

ARE BANKS AFFECTED BY THEIR HOLDINGS OF GOVERNMENT DEBT?

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Highlights

- Banking and sovereign risk in the euro area are highly correlated. This working paper sheds light on the link. We study the stock market performance and the holdings of government debt of the banks stress tested by the European Banking Authority in July and December 2011. Banks' holdings of the sovereign bonds of vulnerable countries generally decreased during the period December 2010 to September 2011.
- The average stock market performance of each country's banks was very uneven. The European Central Bank's long-term refinancing operation (LTRO) had no material effect on banks' stock market values in the countries under consideration. Greek debt holdings had an effect on banks' market values in the period July to October 2011. After October, this effect disappeared. Holdings of Italian and Irish debt had a material effect on banks' market value in the period October to December 2011. Holdings of debt of other periphery countries, in particular Spain, were not an issue. The July PSI deal did not substantially affect the risk resulting from holdings of debt other than Greek debt.
- The location of banks matters for their market value.

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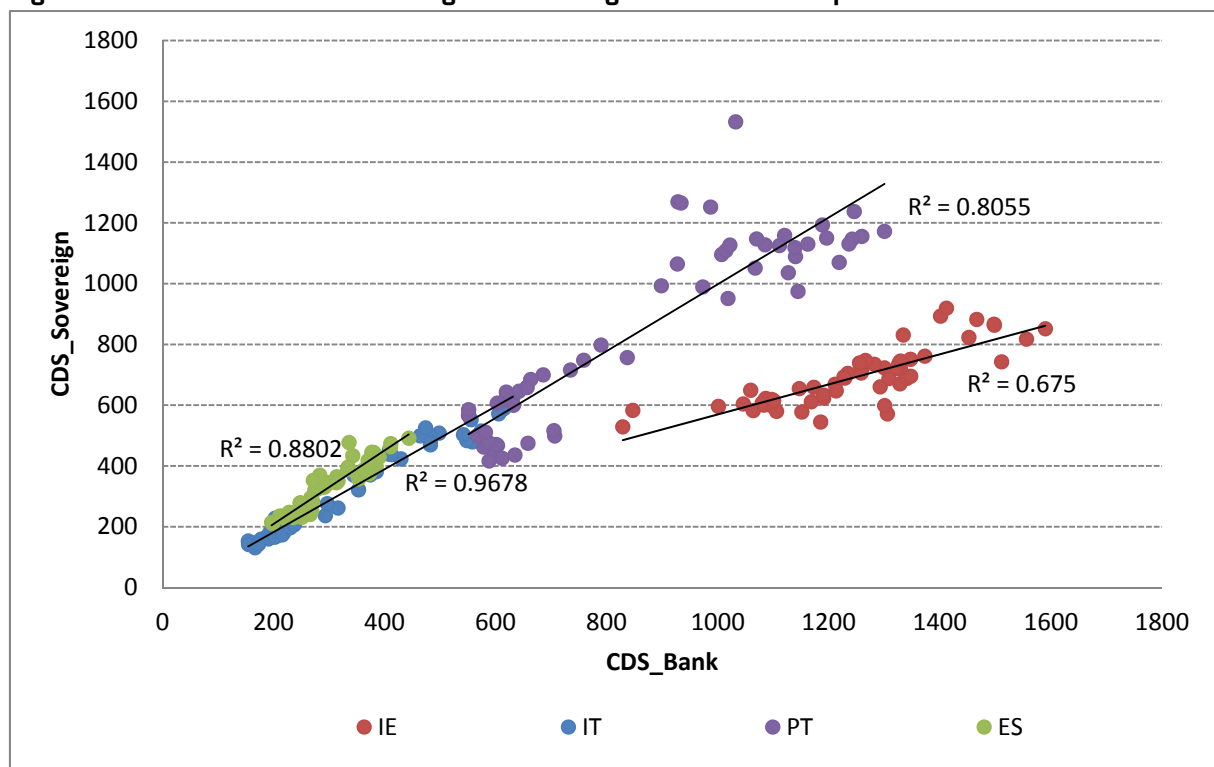


Introduction

The strong link between sovereign and banking stress is frequently emphasised, especially since the start of the European sovereign debt crisis. Figure 1 underscores the interdependence between sovereign and banking risk by showing that sovereign and bank credit default swaps (CDS) were positively correlated during 2011 for a number of euro-area countries. It is worth noting that the same graphical result holds not only for periphery countries but also for stronger EU economies such as Germany and France. However, the reasons for the interconnectedness between financial and sovereign sector risk are little understood. Our paper sheds light on this link.

A recent paper (BIS, 2011) recognises four main channels through which a deterioration in the creditworthiness of a sovereign can have an impact on the banking system. First, banks' holdings of sovereign government debt have a negative impact on banks' assets in case the sovereign has problems. Second, higher sovereign risk reduces the value of collateral that can be used for funding. Third, sovereign downgrades normally translate into lower ratings for banks located in the downgraded country. Lastly, increased sovereign risk reduces the value of the implicit/explicit government guarantees to banks. However, Gray (2009) highlights the lack of proper measurement and analysis of risks associated with the interdependence of financial and sovereign sectors. The literature so far has not strongly and empirically established that the holding of government debt by banks actually matters for bank stress. Our paper aims to deal with this issue in the context of the euro area.

Figure 1: Correlation between sovereign and banking credit default swaps



Source: Bruegel calculations with data from Datastream and Macrobond.

Note: Weekly averages from January 2011 to February 2012. Banking CDS by country are calculated as weighted averages of CDS of the individual banks considered for each country. The graph for Greece is not displayed since it is characterised by hyperbolic pattern. The same graphical result holds not only for periphery countries but also for stronger EU economies such as Germany and France.

Various studies have analysed the spillovers from banks to sovereigns. Mody (2009) documented that, following the rescue of Bear Stearns in mid-March 2008, the domestic financial sector has become a driver of sovereign CDS spreads. Mody and Sandri (2011) recognised that sovereign spreads mirror the domestic vulnerabilities of national banking sectors and that this feedback loop has more a severe impact on countries with high debt-to-GDP ratios. Gerlach, Schulz and Wolff (2010) show that sovereign risk premia increase with the size of the banking system during periods of financial crisis, in particular following the implementation of government rescue packages. Similarly, Pisani-Ferry (2012) shows that bank asset size has become large relative to tax revenues, suggesting that small problems in the banking system can become an issue for government solvency. The explanation of the risk spillovers from banks to sovereigns relies on the explicit and implicit government guarantees for the banks in their jurisdictions. In addition, the importance for the real economy of a sound banking sector makes governments implicitly responsible for the domestic financial system. Thus, in periods of financial crisis, the implicit guarantee is likely to become actual and this impacts directly the level of sovereign risk (Gray *et al*, 2008; Gerlach, Schulz and Wolff, 2010; Pisani-Ferry, 2012). Reinhart and Rogoff (2009) show that historically public debt-to-GDP ratios are higher following a country's banking crisis. The deterioration of sovereign creditworthiness is, however, only partly due to cost of rescuing troubled banks. The main explanation is the economic slowdown caused by the banking crisis.

Another literature focuses on the impact of sovereign risk on banking risk and discusses potential channels by which sovereign and banking stress can be mutually reinforcing. Banking risk translates into higher sovereign risk, while banking risk may be driven by sovereign problems (Acharya *et al*, 2011). Similarly, sovereign risk is linked with the likelihood of financial sector bailout, since the cost of rescuing the domestic banking sector translates into a deterioration of the sovereign's creditworthiness. On the other hand, the sovereign credit risk's feedback to the financial sector is explained by the direct holding of government debt in banks' assets and by the existence of explicit/implicit government guarantees. Dieckmann and Plank (2010) find a negative relationship between banks and sovereign credit default swaps while rescue packages are being put in place, and a positive correlation afterwards. Alter and Schüler (2011) find that the pre-bailout direction of contagion is from financial sector to governments, while in post-bailout periods, sovereign CDS spreads were drivers of banks' credit default swaps. Recent literature has focused on the increased holding of government debt by domestic residents. Merler and Pisani-Ferry (2012), for example, establish that domestic banks in particular are holding more domestic government debt since the Lehman bankruptcy. This increased holding increases the potential for negative feed-back loops between sovereign stress and banking stress¹. Wolff (2011) shows that banks' market valuations from July-October 2011 were not affected by the holdings of government debt of Italy, Spain, Portugal and Ireland. Only a clear relationship between Greek holdings and market valuation was established. This was seen as evidence that the promise of euro-area heads of state and government to keep private sector involvement restricted to Greece was perceived as credible.

This paper focuses on the first channel of transmission from sovereigns to banks, according to BIS terminology, namely the sovereign debt portfolios held as assets in the banking systems. In particular, it takes a deeper look into the microeconomic link between banks' balance sheet holdings of government debt, and their perceived riskiness and market valuation. We base our analysis on the European Banking

¹ At the same time, the reduced cross-border holdings may be beneficial for financial stability as country stress has less implications for the partner countries in the euro area.

Authority (EBA) July 2011 stress test of 90 banks, and on the EBA's December 2011 EU capital exercise. This detailed data source allows us to investigate the change in exposure to sovereigns during 2011 and banks' valuations of their holdings of government debt of different euro-area countries. We also study if the recent long-term refinancing (LTRO) has had a beneficial effect on banks' stock market value.

The remainder of the paper is structured as follows. The next section presents statistics on banking stress and banks' balance sheets. In section 3, we explore the link between the two, comparing in particular the periods July-October, October-December and April-July 2011. Section 4 presents robustness checks using CDS contracts as an alternative to stock market valuation. Section 5 concludes.

2) Banking stress and banks' balance sheets

Stress in the interbank market increased steeply after July 2011 (Figure 2). In particular, the Euribor-Eonia Swap spread recorded a first peak at the end of September 2011. A second peak occurred in December 2011, with spreads reaching the value of 100 basis points.

Figure 2: Euribor-Eonia swap spread

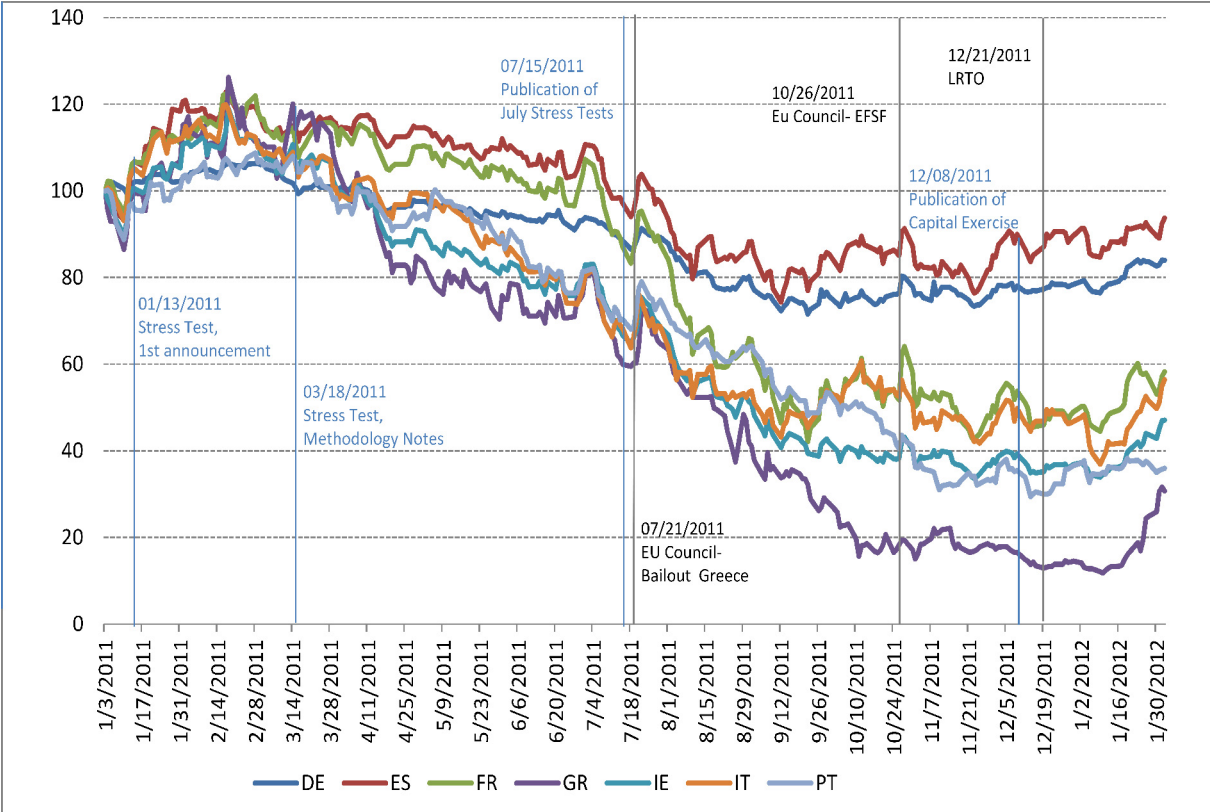


Source: Bruegel calculations with data from Datastream.

At the same time, banks' stock prices on average developed differently during 2011 in the different countries. In Figure 3, we normalise the simple average bank stock market index consisting of the banks located in one country to 100 on January 2011. The stock market valuation of Greek banks declined by the greatest amount, followed by Portuguese, Irish, Italian, French and German banks. We plot the dates of the European Council meetings of 21 July and 26 October, and the 21 December starting date of the European Central Bank's three-year LTRO. Both summits seem to have had a one-day impact on the market performances of counties' banking systems but did not fundamentally alter the long-term trends

underlying the banks' stock market performance. The LTROs of 21 December 2011 also did not lead to a significant change in the trend as bank stocks have continued to move sideways since the October summit. The graph also highlights some banking-specific events, such as the dates of the announcement and publication of stress tests. The initial announcement of the 2011 stress test was welcomed by the markets as an exercise aimed at increasing bank transparency. However, the release of the methodological notes and the publication of the results in July and in December do not seem to have materially changed stock price trends. Thus, as stressed by Petrella and Resti (2011), the EBA supervisory exercises failed to reverse the decline in banks performance caused by the sovereign debt crisis.

Figure 3: Average stock price performances during 2011, by country



Source: Bruegel calculations with data from Datastream and Macrobond.
 Note: Daily data, normalised.

To form a better view of stock market valuation differences across countries, we study average stock market changes in four periods: (1) the 12 weeks before the publication of the first stress test, ie 25 April to 18 July 2011; (2) the 12 weeks after the publication of the stress test, ie 18 July to 3 October; (3) the period October to 21 December, when the three-year LTR0 entered into force; and (4) the period since the start of the LTR0 up to now. Looking at the country-level bank prices' changes (Table 1), Greece, Italian, Portuguese and Irish banking systems faced the highest negative changes from April-July and July-September. Interestingly, the French banking system experienced a huge negative price change in the period following the publications of the July stress test results. This may have been a consequence of their high disclosed exposures towards the Greek, Irish, Italian, Portuguese and Spanish sovereigns. In the last period, on average the weekly price changes have been positive for all the countries, even though they have also been associated with increased volatility.

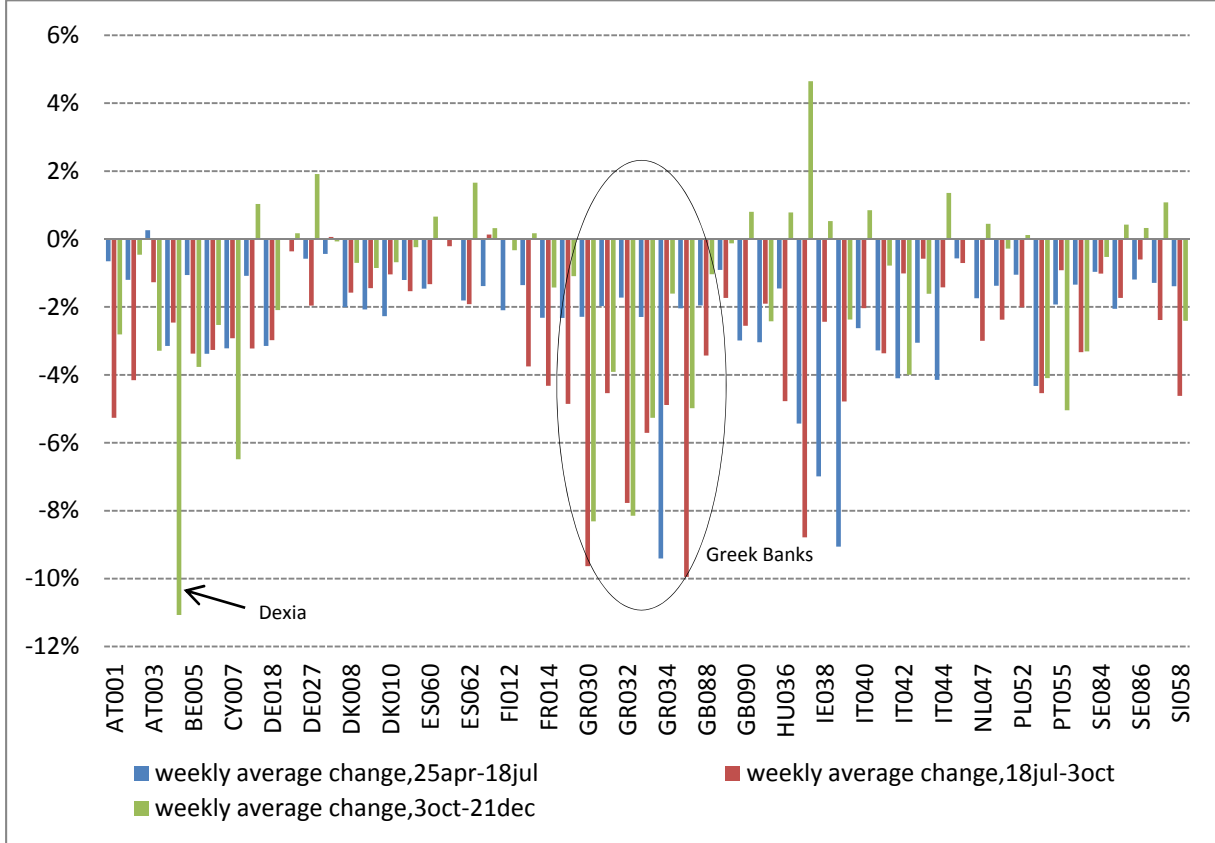
Table 1: Summary statistics on the arithmetic average changes in stock market valuation, broken down by countries

| | DE | ES | FR | GR | IE | IT | PT |
|-----------------------------------|--------|--------|--------|--------|--------|--------|--------|
| Weekly change, 25apr-18jul | -0.96% | -1.36% | -1.82% | -2.44% | -6.08% | -3.18% | -2.36% |
| Weekly change, 18jul-3oct | -1.43% | -0.82% | -3.74% | -5.91% | -4.54% | -1.33% | -2.67% |
| Weekly change, 3oct-21dec | 0.36% | 0.58% | -0.33% | -3.83% | 1.81% | -0.43% | -3.62% |
| Weekly change, 21dec-30jan | 1.98% | 0.05% | 2.80% | 14.01% | 5.84% | 1.55% | 2.98% |

Source: Bruegel calculations with data from Datastream and Macrobond.

In Figure 4, we report the weekly average growth rate of the individual banks' stock market index for three consecutive 12-week periods from April to December 2011. In the periods April-mid July and mid July-September, negative values for all the banks in the sample were recorded. In the period October-December, the weekly average change recorded slightly more positive values.

Figure 4: Weekly average growth rate in banks' stock prices



Source: Bruegel calculations with data from Datastream and Macrobond.

We now turn to banks' exposure to sovereign debt. Table 2 shows the exposure of the French, German, Greek, Irish, Italian, Portuguese and Spanish banking systems towards the sovereign debts² of the five so-called "periphery" countries. Data comes from the EBA's recapitalisation exercise, published on 8 December 2011³, and from the July 2011 exercise. The total sample of the EU capital exercise comprises 71 banks, but the EBA disclosed bank-by-bank figures only for 65 banks. They are among the 91 banks analysed in the 2011 EU-wide stress test. In December's exercise, a subset of small non cross-border banks (in particular belonging to the set of stress tested Spanish banks) were excluded. In addition, since Greek banks are under the EU/IMF assistance programme, their data was not disclosed. Thus, we end up with updated data of banking exposure to sovereigns for 65 European banks. For the purpose of comparison, only those banks for which data is available from both exercises are analysed in Table 2⁴.

In the table, countries' exposures towards periphery countries are determined as the aggregate value of the exposures of their individual banks. The same set of banks analysed in the two periods is compared: the French and German banking systems reduced their exposures towards all the periphery sovereigns. The pattern of the sovereign exposure of the Greek, Irish, Italian, Portuguese and Spanish banking systems is less homogeneous, even if there is again generally a reduction of exposure⁵.

Table 2: Exposure of banks to sovereigns as reported in December's Capital Exercise and in July's Stress Test Exercise by EBA (€ billions), the same set of banks

| | GR | | IE | | IT | | PT | | ES | | Total | |
|-----------|------|------|------|------|-------|-------|------|------|-------|-------|-------|-------|
| | Dec. | Jul. | Dec. | Jul. | Dec. | Jul. | Dec. | Jul. | Dec. | Jul. | Dec. | Jul. |
| FR | 7.5 | 10.1 | 1.8 | 2.1 | 41.8 | 53.0 | 3.6 | 4.8 | 11.4 | 14.6 | 66.1 | 84.6 |
| DE | 6.3 | 7.9 | 0.9 | 1.0 | 29.8 | 36.8 | 3.9 | 3.6 | 17.7 | 18.6 | 58.5 | 67.9 |
| GR | na | 54.4 | Na | 0.0 | na | 0.1 | na | 0.0 | na | 0.0 | 0.0 | 54.6 |
| IE | 0.0 | 0.0 | 12.5 | 12.5 | 0.2 | 0.8 | 0.1 | 0.2 | 0.0 | 0.3 | 12.8 | 13.9 |
| IT | 1.5 | 1.4 | 0.2 | 0.2 | 156.0 | 164.0 | 0.3 | 0.4 | 3.8 | 3.2 | 161.8 | 169.2 |
| PT | 1.0 | 1.4 | 0.5 | 0.5 | 1.0 | 1.0 | 22.7 | 19.6 | 0.1 | 0.3 | 25.4 | 22.8 |
| ES | 0.3 | 0.4 | 0.0 | 0.0 | 6.9 | 6.4 | 3.4 | 5.0 | 167.6 | 171.5 | 178.2 | 183.3 |

Source: Bruegel calculations with data from EBA, July and December 2011.

The changes in a country's overall exposure reflect, of course, the portfolio decisions of individual banks. In Figures 4 and 5, we show the change in sovereign exposures expressed in percentage of Core Tier 1 capital of the above-listed countries. This ratio makes the figures of sovereign exposure highly

² As defined by the EBA, "Sovereign debt exposures for the purpose of the capital exercise are those towards the central, regional and local governments of the European Economic Area (EEA) countries. They include direct and indirect sovereign exposures (i.e., on- and off-balance sheet) in the trading and in the banking book. Central bank deposits are not included." (EU 2011 Capital Exercise-Methodological Note, EBA)

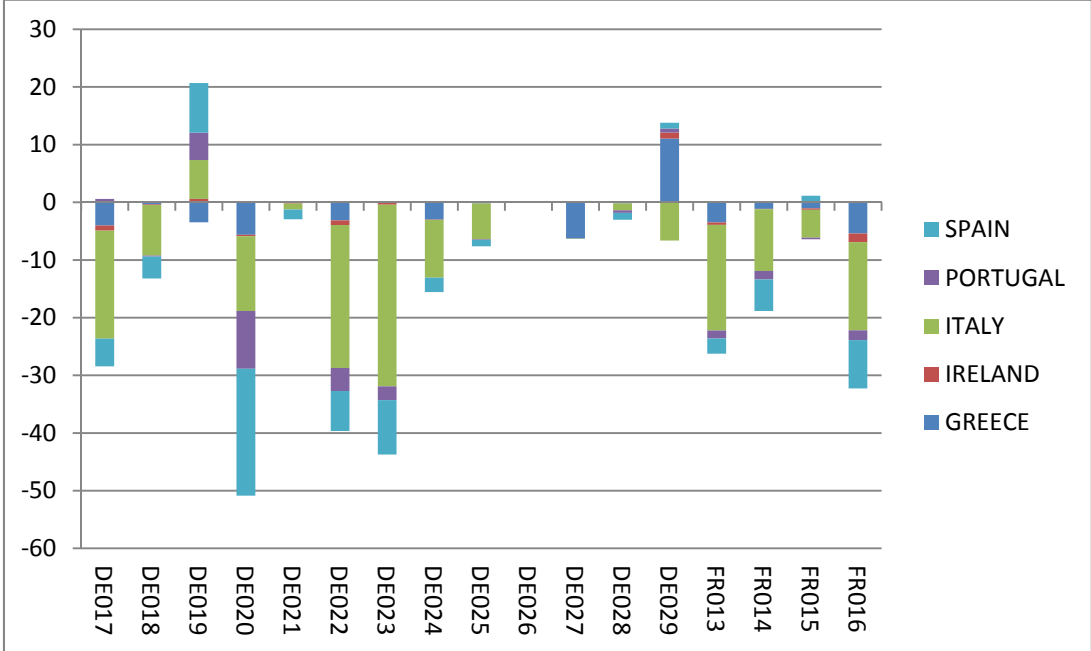
³ 2011 EU Capital Exercise was published on 8 December 2011 and contains sovereign exposure data as of 30 September 2011. The 2011 EU-wide stress test was published on 15 July and it is based on 31 December 2010 information.

⁴ See Annex for the list of banks.

⁵ It must be noted that the aggregate exposure of the Spanish banking system toward domestic sovereign securities reported in Table 2.2 in the Annex is higher than that reported in Table 2 because many Spanish banks were excluded from the December exercise (Table 2.3 in the Annex).

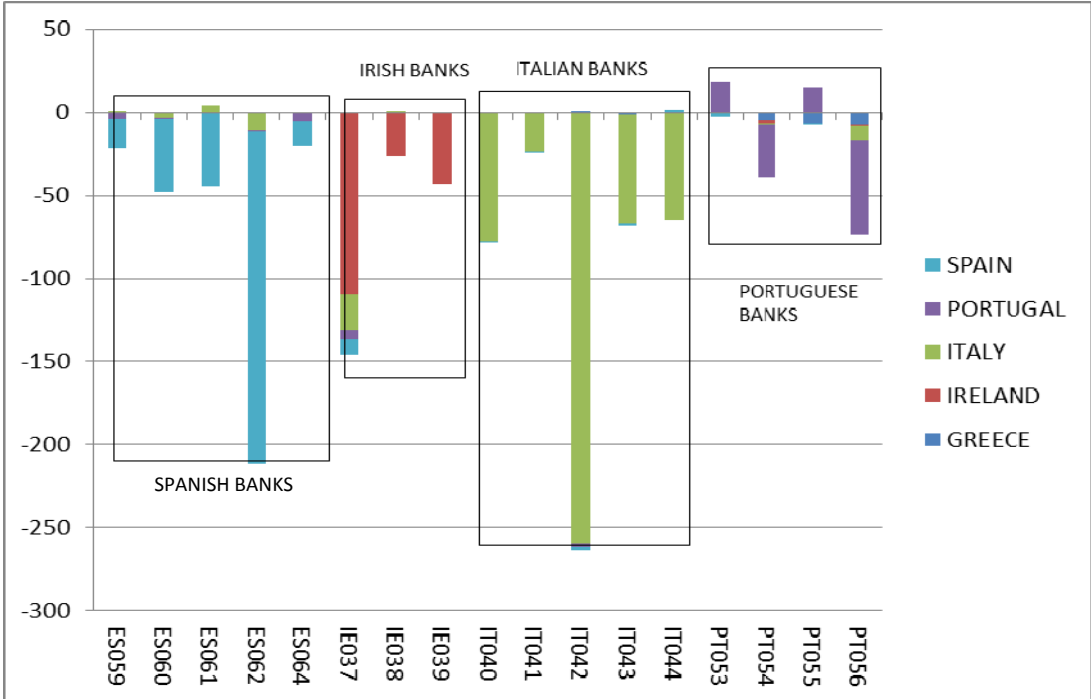
comparable across different banks and gives an indication of the sovereign risk position of each financial institutions vis-à-vis its capital adequacy.

Figure 5: Difference in French and German bank exposures to Greek, Irish, Italian, Portuguese and Spanish sovereigns, in percent of Tier 1 capital, between December Capital Exercise and July stress test



Source: Bruegel calculations with data from EBA, July and December 2011.

Figure 6: Difference in periphery country bank exposures to Greek, Irish, Italian, Portuguese and Spanish sovereigns, in percent of Tier 1 capital, between December Capital Exercise and July stress test



Source: Bruegel calculations with data from EBA, July and December 2011.

With the exception of two cases, all German and French banks reduced their exposure, in particular towards Italian and Spanish sovereigns, between the July to the December publications of stress test results, ie for the reporting time December 2010 to September 2011. The behavior of banks in the periphery countries is worth noting: the main result was a reduction of banking exposure towards their home country's sovereign. Two conclusions can be drawn: first, these observations represent a confirmation of the euro-area banking system's home bias in government-bond portfolio allocations. As confirmed by Table 1, banks are highly and mainly exposed to the sovereign debt securities of the countries in which they are based. While Merler and Pisani-Ferry (2012) find an increase in domestic exposure in percent of marketable debt between 2007-11, this increase slowed or reversed during 2011. Second, for France and Germany there is a clear reduction in exposure expressed both in € billions and the percentage of Core Tier 1 capital; for the periphery countries the reduction in exposure is evident when expressed in percentage of Core Tier 1 capital, but less so in absolute amounts. This implies that these banks followed a strategy of increasing the amount of equity (Core Tier 1 capital), rather than of selling huge amounts of government debt securities.

In this regard, Table 3 provides a more detailed overview of the values of Core Tier 1 capital as reported in the two EBA exercises, and the changes between the two periods. The result shows that the banks in the analysed countries have overall increased their levels of Core Tier 1 capital. The increase has been significant for banks located both in the periphery countries and in France and Germany. This highlights a generalised tendency towards more sound capital adequacy of banks.

Table 3: Difference in Core Tier 1 capital (€ millions), the same set of banks

| | Dec. | July | Difference | Change in % |
|----|-----------|-----------|------------|-------------|
| FR | 211,564.8 | 161,396.1 | 50,168.6 | 31.08% |
| DE | 154,877.2 | 114,316.9 | 40,560.4 | 35.48% |
| GR | na | 22,778.0 | na | na |
| IE | 30,814.9 | 12,387.1 | 18,427.9 | 148.77% |
| IT | 108,408.1 | 80,195.3 | 28,212.9 | 35.18% |
| PT | 19,781.6 | 16,682.9 | 3,098.7 | 18.57% |
| ES | 132,944.5 | 101,264.6 | 31,679.9 | 31.28% |

Source: Bruegel calculations with data from EBA, July and December 2011.

There are at least four reasons for the seeming inconsistency between our findings and those of Merler and Pisani-Ferry (2012). First, and most importantly, the two analyses rely on different definitions of banks. Merler and Pisani-Ferry focus on resident banks, defined as banks located and operating in a given country as captured by national accounts. In our case, in accordance with the EBA's methodology, we look at the entire bank groups, ie in the words of the EBA: "the exercise is conducted at the highest level of consolidation, covering all subsidiaries and branches operating in foreign countries"⁶. Second, again following the EBA's approach, our sample of banks considered for each country is not representative of a country's whole banking system: banks are selected as "covering over 65% of the EU banking system total assets, and at least 50% of the national banking sectors in each EU Member State, as expressed in terms of total consolidated assets as of end of 2010". Thus, even if this analysis provides evidence for the most important EU banks, the aggregate figures of the whole banking systems might tell a slightly

⁶ [http://www.eba.europa.eu/cebs/media/Publications/Other%20Publications/2011%20EU-wide%20stress%20test/EBA-ST-2011-004-\(Detailed-Methodological-Note\)_1.pdf](http://www.eba.europa.eu/cebs/media/Publications/Other%20Publications/2011%20EU-wide%20stress%20test/EBA-ST-2011-004-(Detailed-Methodological-Note)_1.pdf)

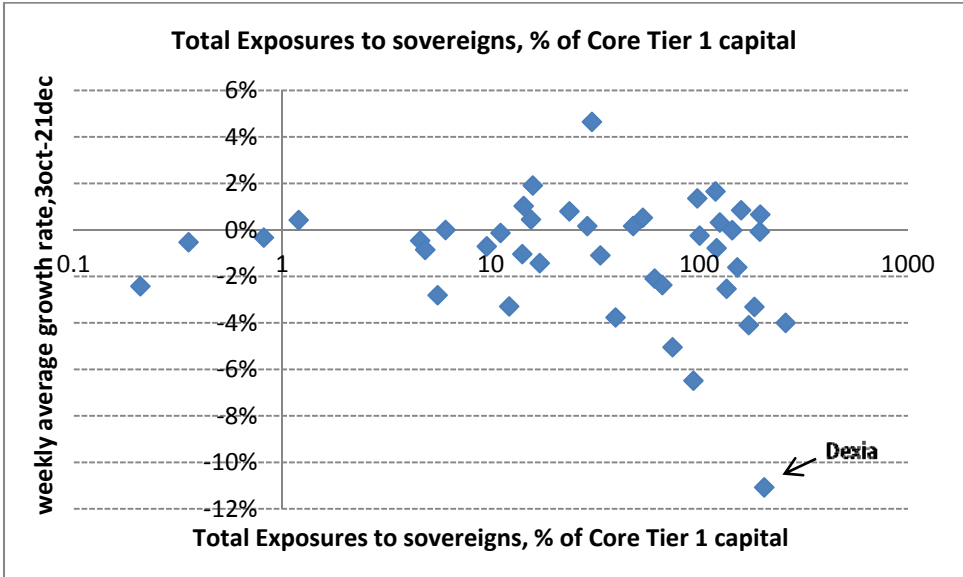
different story. Third, as pointed out above, the diminished exposures towards sovereign securities, in percentage of Core Tier 1 capital, can be explained also by an increase in the Core Tier 1-denominator. Fourth, the periods under consideration are different. In Merler and Pisani-Ferry, the analysis covers 2007 to the second quarter of 2011, whereas we focus on 2011 only, with a special interest in within-2011 patterns. Thus an increase in government debt portfolios during 2007-2011 does not exclude reduced sovereign exposure during 2011. Finally, the two analyses rely on different data sources: in Merler and Pisani-Ferry, data comes from national sources, such as national central banks, statistical authorities and treasuries, while our study is based on data provided by the EBA.

3) Bank valuation and sovereign bond holdings

We now investigate the relationship between changes in banks' stock prices and their exposure towards debt securities issued by the Greek, Irish, Italian, Portuguese and Spanish governments. We focus on the period October to December 2011 and contrast the findings with the results of Wolff (2011), who investigated the period July to October 2011, and with empirical evidence from the period April to July 2011.

Figure 7.1 plots the average weekly change from October to December 2011 in banks' stock prices against their total exposure toward periphery country sovereigns in percentage of Core Tier 1 capital⁷. As the pattern shows, there is no clear correlation between the two series. It must be noted that banks with an exposure exceeding 100 percent of Core Tier 1 capital are mostly located in Spain, Italy, Cyprus and Portugal. Moreover, Dexia stands out as an outlier in terms of its stock market valuation: this reflects, of course, the troubles experienced by the Belgian bank in late 2011, and has no clear and immediate connection with its exposure to sovereigns.

Figure 7.1: Change in stock market index to total exposure to sovereigns in percent of Tier 1 capital

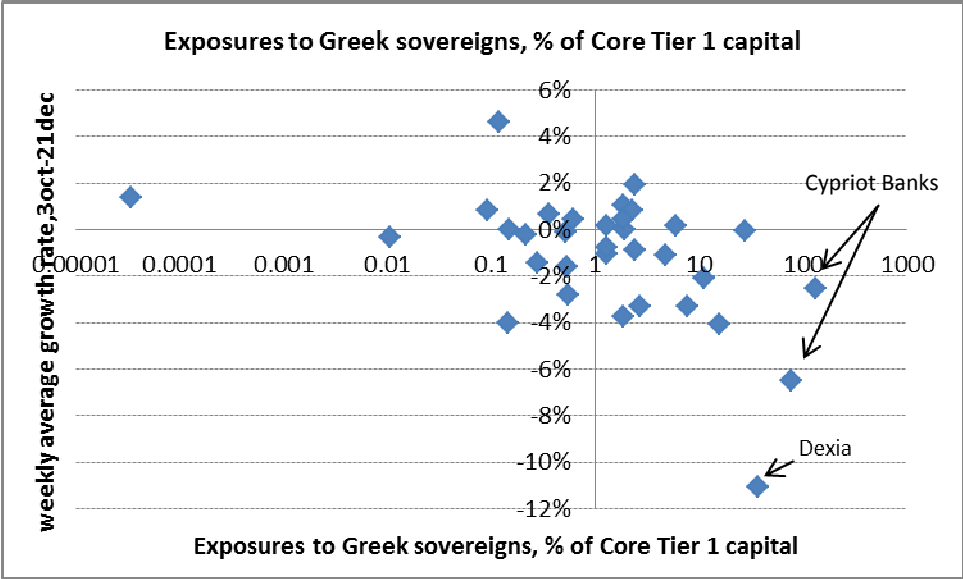


Source: Bruegel calculations with data from EBA, December 2011, Datastream and Macrobond.
 Note: Total exposure refers the exposure of the banks under consideration to the sum of Greek, Irish, Italian, Portuguese and Spanish sovereign debt. The sample does not include Greek banks since EBA does not disclose their relative figures in 2011 EU Capital Exercise.

⁷ Figures for the period October 2011 to January 2012 look similar.

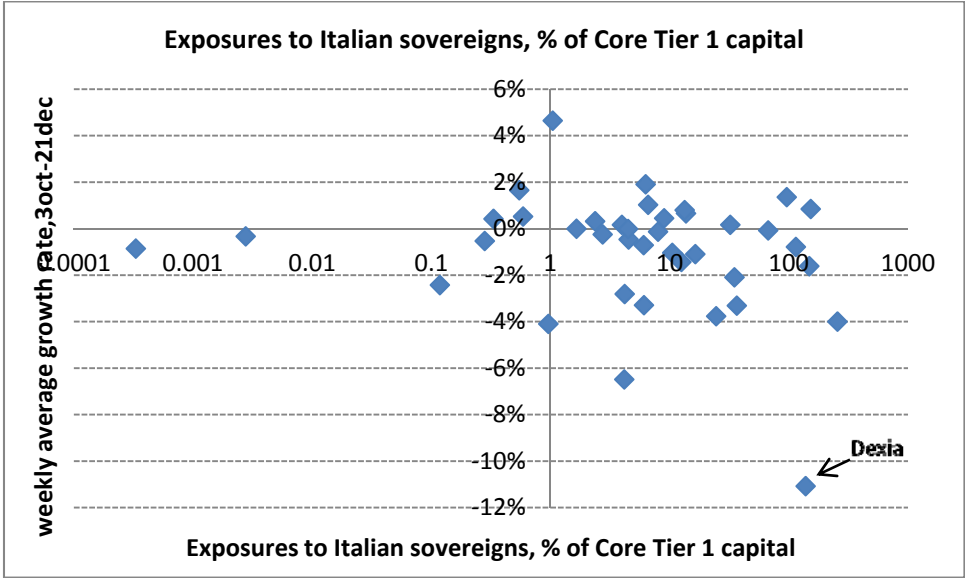
The same conclusion holds when the exposure towards individual periphery countries, rather than the aggregate value, is plotted against changes in banks' stock prices. The scatter plots in Figures 7.2 and 7.3 show that price changes are not correlated with the exposure towards Greek sovereigns (Figure 7.2) and Italian sovereigns (Figure 7.3). Thus the graphic analysis seems to suggest that the exposure of European banks' asset portfolios towards periphery sovereigns is not a clear-cut determinant of their performances in financial markets.

Figure 7.2: Change in stock market index to exposure to Greek sovereigns in percent of Tier 1 capital



Source: Bruegel calculations with data from EBA, December 2011, Datastream and Macrobond.
 Note: The sample does not include Greek banks since EBA does not disclose their relative figures in 2011 EU Capital Exercise.

Figure 7.3: Change in stock market index to exposure to Italian sovereigns in percent of Tier 1 capital



Source: Bruegel calculations with data from EBA, December 2011, Datastream and Macrobond.

However, the xy-scatterplots leave out a number of important control variables, in particular related to banks' capitalisation, size and location. We therefore perform a regression analysis to study the impact of

sovereign debt portfolios on banks' market performances. More precisely, the dependent variable is the average growth rate of banks' stock prices. We consider as explanatory variables the exposures towards each of the five periphery countries in percent of Core Tier 1 capital. Moreover, Core Tier 1 ratio and risk-weight assets are included in the regression as controls for banks' size. The analysis is conducted both without and with the inclusion of country dummies, and with a restricted sample that excludes banks headquartered in the periphery countries.

Considering the stock price growth rate in the period October-December 2011⁸, exposure towards the Italian sovereign (as reported in December's exercise) is estimated to have had a negative impact on banks' market performances, with its coefficient negative and statistically significant in most specifications. In particular, in specification 2 (Table 4), in which we include all banks in all countries and control for banks' average performance per country with country dummies, we find a statistically highly significant and negative coefficient for banks' holdings of Italian government debt. In specifications 3-5, we exclude the banks located in the five concerned periphery countries. In specification 3, the coefficient fails to be statistically significant. Apparently, when looking only at banks outside of the five countries and when controlling for the location of that country, no significant effect is found. When we stop controlling for the country location of the bank, ie drop the country dummies in specification 4, we find a highly significant coefficient. In specification 5, we control only for the average performance of French and German banks and continue to find a significant effect. It thus appears that cross-country variations of holdings of Italian debt matter. A similar story emerges for the holdings of Irish sovereign debt and to a lesser extent for Portuguese debt. In contrast, the holdings of Spanish debt do not appear to matter at all for the market valuation of banks, within the concerned countries or in the EU as whole.

Interestingly, when the dependent variable is the stock price change during the period July-September 2011 (Table 5), neither Italian nor Spanish nor Portuguese sovereign exposures (as reported in July exercise) are found to be a determinant of banks' stock prices. The coefficient of Greek exposure and Irish exposure turns out to be negative and significant only in those specifications in which the banks of the periphery countries are included. We replicate the regression by Wolff (2011) for convenience.

⁸ The same results hold if the regression analysis is performed with the stock price growth rates in the periods October-January and with the exclusion of the outlier Dexia.

Table 4: Average stock price growth rate, October-December and December exposures

| VARIABLES | (1) Oct-Dec | (2) Oct-Dec | (3) Oct-Dec | (4) Oct-Dec | (5) Oct-Dec |
|-----------------|----------------------------|-----------------------------|--------------------------|-----------------------------|-----------------------------|
| ln_dec_rwa | 0.001003 (0.400147) | -0.001441 (-0.387218) | 0.002156 (0.489946) | 0.002397 (1.431581) | 0.001660 (0.964417) |
| dec_ct1ratio | 0.230912* (1.779526) | 0.192780 (1.367152) | 0.461355 (1.773101) | 0.244073** (2.474888) | 0.234622** (2.438509) |
| dec_gr | -0.000299** (-2.040776) | 0.000116 (0.346316) | 0.000753 (0.818887) | -0.000047 (-0.458263) | -0.000058 (-0.573280) |
| dec_ie | -0.000197 (-0.675823) | -0.001506*** (-2.857663) | 0.000270 (0.060928) | -0.003284*** (-3.059771) | -0.003125*** (-2.933537) |
| dec_it | -0.000101 (-1.663961) | -0.000364*** (-3.679081) | -0.000607 (-1.075208) | -0.001144*** (-5.465925) | -0.001248*** (-5.944567) |
| dec_pt | -0.000197* (-1.816445) | 0.000272 (0.994563) | -0.000627 (-0.134930) | 0.003107* (1.915629) | 0.004384** (2.542977) |
| dec_es | 0.000105 (1.350461) | 0.000238 (1.222882) | 0.000722 (0.850443) | 0.000822* (1.827731) | 0.000183 (0.309147) |
| Constant | -0.043507 (-1.300987) | -0.047630 (-0.780302) | -0.187330 (-1.423369) | -0.058973** (-2.635447) | -0.050477** (-2.256431) |
| Country Dummies | No | Yes | Yes | No | FR and DE only |
| Observations | 49 | 49 | 33 | 33 | 33 |
| R-squared | 0.401766 | 0.832293 | 0.902813 | 0.808141 | 0.834534 |
| r2_a | 0.300 | 0.650 | 0.717 | 0.754 | 0.770 |

Table 5: Average stock price growth rate, July-September and July exposures

| VARIABLES | (1) Jul-Sep | (2) Jul-Sep | (3) Jul-Sep | (4) Jul-Sep | (5) Jul-Sep |
|-----------------|-----------------------------|-----------------------------|---------------------------|---------------------------|--------------------------|
| ln_jul_rwa | -0.002699 (-1.147852) | -0.008436** (-2.545695) | -0.007916* (-1.903037) | -0.000008 (-0.004161) | 0.000500 (0.240677) |
| jul_ct1ratio | -0.149907 (-1.172177) | -0.287035** (-2.262080) | -0.286621 (-1.304200) | 0.225608 (1.604440) | 0.177549 (1.198508) |
| jul_gr | -0.000069*** (-3.599424) | -0.000002 (-0.103843) | -0.000162 (-0.279366) | -0.000039 (-0.448333) | -0.000049 (-0.549720) |
| jul_ie | -0.000320*** (-2.860062) | -0.001062*** (-3.287837) | -0.000172 (-0.071771) | 0.000396 (0.359591) | 0.000464 (0.415362) |
| jul_it | 0.000029 (0.833233) | 0.000022 (0.501166) | -0.000070 (-0.181586) | -0.000400* (-2.042215) | -0.000338 (-1.651020) |
| jul_pt | -0.000058 (-0.722520) | -0.000147 (-1.095011) | 0.002175 (1.088396) | 0.003020* (1.970116) | 0.002713 (1.619884) |
| jul_es | 0.000068 (1.427677) | -0.000054 (-0.682213) | -0.000641 (-1.052455) | -0.000437 (-0.833293) | -0.000389 (-0.601459) |
| Constant | 0.018274 (0.552923) | 0.108582** (2.298672) | 0.092411 (1.536023) | -0.044752 (-1.499024) | -0.045399 (-1.514960) |
| Country Dummies | No | Yes | Yes | No | FR and DE only |
| Observations | 54 | 54 | 32 | 32 | 32 |
| R-squared | 0.367106 | 0.830541 | 0.849967 | 0.335592 | 0.388852 |
| r2_a | 0.271 | 0.667 | 0.535 | 0.142 | 0.139 |

Turning to the earlier period preceding the stress tests, we find a clearly significant effect of the exposure to Greece in both banks within and outside the five periphery countries. Exposure to other countries does not really matter (Table 6).

Table 6: Average stock price growth rate, April-July and July exposures

| VARIABLES | (1) Apr-Jul | (2) Apr-Jul | (3) Apr-Jul | (4) Apr-Jul | (5) Apr-Jul |
|--------------------|-----------------------------|-----------------------------|--------------------------|-----------------------------|-----------------------------|
| ln_jul_rwa | -0.001666 (-1.228777) | -0.000258 (-0.101449) | -0.001694 (-0.445586) | -0.002303* (-1.820519) | -0.002142 (-1.638583) |
| jul_ct1ratio | 0.030593 (0.414780) | 0.086702 (0.890145) | -0.024448 (-0.121697) | -0.134069 (-1.536397) | -0.163516* (-1.753287) |
| jul_gr | -0.000070*** (-6.304044) | -0.000086*** (-5.380054) | 0.000718 (1.354731) | -0.000154*** (-2.849065) | -0.000163*** (-2.931257) |
| jul_ie | -0.000477*** (-7.388896) | 0.000422* (1.704403) | 0.003518 (1.603332) | -0.000137 (-0.200914) | -0.000016 (-0.022949) |
| jul_it | -0.000054*** (-2.695102) | -0.000009 (-0.258212) | -0.000277 (-0.789067) | -0.000068 (-0.555757) | -0.000078 (-0.603156) |
| jul_pt | -0.000033 (-0.704795) | -0.000098 (-0.952191) | -0.000325 (-0.177961) | 0.000037 (0.038875) | 0.000369 (0.349607) |
| jul_es | 0.000027 (0.989248) | -0.000022 (-0.364945) | -0.000373 (-0.671051) | 0.000201 (0.616782) | -0.000028 (-0.067996) |
| Constant | 0.001314 (0.068957) | -0.015906 (-0.438675) | 0.008033 (0.146064) | 0.024402 (1.317113) | 0.025437 (1.348321) |
| Country Dummies | No | Yes | Yes | No | FR and DE only |
| Observations | 54 | 54 | 32 | 32 | 32 |
| R-squared | 0.688300 | 0.852156 | 0.705248 | 0.398414 | 0.430517 |
| r2_a | 0.641 | 0.710 | 0.0863 | 0.223 | 0.198 |

Banks holding significant amounts of Greek debt lost significant market value in the period July to October and in particular April to July 2011. However, the further European Council decisions of 26 October did not seem to have any consequences in terms of further falls in the value of banks stocks; furthermore, stock prices did not react to larger holdings of Greek debt in this period. Instead, large holdings of Italian government bonds are now weighing on the stock market performance of banks. This also holds true, when banks located in the five periphery countries are excluded from the sample. However, when one controls for the location of the bank, the effect of holding Italian debt seems to disappear, suggesting that country location interacts with sovereign exposure to Italy. Similarly, we find such effects for Irish and Portuguese debt.

Attitudes towards Italian debt seem to have changed in the period October-December 2011, with more market participants believing that Italian bond holdings could reduce banks' profits and market values. A number of potential explanations can be offered. First, domestic political difficulties in Italy were particularly virulent and contrasted with the relatively stable political situation in Spain. This difference in political stability may explain why Italy's solvency risk was seen to be increasing significantly. Second, the 26 October summit was followed by a very difficult time in the euro area because of the possibility of a Greek referendum with implications for Greece's euro-area membership. The integrity of the euro area was increasingly brought into question, with political problems in Italy adding fuel to the fire. It is noteworthy that this effect appears to be restricted to Italy, Ireland and Portugal. For Spain, throughout the period we do not find a significant effect.

Overall, the regression results suggest that before October 2011, bank shareholders were really only concerned about Greece. After the discussions in October, the floating of the idea of a Greek referendum and the political difficulties in Italy, the debt of Italy, Ireland and Portugal was increasingly considered to be risky. Only Spanish debt was considered to not be affected by the crisis.

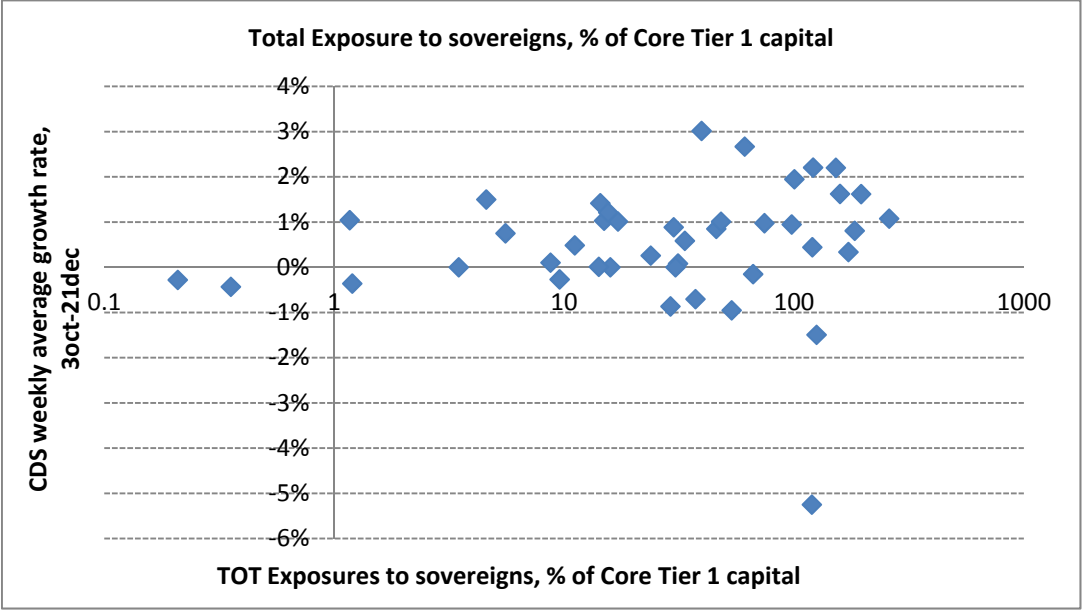
4) Robustness check with CDS data

As a robustness check of our results, we look at the change in the CDS price for sovereign bonds. *A priori*, we expect the results to look relatively similar to the effects on stock market valuation, because the CDS price measures the cost of insurance against losses for bank bonds, while the stock market price measures expectations for the performance of the corporation and its profits. Both measures convey different information but should be correlated⁹. Indeed, a simple scatter-plot analysis shows that the two measures have a fair degree of correlation.

We present our typical scatter plots relating CDS performance to the exposure of individual bank to sovereign bonds. The simple graphical analysis corroborates our previous results. Indeed, Figure 8.1 suggests that no general link between the periphery's debt holdings and the price of insuring the respective banks can be found. However, exposure to Italy does have an effect on the price of insuring the bank holding such debt (Figure 8.3).

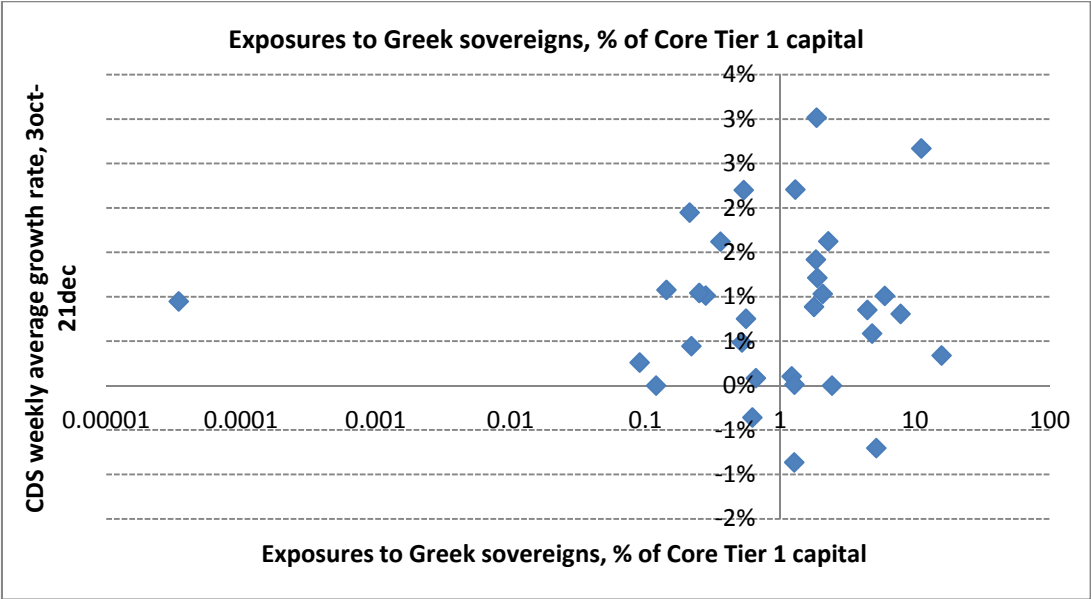
⁹ The annex shows the average CDS price behaviour over 2011 by country (Figure 9). While Figure 2 show a clear downward trend for all countries, CDS price pattern is characterised by upward trend. The comparison of the two figures allows to conclude that the two series move together in opposite directions.

Figure 8.1: Change in CDS prices to total exposure to Greek, Irish, Italian, Portuguese and Spanish sovereigns in percent of Tier 1 capital.



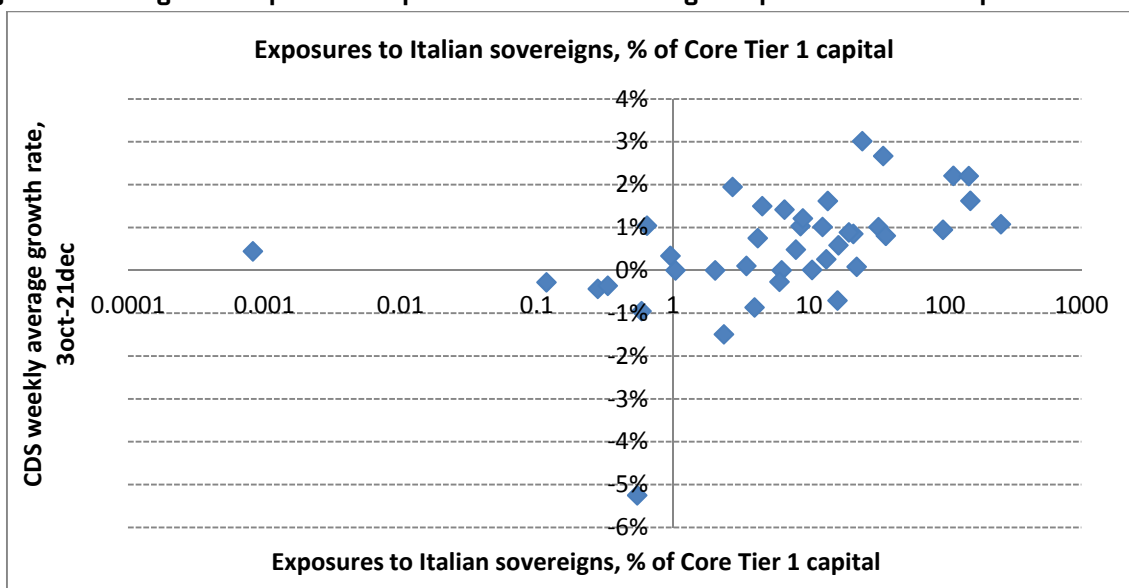
Source: Bruegel calculations with data from EBA, December 2011, Datastream and Macrobond.

Figure 8.2: Change in CDS prices to exposure to Greek sovereigns in percent of Tier 1 capital.



Source: Bruegel calculations with data from EBA, December 2011, Datastream and Macrobond.

Figure 8.3: Change in CDS prices to exposure to Italian sovereigns in percent of Tier 1 capital.



Source: Bruegel calculations with data from EBA, December 2011, Datastream and Macrobond.

5) Conclusions

In this paper we have studied the link between banks' stock market performance and their exposure to the sovereign bonds of countries that are generally considered to be vulnerable. A number of results stand out.

1. First, we have shown that holdings of sovereign bonds of vulnerable countries have generally *decreased* at the level of banks during the period December 2010 to September 2011, the two measurement points of the two stress tests. This is particularly the case when measured in percent of Tier 1 capital. Banks have also managed to increase their capital on average.
2. Second, the average stock market performance of banks has been very uneven across countries during 2011. In addition, the December LTRO had no material effect on banks' stock market values; as regards banks' credit default swaps, again the ECB's measure did not exhibit any substantial effect on the ongoing CDS patterns.
3. Greek debt holdings had a material effect on banks' market values in the period April to October 2011. After October, this effect disappears, suggesting that investors had already to a great extent priced in any Greek default and haircut.
4. Italian debt holdings had a material effect on banks' market values in the period October to December 2011, as did holdings of Irish and to some extent Portuguese debt. Holdings of Spanish debt were not an issue.
5. In the earlier periods, namely April to July and July to October 2011, only Greek debt was partially a matter of concern for the market valuation of banks.
6. The location of banks mattered for their market value. Stock market performance across countries differed markedly. The sovereign-banking link appears to be less related to banks' holdings of sovereign debt: our regression results and scatter plots do not show a very strong relationship between banks' sovereign debt holdings and their market valuations. The strong link between sovereign and bank risk thus appears rather to reflect the crucial importance of the credibility of governments to the viability of the economy and the financial system. A sovereign

debt crisis has severe implications for those holding sovereign debt, and is also highly correlated with economic growth and corporate performance. The sovereign-banking link thus appears to be much more driven by location of banks, and the fact that the economy is a highly integrated system

7. Finally, the July private-sector involvement deal did not really affect the risk resulting from the holding of debt other than Greek debt. Evidence for contagion is only visible as of October 2011, when a number of very detrimental events for the euro area's stability emerged, such as the possibility of a Greek referendum and potential euro-area exit and the political instability in Italy. Political stability in Spain meant that Spanish debt was not priced into banks' market values.

Overall, our results show that the holding of government debt by banks is not the main determinant of the banks' performance. Rather, bank risk and sovereign risk appear to be linked by many other factors including bank location. This means that in the euro area, international investors now consider that country risk has come back. If one wishes to decouple bank from sovereign risk, it will therefore not be sufficient to require banks to hold government debt only against large equity buffers as some have proposed. In fact, a common guarantee similar to the US Federal Deposit Insurance Corporation (FDIC) for the euro area appears necessary. Ultimately, a banking union is required.

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**Annex
Data**

| Country | BankCode | Bank Name | July Stress Test | December Capital Exercise | Stock Prices Data | CDSs Data |
|---------|----------|--|-----------------------|---------------------------|-------------------|-----------|
| AT | AT001 | Erste Group Bank AG | yes | yes | yes | yes |
| AT | AT002 | Raiffeisen Zentralbank Österreich AG | yes | yes | yes | yes |
| AT | AT003 | Österreichische Volksbank AG | yes | yes | yes | missing |
| BE | BE004 | DEXIA | yes | yes | yes | missing |
| BE | BE005 | KBC BANK | yes | yes | yes | yes |
| CY | CY006 | MARFIN POPULAR BANK PUBLIC CO LTD | yes | yes | yes | missing |
| CY | CY007 | BANK OF CYPRUS PUBLIC CO LTD | yes | yes | yes | missing |
| DK | DK008 | DANSKE BANK | yes | yes | yes | yes |
| DK | DK009 | Jyske Bank | yes | yes | yes | missing |
| DK | DK010 | Sydbank | yes | yes | yes | missing |
| DK | DK011 | Nykredit | yes | yes | missing | missing |
| FI | FI012 | OP-Pohjola Group | yes | yes | yes | missing |
| FR | FR013 | BNP PARIBAS | yes | yes | yes | yes |
| FR | FR014 | CREDIT AGRICOLE | yes | yes | yes | yes |
| FR | FR015 | BPCE | yes | yes | missing | missing |
| FR | FR016 | SOCIETE GENERALE | yes | yes | yes | yes |
| DE | DE017 | DEUTSCHE BANK AG | yes | yes | yes | yes |
| DE | DE018 | COMMERZBANK AG | yes | yes | yes | yes |
| DE | DE019 | Landesbank Baden-Württemberg | yes | yes | missing | yes |
| DE | DE020 | DZ BANK AG Dt. Zentral-Genossenschaftsbank | yes | yes | missing | missing |
| DE | DE021 | Bayerische Landesbank | yes | yes | missing | yes |
| DE | DE022 | Norddeutsche Landesbank -GZ | yes | yes | missing | yes |
| DE | DE023 | Hypo Real Estate Holding AG, München | yes | yes | missing | missing |
| DE | DE024 | WestLB AG, Düsseldorf | yes | yes | missing | yes |
| DE | DE025 | HSH Nordbank AG, Hamburg | yes | yes | missing | yes |
| DE | DE026 | Landesbank Hessen-Thüringen GZ, Frankfurt | yes but not disclosed | yes | yes | yes |
| DE | DE027 | Landesbank Berlin AG | yes | yes | yes | yes |
| DE | DE028 | DekaBank Deutsche Girozentrale, Frankfurt | yes | yes | missing | missing |
| DE | DE029 | WGZ BANK AG Westdt. Geno. Zentralbk, Ddf | yes | yes | yes | missing |
| GR | GR030 | EFG EUROBANK ERGASIAS | yes | yes but not disclosed | yes | yes |
| GR | GR031 | NATIONAL BK.OF GREECE | yes | yes but not disclosed | yes | yes |
| GR | GR032 | ALPHA BANK | yes | yes but not disclosed | yes | yes |
| GR | GR033 | BANK OF PIRAEUS | yes | yes but not | yes | missing |

| | | | | | | |
|----|-------|---|-----|-----------------------|---------|---------|
| | | | | disclosed | | |
| GR | GR034 | AGRI.BANK OF GREECE | yes | yes but not disclosed | yes | missing |
| GR | GR035 | TT HELLENIC POSTBANK | yes | yes but not disclosed | yes | yes |
| HU | HU036 | OTP BANK NYRT. | yes | yes | yes | yes |
| IE | IE037 | ALLIED IRISH BANKS PLC | yes | yes | yes | yes |
| IE | IE038 | BANK OF IRELAND | yes | yes | yes | yes |
| IE | IE039 | IRISH LIFE AND PERMANENT | yes | yes | yes | yes |
| IT | IT040 | INTESA SANPAOLO S.p.A | yes | yes | yes | yes |
| IT | IT041 | UNICREDIT S.p.A | yes | yes | yes | yes |
| IT | IT042 | BANCA MONTE DEI PASCHI DI SIENA S.p.A | yes | yes | yes | yes |
| IT | IT043 | BANCO POPOLARE - S.C. | yes | yes | yes | yes |
| IT | IT044 | UNIONE DI BANCHE ITALIANE SCPA (UBI BANCA) | yes | yes | yes | yes |
| LU | LU045 | BANQUE ET CAISSE D'EPARGNE DE L'ETAT | yes | yes | missing | missing |
| MT | MT046 | BANK OF VALLETTA (BOV) | yes | yes | yes | missing |
| NL | NL047 | ING BANK NV | yes | yes | yes | yes |
| NL | NL048 | RABOBANK NEDERLAND | yes | yes | missing | yes |
| NL | NL049 | ABN AMRO BANK NV | yes | yes | missing | yes |
| NL | NL050 | SNS BANK NV | yes | yes | missing | yes |
| NO | NO051 | DnB NOR Bank ASA | yes | yes | yes | yes |
| PL | PL052 | POWSZECHNA KASA OSZCZĘDNOŚCI BANK POLSKI S.A. (PKO BANK POLSKI) | yes | yes | yes | missing |
| PT | PT053 | CAIXA GERAL DE DEPÓSITOS, SA | yes | yes | missing | yes |
| PT | PT054 | BANCO COMERCIAL PORTUGUÊS, SA (BCP OR MILLENNIUM BCP) | yes | yes | yes | yes |
| PT | PT055 | ESPÍRITO SANTO FINANCIAL GROUP, SA (ESFG) | yes | yes | yes | yes |
| PT | PT056 | Banco BPI, SA | yes | yes | yes | yes |
| SI | SI057 | NOVA LJUBLJANSKA BANKA D.D. (NLB d.d.) | yes | yes | missing | missing |
| SI | SI058 | NOVA KREDITNA BANKA MARIBOR D.D. (NKBM d.d.) | yes | yes | yes | missing |
| ES | ES059 | BANCO SANTANDER S.A. | yes | yes | yes | yes |
| ES | ES060 | BANCO BILBAO VIZCAYA ARGENTARIA S.A. (BBVA) | yes | yes | yes | yes |
| ES | ES061 | BFA BANKIA | yes | yes | yes | missing |
| ES | ES062 | CAJA DE AHORROS Y PENSIONES DE BARCELONA | yes | yes | yes | yes |
| ES | ES063 | EFFIBANK | yes | no | no | no |
| ES | ES064 | BANCO POPULAR ESPAÑOL, S.A. | yes | yes | yes | yes |
| ES | ES065 | BANCO DE SABADELL, S.A | yes | no | no | no |
| ES | ES066 | CAIXA D'ESTALVIS DE CATALUNYA, TARRAGONA I MANRESA | yes | no | no | no |
| ES | ES067 | CAIXA DE AFORROS DE GALICIA, VIGO, OURENSE E PONTEVEDRA | yes | no | no | no |

| | | | | | | |
|-------------------------------------|-------|--|-------------------------|-------------------------------|--------------------------|-----|
| ES | ES068 | GRUPO BMN | yes | no | no | no |
| ES | ES069 | BANKINTER, S.A | yes | no | no | no |
| ES | ES070 | CAJA ESPAÑA DE INVERSIONES, SALAMANCA Y SORIA, CAJA DE AHORROS Y MONTE DE PIEDAD | yes | no | no | no |
| ES | ES071 | GRUPO BANCA CIVICA | yes | no | no | no |
| ES | ES072 | CAJA DE AHORROS Y M.P. DE ZARAGOZA, ARAGON Y RIOJA | yes | no | no | no |
| ES | ES073 | MONTE DE PIEDAD Y CAJA DE AHORROS DE RONDA, CADIZ, ALMERIA, MALAGA, ANTEQUERA Y JAEN | yes | no | no | no |
| ES | ES074 | BANCO PASTOR, S.A. | yes | no | no | no |
| ES | ES075 | GRUPO BBK | yes | no | no | no |
| ES | ES076 | CAIXA D'ESTALVIS UNIO DE CAIXES DE MANLLEU, SABADELL I TERRASSA | yes | no | no | no |
| ES | ES077 | CAJA DE AHORROS Y M.P. DE GIPUZKOA Y SAN SEBASTIAN | yes | no | no | no |
| ES | ES078 | GRUPO CAJA3 | yes | no | no | no |
| ES | ES079 | BANCA MARCH | yes | no | no | no |
| ES | ES080 | CAJA DE AHORROS DE VITORIA Y ALAVA | yes | no | no | no |
| ES | ES081 | CAJA DE AHORROS Y M.P. DE ONTINYENT | yes | no | no | no |
| ES | ES082 | COLONYA - CAIXA D'ESTALVIS DE POLLENSA | yes | no | no | no |
| ES | ES083 | CAJA DE AHORROS DEL MEDITERRANEO | yes | no | no | no |
| SE | SE084 | Nordea Bank AB (publ) | yes | yes | yes | yes |
| SE | SE085 | Skandinaviska Enskilda Banken AB (publ) (SEB) | yes | yes | yes | yes |
| SE | SE086 | Svenska Handelsbanken AB (publ) | yes | yes | yes | yes |
| SE | SE087 | Swedbank AB (publ) | yes | yes | yes | yes |
| GB | GB088 | ROYAL BANK OF SCOTLAND GROUP plc | yes | yes | yes | yes |
| GB | GB089 | HSBC HOLDINGS plc | yes | yes | yes | yes |
| GB | GB090 | BARCLAYS plc | yes | yes | yes | yes |
| GB | GB091 | LLOYDS BANKING GROUP plc | yes | yes | yes | yes |
| Number of Banks with available data | | | 90 | 65 | 55 | 50 |
| Data Source | | | 2011 EU Stess Test, EBA | 2011 EU Capital Exercise, EBA | Datastream and Macrobond | |

Table 2.2: Exposure of banks to sovereigns as reported in December's Capital Exercise and in July's Stress Test Exercise by EBA (billions of Euros), whole sample

| | 2011 EU Capital Exercise, December | | | | | 2011 EU Stess Test, July | | | | |
|----|------------------------------------|------|-------|------|-------|--------------------------|------|-------|------|-------|
| | GR | IE | IT | PT | ES | GR | IE | IT | PT | ES |
| FR | 7.5 | 1.8 | 41.8 | 3.6 | 11.4 | 10.1 | 2.1 | 53.0 | 4.8 | 14.6 |
| DE | 6.3 | 0.9 | 30.0 | 4.0 | 19.2 | 7.9 | 1.0 | 36.8 | 3.6 | 18.6 |
| GR | na | na | Na | na | na | 54.4 | 0.0 | 0.1 | 0.0 | 0.0 |
| IE | 0.0 | 12.5 | 0.2 | 0.1 | 0.0 | 0.0 | 12.5 | 0.8 | 0.2 | 0.3 |
| IT | 1.5 | 0.2 | 156.0 | 0.3 | 3.8 | 1.4 | 0.2 | 164.0 | 0.4 | 3.2 |
| PT | 1.0 | 0.5 | 1.0 | 22.7 | 0.1 | 1.4 | 0.5 | 1.0 | 19.6 | 0.3 |
| ES | 0.3 | 0.0 | 6.9 | 3.4 | 167.6 | 0.4 | 0.1 | 7.4 | 5.5 | 231.7 |

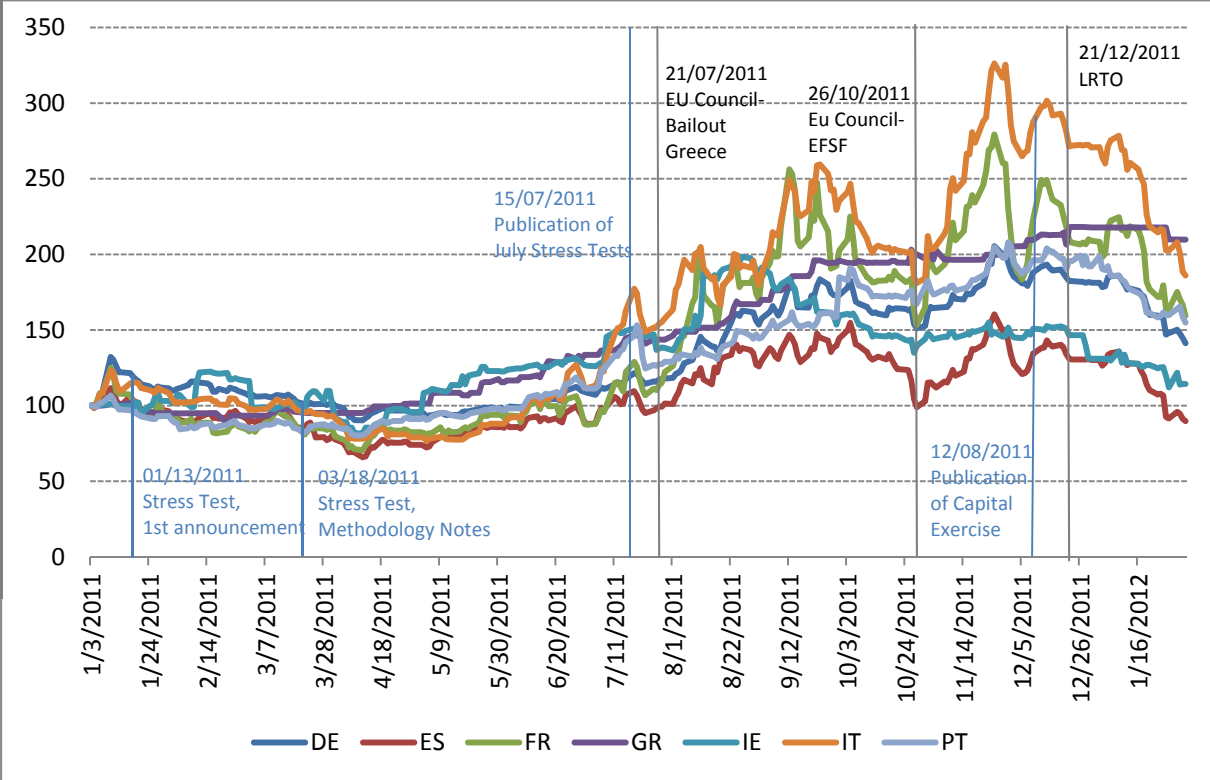
Source: Bruegel calculation with data from EBA, July and December 2011.

Table 2.3: Exposure of banks to sovereigns as reported in July's Stress Test Exercise by EBA (billions of Euros), comparison between whole and restricted sample of banks.

| | 2011-July EU Stess Test, whole sample | | | | | 2011-July EU Stess Test, restricted sample | | | | | Diff. |
|----|---------------------------------------|------|-------|------|-------|--|------|-------|------|-------|-------|
| | GR | IE | IT | PT | ES | GR | IE | IT | PT | ES | |
| FR | 10.1 | 2.1 | 53.0 | 4.8 | 14.6 | 10.1 | 2.1 | 53.0 | 4.8 | 14.6 | 0.0 |
| DE | 7.9 | 1.0 | 36.8 | 3.6 | 18.6 | 7.9 | 1.0 | 36.8 | 3.6 | 18.6 | 0.0 |
| GR | 54.4 | 0.0 | 0.1 | 0.0 | 0.0 | 54.4 | 0.0 | 0.1 | 0.0 | 0.0 | 0.0 |
| IE | 0.0 | 12.5 | 0.8 | 0.2 | 0.3 | 0.0 | 12.5 | 0.8 | 0.2 | 0.3 | 0.0 |
| IT | 1.4 | 0.2 | 164.0 | 0.4 | 3.2 | 1.4 | 0.2 | 164.0 | 0.4 | 3.2 | 0.0 |
| PT | 1.4 | 0.5 | 1.0 | 19.6 | 0.3 | 1.4 | 0.5 | 1.0 | 19.6 | 0.3 | 0.0 |
| ES | 0.4 | 0.1 | 7.4 | 5.5 | 231.7 | 0.4 | 0.0 | 6.4 | 5.0 | 171.5 | 61.9 |

Source: Bruegel calculation with data from EBA, July 2011.

Figure 9: Average CDS Price Performances over 2011, by country



Source: Bruegel calculations with data from Datastream and Macrobond.

Note: Daily data, normalised.