Deutsche Bank Research

Monitoring cross-border exposure

A primer on how to exploit the BIS banking statistics

November 26, 2010

The Bank for International Settlements (BIS) consolidated banking sector statistics provide a comprehensive data set on banks' cross-border exposure. We show how the data can be used most effectively to monitor potential threats to banking sector stability. We explore structural vulnerabilities at the country level, but also look at bilateral exposures within a network context.

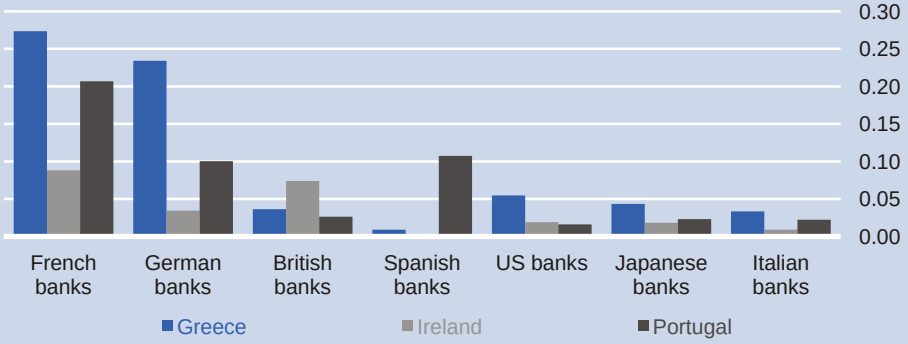
With regard to current hotspots, we find that both Germany and France display relatively high exposure to the euro area's peripheral sovereigns. The data show that German and French banks have a higher share of their exposure directed to the euro area's peripheral sovereigns than most other countries. Moreover, the UK and Germany – but also Belgium and Denmark – have relatively large exposure to the private sector in Ireland, although the BIS figures overstate true exposure due to Ireland's role as a centre for financing vehicles.

Interconnection among the peripheral countries may constitute a further channel for contagion in the euro area. Portugal, for instance, displays large exposures to Spain and Greece but has some exposure also to Ireland, while Spanish banks are significantly exposed to Portugal. Greece, by contrast, has little exposure to other euro-area peripherals but has strong links with Romania, Bulgaria and further Eastern European countries.

The data also show that banks' exposure to the current hotspots seems to be limited if measured against total bank assets. This does not rule out contagion risk due to relatively large exposures of individual banks or non-bank financial institutions. After all, market perceptions of debt sustainability remain an important factor that may affect banking sector stability.

Banks' exposures to the euro area's peripheral countries

Claims on foreign sovereigns in % of total bank assets of lender



Sources: BIS Quarterly Review, national sources, DB Research

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Monitoring banking sector risk

Empirical evidence demonstrates that banking sector risk arises mainly from two sources:

(i) a common exposure of banks to (domestic or foreign) macro risks,[1]

(ii) contagious effects between banks, markets and countries.

In systemic crises, usually both kinds of risk add to and reinforce each other. Thus, both aspects need to be considered when monitoring banking sector risk. Although a number of tools have been developed to assess banking sector risk, there is no consensus yet as to how to measure systemic risk.[2]

[1] Complementing the approach presented in this paper, Weistroffer and Vallés (2009) developed a monitoring tool to assess the risk of macro shocks to the banking sector.

[2] A more elaborate discussion about the challenges of measuring systemic risk can be found in Borio and Drehman (2009).

Country abbreviations

AU	Australia
AT	Austria
BY	Belarus
BE	Belgium
BG	Bulgaria
CA	Canada
HR	Croatia
CY	Cyprus
CZ	Czech Republic
DK	Denmark
EE	Estonia
FI	Finland
FR	France
DE	Germany
GR	Greece
HU	Hungary
IE	Ireland
IT	Italy
JP	Japan
NL	Netherlands
PL	Poland
PT	Portugal
RO	Romania
SP	Serbia
SK	Slovakia
SI	Slovenia
ES	Spain
SE	Sweden
CH	Switzerland
TR	Turkey
UK	United Kingdom
US	United States

Introduction

The Bank for International Settlements (BIS) consolidated banking statistics provide a rich data set of aggregate cross-border exposures. The data are used primarily by the BIS, central banks and supervisory authorities to monitor vulnerabilities of and possible spill-over effects for national banking sectors. It allows quantifying to which extent banks are exposed to foreign credit risk – thereby complementing the national view on bank credit exposures. The BIS statistics provide a valuable data source not only to the official bodies, but also to institutional investors and internationally active banks. Using the data on cross-border exposure can greatly benefit the assessment and understanding of bank systemic risk – especially for the developed countries, which form the bulk of the BIS reporting countries.

This article provides a primer on how the BIS consolidated banking statistics can be used to monitor banking sector risk that stems from cross-country *lending* exposure. The data can also be used to look at the transmission of shocks through banks' foreign *funding* exposure – which we plan to address in a follow-up paper. In addition to providing a brief introduction to the BIS statistics, this paper demonstrates how network analysis can be deployed to produce a bird's eye view on interlinkages and structural changes in cross-border claims.[1] The analytical framework presented in this paper puts the data into perspective and helps to uncover – sometimes not so obvious – cross-country dependencies.

We start by describing the scope and limitations of BIS data. Next, we calculate simple ratios at the country level that help assess the vulnerability of lenders to cross-border exposures. We then proceed by establishing a network of 19 BIS reporting countries and assess their mutual dependencies.[2] Responding to the heightened interest in the EU peripheral countries, we finally show how problems in these countries translate into exposures of the international banking system.

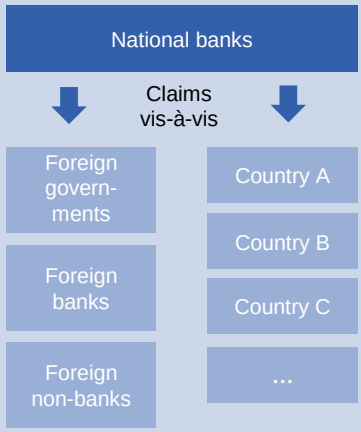
New interest in cross-country exposures

The financial crisis has demonstrated – once again – that significant risks to national banking sectors can stem not only from domestic asset and credit markets but also from cross-border exposures. Germany provides a case in point. Prior to the financial crisis, country risk indicators at the national level typically issued no alerts. However, German banks held a significant portion of claims on US borrowers (although to a good deal off-balance sheet), which left them highly vulnerable to the international credit crisis. Likewise, Belgium, the Netherlands and Switzerland were adversely affected through their banks' US exposures.

[1] Our approach is closely related to work by McGuire and Tarashev (2007), Hattori and Suda (2007), Espinosa-Vega and Solé (2010) as well as to a recent report published by Fitch Ratings (2010), who all apply network analysis to the BIS *consolidated* banking statistics. By contrast, Von Peter (2010) looks at the BIS *locational* banking statistics to identify important banking centres using network methods. Castrén and Kavonius (2009), in turn, use euro area flow of funds data to identify sectors and channels through which local shocks may propagate through the financial system.

[2] Australia, Austria, Belgium, Canada, Denmark, France, Germany, Greece, Ireland, Italy, Japan, the Netherlands, Portugal, Spain, Sweden, Switzerland, Turkey, the UK and the US.

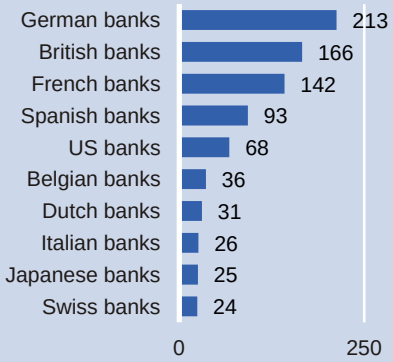
The BIS consolidated banking statistics



Source: BIS, DB Research 1

Banks' exposure to euro-area periphery

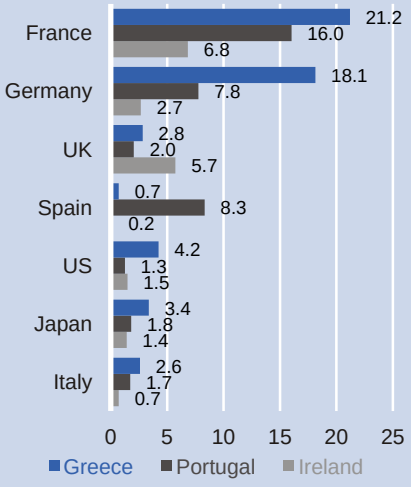
EUR bn, Q2/2010, total bank claims on Portugal, Ireland and Greece



Source: DB Research 2

Exposure to sovereign borrowers

EUR bn, Q1/2010, bank claims on euro-area periphery sovereign borrowers



Source: BIS Quarterly Review, DB Research 3

With regard to the debt sustainability issues currently witnessed in some euro-area countries, banks face significant foreign exposures, again in absolute terms. France and Germany seem to be particularly exposed to the euro-area peripheral countries. In this context, financial analysts and the public have gained valuable insights from the BIS data, guiding them to quantify the possible impact of sovereign debt problems in the euro-area peripheral countries.

Scope and limitations of the BIS statistics

The BIS statistics look at banks' foreign claims, which includes loans, deposits placed, holdings of debt securities, holdings in unconsolidated banks or non-bank subsidiaries and other on-balance sheet items. The statistics cover claims by bank head offices, including the exposures of their foreign affiliates. Inter-office positions are being netted out.[3] The BIS reporting scheme distinguishes between reporting countries and non-reporting countries. For the 26 reporting countries – usually the more advanced economies[4] – the BIS publishes bank claims on all other countries. The non-reporting countries – of which there are more than 200 – are captured only in their role as borrowers.[5] The data is updated on a quarterly basis.

Already from June 1999, bank claims are reported on an immediate borrower basis, where each loan is attributed to the borrower's country of residence.[6] Since 2005, the BIS has also provided information on a so-called ultimate risk basis, which accounts for the residency of the ultimate obligor. In this case, the statistics account for the fact that the head office of a legally dependent obligor may reside in another country. In addition, risk transfer via credit derivatives, guarantees or other contingent commitments is taken into account: The country that has sold credit protection or issued a credit guarantee then becomes the ultimate risk-bearing country.

An important limitation is the difficulty to obtain a two-dimensional breakdown, i.e. sector breakdown plus bilateral country breakdown of the data. At the national level, the BIS generally reports banks' total exposure vis-à-vis another country or total foreign exposure vis-à-vis banks, non-banks and governments in aggregate, but not exposure to a specific sector in a specific country (see figure 1).

As there is an exception to every rule, the BIS in June 2010 for the first time published country-specific sector data on an ad-hoc basis in its Quarterly Review (BIS, 2010a). The data was updated in September 2010 (BIS, 2010b). In its Quarterly Review the BIS reported bank exposures of several large countries to Greece, Ireland, Portugal and Spain, distinguishing between claims vis-à-vis banks, non-banks and governments (see figure 3 for bank claims on a selected group of EU peripheral sovereigns). Likewise, the Deutsche Bundesbank reports German banks' exposure to specific

[3] For a detailed description of the database, see BIS (2006): "Guidelines to the international consolidated banking statistics"; online access: http://www.bis.org/statistics/consbankstatsguide.pdf

[4] The countries mentioned in footnote 1, plus Brazil, Chile, India, Mexico, Panama and Taiwan.

[5] Finland has stopped reporting bilateral claims as of December 2003.

[6] For an elaborate discussion of how the statistics evolved over time, see BIS (2005).

countries by sector.[7] So far, no other central bank has made available the data for a two-dimensional breakdown.

As a further limitation, for Germany and Denmark, the statistics are only available on an immediate borrower basis. In these cases, the data may display a somewhat distorted picture of banks' exposure to specific countries. Moreover, banks' exposure to non-consolidated investment vehicles in Ireland is captured as cross-border lending to Irish non-banks – regardless of whether the funds are used to finance Irish or other foreign debt. As a consequence, a large fraction of German banks' claims is vis-à-vis investment vehicles that reside in Ireland but do not represent actual exposure to the Irish economy. The Bundesbank estimates that instead of the reported USD 139 bn, German banks have only EUR 25 bn actual exposure to Irish borrowers overall.[8]

Putting the data into perspective

There are a number of possible ways to explore the data, of which we will highlight the most relevant for monitoring banking sector risk. One of the most basic approaches is to look at absolute numbers of foreign and domestic exposures. Take the case of France, where both domestic and foreign exposure has increased significantly during the past five years (see appendix, figure 12). Foreign exposure can be broken further down by debtor country. Figures 13 to 15 show the top fifteen debtor countries of the UK, Germany and France, respectively – in all cases led by the US. Such simple charts can already give valuable hints as to which other countries one should look for in order to assess domestic banking sector risk. At the same time, one can easily assume the reverse perspective and ask which countries will mainly be affected by problems – say – of the euro-area peripheral countries (see figures 2 and 3 on page 3). Regional or local hotspots can thus easily be traced to the international banking system.

A further possibility in monitoring cross-country exposures is to take into account the time dimension of the data. For instance, comparison of the data over time reveals to which countries domestic exposure has become significantly larger or smaller in recent times (see appendix: figures 16 to 18). In doing so, one can also trace the build-up and decline of bank exposures to current hotspots, such as the euro area periphery (see figure 4) – with the stronger movements warranting further investigation into the causes of the changes and their possible implications for banking sector risk.

Vulnerability measures at country-level

In order to assess structural vulnerabilities of banks in an international comparison it makes sense to look at the data not only in absolute, but also in relative terms. At the country level, we deem essential at least three lender ratios (see Box 1 on the following page)[9]:

[7] Online access: http://www.bundesbank.de/download/statistik/bankenstatistik/auslandsforderungen_nach_laendern_und_sektoren.xls

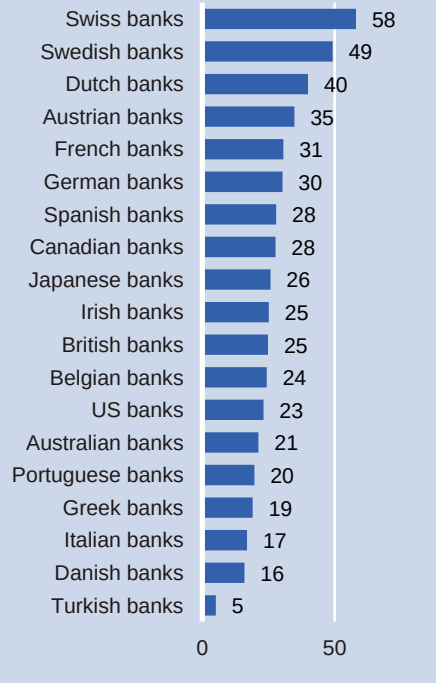
[8] According to a verbal statement by Bundesbank vice president Franz-Christoph Zeitler (Nov 25, 2010). Please note that all calculations in this study are based on BIS reported figures.

[9] In this section, we consider aggregate ratios only. In a later section, we will calculate ratios for the bilateral exposures represented in a network context.

Relative size of banking sector
%, bank assets to GDP, Q2/2010

Sources: National sources, DB Research 5

Foreign lending ratio
%, foreign lending to total bank assets, Q2/2010



Sources: BIS, natioanal sources, DB Research 6

— First, the potential impact of banking sector problems on economic activity is measured by the **"relative size of the banking sector"**, i.e. the size of the banking industry relative to GDP.[10] The greater the size of the banking sector relative to GDP, the more severely banking sector problems would affect economic activity or – in case banks need to be supported by the government – could increase public debt.

— Second, we look at the overall exposure of banks to foreign borrowers – the **"foreign lending ratio"**. The foreign lending ratio captures the vulnerability of the national banking sector to cross-country spill-over effects. It is calculated by taking foreign exposure over total bank assets (i.e. domestic and foreign exposure). A large ratio implies that write-downs on the foreign exposure may have a substantial impact on the stability of the national banking system.

— Third, we consider the **"borrower concentration ratio",** i.e. the diversification of banks' foreign exposure across other countries. To this end, we apply the Herfindahl Index – usually a common market concentration measure – to measure concentration of a country's top ten borrowers. This ratio is relevant for the analysis of banks' vulnerability to first-round contagion effects. For a banking sector that is highly exposed to a single or very few other countries, contagion risk may be stronger than for a country that is well diversified in its foreign lending exposure.

Box 1: Lender ratios

(i) Relative size of banking sector

$$\frac{\textit{Total bank assets of country } i}{\textit{Gross domestic product of country } i}$$

(ii) Foreign lending ratio

$$\frac{\textit{Total foreign exposure of national banking sector } i}{\textit{Total bank assets of country } i}$$

(iii) Borrower concentration ratio

$$\sum_{j=1}^{10}\left(\frac{\textit{Exposure of banking sector vis-à-vis country } j}{\textit{Total foreign exposure of } i}\right)^2$$

Source: DB Research

Assessment of structural vulnerabilities

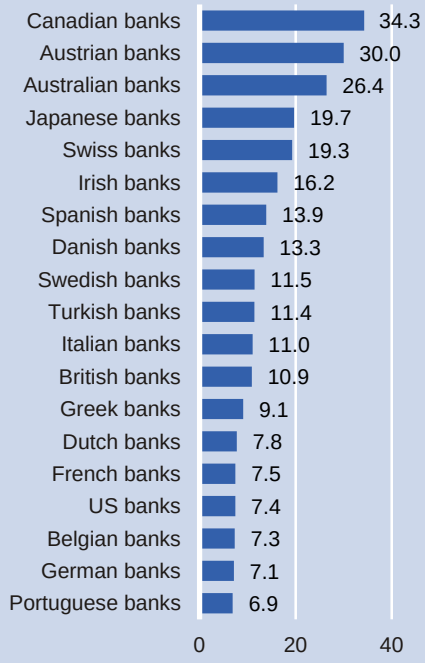
The relative size of a banking sector reflects the importance of the banking industry for the national economy (see figure 5). On top of the list you will find some of the traditional financial hubs, such as the UK and Switzerland – but also the currently beleaguered Ireland, where the financial sector grew strongly between the mid-1990s and the beginning of 2008. The US – which probably hosts the most important financial hub worldwide (rivalled only by the UK) – can be found close to the bottom of the list, owing to its large economic capacity and its market-based financial system in which bank-financing assumes a smaller role.

The foreign lending ratio shows how much the banking sector of a particular country depends on cross-border activities (see figure 6). The combination of trade openness, a limited home market and

[10] This ratio is based on various national sources rather than the BIS statistics.

Borrower concentration ratio

%, Herfindahl Index for the top 10 exposures*, Q2/2010

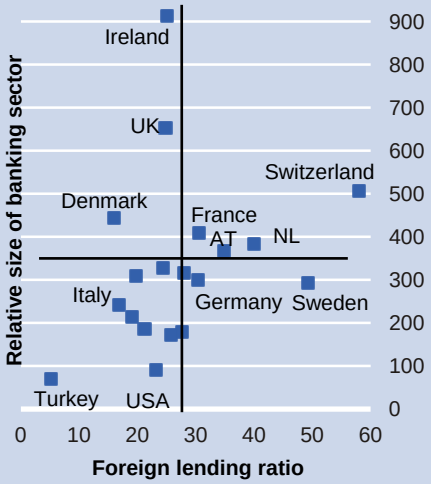


* Please note that the index is defined as shown in Box1 (iii).

Source: BIS, DB Research 7

Economic exposure to cross-border lending

%, Q2/2010



Source: BIS, DB Research 8

international competiveness of national banks, in particular, seems to result in a high ratio. Geographical proximity and cultural distance to other major countries or regions play an important role, too. For instance, Canada has high exposures vis-à-vis the US, Sweden vis-à-vis Scandinavia and the Baltic countries, the Netherlands vis-à-vis the Benelux countries, and Austria vis-à-vis Eastern Europe. In Switzerland it is mainly the two large banks with international investment banking operations that are responsible for relatively high foreign exposures. All this is reflected in the ranking according to the foreign lending ratio, led by Swiss, Canadian, Dutch and Swedish and Austrian banks, with ratios between 35% and 58% (see figure 6 on page 5). Four of the largest European countries follow suit, i.e. France, Germany, the UK and Spain. Finally, Japanese banks, US banks, Australian and Turkish banks are ranked at the bottom according to this measure.

The borrower concentration ratio identifies those countries that have concentrated their foreign lending activities on specific regions or countries – often their neighbouring countries (see figure 7). At the top of the list is Canada which is exposed primarily to the US, Austria which lends to the Czech Republic and Germany, as well as Australia which lends to New Zealand. Japanese and Swiss banks which also face high borrower concentration ratios both lend heavily to the US. Most European countries are quite well diversified in their foreign lending exposures.

Of course, the ratios can be easily displayed in matrix form in order to identify those countries that are vulnerable in more than one respect. For instance, a matrix which combines the relative size of the banking sector with the foreign lending ratio readily identifies Switzerland, the Netherlands, Austria but also France as having relatively high exposure (see figure 8). From the chart it also becomes clear that Ireland is an outlier concerning its relative size of the banking sector. Finally, it can also be useful to look at the development of the lender ratios over time. Doing so helps to trace the build-up of vulnerabilities and identify possible hotspots in a timely manner.

Bilateral exposures – a network perspective

The network perspective is readily introduced by looking at bilateral lending relationships between the countries in our sample. Analogous to the lending ratios as described in the previous section, we introduce three ratios to capture the importance of bilateral lending activities for the banking sector and the economy overall.

Box 2: Network variables

(i) Bilateral exposure to GDP

$$\frac{\textit{Exposure of national banking sector } i \textit{ vis-à-vis country } j}{\textit{Gross domestic product of country } i}$$

(ii) Bilateral exposure to total bank assets

$$\frac{\textit{Exposure of national banking sector } i \textit{ vis-à-vis country } j}{\textit{Total bank assets of country } i}$$

(iii) Bilateral exposure to total foreign exposure

$$\frac{\textit{Exposure of national banking sector } i \textit{ vis-à-vis country } j}{\textit{Total foreign exposure of national banking sector } i}$$

The limits of network analysis

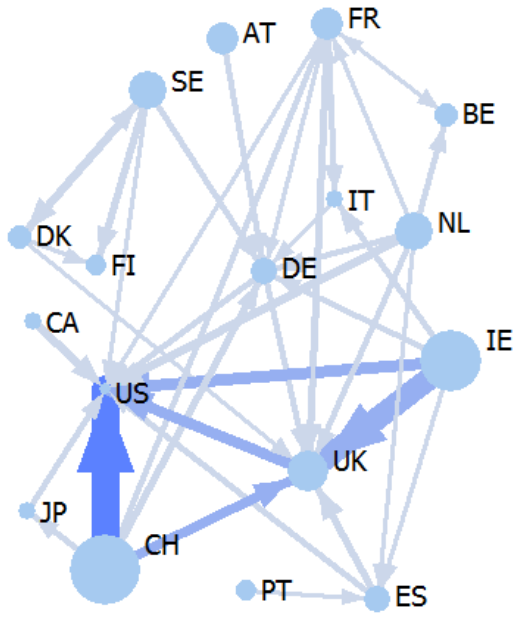
The application of network analysis has several limits: First, complexity is an obvious price to pay for processing a large data set. A network is merely an alternative representation of a data matrix. If the relationship of *n* micro subjects among themselves is modelled, there are *n(n-1)* possible bilateral relationships and *2^(n(n-1))* possible networks and the analysis can quickly become messy. Aggregate statistics, i.e. centrality and density measures, offer an effective means to consolidate the information in networks.

Second, the availability of network data is often limited. In our case, the available data set is restricted to the BIS reporting countries. Countries outside the network, i.e. the non-reporting countries, can only be included in their role as borrowers, but not as lenders. In future, the scope, quality and timeliness of the BIS data are likely to increase, as the recent crisis has underscored the importance of collecting data for macro-prudential analysis.

While complexity and data availability are important restrictions of network analysis, the main challenges relate to more fundamental economic questions. An obvious shortcoming is the static nature of the analysis, as the severance of existing links and the formation of new links can have a large economic impact. For instance, using data of a well-functioning interbank market does not help to simulate an impaired interbank market, where each bank is only willing to borrow from and lend to the central bank. Finding the equilibrium network, where no new links are formed and existing links are not severed, is a challenging task and, to the best of our knowledge, it is still an unsolved theoretical issue.

Given the limitations described, network analysis should not be used on a stand-alone basis to monitor banking sector risk. Instead, network analysis should be embedded in a more comprehensive monitoring system, which captures further aspects of banking sector risk, e.g. macro and market risk but also the ability of banks to withstand shocks.

Network 1: BIS reporting countries
Bilateral exposure to GDP, Q2/2010



Top 5 links:

CH to US	133.3%
IE to UK	98.3%
UK to US	51.0%
IE to US	45.2%
CH to UK	39.7%

Note:

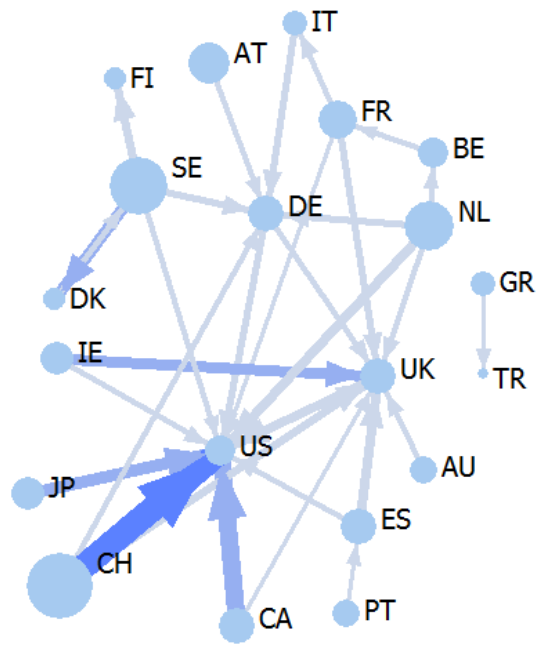
(a) Only links above 10% are considered.

(b) The size of nodes is proportional to the aggregated "total foreign exposure to GDP" ratio.

(c) Do not compare the thickness of arcs and the size of nodes across networks.

Sources:
BIS, DB Research

Network 2: BIS reporting countries
Bilateral exposure to total bank assets, Q2/2010



Top 5 links:

CH to US	24.0%
CA to US	16.0%
JP to US	11.2%
SE to DK	10.1%
IE to UK	9.0%

Note:

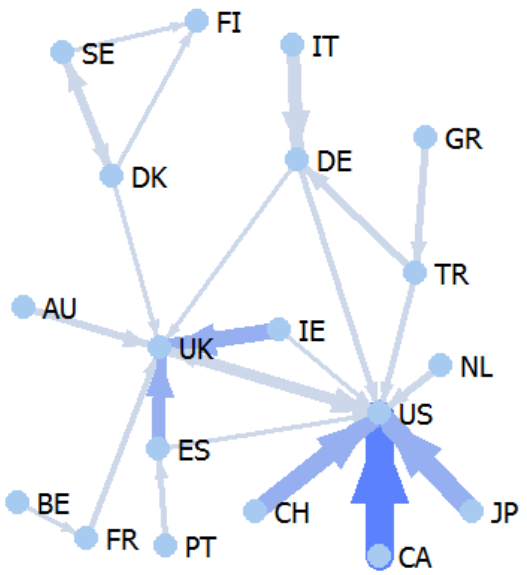
(a) Only links above 3 % are considered.

(b) The size of nodes is proportional to the aggregated "total foreign exposure to bank assets" ratio.

(c) Do not compare the thickness of arcs and the size of nodes across networks.

Sources:
BIS, DB Research

Network 3: BIS reporting countries
Bilateral exposure to total foreign exposure, Q2/2010



Top 5 links:

CA to US	57.9%
JP to US	43.1%
CH to US	41.4%
IE to UK	35.7%
ES to UK	30.5%

Note:

(a) Only links above 15 % are considered.

(b) Do not compare the thickness of arcs and the size of nodes across networks.

Sources:
BIS, DB Research

The three bilateral ratios for the 19 BIS countries of our sample form the basis used to depict the corresponding networks. For the sake of clarity, only arcs with a value above a certain threshold are drawn. In choosing the thresholds, we take account of the average level of the ratios represented.[11] The thresholds are determined so as to ensure that each of the networks can be displayed in a clearly arranged manner. Although, the underlying data would allow to have a view on *all* bilateral relations, the following thresholds allow to simplify the graphical representation of the network: (i) For the "bilateral exposure to GDP" the threshold is set at 10%; (ii) for the "bilateral exposure to total bank assets" a threshold of 3% is chosen, and (iii) for the "bilateral exposure to total foreign exposure" the threshold is set at 15%.

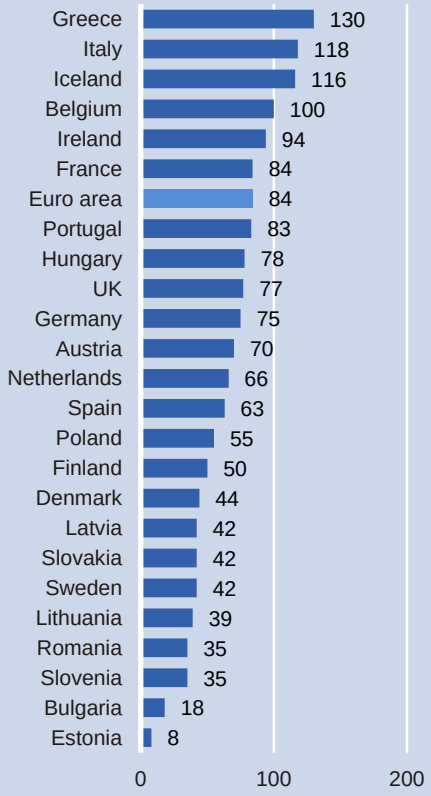
Characteristics of the lending networks

All three networks depict the strong lending activities from Japan to the US, whereas lending activities of Japanese banks to other countries are relatively small. The networks show further well-known lending relationships between countries. For instance, the United States and the United Kingdom are clearly identified as the global financial centres. The US and the UK are borrowing from many other countries and their main lending activities take place among each other. Other important financial hubs can be identified among the large EU countries. For instance, several European countries have relatively large lending exposures to Germany; whereas Germany's major lending activities are concentrated on the US and the UK. Close relationships also exist between the Nordic countries: Finland[12], Sweden and Denmark (Norway is not among the BIS reporting countries). Several comparably small countries with a large banking sector, i.e. the Netherlands, Ireland and Switzerland, mainly lend to the US and the large EU countries.

[11] E.g. bilateral exposure to total foreign lending is much higher on average than bilateral exposure to total bank assets, warranting a lower threshold for the latter.
[12] Finland is captured only in its role as borrower, as the lending data is not available.

Case study: The European debt crisis

General government gross debt, 2010e
% of GDP



Source: IMF, World Economic Outlook, October 2010

9

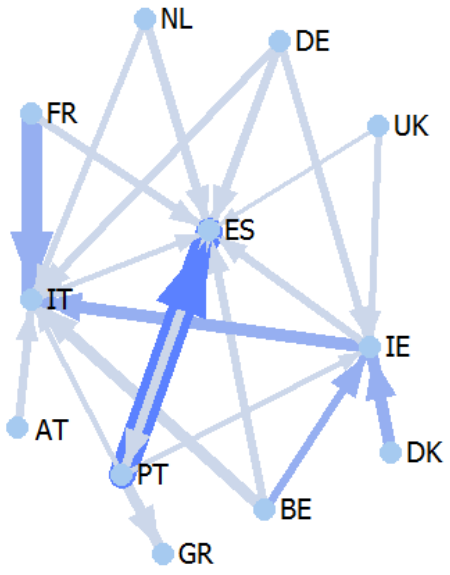
The IMF-EU rescue package for Greece and the enactment of the European Financial Stability Facility (EFSF) were strongly driven by the fear that a sovereign debt crisis in one EMU country could result in a crisis of the European banking sector overall. In this context, cross-border bank exposures are considered a possible channel for contagion. In the following, we thus look at the BIS data in order to identify possible channels through which debt problems of some countries could spread through the euro-area financial sector.

How exposed are banks to the euro-area periphery?

The most important lending activities to the euro-area peripheral countries are shown in Network 4. Many foreign banks have a relatively large lending exposure to Ireland. The national banking sectors of Belgium and Denmark direct more than 7% of their total foreign lending activity to Ireland. German and British exposures still amount to 4.6% and 3.5%, respectively. By contrast, most other countries in our sample have less than 2% of their foreign lending exposed to Ireland.

Spain is in a similar position as Ireland. It borrowed relatively heavily from German, Italian, French, Dutch and also Irish banks whereas the UK and the US banks have lent relatively small amounts to Spain. Particularly interconnected are the countries Spain and Portugal, as foreign lending of Spanish banks to Portugal amounts to 6% of total foreign lending of Spanish banks. Portuguese banks even direct 17% of their foreign lending to Spain. Overall, Portugal seems particularly vulnerable to contagion from other peripheral countries. Portuguese banks have not only lent to Spain and Ireland but they have also directed around 7% of their foreign lending to Greece. Fortunately, the risk to the Portuguese banking sector overall and the wider economy seems to be limited, as banks' foreign exposure relative to total bank assets is below 20% and the ratio of "total bank assets to GDP" is still moderate at about 300%.

Network 4: Exposure to euro-area peripheral countries
Bilateral exposure to total foreign exposure, Q2/2010



Top 5 links:

PT to ES	17.1%
FR to IT	13.1%
DK to IE	7.5%
BE to IE	7.5%
IE to IT	7.4%

Note:

(a) Only links above 2% are considered.

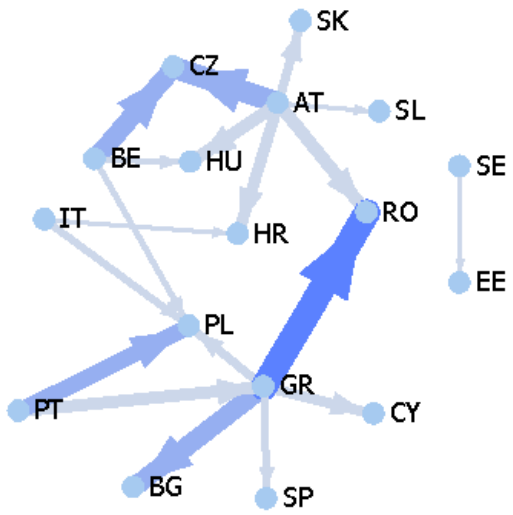
(b) Do not compare the thickness of arcs across networks.

Sources:
BIS, DB Research

Other BIS reporting countries seem to have even less exposure to Greece. Based on the BIS data one is led to conclude that contagion risk due to direct holdings of sovereign debt is relatively modest in the case of a restructuring of Greek government debt. However, this does not exclude the possibility that there are significant exposures of individual banks. For instance, some banks in France and Germany are strongly exposed to Greek borrowers as pointed out by the CEBS stress test. To the extent that debt restructuring affects individual banks, second-round effects may be triggered which – together with an elevated risk aversion – may drag down other banks as well. Moreover, exposures of other investors, such as pension funds or other non-bank financial institutions, may constitute a further channel for contagion that is not captured by the BIS data. Risk perception of market participants is another channel through which banking sector stability can be affected.

So far we have discussed which national banking sectors would be affected in the case of a restructuring of Greek government debt. However, it might also be important to understand the exposure of Greek banks to other countries. Network 1, 2 and 3 all show that the lending activities of Greek banks to the 19 BIS countries are modest. Greek banks lend some funds to the UK and Turkey but little to other EU peripherals. Relative to Greek total foreign lending, the UK exposure amounts to 13% and the Turkish exposure to 19%. However, more than half of Greek foreign exposure is vis-à-vis non-reporting countries, i.e. mainly to Eastern Europe (39%), although in economic terms these links are of limited significance when compared to Greek total bank assets or GDP.

Network 5: Exposure to the CEE countries
Bilateral exposure to total foreign exposure, Q2/2010



Top 5 links:

GR to RO	14.6%
AT to CZ	11.7%
BE to CZ	10.4%
GR to BG	10.0%
PT to PL	9.4%

Note:

(a) Only links above 3 % are considered.

(b) Do not compare the thickness of arcs across networks.

Sources:
BIS, DB Research

How strong are the links with Eastern Europe?

In a next step, we extend our analysis to shed further light on the euro area's exposure to the (BIS non-reporting) Central and Eastern European (CEE) countries.[13] Network 5 displays reporting banks'

[13] Our sample includes Albania, Belarus, Bosnia and Herzegovina, Bulgaria, Croatia, Cyprus, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Macedonia, Montenegro, Poland, Romania, Russia, Serbia, Slovakia, Slovenia and Ukraine.

bilateral exposures – relative to total foreign exposures – vis-à-vis the CEE countries.[14] It is worth noting that the most heavily indebted EMU countries, i.e. Greece, Italy, Belgium and Portugal, all display some links to the CEE countries. As mentioned above, about 39% of Greek cross-border lending is aimed at CEE countries, of which the strongest links are with Romania (15%) and Bulgaria (10%). Besides Greece, only Austria, Belgium, Italy, Portugal and Sweden maintain significant cross-border activities to CEE countries, according to BIS data. Austrian banks are exposed to the region even more strongly than Greek banks, with approximately 55% of Austria's foreign lending being directed to Eastern Europe.

When sovereign debt problems emerged in the euro-area periphery, the possibility of reverse contagion became an issue for Eastern Europe. Although lending exposure of the CEE countries to core and peripheral euro area countries is weak, foreign funding exposure of CEE banks' could in principle affect stability of the banking sector in the CEE countries.[15]

By contrast, spill-over risk from Eastern Europe to the euro area seems to be limited. Except for Austria and Greece, bank exposure to the CEE countries represents only a small fraction of total bank assets in all other European countries. More importantly, the risk of large-scale write downs on banks' Eastern European exposures is small, as non-performing loans (NPLs) in CEE are expected to have reached their peak levels and provisioning is relatively sound. After all, sovereign debt levels in most Eastern European countries remain below that of the euro area peripherals (see figure 9) and European banks' exposure to CEE sovereigns is much more limited than to the euro area peripheral sovereigns.

Conclusions

The BIS cross-border lending data is the most comprehensive source of banks' international lending activities as of today. In this paper we discussed how the data available can be used to monitor banking sector risk. To this end, we proposed a set of ratios that aim to assess possible vulnerabilities at the country level. In order to capture bilateral relationships, we described the data in a network context. The network perspective helps to develop an overview of mutual interlinkages and to uncover less obvious interdependencies. We applied the approach to the BIS reporting countries – including the euro-area peripheral countries – plus a selected group of (BIS non-reporting) Eastern European countries in order to visualise the various cross-border interlinkages in our sample.

Besides identifying geographic lending patterns and structural vulnerabilities of national banking sectors, our analysis sheds light on bank exposure to the current hotspots. It shows that France and Germany would be affected more strongly than other countries – in absolute but also in relative terms – if the euro-area peripherals

[14] The CEE countries are all BIS non-reporting countries, so that we are not able to assess lending exposures of these countries to the euro area. However, anecdotic evidence suggests that Eastern Europe has relatively little exposure to the euro-area periphery.

[15] Funding risk arises to the extent the domestic banking sector depends on foreign funding sources. For a recent analysis of funding risk in CEE credit markets, see Mühlberger and Deuber (2010). The authors argue that funding risk in the major CEE countries appears to be limited as foreign financing proves relatively stable – not least due to the region's deep integration with the Western European financial sector.

experienced deterioration in quality of public or private debt. Belgium and Denmark also have significant exposures to the private sector in Ireland.[16]

Further risks may arise from interconnections among the euro peripheral countries. Among the countries at risk, Portugal displays large exposures to Spain and Greece but has some exposure also to Ireland. Spain, in turn, has a large share of its foreign exposure directed to Portugal. Measured against banks' total assets, exposure to the current hotspots seems to be limited, though.

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[16] As mentioned above, in the case of German banks' exposure to Ireland, official figures tend to overstate true exposure, since a large fraction of exposures is to non-consolidated investment vehicles.

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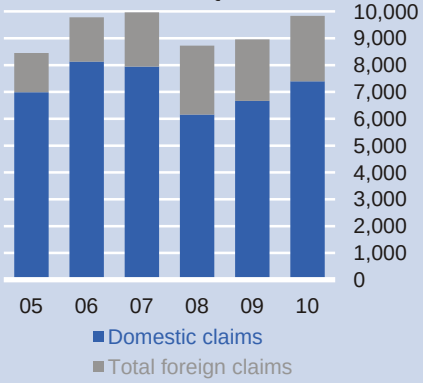
Appendix

UK: How exposed are banks to other countries?

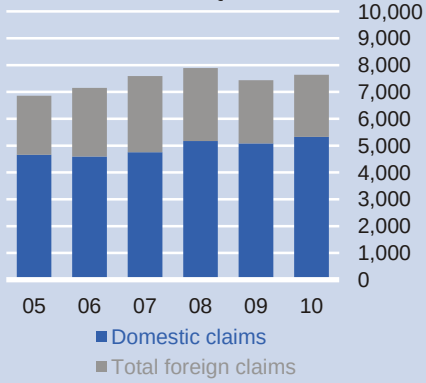
GBP bn, British banks' foreign and domestic claims until Q2/2010



Sources: BIS, ECB, DB Research 10

Germany: How exposed are banks to other countries?

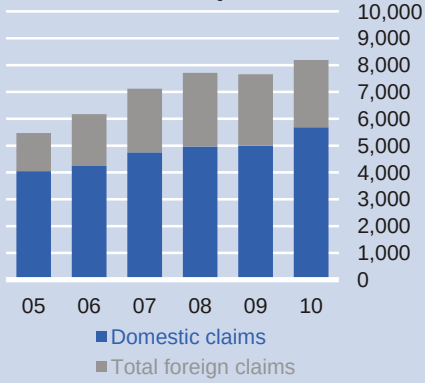
EUR bn, German banks' foreign and domestic claims until Q2/2010



Sources: BIS, ECB, DB Research 11

France: How exposed are banks to other countries?

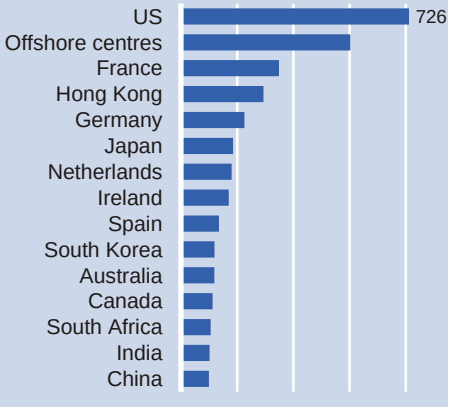
EUR bn, French banks' foreign and domestic claims until Q2/2010



Sources: BIS, ECB, DB Research 12

UK: Who are banks lending to?

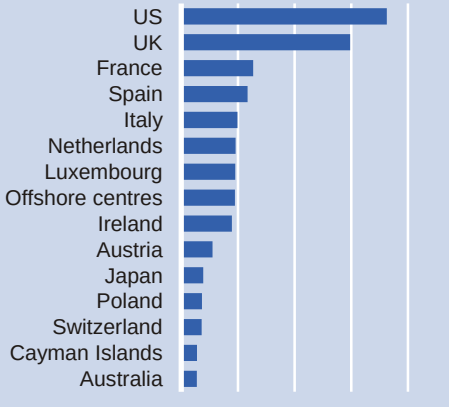
GBP bn, British banks' claims on top 15 debtor countries, Q2/2010



Sources: BIS, DB Research 13

Germany: Who are banks lending to?

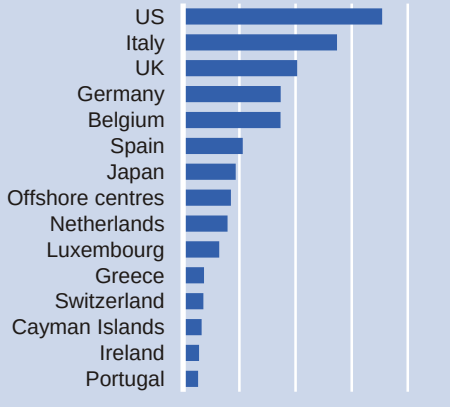
EUR bn, German banks' claims on top 15 debtor countries, Q2/2010



Sources: BIS, DB Research 14

France: Who are banks lending to?

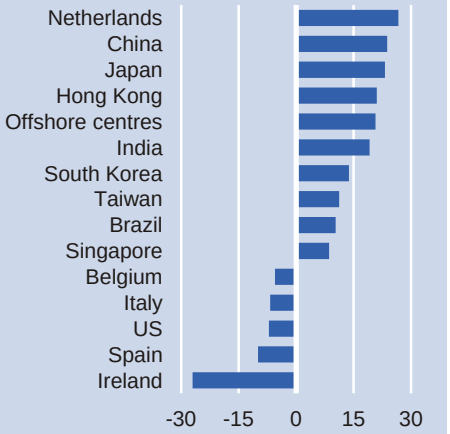
EUR bn, French banks' claims on top 15 debtor countries, Q2/2010



Sources: BIS, DB Research 15

UK: How has exposure changed over time?

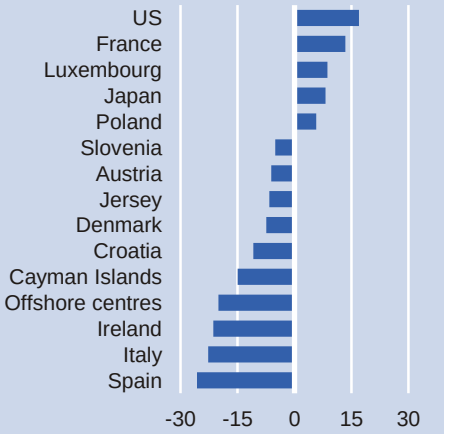
GBP bn, British banks' claims, top 15 absolute changes yoy, Q2/2010



Sources: BIS, DB Research 16

Germany: How has exposure changed over time?

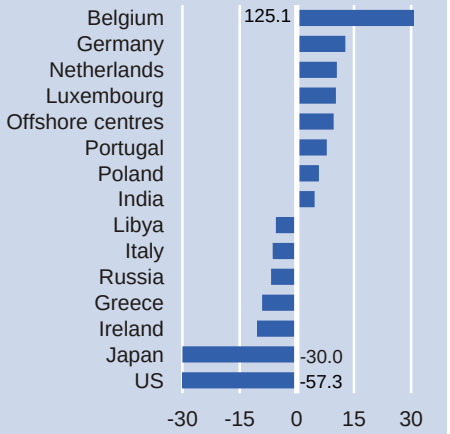
EUR bn, German banks' claims, top 15 absolute changes yoy, Q2/2010



Sources: BIS, DB Research 17

France: How has exposure changed over time?

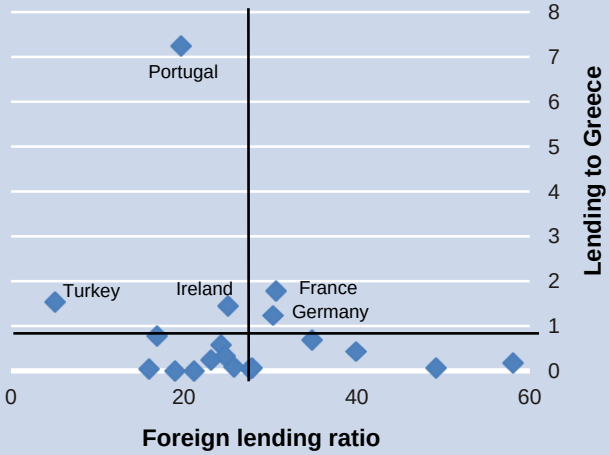
EUR bn, French banks' claims, top 15 absolute changes yoy, Q2/2010



Sources: BIS, DB Research 18

Banks' exposure to Greece

Q2/2010
x-axis: Total foreign lending to total bank assets (%)
y-axis: Lending to Greece to total foreign lending (%)

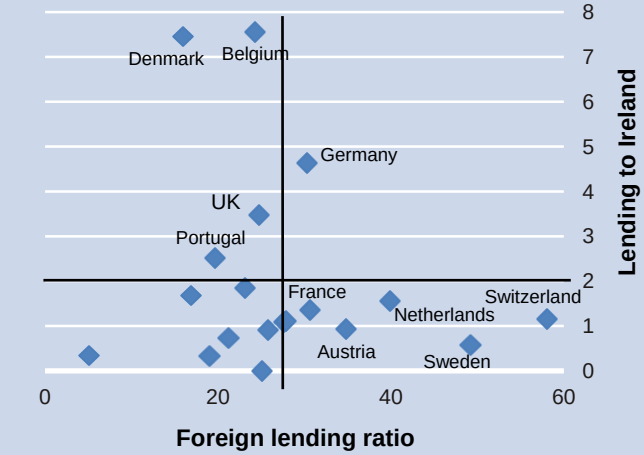


Sources: BIS, DB Research

19

Banks' exposure to Ireland

Q2/2010
x-axis: Total foreign lending to total bank assets (%)
y-axis: Lending to Ireland to total foreign lending (%)

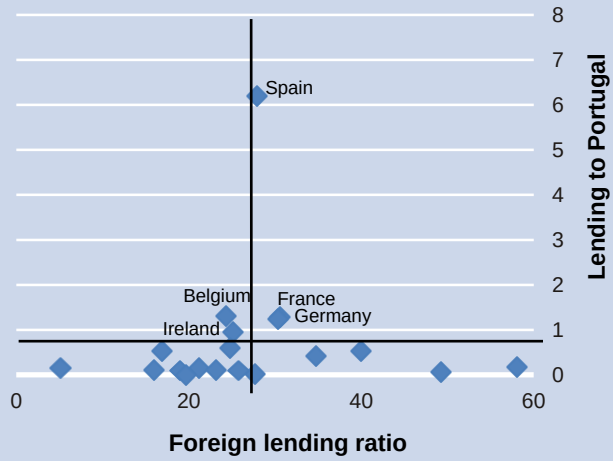


Sources: BIS, DB Research

20

Banks' exposure to Portugal

Q2/2010
x-axis: Total foreign lending to total bank assets (%)
y-axis: Lending to Portugal to total foreign lending (%)

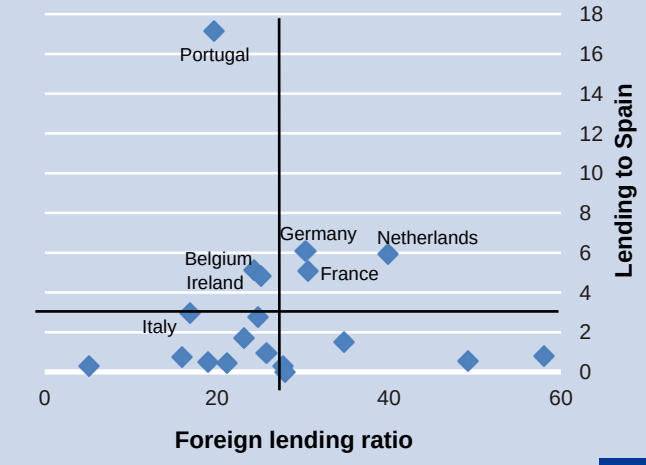


Sources: BIS, DB Research

21

Banks' exposure to Spain

Q2/2010
x-axis: Total foreign lending to total bank assets (%)
y-axis: Lending to Spain to total foreign lending (%)

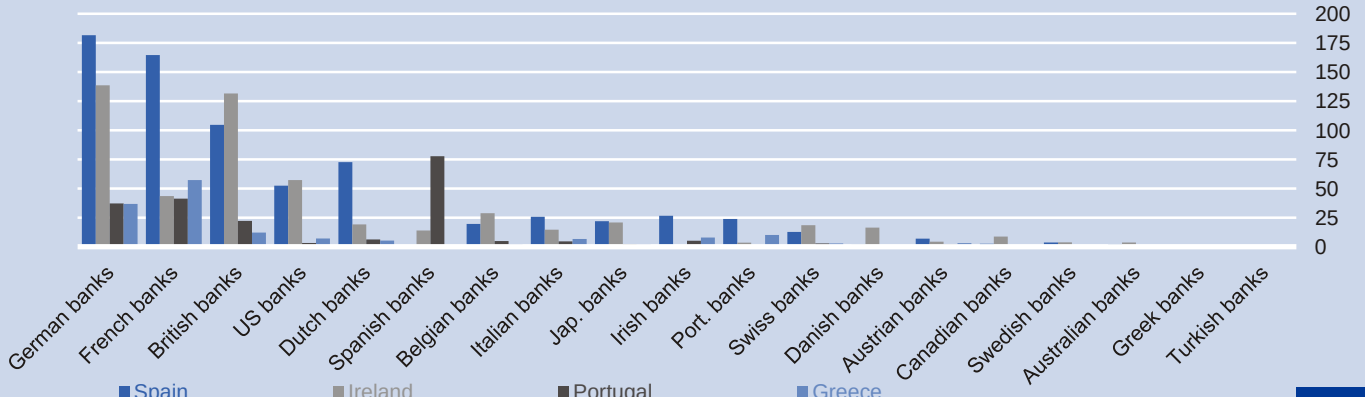


Sources: BIS, DB Research

22

Banks' exposure to the euro-area periphery

USD bn, banks' claims to all sectors, Q2/2010



Sources: BIS, DB Research

23

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