

# **WORKING PAPER**

## **2011 / 1**

### **A COMPREHENSIVE APPROACH TO THE EURO-AREA DEBT CRISIS**

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February 2011



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## **Abstract**

The euro area's sovereign debt crisis continues though significant steps have been taken to resolve it. This paper proposes a comprehensive solution to the crisis based on three pillars: a plan to restore banking sector soundness in the whole euro area, a resolution of sovereign debt crisis -including a revision of EU assistance facilities and a reduction of the Greek public debt- and a strategy to foster growth and competitiveness. The paper provides novel estimates and analysis focusing on the current situation of Greece, Ireland, Portugal and Spain.

JEL: F34, E60, H63

Keywords: fiscal sustainability; euro-area crisis; financial interdependence

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# 1. Introduction

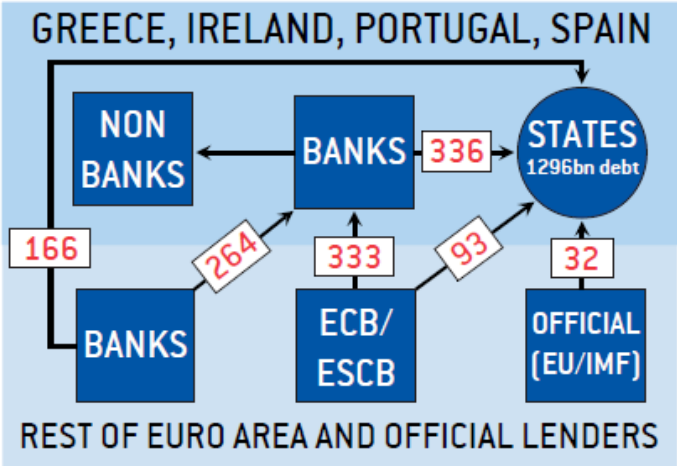
More than a year after it started in Greece and later on spread to three other peripheral countries, Ireland, Portugal and Spain<sup>1</sup>, the sovereign debt crisis in the euro area still goes on. True, significant steps have been taken to resolve the predicament. Crisis mechanisms have been set up by the EU (the European Financial Stability Mechanism - EFSM) and by the euro area (the European Financial Stability Facility - EFSF), and financial assistance has been provided to Greece and Ireland. Governments in these and other affected countries have implemented severe austerity measures and started to put in place structural reform programmes. And the European Central Bank (ECB) has embarked on a (controversial) peripheral sovereign debt purchase programme, while continuing its earlier support to euro-area banks with ample liquidity provision. But these measures have not been sufficient to restore calm in markets. In early February 2011, spreads on 10-year government bonds issued by Greece, Ireland, Portugal and Spain are all higher than they were in April 2010, before rescue measures started to be implemented.

There are three reasons why European policies have been insufficient to solve the problem:

- First, they have failed to recognise the possibility of insolvency and have addressed all crises as if they were purely liquidity crises.
- Second, they have failed to address in a systemic way the interdependence between banking and sovereign crises and the interdependence across countries.
- Third, they have been mostly reactive rather than proactive, thereby squandering their initially strong credibility by a series of partial, inadequate and belated responses.

To restore market stability and regain credibility a swift, radical and comprehensive solution is now needed. Such a strategy must comprise of three components: fostering adjustment and growth by promoting budgetary consolidation and competitiveness-enhancing domestic reforms in peripheral countries; revising the conditions of EU assistance and restructuring of public debt where needed; and restructuring of banks where needed.

**Figure 1. Euro-area exposure map, end-2010 (€ billions)**



Sources and notes: see Appendix 2.

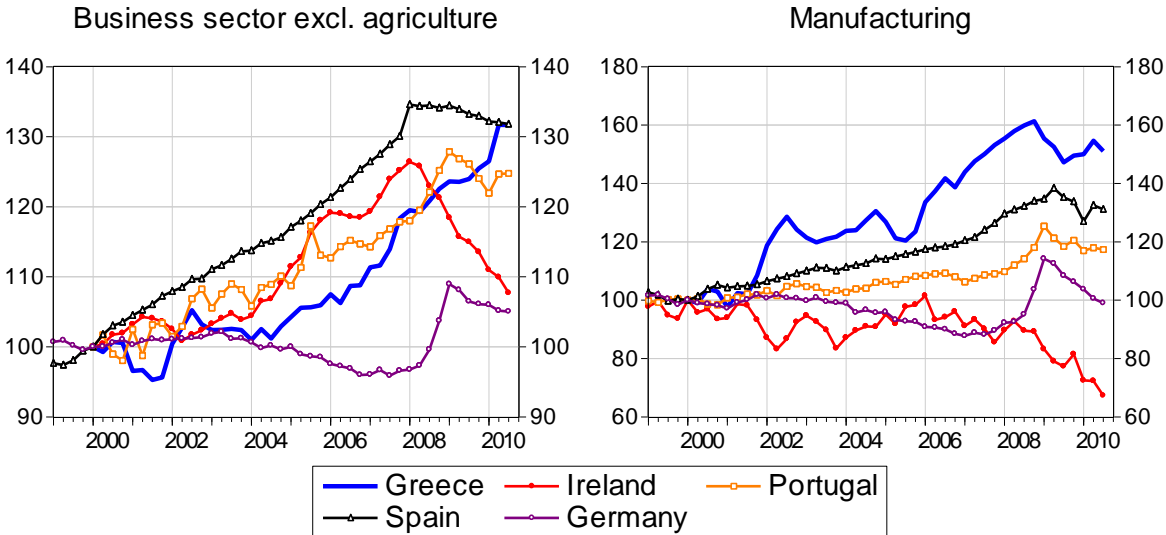
<sup>1</sup> Our criterion for focusing on these countries is the level of interest-rate spreads on long-term government bonds. We call them ‘peripheral countries’, because this is the standard expression used by others. We could have spoken of ‘high-spread countries’.

## 2. The sovereign debt nexus

The countries most affected by the euro-area crisis – Greece, Ireland, Portugal and Spain – share many common traits. They have spent and lived beyond their means by accumulating private and/or public debt and running large current account deficits. Nominal wages have also grown beyond what is justified by productivity gains, resulting in prices growing too fast relative to the rest of the euro area (Figure 2). In some cases (Ireland) price divergence essentially took place in the non-traded sector – especially construction and services – whereas in other countries the traded sector – especially manufacturing – was also affected. Such behaviour, and the policies that made it possible, was fundamentally at odds with euro participation.

In the last two years adjustment has started in these countries and major policy measures have been taken. Results are already visible in Ireland.

**Figure 2. Unit labour cost developments 1999Q1-2010Q3 (2000Q1=100)**



Source: Bruegel calculations with OECD data

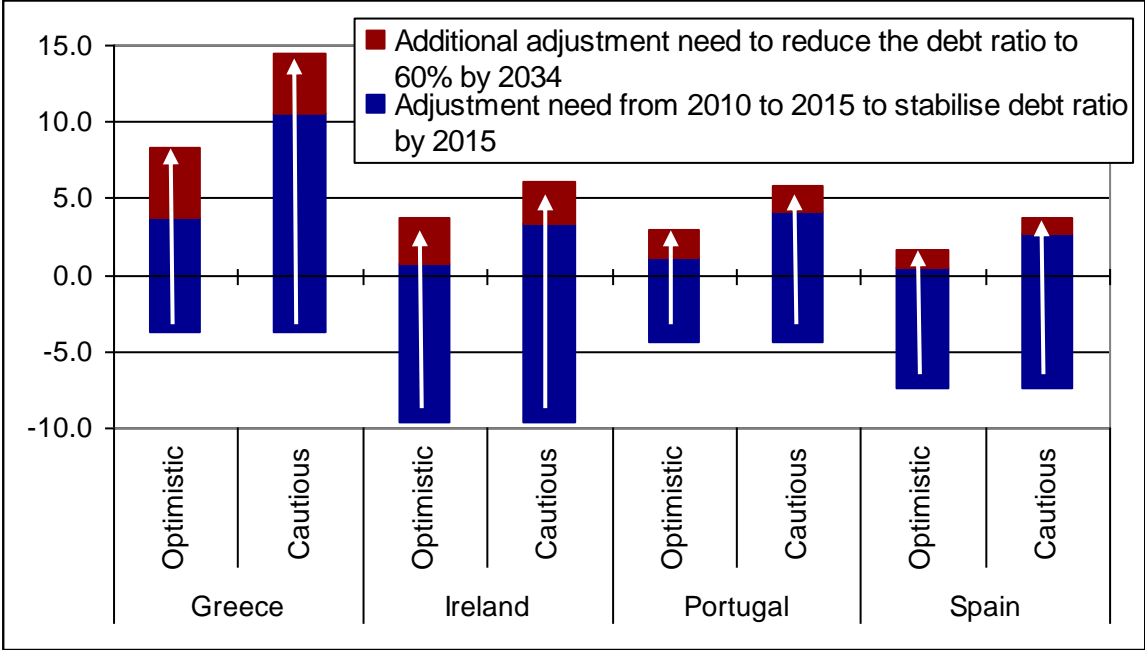
However, as argued by Marzinotto *et al* (2010), the Greek crisis stands apart from those in the other peripheral countries. First, Greece's public debt predicament has arisen mainly because of public finance mismanagement, while banking problems have played a secondary role. Second, with a debt-to-GDP ratio scheduled to exceed 150 percent, Greece is clearly on the verge of insolvency. By contrast, in Ireland and Spain, the public finance consequences of private-sector debt accumulation is the main reason for solvency concerns, not least because of the cost of rescuing insolvent banks. Public debt levels in Ireland, Portugal and Spain are more manageable than in Greece<sup>2</sup>.

This assessment is confirmed by a forward-looking evaluation of the public debt situation in the four countries (Box 1). Under Consensus Economics (2010) forecasts of GDP growth, and

<sup>2</sup> Levels in 2011 are forecast to remain below 70, 90 and 110 percent of GDP, respectively, in Spain, Portugal and Ireland.

an optimistic evolution of market interest rates (in the case of Greece, a reduction of spreads vis-à-vis Germany from 970 basis points today to 350 in 2014), the adjustment needs are of a frightening magnitude, not only in Greece but also in Ireland. This is even truer under more cautious growth and interest rate assumptions (Figure 3).

**Figure 3. Required improvement in the primary balance (% GDP) from its 2010 annual level to its 2015 annual level under different macroeconomic scenarios and different debt stabilisation objectives**



Note: the bottom of the blue bar shows the 2010 primary balance (excluding bank support in the case of Ireland); the top of the blue bar shows the debt stabilising level of primary balance in every year from 2015 onward; and the top of the dark red bar shows the debt reducing level of primary balance in every year from 2015 onward. The stabilised levels of debts in the case of the adjustment indicated by the blue part of the bars are the following: 160% in Greece, 123% in Ireland, 98% in Portugal and 84% in Spain.

It is not only the size of the adjustment effort that matters. The key indicator of solvency is the size of the primary budget surplus. This needs to be maintained over a period of years to achieve, in the medium term, a gradual return to safe levels of public debt. Here Greece stands apart from the other countries. Even in the optimistic scenario, the primary surplus required to reduce the debt ratio to 60 percent of GDP by 2034 would be 8.4 percent of GDP. It would reach 14.5 percent of GDP under the cautious scenario. This implies devoting between one-fifth and one-third of tax revenues to interest payments on the public debt. Over the last 50 years, no OECD country (except Norway, thanks to oil surpluses) has sustained a primary surplus above six percent of GDP. Even less ambitious targets would require politically unrealistic surpluses<sup>3</sup>.

Our conclusion therefore is that Greece has become insolvent. Further lending without a large enough debt reduction is not viable. This does not apply to Ireland which also needs to carry

<sup>3</sup> Like many countries the Greek state has assets, including significant holdings of land. These could potentially serve as collateral to guarantee loans but even a major divestiture of public property would be insufficient to modify the conclusion.

out a major budgetary adjustment, but where the primary surplus required to keep the debt ratio sustainable remains within the range of what has been achieved historically<sup>4</sup>.

However, the possibility of restructuring Greek sovereign debt has met with total opposition both from the Greek government and other euro-area countries. The main argument seems to be that it could create contagion effects and spillovers, since much Greek debt is held by euro-area banks (mainly French and German), which invested heavily in higher-yielding peripheral bonds.

There is also a ‘wait-and-see’ attitude: it is hoped that Greek reforms will transform the economy, putting it on a faster-track growth path, thereby alleviating the situation. It is also hoped that time will help weaker euro-area banks to restore solvency, so that they are in better shape for restructuring at a later date.

History suggests, however, that a ‘wait-and-see’ approach is a dubious strategy. Although clearly desirable, reforms and growth acceleration are difficult and time-consuming processes. The lingering threat of restructuring is likely to be economically and financially damaging. Moreover, as official creditors - EU partners and the International Monetary Fund (IMF) - are gradually substituting Greece's private creditors, postponement of restructuring would imply, to keep the debt ratio sustainable, either a restructuring of official loans, or a significantly higher eventual haircut on private claims.

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#### **BOX 1: SUSTAINABILITY ASSESSMENT**

We examine two scenarios:

##### Optimistic scenario:

- Interest rate spreads against German Bunds are optimistically assumed to fall by 2014 from the current high levels to 350 bps in Greece, 200 bps in Ireland, 150 bps in Portugal and 100 bps in Spain, and are assumed to stay at these levels.
- Consensus Economics GDP growth forecasts.

##### Cautious scenario:

- Expected interest rates are calculated using the expectation hypothesis of the term structure, leading to considerably higher interest rates than in the optimistic scenario.
- Lower growth and inflation compared to the optimistic scenario due to efforts to regain competitiveness, especially in Greece, Portugal and Spain.

In both scenarios we use estimates from Barclays Capital on potential additional bank recapitalisation by governments (for Ireland and Spain, their high-risk estimate): €10 billion in Greece, €31.5 billion in Ireland, €10 billion in Portugal and €75 billion in Spain. We take into account the €17.5 billion that the Irish government has put aside from its cash reserves and liquid assets to support banks. The Spanish value does not include government support already provided. We remain on the conservative side by not assuming any privatisation

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<sup>4</sup> Considering the current official lending rates to Ireland, a 3.7 percent persistent primary surplus would be needed from 2015 in the optimistic scenario, and 6.1 percent in the cautious scenario, to reduce the debt ratio to 60 percent between 2014 to 2034, according to our calculations. See Table 1 for the impact of possible policies and a fall in market interest rates on these results.

revenue.

The primary balance (in percentage of GDP) in Greece and Ireland is assumed to evolve according to the EU-IMF programme assumptions. For Portugal and Spain we use the European Commission's November 2010 forecast up to 2012, and assume that the primary balance will improve by 1.5 percent of GDP both in 2013 and 2014.

With the above assumptions, we calculated the persistent primary balance needed from 2015 onwards in order to

- (a) stabilise the debt/GDP ratio at its 2015 level,
- (b) reduce the debt/GDP ratio from its simulated 2014 level to 60 percent of GDP (the Maastricht criterion) by 2034.

The Appendix presents the detailed assumptions and calculations.

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### **3. Assessing the soft options**

To be fair, the EU has moved away from complete denial of the Greek debt situation to looking for a middle way between adjustment and debt restructuring. Table 1 gives for the peripheral countries an assessment of what the effects might be of three types of measures that are currently under consideration:

- A lowering of the interest rate charged on all official EU loans (IMF rates cannot be lowered) to 3.5 percent annually;
- An extension of the maturity of all official EU loans to 30 years, and the transformation of the Greek IMF Stand-by Agreement into an Extended Fund Facility (which would extend the repayment date from 2018 to 2023, as in Ireland);
- The purchase by the European Financial Stability Facility (EFSF) of all government bonds currently held by the European Central Bank within the framework of its Securities Market Programme and the retrocession of the corresponding haircut to the issuing country<sup>5</sup>.

We also provide an evaluation of the effect of a drop of 100 basis points in market yields, and the joint impact of the three policies and the drop in market yields, even though it is difficult to assess the expected market reaction to these measures<sup>6</sup>.

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<sup>5</sup> We only consider here buy-backs from the ECB, which is feasible without any market interference. Note also that as the current market value of ECB holdings is close to their value at the time of purchase, we consider this retrocession to be broadly neutral for the ECB profit-and-loss account.

<sup>6</sup> Obviously calculations only apply to measures that are currently applicable. For example, we only consider maturity extension for the countries (Greece and Ireland) that benefit from financial assistance; for Portugal we only consider the buy-back of current ECB bond holdings from a 30-year 3.5 percent loan.

**Table 1: Assessment of alternative policies**

		Persistent primary surplus needed from 2015 onwards to stabilise the debt/GDP ratio at its 2015 level (% GDP)				Persistent primary surplus needed from 2015 onwards to reduce the debt/GDP ratio from its 2014 level to 60 percent by 2034 (% GDP)			
		(a)	(b)	(c)	(d)	(a)	(b)	(c)	(d)
Scenario		Baseline	Deviation from baseline			Baseline	Deviation from baseline		
			Three policies	100 bps lower mkt yields	Three policies + mkt reaction		Three policies	100 bps lower mkt yields	Three policies + mkt reaction
Greece	Optimistic	3.7	-1.3	-1.0	-2.1	8.4	-1.8	-0.8	-2.4
Greece	Cautious	10.5	-2.7	-1.0	-3.4	14.5	-3.0	-0.9	-3.6
Ireland	Optimistic	0.7	-0.5	-0.6	-1.0	3.7	-0.8	-0.4	-1.1
Ireland	Cautious	3.3	-0.8	-0.5	-1.2	6.1	-0.9	-0.4	-1.3
Portugal	Optimistic	1.2	-0.1	-0.7	-0.7	2.9	-0.1	-0.6	-0.8
Portugal	Cautious	4.1	-0.1	-0.7	-0.8	5.8	-0.1	-0.7	-0.8
Spain	Optimistic	0.5		-0.6		1.6		-0.6	
Spain	Cautious	2.7		-0.7		3.8		-0.7	

Source: Bruegel simulations.

Note: Column (d) is not the sum of columns (b) and (c) because the marginal impact of policy measures is smaller (in absolute terms) when market interest rates are lower.

Each measure would clearly help reduce Greece's debt burden both directly and indirectly via lower market interest rates. However, our calculations indicate that even if all the measures were applied it would still not be enough to return Greece to solvency. The primary budget surplus requirement would still be unrealistically high.

Furthermore, the current stance of 'no default now, but possible default on bonds issued from 2013' is inconsistent and not credible. Up to 2012, markets will price in the default option, making it difficult for troubled governments to borrow. From 2013, if the stance is indeed maintained, the Greek government will be unable to issue bonds. However, a second official lending programme for Greece in 2013 would likely meet even more political resistance from euro-area partners and would further increase the share of official creditors in Greek debt.

A debt reduction is therefore necessary for Greece. We estimate that, in order to return to a sustainable path and reach a 60 percent debt-to-GDP ratio by 2034, Greece would need (in addition to the three measures in Table 1) a 30 percent haircut on the marketable public debt<sup>7</sup>.

<sup>7</sup> This assumes that assistance loans will be exempt from restructuring and that market reaction to the debt reduction will result in a drop of the spread vis-à-vis Germany to 200 basis points. Under these conditions, from 2015 a 6 percent persistent primary surplus (the programme assumption) is needed in our cautious scenario, with a 3.6 percent surplus in the optimistic scenario, to reach the 60 percent debt ratio by 2034.



## 4. Assessing potential spillovers

The main obstacle to a rapid resolution of the euro-area crisis is the difficulty policymakers have in tackling the spillover effects between banking and sovereign difficulties and across countries in the absence of European sovereign debt and banking crisis resolution mechanisms.

In order to assess what needs to be done, we start from a simplified map of bank and sovereign interdependence in the periphery countries, and between periphery banks and those elsewhere in the euro area (Figure 1 and Table 2). Although drawing up such a map involves a number of assumptions<sup>8</sup>, it provides a reasonably accurate representation of the actual situation.

	Greece	Ireland	Portugal	Spain	Total
<b>Total government debt (at face value)</b>	325	153	142	677	1297
of which held by :					
Domestic banks	68	11	19	227	336
Rest of euro-area banks	52	14	33	79	166
Other banks	6	9	5	24	43
Non-banks (both domestic and foreign)	119	97	64	347	627
ECB	50	22	21	0	93
IMF, EU and official lenders	32	0	0	0	32
<b>Ratio of average market value to face value of government debt</b>	0.75	0.85	0.9	1	
<b>Foreign banks' exposure to national banking systems</b>	10	119	43	209	381
of which euro-area banks	6	66	37	154	264
<b>Eurosystem lending to banks</b>	95	132	41	65	333

Sources and notes: see Appendix 2.

Starting with Greece, our estimates indicate that the spillover from a sustainability-restoring haircut on sovereign debt would have a manageable impact on banks in the rest of the euro area. Some would no doubt need recapitalisation, but even assuming that recapitalisation would be borne by the public purse (a disputable choice and therefore an extreme assumption), the impact on the public finances of other euro-area countries would remain limited. The fear of a domino effect is understandable, but exaggerated.

Table 2 also shows that spillover effects from crises in other countries are clearly different. The exposure of euro-area banks to Irish sovereign risk is small and it is really exposure to banks that matters. Exposure to Portugal is limited. Only Spain is really systemic, through both the sovereign and the banking channels.

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<sup>8</sup> See the appendix.

## 5. A comprehensive solution

A comprehensive solution to the crisis would have three planks:

- A plan to restore banking-sector soundness;
- Resolution of sovereign debt crises;
- A strategy to foster growth and competitiveness.

### *5.1 Strengthening the euro-area banking system*

Our assumptions are deliberately cautious, but we still assess the spillover risks to be manageable and conclude that only Greece is in need of a public debt reduction. We are aware, however, that our information is incomplete.

Our estimates of financial interdependence in the euro area show the exposure of peripheral banks to peripheral sovereigns, and of non-peripheral banks to both peripheral banks and sovereigns. But what is missing from our mapping is the exposure of peripheral banks to potentially non-performing loans and the resulting risk for banks in the rest of the euro area, and for sovereigns in both peripheral and non-peripheral countries, should banks need to be recapitalised with public funds. This gap was supposed to have been filled by the European stress tests published in July 2010. Unfortunately the stress tests were totally discredited by subsequent developments in Irish banks, leading to market concerns that the position of euro-area banks may be far worse than currently admitted.

The implementation of rigorous and credible stress tests is therefore an absolute priority for the euro area. Because EU banking supervisors squandered credibility in the previous round of stress tests, we advocate involving the IMF and possibly the Bank for International Settlements, in the next round of tests. We suggest that the March 2011 European Council adopts the necessary measures to ensure that the forthcoming stress tests be as rigorous and credible as possible.

Once such tests have been carried out, euro-area countries must proceed immediately with bank restructuring where necessary, which should imply the recapitalisation of viable institutions and the closure of non-viable ones. To this end, EFSF funding should be made available to governments.

The restructuring of some banks in core countries is likely to be necessary, especially if bank losses turn out to be significant in Spain, the only peripheral country where restructuring would, according to our estimates, have a significant spillover effect on the rest of the euro area.

Bank restructuring would be accelerated if EU countries were to introduce special bank resolution mechanisms in their domestic legislation, as proposed by the European Commission. In line with the February 2011 German proposal<sup>9</sup>, we advocate that heads of

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<sup>9</sup> See, for example, the Financial Times of 3 February 2011, 'Eurozone members are negotiating a "grand bargain" to tackle the bloc's debt crisis'.

state and government agree in March to put in place such mechanisms without delay. But beyond national efforts, there is a strong rationale for the creation of a temporary ‘European Bank Treuhand’ (Posen and Véron, 2009), to catalyse recapitalisation and manage any distressed assets that may fall into public ownership, while keeping fiscal outlays in national hands.

Beyond the immediate short term, there is an obvious need to put in place a solid European banking supervision and resolution framework. One lesson from the crisis is that such a framework must go beyond coordination between national institutions. Nothing less than supranational banking supervision and resolution bodies can handle the kind of financial interdependence that now exists in Europe. Ideally, such bodies should cover all EU countries, since they all belong to a single financial market. However, in case this proves to be politically unrealistic, euro-area countries should create their own institutions.

Before the crisis, the creation of EU- or euro-area banking supervision and resolution institutions was considered unacceptable by European countries because it would amount to the pooling of risks associated with bank failures. The crisis has shown that the absence of such institutions imposes even greater burden-sharing on countries, especially within the euro area, where the ECB has been forced to act as the lender of last resort to banks that may turn out to be insolvent.

## ***5.2 Resolution of sovereign debt crises***

Our calculations have shown that it is preferable to implement a significant reduction of Greek debt sooner rather than later.

It would clearly be less disruptive financially to achieve a reduction in the debt level through voluntary exchanges rather than through across-the-board debt restructuring. This justifies giving the EFSF the mission and the financial means to carry out such operations on a significant scale. Euro area leaders should agree to this at the March European Council, as part of the overall package under consideration. The EFSF should immediately buy from the ECB debt securities purchased within the framework of the Sovereign Market Programme.

A debt exchange however is not without problems. In particular, a voluntary exchange will only be marginally effective as long as the EU sticks to its no-restructuring commitment because, if credible, this commitment is an incentive to hold rather than sell the asset. In order to make debt-exchange schemes effective, public authorities would need to convey to markets their determination to achieve a reduction of public debt to a sustainable level. This requires on their part a recognition of the unsustainable character of the present course, and a joint evaluation by the Commission, the ECB and the IMF of the amount of debt reduction needed.

Restructuring would not be easy either, both because of its impact on financial institutions that have not marked debt securities to market (which is the case for many banks) and because of the seniority issue. Currently, bilateral government loans and EFSF loans do not enjoy formal seniority status. Yet it would be unthinkable to bail in those EU members who came to the rescue of their ailing partners, especially since the IMF, which provided parallel loans, enjoys senior creditor status. If formal restructuring is needed, we advocate that it takes

inspiration from the mechanism presented in Gianviti *et al* (2010).

In both cases, the burden of adjustment should not fall only on private bondholders. First, investors should be offered a variety of new, guaranteed instruments (eg Delpa and von Weizsäcker, 2011). Second, investors should be able to benefit from an upturn in economic conditions through eg GDP-indexed bonds. Third, Greece should post collateral to guarantee the new debt instruments.

Furthermore, Greece and Ireland currently benefit from loans from EU states or the EFSM/EFSSF at relatively high interest rates compared to the rates at which these countries or institutions are able to borrow. This was intended to signal that these loans should not be regarded as concessionary, partly in response to fear of recourse to the German constitutional court for breach of the EU treaty's no bail-out clause. However, high interest rates have caused political tensions in the borrowing countries and reduced the domestic ownership of the programmes. High rates have also weakened the credibility of these programmes by aggravating somewhat the Greek and Irish sustainability problem. Interest rates on official loans should correspond to the lender's borrowing cost, plus an operational margin, in line with EU assistance to Hungary, Latvia and Romania. The experience of the three countries suggests that countries may be willing not to draw the full amount of the preferential-rate assistance when reasonable market borrowing conditions are restored, in order to boost market confidence<sup>10</sup>. Longer maturity EU assistance would also reduce the magnitude of haircut on marketable Greek debt and improve the sustainability of other countries receiving assistance.

### ***5.3 Fostering growth in the peripheral countries***

Given the size of public and private debt in the peripheral countries, regaining sustainability will mean a combination of lower living standards and higher production, especially in the tradable sector. Economic policy should be geared, first and foremost, towards implementing domestic reforms to increase employment and productivity. However, even if successful, these will take time to produce results. In the meantime, growth will remain subdued and debt, though reduced, will remain high. Private and public sector efforts to pay off their debts will have a negative impact on growth, and low growth will make it more difficult to reduce debt levels. These countries are also confronted with the risk of debt deflation, because restoring competitiveness in the tradable sector will require low price increases and perhaps even deflation.

In order to break this vicious circle, peripheral countries need to first stabilise and then reduce their debt levels while accelerating the pace of economic reform. The EU can and should help with this by fostering reforms and growth in these countries.

We have already emphasised the potential role of better terms for conditional financial assistance and the implementation of comprehensive measures to exit the debt deadlock.

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<sup>10</sup> The Hungarian government launched in July 2009 a five-year euro-denominated bond with a coupon of 6.75 percent. Following the success of this issuance it has not drawn anything from the remaining portion of the assistance programmes. The Latvian and Romanian governments have also not drawn the full available amounts.

Currently, private investment is being held back and public borrowing costs are high due to lingering uncertainty about banking sector resolution and sovereign defaults.

But the EU should also do more with the instruments at its disposal. We strongly advocate a temporary refocusing of the structural funds earmarked for the peripheral countries, with monies mobilised to support new growth strategies. As argued in Marzinotto (2011), this requires front-loading EU structural spending (without changing its distribution by country), so that it can contribute to fostering reform and growth during the most acute phase of the adjustment. This also requires a joined-up, coordinated approach, including with the EU-IMF programme, instead of the current silo approach. We suggest the March 2011 European Council adopts a programme along these lines.

In the longer term the EU can also help by making better use of its budget. The discussion on the next 2014-20 multiannual financial framework is an opportunity for fresh thinking about new ways to foster investment in the four countries and other crisis-affected countries, especially in central and eastern Europe.

## **6. Conclusion**

For several weeks there has been an expectation among political observers and market participants that the March European Council will deliver measures amounting to a comprehensive solution to the euro-area crisis. This expectation was reinforced by the 4 February 2011 European Council, where euro-area heads of state and government announced their intention to finalise in March a ‘comprehensive strategy to preserve financial stability’.

We argue that a comprehensive approach must start by recognising two basic facts. First, peripheral countries face a huge challenge in adjusting their weak economies and avoiding a vicious circle of high private and public debt and low growth. Second, banks and sovereigns throughout the euro area are closely interdependent.

Starting from these two facts, which we have documented in this policy brief, we propose a comprehensive strategy comprising three components: the cleaning up of banks, wherever needed and simultaneously throughout the euro area, based on the results of a rigorous stress test given added credibility by the involvement of the IMF and possibly the BIS; revision of the conditions of EU assistance programmes, further empowering the EFSF and the reduction of the public debt in Greece, the only euro-area country which has become insolvent; fostering adjustment and growth in peripheral countries through budgetary consolidation and competitiveness-enhancing measures, and through mobilisation and better implementation of EU structural funds.

Too much time has been lost, too much confidence has been dented and too much credibility has been squandered in the past year. Building on important decisions already taken, EU leaders should move decisively and agree on a comprehensive package along these lines at the March 2011 summit. This would be a major contribution to the cohesion and the revival of the euro area.

## Appendix<sup>11</sup>

The first part of this appendix describes our sustainability analysis. The second part discusses our euro-area exposure calculations.

### A1. Fiscal sustainability assessment

Fiscal sustainability depends on several medium- and long-term factors. In this paper we leave to one side the longer-term issues<sup>12</sup> and concentrate on the medium term (up to 2020), as this is the relevant horizon in the current debates about the euro-area sovereign-debt crisis. Apart from the initial level of debt, fiscal sustainability depends on:

- a. borrowing costs,
- b. GDP growth,
- c. ‘non-standard’ revenues and expenditures (such as bank bail-outs or privatisation revenues),
- d. primary balance apart from ‘non-standard’ operations.

After outlining our two scenarios in section A1.1, we discuss these four aspects in sections A1.2 to A1.5; section A1.5 also includes our baseline simulation results. Section A1.6 details the calculations behind the assessment of the three types of measures that are currently under consideration (lowering the interest rate on EU loans; extending the maturity of official loans; debt buy-back from the ECB). Section A1.7 describes the calculation behind the haircut needed to restore fiscal sustainability in Greece. Section A1.8 provides a sensitivity analysis to the underlying assumptions.

#### A1.1 Overview of scenarios

Since official programme assumptions about growth and interest rates are widely viewed with scepticism, we use market information whenever available. We describe two scenarios: ‘optimistic’ and ‘cautious’, which differ only in terms of interest rate and growth assumptions. The first scenario is optimistic in the sense that it assumes a significant fall in the market interest rates for Greece, Ireland, Portugal and Spain compared to current and expected future market interest rates.

##### **Borrowing cost:**

We take official lending rates as given and adopt assumptions concerning future market interest rates, as follows:

Optimistic scenario: Interest rate spreads against German Bunds are optimistically assumed to fall from the current high levels to 350 bps in Greece, 200 bps in Ireland, 150 bps in Portugal and 100 bps in Spain by 2013/14 and are assumed to stay at these levels;

Cautious scenario: Expected future interest rates are calculated using the expectation

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<sup>11</sup> This appendix was jointly written with Christophe Gouardo.

<sup>12</sup> Every third year, the European Commission performs a sustainability assessment with a 50-year horizon, placing special emphasis on the consequences of ageing. See the latest assessment in European Commission (2009).

hypothesis of the term structure of interest rates (which leads to considerably higher expected future interest rates than in the optimistic scenario).

### **GDP growth:**

Optimistic scenario: Consensus Economics (2010);

Cautious scenario: Lower GDP growth is assumed than in the optimistic scenario, because, especially in the case of Greece, Portugal and Spain, where the business climate is weak and where we see serious competitiveness problems, efforts to regain competitiveness are assumed to impact growth and inflation negatively compared to the previous scenario.

The two scenarios are identical in all other aspects.

**Potential additional bank recapitalisation by governments:** estimates from Barclays Capital.

### **Primary balance in 2011-14:**

Greece and Ireland: we use the EU-IMF programme assumptions, as indicated in the IMF country reports published in December 2010 (see IMF 2010a and IMF 2010b).

Portugal and Spain: November 2010 forecast of the European Commission up to 2012, and 1.5 percentage points of GDP additional improvement in both 2013 and 2014.

With the above assumptions, we calculate the persistent primary balance needed from 2015 onwards in order to (a) stabilise the debt/GDP ratio at its 2015 level, (b) reduce the debt/GDP ratio from its simulated 2014 level to a level in 2020 that is consistent with a further fall to 60 percent of GDP (the Maastricht criterion) by 2034. For simplicity, we refer to the second case as the case in which the debt ratio is reduced to 60 percent by 2034.

## **A1.2 Borrowing costs**

### **A1.2.1 Official lending rates**

Table A1 shows the composition of financial assistance to Greece and Ireland, which needs to be considered for the overview of official lending rates.

**Table A1: Composition of financial assistance programmes (€ billion, unless otherwise indicated)**

<b>Contributor</b>	<b>Greece</b>	<b>Ireland</b>
IMF	30	22.5
Euro-area bilateral lenders *	80	-
Non-euro-area bilateral lenders	-	4.8
• <i>UK</i>		3.8
• <i>Sweden</i>		0.6
• <i>Denmark</i>		0.4
European Financial Stability Facility (EFSF)	-	17.7
European Financial Stability Mechanism (EFSM)	-	22.5
Irish government	-	17.5
<b>Total</b>	<b>110</b>	<b>85.0</b>
Percent of 2010 GDP	48%	54%
<b>Total excluding own contribution</b>	<b>110</b>	<b>67.5</b>
Percent of 2010 GDP	48%	42%
<b>Projected public debt in 2013 (according to IMF baseline scenario)**</b>	<b>374</b>	<b>211</b>
Percent of projected official lending in 2013 public debt	29%	32%

Sources: for Greece IMF Country Report No. 10/372 IMF and European Economy Occasional Paper No. 68; for Ireland IMF Country Report No. 10/366 and European Economy Occasional Paper No. 76.

Note: \* The shares of participating member states in the total loan are calculated using the adjusted ECB paid capital key. \*\* IMF presents baseline scenario on the debt/GDP ratio and on nominal GDP growth. We have used these figures and 2010 nominal GDP data to calculate projected public debt in €.

### **IMF arrangements**

Greece has received a ‘Stand-By Arrangement’ (SBA), while Ireland has received an ‘Extended Fund Facility’ (EFF)<sup>13</sup>. The SBA is of shorter duration (typically 12-24 months, though the Greek programme is for three years, similarly to the Irish programme), with a repayment period of 3¼–5 years, while the EFF is typically three years in duration, with a longer repayment period, between 4½–10 years.

The facilities have identical lending rates, tied to the IMF’s market-related interest rate (the SDR interest rate, which is a weighted average of euro-area, Japan, UK and US 3-month interest rates; see Table A2). Large loans carry a surcharge of 200 basis points, paid on the amount of credit outstanding above 300 percent of quota. If credit remains above 300 percent of quota after three years, this surcharge rises to 300 basis points<sup>14</sup>. A service charge of 50 basis points is applied on each amount drawn. There is also a 15-30 basis points commitment fee on amounts that could be drawn in the period, but this fee is refunded if the amounts are borrowed during the relevant period.

<sup>13</sup> See at: <http://www.imf.org/external/np/exr/facts/sba.htm> and <http://www.imf.org/external/np/exr/facts/eff.htm>

<sup>14</sup> Committed IMF lending to Greece amounts to 3,212 percent of Greece’s quota, while in the case of Ireland 2,322 percent of Ireland’s quota.



**Table A2: Composition of the SDR interest rate and its expected development (percent)**

	USD	EUR	GBP	JPY	SDR- weighted average
<b>11 February 2011 data</b>					
Interest rates used to calculate the SDR interest rate	0.12	0.81	0.53	0.12	<b>0.42</b>
Interbank interest rates	0.31	1.09	0.80	0.19	<b>0.64</b>
Spread	0.19	0.28	0.27	0.07	<b>0.22</b>
<b>Interbank interest rate futures</b>					
2011	0.5	1.5	1.3	0.4	<b>1.0</b>
2012	1.7	2.3	2.5	0.5	<b>1.9</b>
2013	2.9	2.9	3.5	0.6	<b>2.7</b>
2014	3.8	3.3	4.1	0.9	<b>3.4</b>
2015	4.7	3.7	4.5	1.2	<b>4.0</b>
2016	5.2	3.8	4.6	n.a.	
2017	5.4	n.a.	n.a.	n.a.	
2018	5.5	n.a.	n.a.	n.a.	
2019	5.6	n.a.	n.a.	n.a.	
2020	5.8	n.a.	n.a.	n.a.	

Source: Bloomberg and IMF ([http://www.imf.org/external/np/fin/data/sdr\\_ir.aspx](http://www.imf.org/external/np/fin/data/sdr_ir.aspx)).

Note: The following interest rates are used to calculate the SDR interest rate: three-month Eurepo rate; three-month Japanese Treasury Discount bills; three-month UK Treasury bills; and three-month US Treasury bills. The Eurepo is the rate at which one prime bank offers funds in euro to another prime bank if in exchange the former receives from the latter the best collateral in terms of rating and liquidity. Futures are not available for the interest rates used to calculate the SDR interest rate, but available for interbank interest rates. The included interbank interest rates: EURIBOR for the euro and LIBOR for the other three currencies. The difference between the LIBOR rate and the Treasury bill yield is called the TED spread, which is a frequently used measure of liquidity. In the long run the TED spread will likely normalise close to zero. The annual interbank interest rate futures shown are the averages of the implied futures for the middle of March, June, September and December of each year.

Table A3 shows the scheduled disbursements, repayments and proximate interest rate according to December 2010 information.

**Table A3: Scheduled indicators of IMF credit (SDR billions, unless otherwise noted)**

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
<b>Greece</b>														
Disbursements	9.13	9.61	5.77	1.92	--	--	--	--	--	--	--	--	--	--
Outstanding stock	9.13	18.74	24.51	24.96	18.08	8.74	2.70	0.30	--	--	--	--	--	--
Charges	0.05	0.44	0.70	0.94	0.95	0.59	0.22	0.03	0.00	--	--	--	--	--
Amortisation	--	--	--	1.47	6.88	9.34	6.04	2.40	0.30	--	--	--	--	--
Charges/previous year outstanding stock (%)	--	4.8%	3.7%	3.8%	3.8%	3.3%	2.5%	1.1%	1.0%	--	--	--	--	--
<b>Ireland</b>														
Disbursements	5.01	7.36	5.67	1.43	--	--	--	--	--	--	--	--	--	--
Outstanding stock	5.01	12.37	18.04	19.47	19.47	18.32	16.03	12.96	9.72	6.47	3.23	1.13	0.18	--
Charges	0.03	0.21	0.44	0.57	0.76	0.77	0.71	0.60	0.46	0.32	0.18	0.05	0.01	0.00
Amortisation	--	--	--	--	--	1.14	2.30	3.07	3.24	3.24	3.24	2.10	0.95	0.18
Charges/previous year outstanding stock (%)	--	4.3%	3.6%	3.2%	3.9%	4.0%	3.9%	3.7%	3.5%	3.3%	2.7%	1.5%	1.1%	1.1%

Source: First four rows of each block: Table 22 in IMF (2010a) and Table 9 in IMF (2010b). Bruegel calculation for the fifth rows.

Note: The values shown are December 2010 projections. Ireland did not draw from the facility in 2010; the first disbursement (in parallel with the first EU disbursement) was on 18 January 2011 (see IMF, 2011). Charges/previous year outstanding stock is an imperfect measure of the interest rate, because part of the charges are related to current year disbursements.

Since IMF lending is disbursed in SDRs and the loan is a floating interest rate arrangement tied to the SDR interest rate, it can be wise to hedge the exchange rate and interest rate risks. Indeed, Table A2 indicates that all components of the SDR interest rate are forecast to increase according to exchange-traded futures contracts. The SDR interest rate may increase from the current 0.42 percent to around 4 percent by 2015 and by even more thereafter. Therefore, the proximate interest rates for the coming years reported in Table A3 may prove to be too optimistic. The Irish National Treasury Management Agency (2010) argues that IMF lending could be swapped into a 5.7 percent fixed euro lending rate with a 7.5-year maturity, which is in line with the expected rise in the components of the SDR interest rate. In our calculations we have used this equivalent. For Greece, such a calculation is not available. As the Greek programme is shorter, its fixed-rate euro equivalent is likely to be lower and therefore we assumed 5.0 percent.

### EU arrangements

EU funding for Greece is organised through bilateral loans from the participating member states. The loans are centrally pooled by the Commission, which transforms the bilateral loans into a single loan to Greece, conceptually similar to loan syndication. The interest is calculated on the basis of a floating rate (3-month Euribor) with a margin of 300 basis points for the first three years, and 400 basis points thereafter, for each disbursement, plus an up-front service charge of 50 basis points (see European Commission, 2010).

In order to project the EU's effective lending rate, we used the implied Euribor rates from the London International Financial Futures and Options Exchange (LIFFE) Euribor futures contracts curve, which is available up to 2016 (we assumed that Euribor stays constant in later years). The derived effective lending rate in Table A4 takes into account the different annual vintages of EU lending and the up-front service charge:

**Table A4: Implied Euribor futures and the effective EU lending rate to Greece (percent)**

	2011	2012	2013	2014	2015	2016	2017
<b>3-month Euribor</b>	1.5	2.3	2.9	3.3	3.7	3.8	3.8
<b>Effective EU lending rate to Greece</b>	4.8	5.5	6.0	6.5	7.2	7.5	7.8

Source: LIFFE (Euribor 2011-16), Bruegel assumption (Euribor 2017) and Bruegel calculations (effective EU lending rate).

According to the Irish National Treasury Management Agency (2010), the European Financial Stability Mechanism (EFSM) lending rate to Ireland is 5.7 percent, while the lending rate of European Financial Stability (EFSF) is 6.05 percent<sup>15</sup>. The interest rate on the loans from the three non-euro area countries was not yet set at the time of publication of Irish National Treasury Management Agency (2010); the technical assumption was made that the bilateral loans from the three EU member states will be on the same terms as the funds from the EFSF, ie at 6.05 percent<sup>16</sup>.

### A1.2.2 Market rates

For market borrowing up to 2010 we have used the average coupon value of fixed interest rate bonds, which are (in percent) 3.53 percent in Germany, 4.97 in Greece, 4.64 in Ireland, 4.39 in Portugal and 4.35 in Spain. For simplicity we assumed that these average interest rates apply to all pre-2010 borrowing, but we track different yearly vintages and phase them out according to expiry<sup>17</sup>.

There are two main possibilities for incorporating new market borrowing into our calculations:

1. making assumptions concerning different maturity borrowing in each year and using their maturity-specific interest rates,
2. assuming that the maturity of all new borrowing equals the average maturity and using the average interest rate across all maturities.

Implementing the first choice would be cumbersome and in our view the simplification

<sup>15</sup> See information about the EFSF at <http://www.efsf.europa.eu/>. We could not find an official website for the EFSM. See Box 10 of European Commission (2011) for details about the EFSF and EFSM financing to Ireland.

<sup>16</sup> While we used the 6.05 percent rate for the bilateral loans according to the technical assumption provided in Irish National Treasury Management Agency (2010), more recent information suggested that bilateral lending of UK to Ireland was provided at the 5.9 percent, see <http://debates.oireachtas.ie/dail/2010/12/16/00115.asp>. The difference in interest rate (0.15 percentage points) is very small on an otherwise relative small portion of assistance loans and therefore our result would not change much by using this somewhat lower interest rate.

<sup>17</sup> To be more precise, we had information on the maturity structure of about 85/95 percent of tradable securities, which constitute 56 percent of total borrowing in Germany, and 95 percent in Greece, 61 percent in Ireland, 81 percent in Spain and 89 percent in Portugal. The large discrepancy in the case of Germany is primarily due to state and local level government borrowing, which took the form of loans. We assumed that the remaining tradable securities and all loans have the very same maturity structure as the tradable securities for which we have information.

incorporated in the second assumption does not distort the calculations; therefore, we use this second option. Since the current average maturity in the four countries ranges from 6.5-7.7 years, we assume that new debt issuances will have a 7-year maturity and will carry the average interest rate across all maturities.

The most difficult assumption concerns the future development of interest rates on newly issued debt. One obvious choice is the expected interest rate derived on the basis of the expectations hypothesis of the term structure of interest rates (EHTS, see Box 1). However, it can be argued that trading volume in peripheral bond markets is low, and thus current interest rates may not properly reflect expectations, or that the term premium of longer maturity bonds is sizeable. Furthermore, the probability of default and the implied losses are likely priced in current market yields (especially for Greece). However, market yields will fall if the adjustment programmes succeed and the countries concerned avoid default.

Therefore, in our optimistic scenario, we assume much lower interest rates (especially for Greece and Ireland) than those implied by the EHTS<sup>18</sup>. We make spread assumptions compared to German Bunds, which are optimistically assumed to fall from the current high levels. We emphasise that our spread assumptions apply to the average interest rate (according to our choice made above), ie the average over various maturities and not just the spread over the 10-year interest rate, which is the most closely watched indicator. For example, using our January 2010 data, the Greek spread over 10-year German Bunds was about 800 basis points, while the spread over 3-year German Bunds was about 1150 basis points. Using the maturity structure of the debt to calculate weights, the average spread over German Bunds was 970 basis points in Greece, 550 basis points in Ireland, 370 basis points in Portugal and 200 basis points in Spain. Using EHTS, these spreads would stay broadly stable in the next few years in Ireland, Portugal and Spain, while in Greece the spread would fall to about 780 basis points by 2014. But in our optimistic scenario we assume a more significant fall of the spread in Greece and also falls in the other three countries: we assume that these spreads will gradually fall to 350 basis points in Greece by 2014, 200 basis points in Ireland by 2014, 150 basis points in Portugal by 2013 and 100 basis points in Spain by 2013. They will then stay at these levels.

Figure A1 shows the average market interest rate on newly issued public debt in the two scenarios, relative to Germany. It is interesting to note that, while not deliberate, in the optimistic scenario, the market rate for Ireland in the second half of the decade – close to 6 percent – is quite close to the EU lending rates to Ireland, while the rate in Greece – close to 8 percent – is also very close to the expected cost of EU lending to Greece (see Table A4).

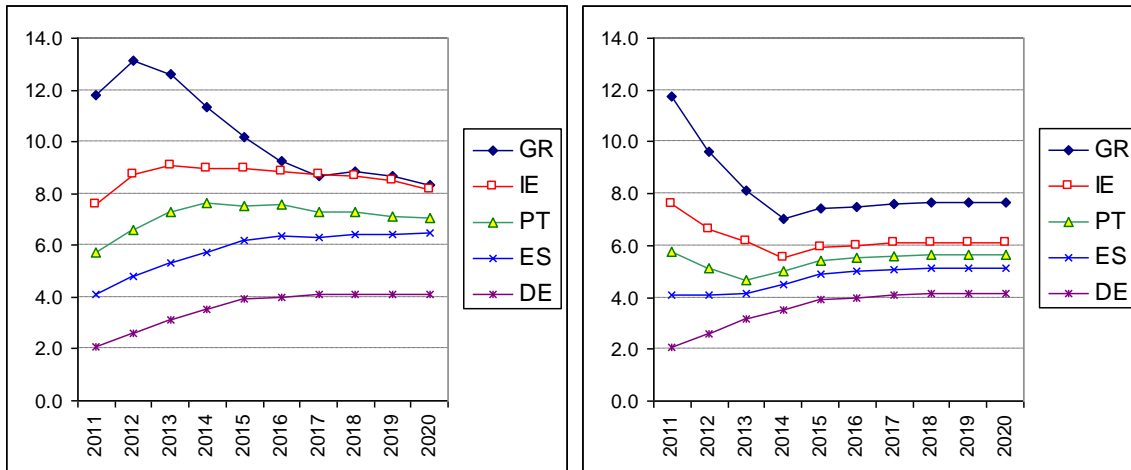
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<sup>18</sup> Yet we use the EHTS to proximate future German interest rates, because the concerns mentioned above do not apply to Germany. Consensus Economics (2010) – which was based on an October 2010 survey of professional forecasters – included forecast for the German 10-year bond for 2016-2020, which was 4.1 percent. Our calculation based on EHTS – using January 2011 data – indicated 4.2 percent for the same period.

**Figure A1: Average market interest rate on newly issued public debt**

*A: Cautious scenario*

*B: Optimistic scenario*



Source: Bruegel calculations.

**Box 1: Using EHTS to calculate expected future interest rates**

The expectation hypothesis of the term structure of interest rates (EHTS) states that yield on a long maturity bond equals the average of the current and the expected future short maturity yields, plus possibly a term premium, which can compensate for risk related to liquidity for instance, or to the segmented nature of short and long maturity bond markets. For example, the (annualised) yield on a 2-year bond is the average of the current yield on a 1-year bond and the expected 1-year yield one year from now, plus possibly a term premium. By assuming that the term premium is negligible, one can calculate the expected future interest rates using current interest rates. For example, let  $i_t^{(1)}$  denote the current 1-year yield,  $i_t^{(2)}$  the current 2-year yield and  $E(i_{t+1}^{(1)})$  expected 1-year yield one year from now (all measured in percent per year). Then, taking aside the term premium,  $(1+i_t^{(2)}) = \frac{1}{2} \left( (1+i_t^{(1)}) + (1+i_t^{(1)})E(i_{t+1}^{(1)}) \right)$ , which allows the calculation of  $E(i_{t+1}^{(1)})$  from the currently observed  $i_t^{(1)}$  and  $i_t^{(2)}$ . The empirical results on EHTS are mixed: some papers reject the hypothesis while some others find support, using various currencies and time periods. In their seminal work Bekaert and Hodrick (2001) find more support for EHTS; see also the recent paper of Bulkley et al (2011) and references therein for similar results.

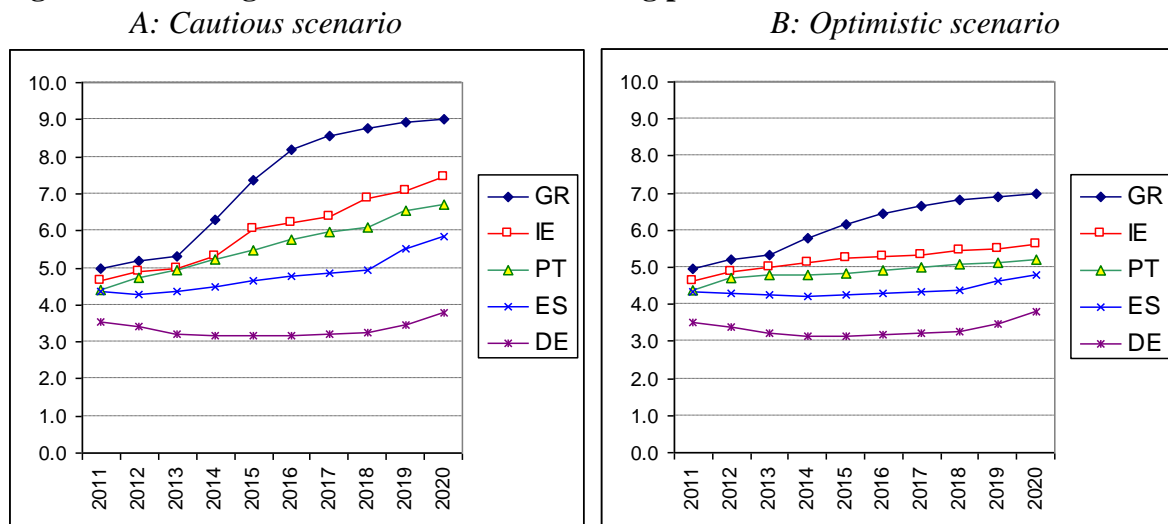
Ideally, zero coupon yields would be needed for using the EHTS, but we could acquire only benchmark yields for the four countries. However, for Germany both zero coupon and benchmark yields are available which are quite similar. We have calculated the implied expected future interest rates for all maturities between 1-year and 10-year up to 2020 (assumed that within year bills pay the 1-year rate and over-10-year bonds pay the 10-year rate). EHTS allows us to derive expected future interest rates for each maturity. But to calculate an average over all maturities we need to make an assumption concerning the future maturity structure of public debt. Lacking a better benchmark, we assumed that the current maturity structure will not change. Consequently, we have then weighted these expected 1, 2, ..., 10-year rates (in every year between 2011 and 2020) with the assumed constant maturity structure of the debt to arrive at the average interest rate of newly issued debt in each year.

### A1.2.3 Average interest rate on outstanding public debt

The volume of newly issued market securities is calculated as the total debt minus the stock of official lending (in Greece and Ireland) minus the stock of pre-2011 market debt. Total debt is determined by debt dynamics and therefore the average interest rate on outstanding debt (Figure A2) depends on the particular scenario used to calculate debt dynamics. Figure A2 is based on our benchmark scenario, though the average interest rate is only slightly different in other scenarios.

For both market and official lending we track their annual vintages<sup>19</sup> and calculate the actual interest to be paid (in euros) in a given year as the product of the interest rate and the debt stock of the particular vintage at the end of the previous year. Dividing total interest payments in a year with the total stock of debt at the end of the previous year provides a measure of the average interest rate on outstanding public debt. The results are shown in Figure A2.

**Figure A2: Average interest rate on outstanding public debt**



Source: Bruegel calculations.

### A1.3 GDP Growth

The four countries have different growth outlooks; in particular, Ireland has better growth prospects than Greece, Portugal and Spain.

Table A5 presents some structural indicators for Greece, Ireland, Portugal and Spain in comparison to Germany, the average of the other ten EU15 countries, and the USA. Ireland clearly stands out in almost every respect: it has an excellent business environment, institutions, educational system and technological capacity. In the latter aspect, it even has a better score than Germany and has scores comparable to those of the USA for a couple of other aspects. Towards the end of the pre-crisis boom, by 2007, Ireland had the third highest share of manufacturing in GDP of all EU15 countries (after Finland and Germany), a share

<sup>19</sup> While interest rates vary within year as well, we treat all borrowing in a given year as paying the same interest rate.

that had risen to the highest level within the whole EU by 2009. It had a significant surplus (9 percent of GDP) in the external balance of goods and services in 2007, which has even expanded to 19 percent of GDP in 2010. All of these are indication of a strong Irish tradable sector and an excellent business climate. However, the three Mediterranean countries, and especially Greece, are weaker in all these dimensions when compared to Ireland, Germany and other EU15 countries, and the data suggests that their tradable sectors are weak.

**Table A5: Some structural indicators**

	Greece	Ireland	Portugal	Spain	Germany	Other EU-15	USA
Quality of institutions (scale: from 1 to 7)*	4.1	5.4	4.8	4.6	5.7	5.4	4.9
Corruption perception (scale: from 1 to 10)*	3.8	8.0	5.8	6.1	8.0	7.8	7.5
Ease of doing business rank 2009, (out of 183)**	109.0	7.0	48.0	62.0	25.0	29.8	4.0
Infrastructure (scale: from 1 to 7)*	4.3	4.0	5.1	5.3	6.7	5.6	6.1
Markets (scale: from 1 to 7)*	4.9	5.5	5.0	5.1	5.8	5.4	5.9
Quality of the educational system (scale: from 1 to 7)*	3.3	5.6	3.5	3.8	4.9	5.1	5.0
Technology access (scale: from 1 to 7)*	4.2	5.5	5.2	5.0	5.4	5.5	5.7
Absorptive capacity (scale: from 1 to 7)*	4.3	5.1	4.0	4.5	4.7	5.0	5.4
Creative capacity (scale: from 1 to 7)*	4.1	5.0	4.1	4.3	4.9	5.0	5.8
Share of manufacturing (% of GDP) in 2007	9.2	21.8	14.6	15.0	23.8	16.2	13.7
Share of manufacturing (% of GDP) in 2009	10.3	24.2	13.0	12.7	19.1	13.7	n.a.
Balance of goods and services (% of GDP) in 2007	-12.0	9.0	-8.0	-6.7	7.1	6.0	-5.1
Balance of goods and services (% of GDP) in 2010	-7.3	19.3	-8.0	-2.1	4.7	5.5	-3.7
Current account balance (% of GDP) in 2007	-15.7	-5.5	-10.2	-10.0	7.6	3.4	-5.1
Current account balance (% of GDP) in 2010	-10.6	-1.1	-10.7	-4.8	4.8	2.2	-3.4

Sources: World Economic Forum's Global Competitiveness Report (Quality of institutions, Infrastructure, and Quality of the educational system), Transparency International (Corruption perception), World Bank (Ease of doing business), AMECO (share of manufacturing, balance of goods and services, current account balance) and the various sources indicated in Veugelers (2010) for Markets, Technology access, Absorptive capacity and Creative capacity using her methodology.

Note: Other EU-15 is the un-weighted average of the ten other EU-15 countries (EU-15 excluding Greece, Ireland, Portugal, Spain and Germany). \*: the higher the better; \*\*: the lower the better

Figure 2 of the main text, showing unit labour cost developments, suggests that Ireland did not have a competitiveness problem in the manufacturing sector even during the boom years<sup>20</sup> and total economy unit labour costs have started to decline substantially since 2008. But Greece, Portugal and Spain need to gain price competitiveness, which will likely lead to a long period of low inflation and growth.

<sup>20</sup> See Darvas (2010b) for further details on sectoral unit labour costs developments in euro-area countries.

On the basis of the above observations Greece, Portugal and Spain have weaker growth prospects than Ireland and we see significant downward risk compared to the forecasts of Consensus Economics (2010). Furthermore, in our assessment the gap between Ireland and the three Mediterranean countries should be greater than what is included in Consensus Economics (2010). Therefore, while we use the GDP forecasts of Consensus Economics (2010)<sup>21</sup> in the optimistic scenario, in the cautious scenario, growth in Greece, Portugal and Spain is downgraded more than growth in Ireland compared to the optimistic scenario (Table A6). Whereas in our assessment the three Mediterranean have slightly different outlooks, for simplicity we assume the same growth rate for these three countries in the cautious scenario. For comparison, Table A6 also includes official projections.

**Table A6: GDP growth assumptions for the sustainability analysis**

		Real GDP growth						Nominal GDP growth					
		2011	2012	2013	2014	2015	2016-20	2011	2012	2013	2014	2015	2016-20
Greece	Official	-3.0	1.1	2.1	2.1	2.7	2.6	-1.5	1.5	2.9	3.3	4.0	4.2
	Optimistic	-2.2	0.6	1.4	1.9	2.1	2.3	-1.2	1.1	1.9	3.0	3.5	4.3
	Cautious	-3.0	0.6	1.0	1.0	1.0	1.0	-1.5	1.1	1.9	2.0	2.0	2.0
Ireland	Official	0.9	1.9	2.4	3.0	3.4	n.a.	1.3	2.7	3.8	4.6	5.1	n.a.
	Optimistic	1.4	2.3	2.6	2.7	2.9	2.9	2.0	3.6	4.1	4.4	4.8	4.8
	Cautious	0.9	1.9	2.4	2.5	2.5	2.5	1.3	2.7	3.8	4.0	4.0	4.0
Portugal	Official	-1.0	0.8	1.1	1.2	1.2	n.a.	0.3	1.8	2.5	2.8	3.0	n.a.
	Optimistic	0.2	0.9	1.4	1.6	1.8	1.9	1.2	1.8	2.9	3.2	3.6	3.8
	Cautious	-1.0	0.8	1.0	1.0	1.0	1.0	0.3	1.8	2.0	2.0	2.0	2.0
Spain	Official	0.7	1.7	2.1	2.1	2.0	n.a.	1.7	3.2	3.5	3.8	3.9	n.a.
	Optimistic	0.6	1.2	1.5	1.8	2.1	2.0	1.9	2.7	3.1	3.5	3.8	3.8
	Cautious	0.6	1.0	1.0	1.0	1.0	1.0	1.7	2.0	2.0	2.0	2.0	2.0

Note. **Official:** for Greece and Ireland IMF country reports December 2010 (IMF 2010a and 2010b), for Portugal and Spain ECFIN November 2010 forecasts for 2011-12 and IMF World Economic Outlook October 2010 forecasts for 2013-15; **Optimistic:** Consensus Economics (2010) forecast made in October 2010; **Cautious:** lower of the Consensus Economics forecast and the official programme assumption, but not larger than 1% real/2% nominal growth for Greece, Portugal and Spain and 2.5% real/4.0% nominal growth for Ireland.

#### A1.4 Bank bail-out and privatisation

In both scenarios we use estimates from Barclays Capital of potential additional bank recapitalisation by governments. For Ireland and Spain we use their high-risk estimate, but for Greece and Portugal we use the benchmark, as Barclays does not report high-risk estimates for these countries. The corresponding public finance cost amounts to €10 billion in Greece, €31.5 billion in Ireland, €10 billion in Portugal and €75 billion in Spain. We take into account the fact that the Irish government has put aside €17.5 billion from its cash reserves and liquid assets to support banks and therefore only bank capital needs above this value will add to public debt. The Spanish value does not include support already provided by the government. We do not assume any privatisation revenue in order to remain on the conservative side<sup>22</sup>.

<sup>21</sup> Consensus Economics (2010) was formed in October 2010 and therefore its short-term forecasts may be somewhat out-dated. However, since our focus is on the medium term, the change in short term forecasts do not matter much for the medium-term analysis.

<sup>22</sup> Note that for Greece, IMF (2010a) estimates privatisation revenue of about an average 0.5 percent of GDP per year between 2011 and 2020 (somewhat higher values in 2012-2015 and somewhat lower in 2011 and after 2015). IMF (2010b) does not assume any privatisation revenue for Ireland.



### A1.5 Primary balance (excluding bank support and privatisation)

The primary balance (in percentage of GDP) in Greece and Ireland is assumed to evolve according to the EU-IMF programme assumptions as indicated in the IMF country reports published in December 2010 (IMF 2010a and 2010b). For Portugal and Spain we use the European Commission's November 2010 forecast up to 2012, and assume that the primary balance will improve by 1.5 percentage point of GDP both in 2013 and 2014. Table A7 details these assumptions along with historical data.<sup>23</sup>

**Table A7: Primary balance assumptions (percent of GDP)**

	Actual					Forecasts and projections			
	2006	2007	2008	2009	2010	2011	2012	2013	2014
Greece	-1.4	-1.9	-4.5	-10.1	-3.7	-0.8	1.1	3.5	6.0
Ireland (excluding bank support)	3.9	1.1	-5.9	-12.2	-29.3	-6.7	-4.1	-1.4	1.2
Portugal	-1.4	0.0	0.0	-6.5	-4.4	-1.2	-1.1	0.4	1.9
Spain	3.7	3.5	-2.6	-9.4	-7.3	-4.1	-2.7	-1.2	0.3

Sources: Actual: AMECO and IMF (2010b); Forecasts and projections: for Greece IMF (2010a), for Ireland IMF (2010b), for Portugal and Spain European Commission Autumn 2010 forecast for 2011-12 and Bruegel assumption for 2013-14.

Concerning the primary balance from 2015 onward we calculate two measures: the persistent primary surplus needed in order to:

- stabilise the debt/GDP ratio at its 2015 level<sup>24</sup>,
- reduce the debt/GDP ratio from its simulated 2014 level to a level by 2020 that is consistent with a further fall to 60 percent of GDP (the Maastricht criterion) by 2034<sup>25</sup>.

<sup>23</sup> In order to project the average interest rate of outstanding debt in Germany (see Figure 2) we also needed to make an assumption for the German primary balance (as a percent of GDP) developments. We use the European Commission's Autumn 2010 forecast for 2011 (-0.34 percent) and 2012 (0.63 percent). For 2013 and 2013 we assumed 0.5 percentage point improvement in both years. We calculated the persistent primary surplus from 2015 onward as the one that allows to reach a 0.35 percent of GDP overall budget deficit in 2016 in line with the German fiscal rule, which is 1.9 percent.

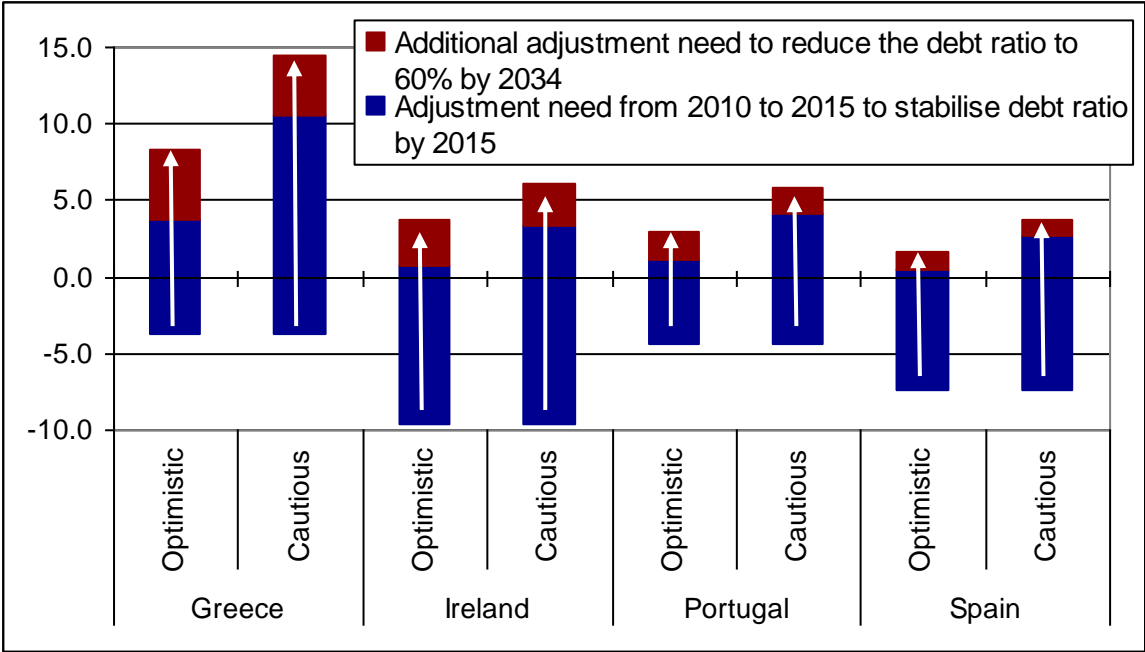
<sup>24</sup> Figure 2 indicates that the average interest rate on outstanding public debt continues to increase in the second half of the decade, while we have assumed constant GDP growth in 2016-20 (Table 5). Therefore, with a constant primary surplus in 2015-20 it is not possible to stabilise the debt ratio. However, for expositional purposes we did not calculate a time-varying primary surplus for 2015-20, but assumed that it would be constant, and calculated this constant level as the one that minimised the standard deviation of the debt ratio in 2015-20.

<sup>25</sup> For example, for a 160 percent debt ratio in 2014 (which is 100 percentage points higher than the 60 percent Maastricht criterion) we require that fall in the debt ratio be 5 percentage points in each year. This interpretation of the Maastricht criteria has already been adopted in Darvas (2010a).

For simplicity, we refer to the second case as the case in which the debt ratio is reduced to 60 percent by 2034.

Figure A3 (which is included in the main text as Figure 3) shows the adjustment needed in the primary balance (as a percent of GDP) by 2015 from the 2010 level to achieve these two objectives. For example, the Greek primary balance was -3.7 percent of GDP in 2010 (the bottom of the blue bar). The debt stabilising primary surplus in every year from 2015 onward is 3.7 percent in the optimistic scenario and 10.5 percent in the cautious scenario (top of the blue bar), while the debt reducing primary surplus in every year from 2015 onward is 8.4 percent in the optimistic scenario and 14.5 percent in the cautious scenario (top of the dark red bar).

**Figure A3: Required improvement in the primary balance (% GDP) from its 2010 annual level to its 2015 annual level under different macroeconomic scenarios and different debt stabilisation objectives**



Note: the bottom of the blue bar shows the 2010 primary balance (excluding bank support in the case of Ireland); the top of the blue bar shows the debt stabilising level of primary balance in every year from 2015 onward; and the top of the dark red bar shows the debt reducing level of primary balance in every year from 2015 onward. The stabilised levels of debts in the case of the adjustment indicated by the blue part of the bars are the following: 160% in Greece, 123% in Ireland, 98% in Portugal and 84% in Spain.

## A1.6 Assessment of recently emerged alternatives

In this section we assess three types of measures currently under consideration:

- **Interest rate cut:** A lowering of the interest rate charged on all official EU loans (IMF rates cannot be lowered) to 3.5 percent annually;
- **Maturity extension:** An extension of the maturity of all official EU loans to 30 years (1/30 of the principal to be paid back in each year), and the transformation of the Greek IMF Stand-by Agreement into an Extended Fund Facility (which would extend the repayment date from 2018 to 2023, as in Ireland (Table A3); however, due to the extended maturity, the fixed-rate euro equivalent of the floating IMF SDR-based lending rate is assumed to be the same as in Ireland, which would imply a 0.7 percentage point increase in the effective interest rate; see Section 1.2.1);
- **Debt buy-back from ECB:** The purchase by the European Financial Stability Facility (EFSF) of all government bonds currently held by the European Central Bank within the framework of its Securities Market Programme and the retrocession of the corresponding haircut to the issuing country<sup>26</sup>. We assume that retrocession takes the form of an EFSF lending to the issuing country.

We wish to assess the individual impact of these measures as well as their joint impact. However, the individual impact of the second and third measures is very small, or even could have a seemingly perverse impact.

- **Maturity extension.** As shown in Table A4, the EU lending rate to Greece is expected to increase to 7.8 percent by 2017, which is broadly similar to our assumed market interest rate in the optimistic scenario (Figure A1). Therefore, maturity extension would not reduce the interest burden (though it would lead to lower borrowing needs from the market, which could be helpful).
- **Debt buy-back from the ECB.** The average market discount on Irish and Portuguese bonds is reasonably small (see Section 2) and therefore the implied reduction in debt would also be reasonably small. The debt buy-back would reduce the stock of securities issued in previous years which had an average coupon of 4.64 percent in Ireland and 4.39 percent in Portugal (Section 1.2.2). However, if the retrocession of the corresponding haircut from the debt buy-back to the issuing country would be done through an EFSF lending to the countries at 6.05 percent, as in the current EFSF lending to Ireland, then this higher interest rate debt could gradually neutralise and even overturn the positive impact of a reduced debt level.

Consequently, while we assess the impact of interest rate cuts on EU lending on its own, we assess maturity extension and debt buy-back alongside a rate cut on EU lending.

We would expect a positive market reaction to these measures, but it is very difficult to assess its likely impact. For illustration, we also provide an evaluation of the effect of a drop of 100 basis points in market yields and the joint impact of the three policies and the drop in market

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<sup>26</sup> We only consider here buy-backs from the ECB, which is feasible without any market interference. Note also that as the current market value of ECB holdings is close to their value at the time of purchase, we consider this retrocession to be broadly neutral for the ECB profit-and-loss account.

yields just mentioned. Note that a 100 basis points drop in market interest implies that in the optimistic scenario, the spread to German bunds would decline to 250 basis points in Greece, 100 basis points in Ireland, 50 basis points in Portugal and zero in Spain.

Obviously calculations only apply to measures that are currently applicable. We only consider maturity extension for the countries (Greece and Ireland) that benefit from financial assistance, while for Portugal we only consider the buy-back of current ECB bond holdings. Table A8 shows the results (a condensed version of this table is included in the main text as Table 1).

**Table A8: Assessment of alternative policies**

**Panel A: Persistent primary surplus needed in every year from 2015 onwards to stabilise the debt/GDP ratio at its 2015 level (% GDP)**

		(a)	(b)	(c)	(d)	(e)	(f)	(g)
		Baseline	Deviation from baseline					All three policies + market reaction
scenario	Rate cut on EU lending		Rate cut + Maturity extension	Rate cut + Debt buy-back from ECB	All three policies	100 bps lower market yields		
Greece	Optimistic	3.7	-0.22	-1.13	-0.37	-1.31	-1.04	-2.05
	Cautious	10.5	-0.44	-2.32	-0.75	-2.65	-1.02	-3.35
Ireland	Optimistic	0.7	-0.35	-0.46	-0.38	-0.54	-0.55	-1.04
	Cautious	3.3	-0.44	-0.65	-0.44	-0.75	-0.53	-1.24
Portugal	Optimistic	1.2			-0.04	-0.06	-0.66	-0.74
	Cautious	4.1			-0.04	-0.07	-0.71	-0.79
Spain	Optimistic	0.5					-0.61	
	Cautious	2.7					-0.65	

**Panel B: Persistent primary surplus needed in every year from 2015 onwards to reduce the debt/GDP ratio from its 2014 level to 60 percent by 2034 (% GDP)**

		(a)	(b)	(c)	(d)	(e)	(f)	(g)
		Baseline	Deviation from baseline					All three policies + market reaction
scenario	Rate cut on EU lending		Rate cut + Maturity extension	Rate cut + Debt buy-back from ECB	All three policies	100 bps lower market yields		
Greece	Optimistic	8.4	-0.47	-1.26	-0.97	-1.76	-0.84	-2.35
	Cautious	14.5	-0.67	-2.35	-1.30	-2.97	-0.85	-3.55
Ireland	Optimistic	3.7	-0.46	-0.55	-0.63	-0.76	-0.44	-1.14
	Cautious	6.1	-0.55	-0.72	-0.68	-0.94	-0.44	-1.33
Portugal	Optimistic	2.9			-0.13	-0.14	-0.64	-0.79
	Cautious	5.8			-0.12	-0.14	-0.69	-0.84
Spain	Optimistic	1.6					-0.61	
	Cautious	3.8					-0.65	

Source: Bruegel.

Note: Column (g) is not the sum of columns (e) and (f) because the marginal impact of policy measures is smaller (in absolute terms) when market interest rates are lower. Column (d) for Portugal considers debt-buy back financed from a 3.5 percent EFSF loan for the same maturity as the current Irish EFSF lending, while column (e) also considers the 30-year extended repayment maturity.

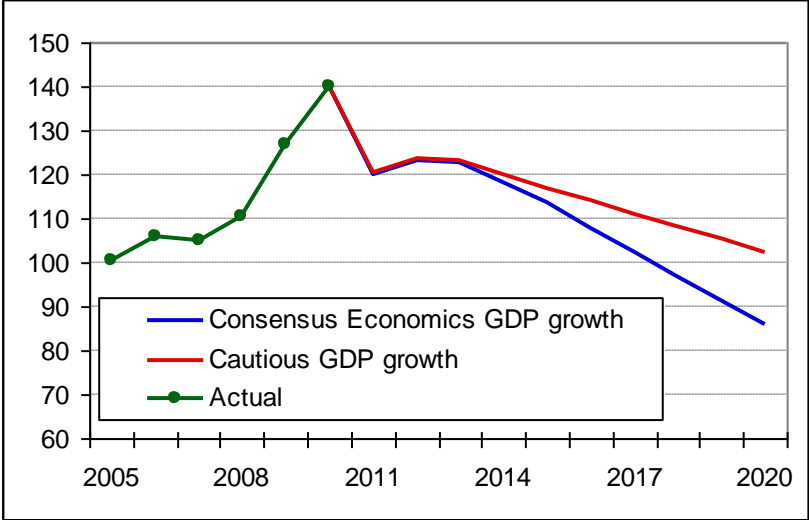
### A1.7 An illustrative calculation for the haircut needed to restore fiscal sustainability in Greece

Our illustrative calculation considers the following aspects:

- Assistance loans will be exempt from the haircut;
- All three policies considered in Section 1.6 are implemented before the haircut in order to minimise its magnitude;
- The haircut will lead to increased confidence and therefore will result in a drop of the spread vis-à-vis Germany to 200 basis points immediately and permanently;
- The persistent primary surplus from 2015 onward will be 6 percent of GDP (the programme assumption);
- The magnitude of the haircut should be sufficient to reach the 60 percent debt ratio by 2034 in our cautious growth scenario.

With these assumptions the haircut should be about 30 percent on the marketable public debt in 2011. Clearly, with such a haircut, the debt ratio would fall faster in the optimistic growth scenario (Figure A4) and the haircut itself could lead to faster GDP growth due to increased confidence.<sup>27</sup>

**Figure A4: Debt ratio developments in Greece with a 6 percent of GDP persistent primary surplus and 30 percent haircut to marketable debt**



Source: Bruegel calculations.

Note: extrapolation of the blue curve will lead to a less than 60 percent debt ratio by 2025

These haircut calculations are merely illustrative. In addition to uncertainties over future GDP growth developments, there are uncertainties over the Greek banking losses and public recapitalisation needs, which may be higher after a haircut (recall that we have assumed a €10 billion public recapitalisation in our calculations); there are uncertainties concerning the actual conditions of the three policy measures considered in section 1.6; and most importantly there is also uncertainty about market reactions: we assumed that the spread vis-à-vis German

<sup>27</sup> This is an important reason for our argument that investors who had to face a haircut should be able to benefit from an upturn in economic conditions through eg GDP-indexed bonds.

Bunds would immediately fall to 200 basis points and would remain at this level. Furthermore, it is also uncertain if the Greek government will be able to maintain a six percent persistent primary surplus from 2015 onward: the market assessment of this would likely be a key factor in market reactions.

## A1.8 Sensitivity analysis

We assess the sensitivity of our key result, the debt-ratio reducing level of primary surplus, to:

- 1 percentage point faster/slower nominal GDP growth (in every year starting in 2011);
- 1 percentage point lower/higher market interest rate on newly issued debt (in every year starting in 2011);
- 50 percent lower/higher public recapitalisation need compared to our baseline assumption (in 2011);

Table A9 shows the results.

**Table A9: Sensitivity analysis - Persistent primary surplus needed in every year from 2015 onwards to reduce the debt/GDP ratio from its 2014 level to 60 percent by 2034 (% GDP)**

		(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)
		Deviation from baseline								
scenario	Baseline	1 pp faster GDP growth	1 pp slower GDP growth	100 bps lower market yields	100 bps higher market yields	50% lower bank recap.	50% higher bank recap.	The 3 deficit-lowering measures	The 3 deficit-increasing measures	
Greece	Optimistic	8.4	-1.81	1.98	-0.84	0.84	-0.29	0.28	-2.84	3.20
	Cautious	14.5	-2.17	2.36	-0.85	0.84	-0.39	0.38	-3.30	3.71
Ireland	Optimistic	3.7	-1.27	1.38	-0.44	0.44	-0.56	0.66	-2.11	2.70
	Cautious	6.1	-1.36	1.47	-0.43	0.43	-0.89	1.01	-2.50	3.16
Portugal	Optimistic	2.9	-1.08	1.16	-0.64	0.65	-0.21	0.21	-1.82	2.12
	Cautious	5.8	-1.23	1.34	-0.68	0.71	-0.28	0.28	-2.09	2.43
Spain	Optimistic	1.6	-0.90	0.97	-0.61	0.62	-0.20	0.20	-1.61	1.90
	Cautious	3.8	-1.01	1.10	-0.65	0.68	-0.27	0.28	-1.84	2.17

Source: Bruegel simulations. Note: column (h) is not the sum of columns (b), (d) and (f) and column (i) is not the sum of columns (c), (e) and (g) because the marginal impact of the individual events is different when the other events are also considered.

## A2. Spillovers map: exposure to euro-area periphery

### A2.1 Main tables and figures

In order to assess the potential magnitude of spillovers, and to clearly identify the different situations in each of the countries considered, we compile a set of estimates of the breakdown of holdings of government debt by creditor and bank exposure. Due to the imperfect comparability of the data we use, as well as the assumptions made in our calculations, these estimates should be regarded as illustrative. Table A10 (which is included in the main text as Table 2) summarises the key interdependencies, while Tables A11, A12 and A13, and Figures A5-A9 provide further details and country-specific exposures.

**Table A10: Estimated exposure to periphery government debt and banking system (€ bn, unless otherwise noted), end-2010**

	Greece	Ireland	Portugal	Spain	Total
Total government debt (at face value)	325	153	142	677	1297
of which held by :					
Domestic banks [1]	68	11	19	227	336
Euro-area banks	52	14	33	79	166
Other banks [1]	6	9	5	24	43
Non-banks (both residents and non-residents) [2]	119	97	64	347	627
ECB	50	22	21	0	93
IMF, EU and official lenders	32	0	0	0	32
Ratio of average market value to face value of government debt [3]	0.75	0.85	0.9	1	
Foreign banks' exposure to national banking systems [4]	10	119	43	209	381
of which euro-area banks	6	66	37	154	264
Eurosystem lending to banks through the national central bank [5]	95	132	41	65	333

Sources: Bruegel calculations and estimates using data from BIS, IMF, World Bank, Eurostat, Eurosystem, CEBS, Datastream, National Sources, Barclays Capital.

Note. (1) The total is not equal to the sum of the columns as intra-country exposures are netted out

(2) Non-Banks is calculated as the unidentified portion of government debt (financial institutions not classified as banks are included in this category)

(3) Average weighted discount based on clean price of fixed-rate, non zero-coupon bonds.

(4) As of June 2010 ; the total also includes intra-country exposures

(5) Lending to euro area credit institutions relating to monetary policy operations by the national central banks

**Table A11: External debt of general government, 2010-Q3 (as percent of gross government debt)**

Finland	96
Austria	91
Netherlands	70
Belgium	69
France	69
Portugal	68
Ireland	64
Greece	64
Germany	59
Spain	53

Italy	48
Luxembourg	35

Source: Eurostat, World Bank (JEDH).

**Table A12: Breakdown of foreign bank exposure to sovereign debt (bn €, end-2010 estimates)**

	GR	IE	PT	ES	Total (1)
<b>Foreign Banks Exposure to Sovereign</b>	58	23	38	103	<b>209</b>
<i>of which :</i>					
DE	20	3	6	24	<b>54</b>
FR	16	6	12	37	<b>71</b>
IT	2	1	1	2	<b>6</b>
ES	1	0	7	-	<b>8</b>
<b>Other euro-area</b>	13	3	6	15	<b>38</b>
UK	3	4	2	8	<b>17</b>
JP	1	2	1	8	<b>12</b>
USA	1	2	1	4	<b>8</b>
<b>Rest of the world</b>	1	2	1	3	<b>7</b>

Source: BIS, Bruegel calculations.

(1) The total is not always equal to the sum of the columns as intra-country exposures are netted out.

**Table A13: Breakdown by Country of Banks' Exposure to National Banking Systems (bn €, June 2010)**

	GR	IE	PT	ES	Total
<b>Foreign Banks Exposure to Domestic Banking System</b>	10	119	43	209	<b>381</b>
<i>of which :</i>					
DE	4	39	14	66	<b>123</b>
FR	1	15	11	41	<b>68</b>
IT	1	2	2	8	<b>13</b>
ES	0	3	6	0	<b>8</b>
<b>Other euro-area</b>	1	7	4	39	<b>52</b>
UK	1	25	5	24	<b>55</b>
JP	0	1	0	4	<b>6</b>
USA	1	16	1	19	<b>37</b>
<b>Rest of the world</b>	1	10	1	8	<b>19</b>

Source: BIS, Bruegel calculations.



Figure A5: Exposure to Greece

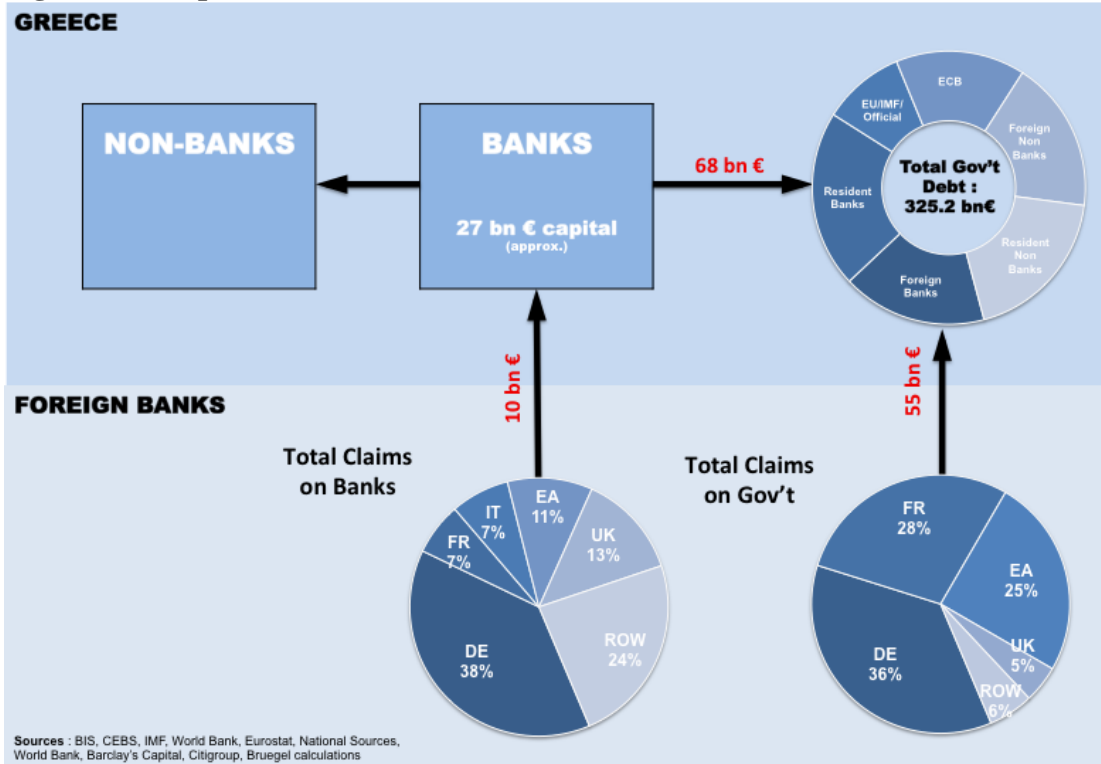
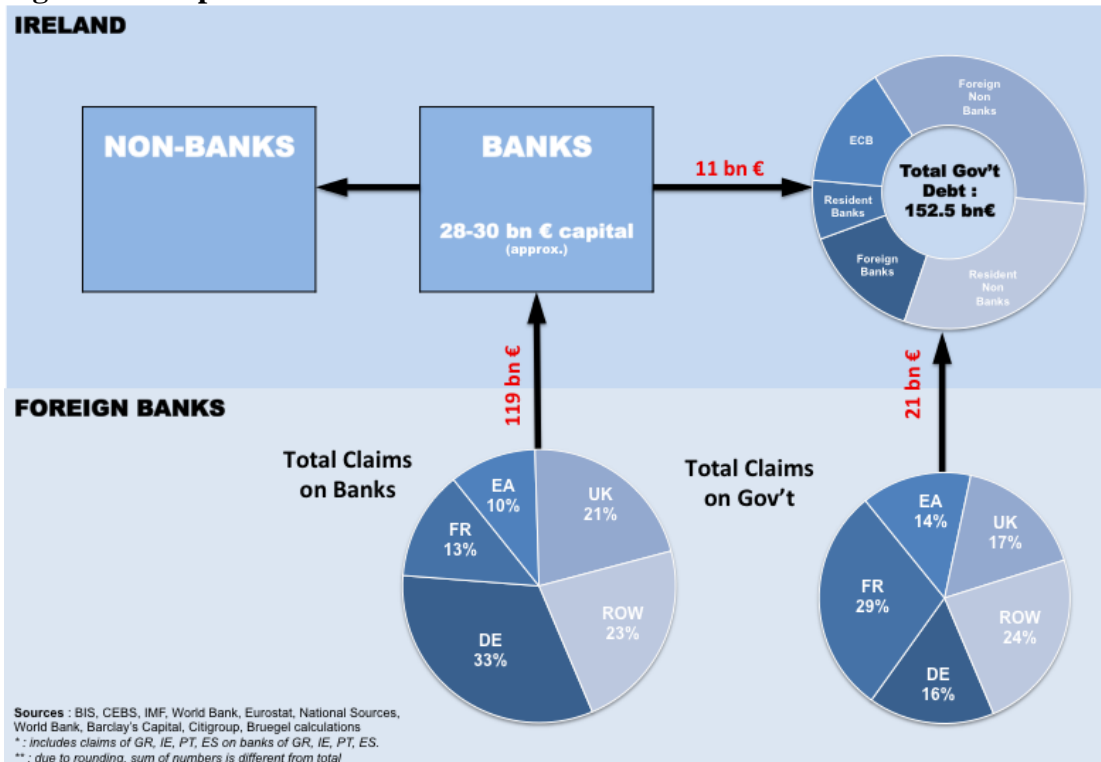
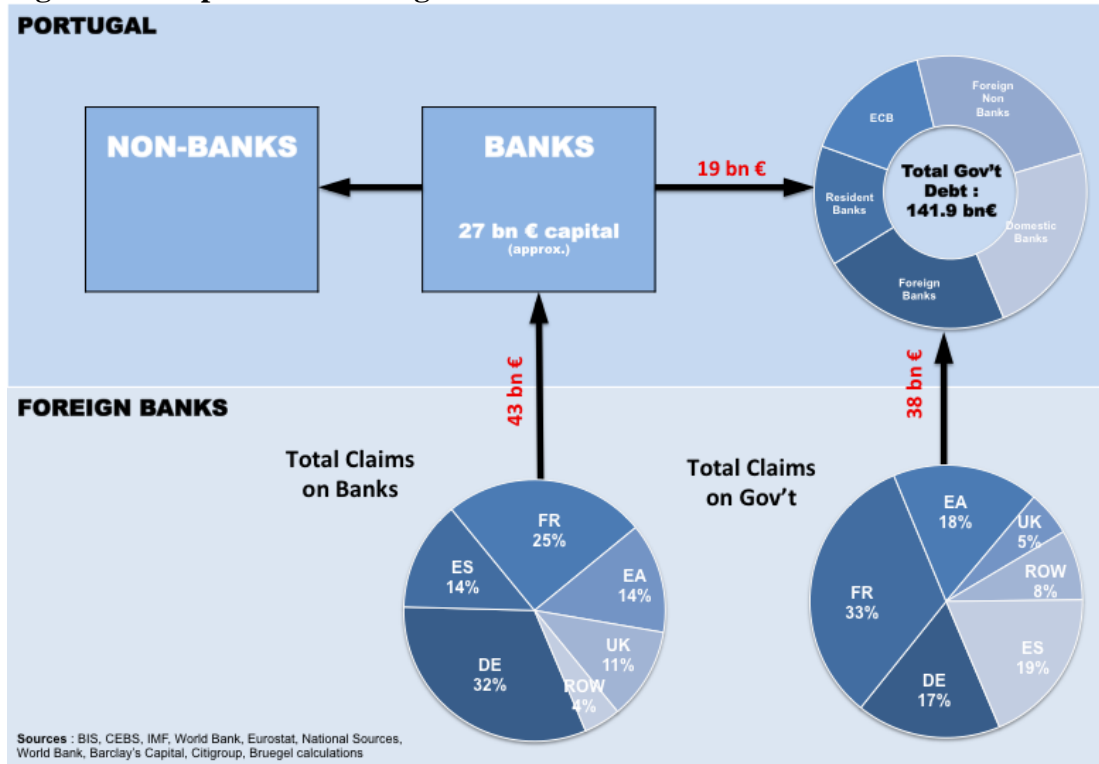


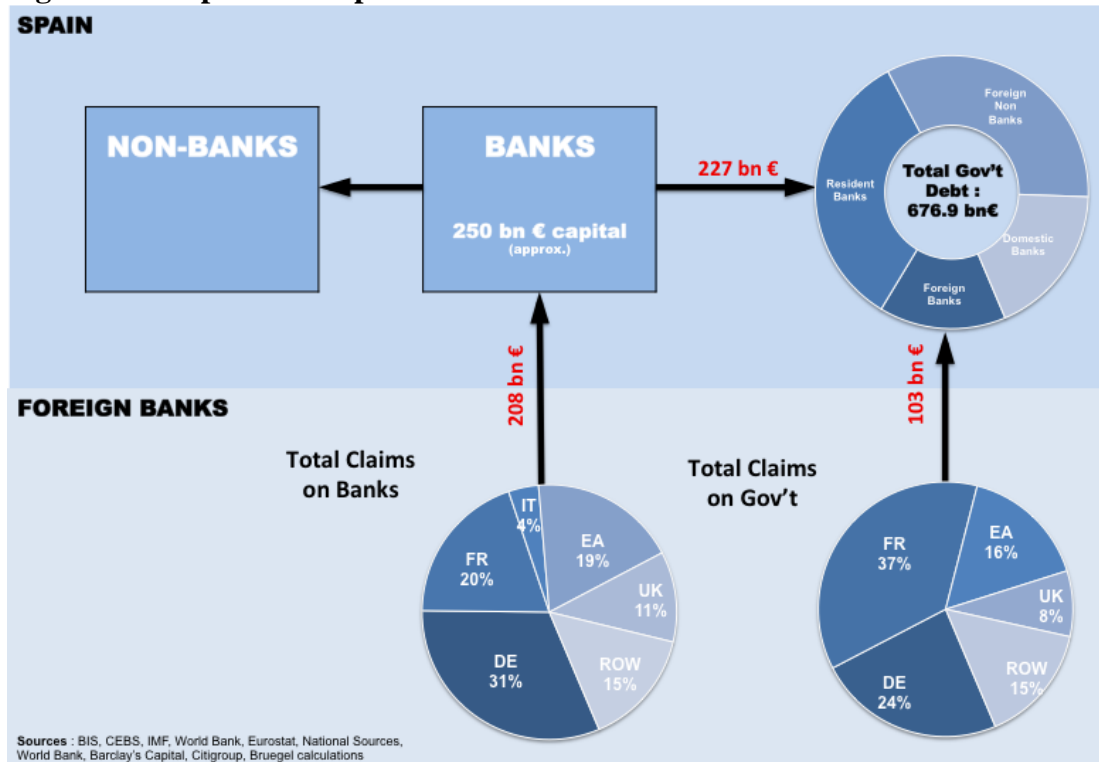
Figure A6: Exposure to Ireland



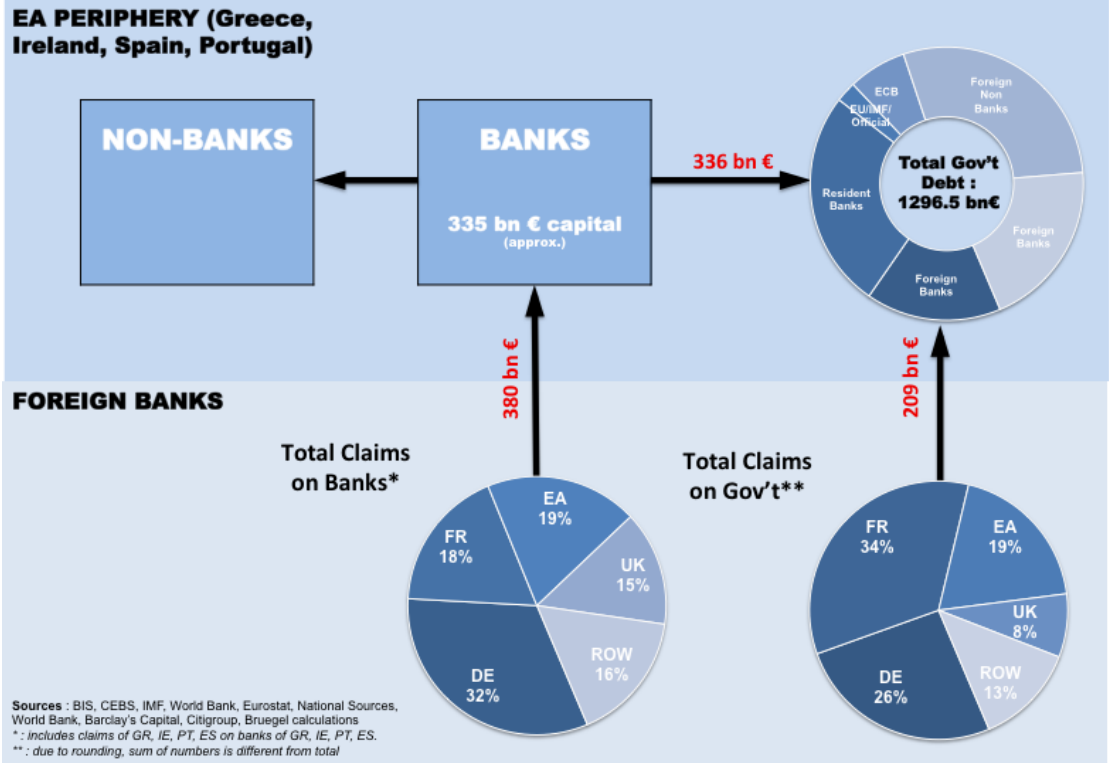
**Figure A7: Exposure to Portugal**



**Figure A8: Exposure to Spain**



**Figure A9: Exposure to euro-area periphery**



**A2.1 Methodology**

**A2.2.1 Sovereign exposure of foreign banks**

The source for these estimates is the BIS's International Consolidated Banking Statistics, as of June 2010 (the latest date for which data broken down by creditor country and debtor sector is available). We report claims on the public sector on an ultimate risk basis. We assume that the public sector is equivalent to general government. Reporting institutions are domestic banks that have their head offices in the reporting country. Only Monetary Financial Institutions are considered as banks (so a large share of the financial sector is excluded from the reporting). As the claims are consolidated, they take into account exposures worldwide. We consider that 15 percent<sup>28</sup> of the reported claims are on the trading book and thus marked to market, and apply an adjustment factor to approach face value. As the claims are from June 2010, while we present estimates for December 2010, we consider that exposures grew at the same rate as total government debt<sup>29</sup>.

**A2.2.2 Sovereign exposure of domestic banks**

As the BIS data only report foreign exposures, we use the information disclosed during the European-wide stress tests to estimate the exposures of domestic banks to the governments of

<sup>28</sup> Blundell-Wignall and Slovik (2010) report that around 83 percent of sovereign debt exposures in the European-wide stress-tests were held on the banking book.

<sup>29</sup> The BIS has published provisional statistics as of Q3 2010, but these are not yet available with the appropriate breakdown.

their own countries. The reporting basis is not exactly the same, but the level of consolidation is comparable. In most cases, the stress-test data and the BIS statistics yield results that are similar in terms of magnitude. The BIS has explained differences and warned against direct comparisons (BIS, 2010) but for our needs, the two sources can be juxtaposed. As the stress-tests did not cover the whole domestic banking sector in all of the countries considered (apart from Spain which also included all of the non-listed *cajas*), we apply an adjustment factor to take this into account<sup>30</sup>. Values as of December 2010 are estimated in the same manner as for foreign banks. The final column in Table A10 is not equal to the sum of the four countries, because intra-bloc exposures are netted out. Exposures between periphery countries are reallocated to the domestic banking sector.

### A2.2.3 Sovereign exposure of ECB

The figures reported in the table are estimates of the face value of the debt held by the European Central Bank. The ECB reports its weekly purchases (at market prices) under the Security Markets Programme, but does not give a breakdown by country. We use estimates provided to us by Barclays Capital and our own estimates on the maturity structure of purchases to calculate an estimate of the face value of the debt held by the ECB. Since we apply no adjustments to the BIS data, we implicitly assume that all of these purchases were made from what we call the non-bank sector. We do this in order to avoid forming hypotheses about how ECB purchases have affected banks' exposures.

### A2.2.4 Sovereign exposure of IMF, EU and Official Lenders

As of December 2010, no disbursements had yet been made to Ireland under the joint IMF/EU programme. Only in the case of Greece is a portion of its debt identifiable as lending from official sources. The numbers reported are those from the IMF (2010a).

### A2.2.5 Sovereign exposure of non-banks

The non-banks category simply corresponds to the unidentified portion of government debt. Because the basis for allocating claims to countries in the case of banks is not residence, we do not provide a breakdown of non-banks between resident and non-resident creditors. Note that non-banks include all financial institutions that do not fall under the category of banks, such as investment funds.

### A2.2.6 Ratio of average market value to face value of government debt

The average weighted discount is based on the clean price of euro-denominated, fixed-rate, non zero-coupon bonds as of the end of January 2011. Note that bonds of some of these countries were traded above face value before the crisis, and the fall in market price therefore does not reflect the current discount. Spain still has a non-negligible stock of bonds trading above face value, so that on average the discount is close to zero. Due to the limitations of our data and calculations, we choose to round the calculated discount to the nearest multiple of 0.05.

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<sup>30</sup> In the case of Ireland we only take into account the six government guaranteed banks.

### A2.2.7 Foreign banks' exposure to national banking systems

The source for these figures is the BIS Consolidated Banking Statistics, and those we report are on an ultimate risk basis. The reporting institutions and the scope of consolidation are the same as for the figures we report for exposures to sovereigns. As the figures are consolidated, they do not include claims on subsidiaries and branches. Note that the criterion for allocating claims on countries is residency of the ultimate obligor (debtor) and not nationality.

### A2.2.8 Eurosystem lending to banks through the national central bank

The balance sheets of national central banks are the sources for these figures. The line we report is "*Lending to euro area credit institutions relating to monetary policy operations*". It can be assumed that national central banks lend nearly exclusively to domestic institutions. The figures are as of December 2010 for Ireland and Portugal, and as of November 2010 for Greece and Spain.

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<http://www.bis.org/statistics/consstats.htm>

[http://www.bis.org/publ/qtrpdf/r\\_qt1012.pdf](http://www.bis.org/publ/qtrpdf/r_qt1012.pdf)

Eurostat

<http://epp.eurostat.ec.europa.eu/portal/page/portal/statistics/themes>

DG ECFIN forecast

[http://ec.europa.eu/economy\\_finance/publications/european\\_economy/forecasts\\_en.htm](http://ec.europa.eu/economy_finance/publications/european_economy/forecasts_en.htm)

IMF World Economic Outlook

<http://www.imf.org/external/ns/cs.aspx?id=29>

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CEBS

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