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THROUGH THE EUROSISTEM**

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Willem H. Buiter, Citigroup and CEPR
Ebrahim Rahbari, Citigroup

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Centre for Economic Policy Research
77 Bastwick Street, London EC1V 3PZ, UK
Tel: (44 20) 7183 8801, Fax: (44 20) 7183 8820
Email: cepr@cepr.org, Website: www.cepr.org

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ABSTRACT

Target2 Redux: The simple accountancy and slightly more complex economics of Bundesbank loss exposure through the Eurosystem*

This study shows that Target2 net claims are a poor measure of Bundesbank loss exposure, and even more so of German loss exposure to the rest of the Eurozone. This is true even under plausible assumptions about a comprehensive break-up scenario that leaves Germany as the only member of the euro area and the Bundesbank as the sole owner of the ECB. In this implausible scenario, the discrepancy between the Bundesbank's Target2 net credit balance and its likely loss exposure has two principal sources. First, the 16 national central banks (NCBs) that exit the Eurosystem (which will on balance be net Target2 debtors) and their sovereigns will not automatically walk away completely from their Target2 debts - defaulting on their debts with a zero recovery rate for the Bundesbank. Legally, the Target2 claims are not extinguished by exit from the Eurosystem by the debtor NCBs. Politically and realistically, many of the exiting NCBs would be able and willing to honour their obligations to Target2 in part or even in full. Second, in the comprehensive break-up scenario, future seigniorage revenues of the Bundesbank would likely go up, as it would be left with a larger share (in our example 100 percent) of the ownership of the ECB. Changes in German exposure to the rest of the euro area (or to the periphery) can differ in magnitude and in sign from Bundesbank exposure.

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Willem H. Buiter
Citigroup
Citigroup Centre
33 Canada Square
Canary Wharf
London E14 5LB

Ebrahim Rahbari
Citigroup
Citigroup Centre
25-33 Canada Square
London
E14 5LB

Email: willem.buiter@citi.com

Email: ebrahim.rahbari@citi.com

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1. Introduction

Several years into the European sovereign debt and banking crisis, one rather arcane corner of the debate about the causes and implications of Europe's misfortune continues to be riddled with misunderstandings. This corner is the debate about the meaning and potential consequences of Target2 imbalances in the euro area. Target2 is the real-time gross settlement (RTGS) system for cross-border transactions owned and operated by the Eurosystem, but is more significant for its role in intermediating lending and borrowing between individual Eurosystem national central banks (NCBs). Such lending is reflected in gross and net liabilities to and claims on Target2. 'Imbalances', that is, net credit or debit positions of NCBs vis-à-vis Target2, have continued to rise to a point where the Bundesbank's claims stand at more than €700bn and the combined Target2 net liabilities of the GIIPS countries (Greece, Ireland, Italy, Portugal, and Spain) have risen to almost €1trn. Against this backdrop, it has been argued that Target2 liabilities pose a grave danger for the creditor NCBs and for the creditor countries.

Even the more alarmist versions of this thesis have now evolved to the point that they recognise that an NCB's Target2 net credit balance is not a measure of the exposure of that national central bank (NCB) to losses in the rest of the Eurozone (or to periphery). The recent dramatic Target2 interpretations and scare stories restrict their applicability to the cases of partial and complete euro area (EA) break-up. This study argues that even these evolved and qualified versions of the Target2 scare story continue to be highly misleading. Specifically, this study makes several points:

First, Target2 claims are in general a poor measure of the exposure of individual NCBs to risks and to actual losses of the Eurosystem. This applies to all EA NCBs, including the Bundesbank. Only if several highly implausible conditions are satisfied would the Bundesbank's net Target2 claims be the right measure of Bundesbank accounting exposure to the Eurosystem. These conditions are:

i) There is no pooling and sharing of losses between the individual NCBs in the Eurosystem. Of course, profit and loss sharing is a major hallmark of the Single Money, Credit and Liquidity Policy (henceforth single monetary policy or SMCLP) of the ECB/Eurosystem.

ii) The total loss suffered by an NCB on its Target2 balances equals its net claims on Target2 (that is, its net claims through Target2 on the ECB). This requires that the ECB and

all NCBs that are continuing members of the Eurosystem repudiate their Target2 liabilities to counterparties that are no longer part of the Eurosystem, and that all exiting NCBs (NCBs that no longer are part of the Eurosystem) likewise repudiate all their liabilities to each other, to the ECB and to the NCBs that are continuing members of the Eurosystem. Repudiation here means a default with a zero recovery rate

iii) There are no capital losses or gains on the conventional balance sheet of the ECB.

iv) There is no change in the value of the Bundesbank's share of the NPV of the current and future profits of the Eurosystem (roughly the NPV of the current and future base money issuance or seigniorage of the Eurosystem).

v) The events that cause losses on the Target2 exposure of the Bundesbank don't cause losses on the other assets of the Bundesbank, including its exposure to its domestic counterparties (commercial banks etc.) This really includes iii) and iv) as special cases.

These five conditions are highly unlikely – effectively impossible – to be satisfied.

Second, we are likely to be closer to circumstances where at least the first two of these conditions are satisfied if there is a comprehensive break-up of the euro area, but still not close. In particular, even a comprehensive break-up of the euro area does not imply that the obligations of former EA member countries and their NCBs are automatically extinguished.

Exits by several countries also imply that the capital share of the remaining euro area countries in the ECB increases commensurately. In extremis, if Germany is the only country remaining in the euro area, the Bundesbank becomes the sole owner of the ECB and the Eurosystem consists of just the Bundesbank and the ECB. In that scenario, the net present discounted value (NPV) of seigniorage profits the Bundesbank can appropriate (even the NPV of the non-inflationary seigniorage) is likely to be higher than it is today, as the countries exiting the EA are likely to exhibit substantial continuing euroisation. The increase in the NPV of future seigniorage for the Bundesbank is a capital gain on a comprehensive balance sheet, which is not recorded in its conventional balance sheet, which should be set against any losses the Bundesbank incurs in a break-up scenario.

Third, as the value of the ECB, because of its legal monopoly of the issuance of base money in the Eurozone, is very high, it is possible that the Bundesbank emerges a net beneficiary from euro area break-up in narrow financial terms.²

² This would require that the value of the roughly 27 percent stake of the Bundesbank in the NPV of current and future Eurosystem profits in today's 27 member EA be less than the value of the 100 percent stake of the Bundesbank in the (diminished) NPV of current and future Eurosystem profits in an EA where Germany is the only member state left.

Fourth, Bundesbank exposure, say, to the GIIPS countries is not equal to German exposure. We estimate the share of the Bundesbank (BuBa) of Eurosystem exposure to GIIPS countries to currently stand at around €423bn. German exposure to the GIIPS countries ex-BuBa was €780bn at end-2011. Over the course of the crisis that started in August 2007, the German private sector has reduced its exposure to the GIIPS countries, while the public sector's exposure (both the Bundesbank's exposure and the exposure of the general government and other parts of the non-central bank public sector) has gone up, and the net increase in German exposure has been smaller than the increase in the Bundesbank's exposure (which in turn is smaller than the increase in its Target2 liabilities). The role of this private to public sector exposure reshuffling dynamic may be more limited in the future. The spectre of larger German exposure to the banking sector of the EA through the membership of the Bundesbank in the Eurosystem may have played a role in the change in German attitudes in favour of some form of banking union (in particular to introduce a single supervisory mechanism) and allowing the bail-in of bank debt to recapitalise weak banks.

Fifth, we revisit some 'classic' misunderstandings of the role of Target2 imbalances. We stress, again, that as a matter of accounting logic (even conventional accounting logic) they need never be driven by current account deficits of EA periphery and core countries, and that in the recent historical experience the proximate drivers of changes in Target2 imbalances can be found mostly in movements in the private financial account (what used to be called the capital account) of the balance of payments. These private capital flows out of the EA periphery into Germany and other core EA member states have (give or take the small current account surpluses of the core vis-à-vis the periphery) their counterpart in the accumulation of Target2 net credit balances by the Bundesbank and other core EA NCBs — what would have been increases in official foreign exchange reserve claims of the core EA NCBs on the EA periphery member states had there still been 17 distinct national currencies in the EA.

Sixth, rising Target2 net credit balances in core EA NCBs do not indicate that there is any restriction in credit to the bank or non-bank private sector in Target2 creditor countries.

Seventh, there is plenty of scope for Target2 gross and net liabilities and the size of the Eurosystem balance sheet to increase further, without necessarily impairing the financial and economic health of any Eurosystem participant.

Finally, the quasi-fiscal actions of the Eurosystem since the beginning of the crisis have redistributed resources between debtors, investors, tax payers and beneficiaries of public spending across the periphery and the core, within the core and within the periphery. The scale and scope of these redistributions has been large – the Eurosystem balance sheet has more than doubled in recent years. As the balance sheet size and the exposure of the Eurosystem grow, its formal and substantive accountability – which is very low even by the standards of operationally independent central banks – needs to be strengthened.

The outline of the rest of the paper is as follows. Section 2 discusses the balance sheets of the ECB, of the consolidated Eurosystem and of individual NCBs like the Bundesbank and contrasts these conventional accounts with the comprehensive accounts or intertemporal budget constraints. It also discusses the exposure of individual NCBs to the rest of the Eurosystem through their shares in the ownership of the ECB and through the profit and loss sharing rule for monetary operations of the Eurosystem. Section 3 discusses Target2 and the imbalances associated with it in greater detail. In Section 4 we develop a formal balance sheet model of the Eurozone, including the Eurosystem, the individual NCBs and the ECB. We model both the ‘limited profit and loss sharing rule’, which is restricted to the equity exposure to the ECB and Target2 balances and the ‘comprehensive profit and loss sharing rule’ (the profit and loss sharing rule for monetary operations of the Eurosystem) as special cases of a general profit and loss sharing rule that involves ‘tit-for-tat’ retaliation when a Eurozone member state exits the Euro and its NCB repudiates its debt to Target2/ECB. Section 5 focuses in detail on potential Bundesbank losses from Eurosystem membership under a range of calamities, from sovereign and NCB default in a periphery country, via Grexit to a comprehensive Eurozone breakup. Section 6 considers the redistribution, among countries and among groups and entities within countries, effected by the quasi-fiscal operations of the Eurosystem. The distinction between the Bundesbank’s exposure to profits and losses through its membership in the Eurosystem and the exposure of Germany Inc. is highlighted in Section 7. Section 8 exposes a number of common theoretical and empirical misconceptions about Target2. Section 9 concludes.

2. NCB conventional and comprehensive accounting exposure through membership of the Eurosystem

Through its membership in the Eurosystem, the NCB of an EA member state is exposed to the losses incurred by the Eurosystem and shares its profits in two ways.³ The first is through the ownership by the 17 NCBs of the EA of the paid-up capital in the European Central Bank (ECB) – see Figure 1. The second way is through the profit and loss sharing rule adopted by the Governing Council of the ECB for the monetary policy operations of the Eurosystem.

Figure 1. Euro area – Capital and capital shares in the ECB, 31 December 2011

NCB of	Capital key		Paid-up capital (bn EUR)
	% of Subscribed capital EU(27)	% of Paid-up capital EA(17) members	
Belgium	2.4	3.5	0.2
Germany	18.9	27.1	1.7
Estonia	0.2	0.3	0.0
Ireland	1.1	1.6	0.1
Greece	2.0	2.8	0.2
Spain	8.3	11.9	0.8
France	14.2	20.3	1.3
Italy	12.5	17.9	1.1
Cyprus	0.1	0.2	0.0
Luxembourg	0.2	0.3	0.0
Malta	0.1	0.1	0.0
Netherlands	4.0	5.7	0.4
Austria	1.9	2.8	0.2
Portugal	1.8	2.5	0.2
Slovenia	0.3	0.5	0.0
Slovakia	0.7	1.0	0.1
Finland	1.3	1.8	0.1
Total	70.0	100.0	6.4

Sources: ECB and Citi Research

2.1. Exposure through the ownership of the ECB

The proportional shares of the EA NCBs in the paid-up capital of the ECB are shown in Figure 1, column 3.^{4 5} Although equity participations are formally characterised by limited liability (the losses to the shareholder are limited to the stock owned), the political reality that EA central banks operate in is likely to create pressures for ECB losses that exceed the value of its equity and reserves to be made good by the shareholders (the NCBs). Where these NCBs find themselves incapable of absorbing their share of the losses of the ECB, there is a strong presumption (although no direct Treaty obligation) that these losses be made good by

³ The Eurosystem consists of the European Central Bank and the NCBs of the countries, currently 17 in number, that have proceeded to the final stage of Economic and Monetary Union (EMU).

⁴ The subscribed capital of the ECB comes from the national central banks (NCBs) of all EU Member States (currently 27 in number). It amounts to €10.76bn (as from 29 December 2010).

⁵ As the membership of the EU and of the Eurozone changes, these ECB capital shares change too. At the beginning of 2007 (the year the North Atlantic financial crisis started), the share of the Bundesbank in the ECB's paid-up capital was 29.52%. When the euro area was created at the beginning of 1999, the Bundesbank's share in the ECB's paid-up capital was 30.93%. Capital shares are determined to 50% by the weight in EA GDP and to 50% according to the share in EA population.

the national sovereigns that are the *de facto* beneficial owners of their NCBs. We refer to the joint ownership by the NCBs of the ECB as the *limited* profit and loss pooling case.

The most recent available balance sheet of the ECB (for year-end 2011) is shown in Figure A1 in the appendix. At the end of 2011, the size of the balance sheet of the ECB was just under €231bn, more than twice the size of the balance sheet at the end of 2006 (when it was just under €106bn).⁶

However, the share in the capital of the ECB also has a value. The value of the ECB (and therefore the value of the Bundesbank's share in the ECB) is much larger than the paid-up capital of the ECB, which stood at €6.4bn at the end of 2011. It is also much larger than the totality of on-balance sheet or conventional loss absorption capacity (CLAC) of the ECB (the sum of paid-up capital, revaluation accounts and provisions, which jointly were just above €37bn at the end of 2011).

Accountants use conventional balance sheets consisting of mostly tangible real and financial assets and some items like 'goodwill' that have crossed the boundary between the relatively simple and concrete world of accounting and the complex and more abstract world of economics and the valuation of time -and state-contingent pay-offs. Economists use intertemporal budget constraints or comprehensive balance sheets. These include all the entries in the conventional balance sheets but add a variety of (risk-adjusted) net present discounted values of contingent future cash flows that don't show up in any balance sheet recognised and certified by a Chartered Accountant.

In the case of central banks, the difference between the conventional balance sheet (shown in Figures A1, A2 and A3 in the appendix for, respectively, the ECB, the Eurosystem and the Bundesbank) and the intertemporal budget constraint or comprehensive balance sheet can be huge. This is because the comprehensive balance sheet includes the net present discounted value of future seigniorage (profits earned from the issuance of base money by the central bank), which is not included in the conventional balance sheet. Buiter (2010c, 2011), Buiter and Rahbari (2012a, b) and Durré and Pill (2011) calculate the non-inflationary loss absorption capacity (NILAC) of the Eurosystem. This is the sum of the CLAC plus the net present discounted value of current and future base money issuance by the Eurosystem, consistent with 2 percent inflation. Making conservative assumptions about the drivers of future real base money demand (real GDP and short risk-free nominal interest rates), Buiter and Rahbari and Durré and Pill estimate the NILAC to be around €3.4trn (of which capital

⁶ This corresponds to the size of the ECB conventional balance sheet. At the same period, the Eurosystem conventional balance sheet was €2.7trn.

plus reserves were €80bn plus the revaluation accounts, mainly capital gains on gold reserves, of just over €400bn, the outstanding amount of currency is €850bn and the value of seigniorage around €2trn). Of course the NPV of future seigniorage is not an item included in the conventional balance sheet of the central banks. But it is a future source of income and, provided the central bank can borrow against it by issuing non-monetary liabilities, an immediate source of non-monetary (and therefore likely non-inflationary) funding for the central bank.

Of course, the NPV of future profits from euro base money issuance/seigniorage could be significantly larger than €2trn used in the NILAC calculations reported here (even in real terms or as a share of GDP) if a higher rate of inflation than 2 percent were tolerated.

The value of the Bundesbank's share in the ECB matters in two ways. First, the ECB's (on and off-balance sheet) 'economic capital' can absorb some of the ECB's potential losses and therefore not all of the ECB's losses will necessarily be passed on to the NCBs in a conventional accounting sense.⁷ There would still be an economic loss to the beneficial owners (the national Treasuries and ultimately the tax payers and beneficiaries of public spending), but given that the conventional accounting value of the claim on the ECB is only booked at the share of the NCB in the ECB's paid-up capital, the potential accounting 'hit' from a loss in the value of the ECB is very limited.

Second, the economic or fair value of the claim of an NCB on the ECB can change. In principle, it can go up or down. We will argue below that in the case of a comprehensive euro area break-up — when the Bundesbank potentially would be left as the sole owner of the ECB — the value of the BuBa's stake in the ECB could rise. EA break-up has the potential to reduce the economic value of the ECB (including the NILAC of the Eurosystem) by reducing the value of certain assets on the ECB's conventional balance sheet, but of course also by shrinking the economic area for which it issues base money and thus the NPV of Eurosystem's non-inflationary seigniorage issuance. In an extreme case, the value of the ECB (including the NPV of future seigniorage) with Germany as the only surviving member of the EA and the sole owner of the ECB, would fall to something close to the value of the Bundesbank just prior to start of EMU in 1999, which in turn would be similar to Germany's share of approximately 27 percent in the current 17 member ECB including the NPV of future seigniorage for the 17 member EA. This would imply that the capital gain or loss would be rather small. However, in our view, it is likely that the degree of euroisation, i.e. the

⁷ The ECB Governing Council, excluding the members of the executive board, and with the votes weighted by the ECB capital share, decides how to distribute the profits and losses between the ECB and the NCBs.

external demand for euro currency and other base money, in the former Eurozone member states and other countries would be relatively high, implying that the value of the Bundesbank's stake in the NPV of future seigniorage would rise, and could potentially even be larger than the value of the Bundesbank's conventional balance sheet losses from break-up.

2.2. Exposure through profit and loss sharing for monetary operations of the Eurosystem

The second way in which the 17 NCBs are exposed to the losses incurred by the Eurosystem and share in its profits is through the profit and loss sharing rule adopted by the Governing Council of the ECB for the monetary policy operations of the Eurosystem. This amounts to the losses or profits of the Eurosystem as a whole being allocated to the NCBs in the same proportions that define the NCBs' share ownership in the ECB, as long as these profits or losses are incurred as a result of the implementation of the common monetary, liquidity and credit policy of the ECB.⁸ We refer to the pooling by the 17 NCBs of the 'monetary policy' profits and losses of the Eurosystem as a whole as the *comprehensive* profit and loss pooling case.⁹

The balance sheet of the consolidated Eurosystem on 5 October 2012 is shown in Figure A2 in the appendix. The size of the balance sheet is €3.1trn, roughly 2 ½ times the size at the start of the North-Atlantic financial crisis (in end-June 2007) when total Eurosystem assets amounted to €1.2trn.

EA NCBs as shareholders are exposed to all assets and liabilities on and off the ECB balance sheet. As participants in the Eurosystem's profit and loss pooling arrangement for monetary operations, four items on the Eurosystem balance sheet are of particular interest. The first is the Eurosystem lending operations to EA banks in euros ('Lending to EA credit institutions related to monetary policy operations denominated in euro'), which stood at €1.2trn on October 5, 2012.

The second are foreign currency lending operations to EA banks, which are captured under 'Claims on EA residents denominated in foreign currency'. This item stood at €40bn on October 5, 2012, but besides foreign currency lending, it also includes securities

⁸ The actual allocation of the losses to the NCBs requires a decision by the GC.

⁹ There is one exception to the profit and loss sharing arrangement for monetary policy operations of the Eurosystem. This exception applies to lending against nation-specific eligible collateral (mostly loans) that was made possible by an ECB decision on February 9, 2012 (http://www.ecb.int/press/pr/date/2012/html/pr120209_2.en.html). This exposure is in principle for the account of the granting NCB only. To our knowledge, no information is available on the aggregate amounts or the country composition of this lending. (See also Buiters (2012a) and Buiters et al (2012)).

investments held as part of foreign exchange reserves (issued by EA residents).¹⁰ As it is of relatively modest size currently (though it had been much higher at times) and we do not have the country split, we will mostly ignore non-euro Eurosystem lending to EA banks in the remainder of this study.

The third item of interest is ‘Securities held for monetary policy purposes’, which include outright purchases of EA sovereign debt of the Eurosystem under the now-terminated Securities Markets Programme (SMP) and outright purchases of covered bonds under the Covered Bonds Purchase Programmes I and II (CBPP I and II). We expect that future purchases of sovereign debt under the ECB’s new Outright Monetary Transactions (OMT) will also be recorded under this entry. This item stood at €280bn on October 5, 2012, but we also disregard the CBPP purchases for the purposes of estimating potential Eurosystem exposures, as we do not have a country split.

Fourth, emergency liquidity assistance (ELA) is one of the activities captured by the item ‘Other claims on EA credit institutions denominated in euro’ which stood at €211bn on October 5, of which we estimate ELA to account for at least €150bn.¹¹

ELA can be offered by an NCB to the banks in its jurisdiction, subject to approval by the Governing Council of the ECB, if these banks no longer qualify as counterparties for borrowing at the regular Eurosystem liquidity facilities.^{12 13} This could be either because the banks themselves are not deemed sufficiently creditworthy to qualify as eligible counterparties of the Eurosystem, or because the quality of the collateral they offer is deemed unacceptable, or both. It is quite likely that, although losses on the assets held by an NCB as part of its ELA facility are not supposed to be pooled and shared by the whole of the Eurosystem but instead represent an exposure of the NCB offering it — and of the sovereign backing that NCB, in principle through an explicit guarantee of or indemnity for the ELA facility — those ELA assets nevertheless represent a *de-facto* exposure for the rest of the Eurosystem if neither the NCB that manages the national ELA facility nor the sovereign that guarantees it has the resources to absorb significant losses on the ELA assets.

¹⁰ Currently, the ECB has \$14.5bn (€11.2bn) outstanding in USD lending to EA banks (http://www.ecb.int/mopo/implement/omo/html/top_history.en.html)

¹¹ After Belgium, Cyprus, Germany, Greece, and Ireland, Spain has recently become the sixth euro area country that has made use of ELA in recent years, even though it has been to a modest scale (€0.7bn) until now apparently. See <http://online.wsj.com/article/SB10000872396390443819404577633233724146916.html> and http://www.bde.es/f/webbde/GAP/Secciones/SalaPrensa/NotasInformativas/12/Arc/Fic/presbe2012_38.pdf.

¹² ELA facilities can be operated in principle by all NCBs in the EA, not just those in the periphery. The first example of an ELA facility was the one operated by the Bundesbank in October 2008, as part of the German government’s €35bn rescue operation for Hypo Real Estate Holding AG.

¹³ See Buiters, Michels and Rahbari (2011a) and Buiters, Michels and Rahbari (2011b).

The amount of Eurosystem lending to EA banks, ELA and SMP purchases sums to around €1.6trn currently or 16% of estimated 2012 EA GDP.

Figure 2 presents amounts and estimates of the Eurosystem exposures to individual EA countries. In the table we ignore the covered bonds purchases of the Eurosystem and we mostly disregard Eurosystem foreign currency lending.

After many months of sizable increases in Eurosystem borrowing by Spanish banks, with the first break in this sequence occurring in September 2012, following the announcement on 6 September of the OMT, Spain currently accounts for the largest share of total Eurosystem exposure for monetary policy operations (€440bn). Eurosystem net borrowing by Spanish banks stood at €400bn in September (or one third of total Eurosystem net borrowing by EA banks, far in excess of the share of Spain in EA GDP (11.3%), the EA banking system (10.6%), or the paid-in capital of the ECB (11.9%)). We estimate SMP holdings of Spanish bonds by the ECB to be around €40bn (at face value).¹⁴ Italy accounts for the second largest share due to heavy reliance of Italian banks on Eurosystem facilities (€277bn), though relatively constant in recent months, and sizable SMP holdings of Italian government bonds (estimated at €96bn at face value) French banks also feature heavily on the ECB balance sheet, while Greek, Irish and Portuguese exposures of the Eurosystem are sizable in absolute terms and very large relative to the size of these economies.

¹⁴ Total SMP holdings stood at €209bn on October 10, 2012. No information on the country split are provided, but we estimate it, assuming that the ECB purchased mostly Greek, Irish and Portuguese sovereign debt from May 2010 until March 2011 and mostly Italian and Spanish government debt since August 2011, in broad proportion to the size of their respective bond markets (stocks outstanding) in May 2010 and August 2011, respectively. For further details please see Buiter and Rahbari (2012a))

Figure 2. EA Countries – Conventional Accounting Exposure of Eurosystem to EA Countries (bn EUR), September 2012

	Eurosystem Lending to EA Credit Institutions related to monetary policy operations in Euros	ELA to EA Credit Institutions (Estimates)	SMP Holdings (Estimates)	Eurosystem Exposure	Bundesbank Exposure	Bundesbank Exposure (% of GDP)
Austria	17.4	0.0	0.0	17.4	4.7	0.2
Belgium	39.7	2.1	0.0	41.9	11.3	0.4
Cyprus	3.7	10.2	0.0	13.9	3.8	0.1
Estonia	0.0	0.0	0.0	0.0	0.0	0.0
Finland	3.7	0.0	0.0	3.7	1.0	0.0
France	176.5	0.0	0.0	176.5	47.8	1.8
Germany	76.8	0.0	0.0	76.8	20.8	0.8
Greece	30.3	100.6	35.8	166.6	45.1	1.7
Ireland	79.1	40.0	17.0	136.1	36.8	1.4
Italy	276.7	0.0	96.2	372.9	100.9	3.8
Luxembourg	5.0	0.0	0.0	5.0	1.4	0.1
Malta	0.6	0.0	0.0	0.6	0.2	0.0
Netherlands	27.7	0.0	0.0	27.7	7.5	0.3
Portugal	54.9	0.0	21.5	76.3	20.7	0.8
Slovakia	2.6	0.0	0.0	2.6	0.7	0.0
Slovenia	3.9	0.0	0.0	3.9	1.0	0.0
Spain	399.9	0.7	39.7	440.3	119.2	4.5
Total	1,198.6	153.7	210.2	1,562.5	422.9	15.9

Note: ELA is Emergency Liquidity Assistance, SMP the Securities Markets Programme. For Austria and Slovakia, the first column is 'Loans to EA residents: MFIs' (which includes claims on EA denominated in foreign currency, lending to EA related to monetary policy operations denominated in euro, other claims on EA credit institutions denominated in euro, and claims equivalent to the transfer of foreign reserves), while for the Netherlands it is 'Domestic loans to MFIs' minus 'Loans to EA MFIs: Target2.' For Spain monthly values are calculated as the average of daily data. ELA estimates are based on the item 'other claims on EA credit institutions denominated in euros'. Due to data availability values for Cyprus, Germany, the Netherlands, Portugal, Slovakia and Slovenia correspond to Aug-2012.

Sources: ECB, National Central Banks and Citi Research Estimates

2.3. Bundesbank exposure as part of the Eurosystem (excluding its share of the NPV of future seigniorage profits)

We shall focus our analysis of the exposure to losses of euro area NCBs to the rest of the Eurosystem, and through that to the EA periphery nations, by considering the case of the German central bank, the Bundesbank. This is partly because it is the largest of the EA central banks by balance sheet and partly because the issue of the Bundesbank's exposure to losses through its 'Target2 net balance', that is, its net credit position vis-a-vis the ECB through its transactions in the Eurosystem's Real Time Gross Settlement System (RTGS), has become a politically controversial one in Germany and sometimes beyond.

With a capital share in the ECB of currently 27.1%, the Bundesbank's exposure to the three monetary-policy-related items on the Eurosystem balance sheet currently (as of Sep-12) stands at around €423bn or 16% of estimated 2012 GDP. This compares to a total balance sheet size of the Bundesbank as of end-2011 of €838bn (Figure, €1,135bn in Aug-2012), capital and reserves of €5bn (€5bn), revaluation accounts of €129bn (€133bn) and provisions of €12bn (no more recent data available).

3. Target2

3.1. The Basics

Target2 is the Real-Time-Gross-Settlement system operated by the Eurosystem. Target2 has to be used for all payments involving the Eurosystem, as well as for the settlement of operations of all large-value net settlement systems and securities settlement systems handling the euro. It is a system of multiple technically centralised, but legally decentralised autonomous national RTGS systems. For example, the Bundesbank runs [Target2-Bundesbank](#). The ECB's RTGS system is called the ECB payment mechanism (EPM).

In 2011, Target2 had 976 direct participants, 3,465 indirect participants and 13,083 correspondents processing a daily average of 348,505 payments, representing a daily average value of €2,385 billion and connecting 23 European countries.¹⁵ Including branches and subsidiaries, almost 60,000 banks across the world can be addressed via Target2. Direct participation with maintenance of an own RTGS account is restricted to the European Economic Area (EEA). This includes the 27 EU member states plus Iceland, Liechtenstein and Norway.

The total Target2 payments and settlements system is a closed system, in an accounting sense: every Target2 transaction by the ECB and the 17 NCBs that make up the Eurosystem is entered once as a credit and once as a debit. Because of this double-entry bookkeeping feature, the net Target2 balance of the consolidated 17 euro area NCBs and the ECB is zero. Individual NCBs and the ECB can have positive or negative net balances at any point in time. It is important to note that the net credit position of any NCB, such as the Bundesbank, under Target2 are claims *against the ECB*, not against one or more of the sixteen individual other Eurosystem NCBs. This is because the EA NCBs don't transact directly with each other but lend/borrow indirectly to/from each other through the pivotal agent of the Target2 system, which can be identified for all relevant purposes as the ECB. Henceforth we refer to this pivotal agent of the Target2 system as Target2/ECB. The NCB of Germany lends to or borrows from Target2/ECB. Target2/ECB lends to Country 2, etc. Borrowing by an NCB (or by the ECB) through Target2 is unsecured.

As we mentioned before, the net credit position of an NCB (the Bundesbank, say) vis-à-vis Target2 can be interpreted as the analogue in the 17-nation EA monetary union of the net stock of gold and official foreign exchange reserve claims vis-a-vis the other 16 EA member states held by the Bundesbank in a hypothetical fixed exchange rate regime for the

¹⁵ See <http://www.ecb.int/paym/t2/html/index.en.html>

17 EA member states with 17 distinct national currencies.¹⁶ The change in the net credit position of the Bundesbank vis-a-vis Target2, can be interpreted (ignoring capital gains and losses) as the surplus on the official settlements balance of the German balance of payments accounts vis-à-vis the 16 other EA member states or, equivalently, the net increase in German official gold and foreign exchange reserve claims on the 16 other EA member states or, equivalently, the monetary balance of Germany vis-a-vis the 16 other EA member states.

Target2 imbalances can therefore be driven by current account deficits of an EA country, or by private financial account deficits (what used to be called capital account deficits). As we have argued before (see Buiter, Michels and Rahbari (2011a) and Buiter, Michels and Rahbari (2011b)), the available evidence suggests that it has been capital flows that have been at the heart of the Target2 imbalances rather than current account deficits (see also Pisani-Ferry and Merler (2012), De Grauwe and Ji (2012), and King (2012)). Buiter, Michels and Rahbari (2011c, d) and Bindseil and Koenig (2011), and Bindseil and Winkler (2012) go through the mechanics and accounting entries that can give rise to Target2 imbalances.

3.2. Recent developments in Target2 balances

Figure 3. Selected Countries – Target2 balance, 2003 – 2012

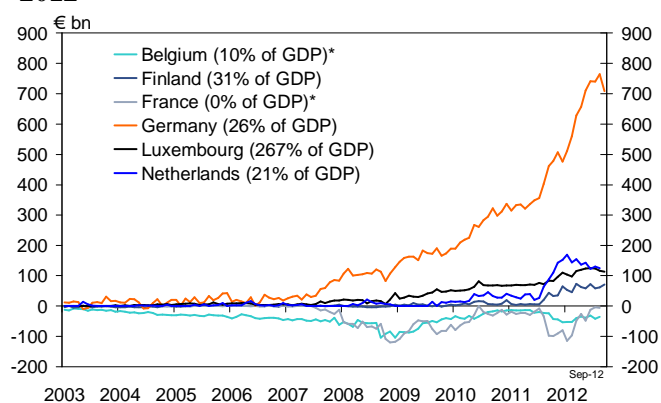
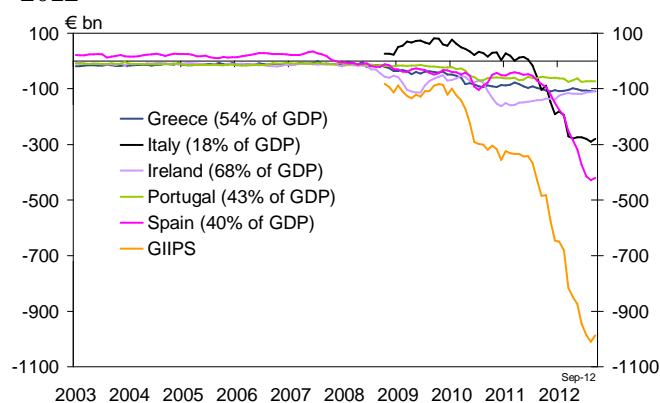


Figure 4. Selected Countries – Target2 balance, 2003 – 2012



Note: Data correspond to items: “EA deposits excl. France (target2 liabilities): MFIs” (France); “other net liabilities within the Eurosystem” (Belgium, Italy); “net claims/liabilities related to target accounts” (Finland, Spain); “net claims within the Eurosystem” (Luxembourg, Germany); “deposits and related instruments (Target2 liabilities)” (Portugal); “other liabilities” (Ireland), “Loans to EA MFIs: Target2” (Netherlands), and “Intra-Eurosystem Liabilities: Net Transactions with the ESCB” (Greece). *Target2 balances are negative for these countries.
Source: National Central Banks and Citi Research

Until 2006/7, Target2 imbalances were roughly zero, but they have risen rapidly during the last few years (see Figure 3 and Figure 4). On the creditor side, the most recent data indicate that Target2 claims of the Bundesbank have roughly doubled over the past year

¹⁶ See Buiter, Michels and Rahbari (2011a)

to reach €764bn in August 2012 but fell back to €78bn in September (by 7.3%, the largest percentage fall since October 2009). Relative to GDP, Target2 claims are even higher in Finland or Luxembourg than in Germany, but have risen less rapidly recently. Target2 claims in the Netherlands are close to those in Germany relative to the size of the economy (21% of GDP), but are down by more than 25% from the peak in January 2012 and have fallen in four out of the last seven months.

The aggregate Target2 balance for the GIIPS countries stood at close to €1trn in September 2012. Spain accounts for more than 40% of the total net Target2 liabilities of EA NCBs, after its Target2 liabilities rose more than tenfold in the last 18 months. Portugal (just), Greece and Ireland have even larger amounts of Target2 liabilities relative to the size of their economies.

The drivers of Target2 imbalances have changed considerably over time. From 2008 to 2010, Ireland accounted for most of the change in the GIIPS's aggregate Target2 balance, mainly because of the heavy use of the Irish Central Bank's ELA by the strained Irish banks. Since mid-2011, the increase in the GIIPS Target2 balance has been driven almost exclusively by Spain and Italy. At that point, the overall GIIPS stood at around €340bn, of which Spain accounted for €50bn and Italy just moved from being a Target2 creditor to a Target2 net debtor. Since then, the Target2 balance of Spain and Italy jointly increased by more than €650bn, mainly after the ECB provided 3YLTROs. Ireland's Target2 net debt balance peaked at the end of 2010 and has since fallen by around a third to €106bn in the most recent data. In Greece and Portugal, Target2 liabilities have been rising at a relatively modest rate in recent months, with more significant fluctuations in both directions in Portugal. Both in Spain and in Italy, Target2 net liabilities fell in September, in Spain for the first time in 12 months.

That Target2 is not a one-way street is also clear by looking at the French data: Its Target2 debt stood at more than €100bn in January, but has since crept back to near-balance.

4. A Eurozone balance sheet model

We now develop a simple (and somewhat simplified) balance sheet model of the Eurozone to provide rigorous underpinnings for our statements concerning the condition under which Bundesbank exposure to the EA periphery equals its Target2 net credit balance and for our statement of the distinction between Bundesbank exposure and the exposure of Germany Inc.

For expositional simplicity, we simplify the pictorial balance sheets of the Eurozone in Figures 5 to 10 below, to a system consisting of three countries plus the ECB. In the algebra, any number, N , of countries, including the 17 that currently constitute the Eurozone, are handled. Each country has 4 sectors: the national central bank, denoted $C(i)$, $i = 1, 2, \dots, N$, the domestic banking sector, denoted $B(i)$, $i = 1, 2, \dots, N$, and the rest of the economy (RoE), denoted $R(i)$, $i = 1, 2, \dots, N$. The rest of the economy therefore contains that part of the financial sector that is not an eligible counterparty of the ECB/Eurosystem for repo purposes ('non-banks'), as well as the non-financial corporate sector, the household sector and the government sector excluding the NCB and the ECB. In Figures 8 to 13, there are three countries, $N = 3$. In what follows, the three countries are Germany (G), Greece (H), and France (F).

In our analysis of the exposure to losses of an NCB like the Bundesbank through its membership of the Eurosystem and its participation in Target2, we make a number of further simplifying assumptions. These only serve to keep the notational clutter to a minimum. Our key result, that the Target2 net balance of the Bundesbank is not an accurate or even useful measure of the exposure of the Bundesbank to losses or profits through its membership in the Eurosystem, does not depend on these simplifying assumptions.

4.1 Key assumptions

1. The N -country plus Target2/ECB system is closed. There are no transactions with the rest of the world.
2. Only domestic banks and Target2/ECB borrow from and lend to NCBs.
3. A country's domestic banks borrow from and lend to the RoE in all N countries.
4. There are no financial transactions between banks in different countries.
5. The banks of a country are domestically owned.
6. Each NCB is domestically owned.
7. NCBs only have one type of liability to the domestic banking sector. No distinction is made between required reserves (which are part of the monetary base), excess reserves (which are also part of the monetary base) and the non-monetary liabilities of the NCBs.
8. There are two kinds of activities undertaken by the NCBs, each associated with its distinct assets and liabilities. The first are for the common Eurozone monetary, credit and liquidity policy only. The second kind of activities engaged in (and assets or liabilities held) by an NCB are for its own account. This includes the Emergency

Liquidity Assistance (ELA) facilities operated by a number of NCBs, the loans to domestic banks against country-specific collateral permitted again since February 2012, after being discontinued at the beginning of 2007, and the assets acquired by the NCB in the process of performing activities as an agent of the national government that is the beneficial owner of the NCB.

9. Real or ‘outside’ assets – stores of value that are an asset to one sector but not a liability to some other sector – are owned only by the RoEs.
10. Target2/ECB does not issue base money, only the NCBs do.
11. All base money is commercial bank deposits with the NCBs (banks’ required and excess reserves); there is no currency.
12. Target2/ECB has assets and liabilities vis-à-vis the RoE in all N countries, in addition to its assets and liabilities with the N NCBs (the Target2 gross and net balances). This reflects the reality of the balance sheet of the ECB. At the end of 2011, for instance, the size of the balance sheet of the ECB was just under €231bn. Its net Target2 asset position was just over €49 bn. At the end of 2010, these figures were a balance sheet size of €164 bn and net Target2 liabilities of €21bn respectively.

4.2 Notation

The gross debt or liability of sector X in country i to sector Y in country j is denoted $D(X(i), Y(j)) \geq 0, i, j = 1, 2, \dots, N$; . When Target2/ECB is involved in the credit or debit relationship, the notation becomes $D(X(i), T) \geq 0, i = 1, 2, \dots, N$, or $D(T, X(i)) \geq 0, i = 1, 2, \dots, N$. As regards the assets and liabilities of the NCBs that are not associated with the implementation of the common monetary, liquidity and credit policy of the ECB, we make the simplifying assumption that these consist exclusively of claims on or from their domestic banking sectors. This can be generalised easily, at the cost of additional notational clutter. The net claim of country i ’s NCB on its banking sector that are not associated with the implementation of the common monetary, liquidity and credit policy of the ECB is denoted $N(B(i), C(i)), i = 1, 2, \dots, N$.

The financial net worth, capital or equity of sector X in country i is denoted $W(X(i))$, the financial net worth of Target2/ECB is $W(T)$ and the financial net worth of the Eurosystem $W(E)$. The proportional share of NCB i in the total equity of Target2/ECB is $\sigma(i) \geq 0, i = 1, 2, \dots, N$, with

$$\sum_{i=1}^N \sigma(i) = 1 \quad (1)$$

When a country (country j , say) leaves the euro area, the equity shares of the remaining $N-1$ member states change from $\sigma(i), i=1, \dots, N, i \neq j$ to

$$\bar{\sigma}(i) = \frac{\sigma(i)}{1 - \sigma(j)}, i=1, \dots, N, i \neq j.$$

The rest of the economy in country i owns ‘outside’ assets, physical and virtual, such as land, physical capital, patents etc., that are an asset to the owner but not a liability of any other entity. It is denoted $K(R(i)) \geq 0$.

4.3. Exposure to losses and profits for NCBs through their membership in the Eurosystem: the limited profit and loss pooling case

The balance sheets of our closed 3-country Eurosystem under limited profit and loss pooling are represented by the first 10 balance sheets of Figure 5 below. Note that this reflects the counterfactual assumption that the NCBs only share the losses and profits of the ECB, not those of the entire Eurosystem (the ECB plus the NCBs of the Eurozone). We consider this case because it emerges as a special case of our general profit and loss sharing rule considered below in Section 4.5.

The 4 balance sheets in the first row are those of the three NCBs and of Target2/ECB. The second row of Figure 5 contains the balance sheets of the three national banking sectors. The third row of Figure 5 gives the balance sheets of the three national RoEs (the consolidated accounts of each nation’s government sector (excluding its NCB and the ECB), household sector, non-financial corporate sector and non-bank financial sector).

We shall wish to consider the accounting exposure of countries as well as of NCBs. We therefore consolidate each country’s 3 sectoral accounts in Figure 6 below. Also in Figure 6 we give the consolidated balance sheet of the three countries (the Eurozone excluding Target2/ECB) and of the consolidated three countries and Target2/ECB (the Eurozone). Country i is denoted $S(i)$.

Figure 5. Target 2 with Limited Profit and Loss Pooling

German NCB C(G)		French NCB C(F)		Greek NCB C(H)		Target2/ECB T	
Assets	Liabilities	Assets	Liabilities	Assets	Liabilities	Assets	Liabilities
$D(B(G),C(G))$	$D(C(G),B(G))$	$D(B(F),C(F))$	$D(C(F),B(F))$	$D(B(H),C(H))$	$D(C(H),B(H))$	$D(C(G),T)$	$D(T,C((G))$
$D(T,C(G))$	$D(C(G),T)$	$D(T,C(F))$	$D(C(F),T)$	$D(T,C(H))$	$D(C(H),T)$	$D(C(F),T)$	$D(T,C((F))$
$N(B(G),C(G))$		$N(B(F),C(F))$		$N(B(H),C(H))$		$D(C(H),T)$	$D(T,C((H))$
$\sigma(G)W(T)$	$W(C(G))$	$\sigma(F)W(T)$	$W(C(F))$	$\sigma(H)W(T)$	$W(C(H))$	$D(R(G),T)$	$D(T,R(G))$
						$D(R(F),T)$	$D(T,R(F))$
						$D(R(H),T)$	$D(T,R(H))$
							$W(T)$

German Banks B(G)		French Banks B(F)		Greek Banks B(H)	
Assets	Liabilities	Assets	Liabilities	Assets	Liabilities
$D(C(G),B(G))$	$D(B(G),C(G))$	$D(C(F),B(F))$	$D(B(F),C(F))$	$D(C(H),B(H))$	$D(B(H),C(H))$
$D(R(G),B(G))$	$D(B(G),R(G))$	$D(R(G),B(F))$	$D(B(F),R(G))$	$D(R(G),B(H))$	$D(B(H),R(G))$
$D(R(F),B(G))$	$D(B(G),R(F))$	$D(R(F),B(F))$	$D(B(F),R(F))$	$D(R(F),B(H))$	$D(B(H),R(F))$
$D(R(H),B(G))$	$D(B(G),R(H))$	$D(R(H),B(F))$	$D(B(F),R(H))$	$D(R(H),B(H))$	$D(B(H),R(H))$
	$N(B(G),C(G))$		$N(B(F),C(F))$		$N(B(H),C(H))$
	$W(B(G))$		$W(B(F))$		$W(B(H))$

German RoE R(G)		French RoE R(F)		Greek RoE R(H)	
Assets	Liabilities	Assets	Liabilities	Assets	Liabilities
$D(B(G),R(G))$	$D(R(G),B(G))$	$D(B(G),R(F))$	$D(R(F),B(G))$	$D(B(G),R(H))$	$D(R(H),B(G))$
$D(B(F),R(G))$	$D(R(G),B(F))$	$D(B(F),R(F))$	$D(R(F),B(F))$	$D(B(F),R(H))$	$D(R(H),B(F))$
$D(B(H),R(G))$	$D(R(G),B(H))$	$D(B(H),R(F))$	$D(R(F),B(H))$	$D(B(H),R(H))$	$D(R(H),B(H))$
$D(R(F),R(G))$	$D(R(G),R(F))$	$D(R(G),R(F))$	$D(R(F),R(G))$	$D(R(G),R(H))$	$D(R(H),R(G))$
$D(R(H),R(G))$	$D(R(G),R(H))$	$D(R(H),R(F))$	$D(R(F),R(H))$	$D(R(F),R(H))$	$D(R(H),R(F))$
$D(T,R(G))$	$D(R(G),T)$	$D(T,R(F))$	$D(R(F),T)$	$D(T,R(H))$	$D(R(H),T)$
$W(B(G))$		$W(B(F))$		$W(B(H))$	
$W(C(G))$		$W(C(F))$		$W(C(H))$	
$K(R(G))$	$W(R(G))$	$K(R(F))$	$W(R(F))$	$K(R(H))$	$W(R(H))$

Source: Citi Research

The NCB of country i , $i = G, H, F$ for our simple example and also for $i = 1, 2, \dots, N$ in general, holds as assets its gross claims on its domestic banks incurred as a result of the common monetary, liquidity and credit policy of the ECB, $D(B(i), C(i))$, its gross claims on Target2/ECB, $D(T, C(i))$, its net assets held for purposes other than the implementation of the common monetary, liquidity and credit policy of the ECB, $N(B(i), C(i))$, and its equity claims on the ECB, $\sigma(i)W(T)$. As noted, for expositional simplicity we assume that the net assets held by an NCB for purposes other than the implementation of the common monetary, liquidity and credit policy of the ECB (and not subject comprehensive profit or loss pooling when we consider the comprehensive profit and loss pooling regime in Section 4.5 below, consist only of claims on the domestic banks. All the equity in the NCB of country i , $W(C(i))$, is owned by the RoE of that country. The Target2 net credit balance of the NCB of country i is given by $D(T, C(i)) - D(C(i), T)$.

Figure 6. Consolidated Country and Eurozone Balance Sheets, under limited profit and loss pooling

Consolidated German S(G)		Consolidated French S(F)		Consolidated Greek S(H)	
Assets	Liabilities	Assets	Liabilities	Assets	Liabilities
$D(T,C(G))$	$D(C(G),T)$	$D(T,C(F))$	$D(C(F),T)$	$D(T,C(H))$	$D(C(H),T)$
$D(R(F),B(G))$	$D(B(G),R(F))$	$D(R(G),B(F))$	$D(B(F),R(G))$	$D(R(G),B(H))$	$D(B(H),R(G))$
$D(R(H),B(G))$	$D(B(G),R(H))$	$D(R(H),B(F))$	$D(B(F),R(H))$	$D(R(F),B(H))$	$D(B(H),R(F))$
$D(B(F),R(G))$	$D(R(G),B(F))$	$D(B(G),R(F))$	$D(R(F),B(G))$	$D(B(G),R(H))$	$D(R(H),B(G))$
$D(B(H),R(G))$	$D(R(G),B(H))$	$D(B(H),R(F))$	$D(R(F),B(H))$	$D(B(F),R(H))$	$D(R(H),B(F))$
$D(R(F),R(G))$	$D(R(G),R(F))$	$D(R(G),R(F))$	$D(R(F),R(G))$	$D(R(G),R(H))$	$D(R(H),R(G))$
$D(R(H),R(G))$	$D(R(G),R(H))$	$D(R(H),R(F))$	$D(R(F),R(H))$	$D(R(F),R(H))$	$D(R(H),R(F))$
$D(T,R(G))$	$D(R(G),T)$	$D(T,R(F))$	$D(R(F),T)$	$D(T,R(H))$	$D(R(H),T)$
$K(R(G))$		$K(R(F))$		$K(R(H))$	
$\sigma(G)W(T)$	$W(S(G))=W(R(G))$	$\sigma(F)W(T)$	$W(S(F))=W(R(F))$	$\sigma(H)W(T)$	$W(S(H))=W(R(H))$
Consolidated Three Countries Eurozone excluding Target2/ECB					
Assets		Liabilities			
$D(T,C(G))+D(T,C(F))+D(T,C(H))$		$D(C(G),T)+D(C(F),T)+D(C(H),T)$			
$D(T,R(G))+D(T,R(F))+D(T,R(H))$		$D(R(G),T)+D(R(F),T)+D(R(H),T)$			
$K(R(G))+K(R(F))+K(R(H))$					
$W(T)$		$W(S(G))+W(S(F))+W(S(H))=W(R(G))+W(R(F))+W(R(H))$			
Consolidated Three Countries Eurozone including Target2/ECB					
Assets		Liabilities			
$K(R(G))+K(R(F))+K(R(H))$		$W(S(G))+W(S(F))+W(S(H))=W(R(G))+W(R(F))+W(R(H))$			

Source: Citi Research

Banks in country i hold net claims on country i 's NCB associated with that NCB's operations under the common monetary, liquidity and credit policy of the ECB given by $D(C(i),B(i)) - D(B(i),C(i))$, and net claims associated with that NCB's operations for its own account given by $-N(B(i),C(i))$. They also hold net claims on the RoEs of all three countries given by $D(R(j),B(i)) - D(B(i),R(j))$, $j = 1, 2, \dots, N$. All the equity in country i 's banks, $W(B(i))$, is owned by the RoE of country i .

Country i 's RoE holds net claims on the banks in all three countries given by $D(B(j),R(i)) - D(R(i),B(j))$, $j = 1, 2, \dots, N$. It also holds net claims on the RoE in the two other countries given by $D(R(j),R(i)) - D(R(i),R(j))$, $j \neq i$. It also owns the equity of country i 's banks, $W(B(i))$, and country i 's NCB, $W(C(i))$, plus the stock of 'outside' real assets, $K(R(i))$. Its financial net worth is $W(R(i))$.

The consolidated accounts of Figure 6 also provide a consistency check on the sectoral accounts for the three countries and Target2/ECB. The finding in the last balance sheet of Figure 6 that the financial net worth of the Eurozone (including Target2/ECB) consists only of the value of the outside assets owned by the rest of economy in the three countries is therefore encouraging.

Finally, Target2/ECB has a net Target2 credit position vis-à-vis the N NCBs given by

$$\sum_{i=1}^N \{ [D(C(i),T) - D(T,C(i))] \}. \text{ In addition, the ECB has further net assets in the form of net}$$

claims on the RoEs of the three countries given by $\sum_{i=1}^N \{[D(R(i),T) - D(T,R(i))]\}$. Its equity, $W(T)$ is owned by the N NCBs.

Note that if we make the simplifying assumption (as we have) that there is no physical currency, and that all gross liabilities of an NCB to its banks take the form of overnight deposits by these banks with the NCB, that is, they consist only of monetary liabilities – required reserves and excess reserves – then the monetary base in each country, $M(i)$ in country $i = 1, 2, \dots, N$ equals the liabilities of the national central bank to the banks in its jurisdiction, so $D(C(i),B(i)) = M(i) \quad i = 1, 2, \dots, N$

4.4 Are the net Target2 balances of the Bundesbank a good measure of its exposure to the rest of the Eurozone in the limited profit and loss pooling case?

Let country 1 be Germany and its central bank the Bundesbank. It follows from the balance sheet accounts in Figure 2 that:

$$\begin{aligned} W(C(G)) = & [D(T, C(G)) - D(C(G), T)] \\ & + [D(B(G), C(G)) - D(C(G), B(G))] \\ & + N(B(G), C(G)) \\ & + \sigma(G)W(T) \end{aligned} \quad (2)$$

Where

$$W(T) = \sum_{i=1}^N \{[D(C(i), T) - D(T, C(i))] + [D(R(i), T) - D(T, R(i))]\} \quad (3)$$

It follows that:

$$\begin{aligned} W(C(G)) = & (1 - \sigma(G))[D(T, C(G)) - D(C(G), T)] \\ & + \sigma(G) \sum_{j=2}^N [D(C(j), T) - D(T, C(j))] \\ & + [D(B(G), C(G)) - D(C(G), B(G))] \\ & + \sigma(G) \sum_{j=1}^N \{[D(R(j), T) - D(T, R(j))]\} \\ & + N(B(G), C(G)) \end{aligned} \quad (4)$$

When $\sigma(G) = 1$, equation (4) becomes

$$\begin{aligned}
W(C(1)) &= \sum_{j=2}^N [D(C(j), T) - D(T, C(j))] \\
&\quad + [D(B(G), C(G)) - D(C(G), B(G))] \\
&\quad + \sum_{j=1}^N \{ [D(R(j), T) - D(T, R(j))] \} \\
&\quad + N(B(G), C(G)) \\
&= [D(T, C(G)) - D(C(G), T)] \\
&\quad + [D(B(1), C(1)) - D(C(1), B(1))] \\
&\quad + N(B(G), C(G)) \\
&\quad + W(T)
\end{aligned} \tag{5}$$

The conventional accounting exposure of Germany's central bank to the rest of the Eurosystem under limited profit and loss sharing is given by those terms in equation (2) or, equivalently, equation (4) that contain claims of Germany's NCB on the Eurosystem and claims of the Eurosystem on Germany's NCB:

$$\begin{aligned}
W(C(G)) &= [D(T, C(G)) - D(C(G), T)] \\
&\quad + \sigma(G)W(T)
\end{aligned} \tag{6}$$

This is the net Target2 credit position of the Bundesbank plus the value of its share of the ECB's equity. In the case where Germany is the only EA member state left and $\sigma(1) = 1$ equation becomes

$$W(C(1)) = [D(T, C(G)) - D(C(G), T)] + W(T) \tag{7}$$

With Germany as the only EA member state left, the Bundesbank is the sole owner of the ECB, so it is quite convenient that the institution is located in Frankfurt. The exposure of the Bundesbank to the Eurosystem in the case of a complete collapse of the Eurozone under restricted profit and loss sharing is therefore its net Target2 credit position plus the value of the ECB. In the Introduction and in Section 2.1 we noted that the economic value of the ECB bears no relationship to the roughly €10bn of paid-up capital provided by the current EA members. Indeed, it is likely to be several times larger than the roughly €700bn exposure through the Bundesbank's net Target 2 credit position.

Apart from noting that the limited profit and loss pooling case analysed here misrepresents the actual profit and loss sharing rules of the ECB, which are analysed in

Section 4.5, there are two other points to make about equations (5) and (7). The first is that it is deeply unrealistic to assume, as we do in equations (5) and (7), that even when the monetary union disintegrates completely, all 16 exiting NCBs will simply walk away from their net Target2 debit balances – their obligations to Target2/ECB. The legal obligation is not extinguished by exit. Willingness to pay and ability to pay may be an issue for those NCBs that have large negative Target2 net credit balances – the NCBs of the periphery – but at the very least the NCBs of the exiting core EA member states can be expected not to walk away from any net debit positions they may have and indeed to share any losses resulting from the possible default on their Target2 obligations by some of the periphery EA member states.

Second, as pointed out in the Deutsche Bundesbank (2012), the counterparty of the gross and net Target2 balances of any NCB is not the other NCBs, jointly or severally, but the ECB. It is surely reasonable to assume that, because the ECB liabilities to the NCBs under Target2 are denominated in euro the ECB is likely to be good for them. After all, the ECB prints euros and can create them electronically in any amount at the click of a finger. If there were a complete disintegration of the euro area leaving the Bundesbank as the sole Eurosystem NCB, the Bundesbank, as sole owner of the ECB ought not to have too much trouble collecting on the debt it would be owed by the ECB under Target2. Of course, if the ECB's Target2 losses (on its exposures to the 16 former Eurosystem NCBs) were to be very large, it might only be able to make good on its Target2 debt to the Bundesbank by additional euro base money creation. This could reduce the real value of the Bundesbank's Target2 claims, even when these claims are honoured in full in nominal terms.

4.5. Exposure to losses and profits for NCBs through their membership in the Eurosystem: the comprehensive profit and loss pooling case

4.5a The 'too good to be true' variant

When we consider the exposure of NCBs to the Eurosystem under full profit and loss pooling, it is helpful to start with the balance sheet of the consolidated Eurosystem (Target2/ECB) and the NCBs (three in our example, 17 in the real world). Note that we exclude from the balance sheet of the Eurosystem the net assets of the NCBs that are not subject to profit and loss pooling by the Eurosystem, $N(B(i), C(i)), i = 1, 2, \dots, N$. The financial net worth, capital or equity of the Eurosystem (excluding net assets held for the NCB's own account, that is, not subject to profit and loss sharing) is denoted $W(E)$. Figure 7, the balance sheet of the consolidated Eurosystem (excluding net assets not subject to profit

and loss pooling) is obtained from the 3 central bank balance sheets and the Target2/ECB balance sheet in the first row of Figure 5.

Figure 7. Consolidated Eurosystem

E	
Assets	Liabilities
$D(B(G), C(G))$	$D(C(G), B(G))$
$D(B(F), C(F))$	$D(C(F), B(F))$
$D(B(H), C(H))$	$D(C(H), B(3))$
$D(R(G), T)$	$D(T, R(G))$
$D(R(F), T)$	$D(T, R(F))$
$D(R(H), T)$	$D(T, R(H))$
	$W(E) = W(C(G)) - N(B(G), C(G))$
	$+ W(C(F)) - N(B(F), C(F)) + W(C(H)) - N(B(H), C(H))$

Source: Citi Research

In Figure 7 the claims of each NCB on Target2/ECB and the matching liabilities of the Target2/ECB to the NCBs cancel out as does the gross debt of each NCB to Target2/ECB and the matching claim of Target2/ECB on the NCB. As a result, the assets of consolidated Eurosystem are the debt of the domestic banks to their NCBs and the debt of the ROEs to Target2/ECB. The liabilities of the consolidated Eurosystem are the debt of the NCBs to their domestic banks and the debt of Target2/ECB to the ROEs. Net worth of the Consolidated Eurosystem, $W(E)$ is therefore given by:

$$\begin{aligned}
 W(E) &= \sum_{i=1}^N \{ [D(B(i), C(i)) - D(C(i), B(i))] + [D(R(i), T) - D(T, R(i))] \} \\
 &= \sum_{i=1}^N \{ W(C(i)) - N(B(i), C(i)) \}
 \end{aligned} \tag{8}$$

Note that the net worth of Target2/ECB cancels out from (8) because Target2/ECB is fully owned by the NCBs.

We now impose the assumption, which accurately reflects the operating principles of the Eurosystem, that all profits and losses incurred by the Eurosystem (excluding those resulting from operations for the NCBs' own accounts) are pooled and shared using the same proportional shares as those that define the NCBs' shareholdings in the ECB.

This means that, effectively, the assets of NCB i are $N(B(i), C(i))$ and its share of the assets of the consolidated Eurosystem, and that the debt of each NCB is its share of the debt of the consolidated Eurosystem. The assets and liabilities of the three NCBs can therefore be very simply expressed as in the first row of Figure 8.

Figure 8. Target2: Full Profit and Loss Pooling, ‘too good to be true’ variant

German NCB C(G)		French NCB C(F)		Greek NCB C(H)	
Assets	Liabilities	Assets	Liabilities	Assets	Liabilities
$N(B(G), C(G))$		$N(B(F), C(F))$		$N(B(H), C(H))$	
$\sigma(G)W(E)$	$W(C(G))$	$\sigma(F)W(E)$	$W(C(F))$	$\sigma(H)W(E)$	$W(C(H))$

German Banks B(G)		French Banks B(F)		Greek Banks B(H)	
Assets	Liabilities	Assets	Liabilities	Assets	Liabilities
$D(C(G), B(G))$	$D(B(G), C(G))$	$D(C(F), B(F))$	$D(B(F), C(F))$	$D(C(H), B(H))$	$D(B(H), C(H))$
$D(R(G), B(G))$	$D(B(G), R(G))$	$D(R(G), B(F))$	$D(B(F), R(G))$	$D(R(G), B(H))$	$D(B(H), R(G))$
$D(R(F), B(G))$	$D(B(G), R(F))$	$D(R(G), B(F))$	$D(B(F), R(F))$	$D(R(F), B(H))$	$D(B(H), R(F))$
$D(R(H), B(G))$	$D(B(G), R(H))$	$D(R(H), B(F))$	$D(B(F), R(H))$	$D(R(H), B(H))$	$D(B(H), R(H))$
	$N(B(G), C(G))$		$N(B(F), C(F))$		$N(B(H), C(H))$
	$W(B(G))$		$W(B(F))$		$W(B(H))$

German RoE R(G)		French RoE R(F)		Greek RoE R(H)	
Assets	Liabilities	Assets	Liabilities	Assets	Liabilities
$D(B(G), R(G))$	$D(R(G), B(G))$	$D(B(G), R(F))$	$D(R(F), B(G))$	$D(B(G), R(H))$	$D(R(H), B(G))$
$D(B(F), R(G))$	$D(R(G), B(F))$	$D(B(F), R(F))$	$D(R(F), B(F))$	$D(B(F), R(H))$	$D(R(H), B(F))$
$D(B(H), R(G))$	$D(R(G), B(H))$	$D(B(H), R(F))$	$D(R(F), B(H))$	$D(B(H), R(H))$	$D(R(H), B(H))$
$D(R(F), R(G))$	$D(R(G), R(F))$	$D(R(G), R(F))$	$D(R(F), R(G))$	$D(R(G), R(H))$	$D(R(H), R(G))$
$D(R(H), R(G))$	$D(R(G), R(H))$	$D(R(H), R(F))$	$D(R(F), R(H))$	$D(R(F), R(H))$	$D(R(H), R(F))$
$D(T, R(G))$	$D(R(G), T)$	$D(T, R(F))$	$D(R(F), T)$	$D(T, R(H))$	$D(R(H), T)$
$W(B(G))$		$W(B(F))$		$W(B(H))$	
$W(C(G))$		$W(C(F))$		$W(C(H))$	
$K(R(G))$	$W(R(G))$	$K(R(F))$	$W(R(F))$	$K(R(H))$	$W(R(H))$

Source: Citi Research

Figure 9. Consolidated country and Eurozone Balance Sheets Full profit and loss pooling; ‘too good to be true’ variant

Consolidated German S(G)		Consolidated French S(F)		Consolidated Greek S(H)	
Assets	Liabilities	Assets	Liabilities	Assets	Liabilities
$D(C(G), B(G))$	$D(B(G), C(G))$	$D(C(F), B(F))$	$D(B(F), C(F))$	$D(C(H), B(H))$	$D(B(H), C(H))$
$D(R(F), B(G))$	$D(B(G), R(F))$	$D(R(G), B(F))$	$D(B(F), R(G))$	$D(R(G), B(H))$	$D(B(H), R(G))$
$D(R(H), B(G))$	$D(B(G), R(H))$	$D(R(H), B(F))$	$D(B(F), R(H))$	$D(R(F), B(H))$	$D(B(H), R(F))$
$D(B(F), R(G))$	$D(R(G), B(F))$	$D(B(G), R(F))$	$D(R(F), B(G))$	$D(B(G), R(H))$	$D(R(H), B(G))$
$D(B(H), R(G))$	$D(R(G), B(H))$	$D(B(H), R(F))$	$D(R(F), B(H))$	$D(B(F), R(H))$	$D(R(H), B(F))$
$D(R(F), R(G))$	$D(R(G), R(F))$	$D(R(G), R(F))$	$D(R(F), R(G))$	$D(R(G), R(H))$	$D(R(H), R(G))$
$D(R(H), R(G))$	$D(R(G), R(H))$	$D(R(H), R(F))$	$D(R(F), R(H))$	$D(R(F), R(H))$	$D(R(H), R(F))$
$D(T, R(G))$	$D(R(G), T)$	$D(T, R(F))$	$D(R(F), T)$	$D(T, R(H))$	$D(R(H), T)$
$K(R(G))$		$K(R(F))$		$K(R(H))$	
$\sigma(G)W(E)$	$W(S(G)) = W(R(G))$	$\sigma(F)W(E)$	$W(S(F)) = W(R(F))$	$\sigma(H)W(E)$	$W(S(H)) = W(R(H))$

Consolidated Eurozone excluding Eurosystem	
Assets	Liabilities
$D(C(G), B(G)) + D(C(F), B(F)) + D(C(H), B(H))$	$D(B(G), C(G)) + D(B(F), C(F)) + D(B(H), C(H))$
$D(T, R(G)) + D(T, R(F)) + D(T, R(H))$	$D(R(G), T) + D(R(F), T) + D(R(H), T)$
$W(E)$	
$K(R(G)) + K(R(F)) + K(R(H))$	$W(R(G)) + W(R(F)) + W(R(H))$

Consolidated Eurozone and Eurosystem	
Assets	Liabilities
$K(R(G)) + K(R(F)) + K(R(H))$	$W(R(G)) + W(R(F)) + W(R(H))$

Source: Citi Research

For future reference we note that, using Figure 7, the consolidated country balance sheets in Figure 9 can also be written as follows:

Figure 10. Consolidated country and Eurozone Balance Sheets Full profit and loss pooling; ‘too good to be true’ variant

Consolidated German S(G)		Consolidated French S(F)		Consolidated Greek S(H)	
Assets	Liabilities	Assets	Liabilities	Assets	Liabilities
$(\sigma(G)-1)D(B(G),C(G))$	$(\sigma(G)-1)D(C(G),B(G))$	$(\sigma(F)-1)D(B(F),C(F))$	$(\sigma(F)-1)D(C(F),B(F))$	$(\sigma(H)-1)D(B(H),C(H))$	$(\sigma(H)-1)D(C(H),B(H))$
$\sigma(G)D(T,C(G))$	$\sigma(G)D(C(G),T)$	$\sigma(F)D(T,C(F))$	$\sigma(F)D(C(F),T)$	$\sigma(H)D(T,C(H))$	$\sigma(H)D(C(H),T)$
$\sigma(G)D(B(F),C(F))$	$\sigma(G)D(C(F),B(F))$	$\sigma(F)D(B(G),C(G))$	$\sigma(F)D(C(G),B(G))$	$\sigma(H)D(B(G),C(G))$	$\sigma(H)D(C(G),B(G))$
$\sigma(G)D(T,C(F))$	$\sigma(G)D(C(F),T)$	$\sigma(F)D(T,C(F))$	$\sigma(F)D(C(F),T)$	$\sigma(H)D(T,C(F))$	$\sigma(H)D(C(F),T)$
$\sigma(G)D(B(H),C(H))$	$\sigma(G)D(C(H),B(H))$	$\sigma(F)D(B(H),C(H))$	$\sigma(F)D(C(H),B(H))$	$\sigma(H)D(B(F),C(F))$	$\sigma(H)D(C(F),B(F))$
$\sigma(G)D(T,C(H))$	$\sigma(G)D(C(H),T)$	$\sigma(F)D(T,C(H))$	$\sigma(F)D(C(H),T)$	$\sigma(H)D(T,C(H))$	$\sigma(H)D(C(H),T)$
$D(R(F),B(G))$	$D(B(G),R(F))$	$D(R(G),B(F))$	$D(B(F),R(G))$	$D(R(G),B(H))$	$D(B(H),R(G))$
$D(R(H),B(G))$	$D(B(G),R(H))$	$D(R(H),B(F))$	$D(B(F),R(H))$	$D(R(F),B(H))$	$D(B(H),R(F))$
$D(B(F),R(G))$	$D(R(G),B(F))$	$D(B(G),R(F))$	$D(R(F),B(G))$	$D(B(G),R(H))$	$D(R(H),B(G))$
$D(B(H),R(G))$	$D(R(G),B(H))$	$D(B(H),R(F))$	$D(R(F),B(H))$	$D(B(F),R(H))$	$D(R(H),B(F))$
$D(R(F),R(G))$	$D(R(G),R(F))$	$D(R(G),R(F))$	$D(R(F),R(G))$	$D(R(G),R(H))$	$D(R(H),R(G))$
$D(R(H),R(G))$	$D(R(G),R(H))$	$D(R(H),R(F))$	$D(R(F),R(H))$	$D(R(F),R(H))$	$D(R(H),R(F))$
$D(T,R(G))$	$D(R(G),T)$	$D(T,R(F))$	$D(R(F),T)$	$D(T,R(H))$	$D(R(H),T)$
$\sigma(G)W(T)$		$\sigma(F)W(T)$		$\sigma(H)W(T)$	
$K(R(G))$	$W(S(G)) = W(R(G))$	$K(R(F))$	$W(S(F)) = W(R(F))$	$K(R(H))$	$W(S(H)) = W(R(H))$

Source: Citi Research

With comprehensive profit and loss pooling, the net worth of the central bank of country 1 (Germany) is given by:

$$\begin{aligned}
 W(C(1)) &= N(B(1), C(1)) + \sigma(1)W(E) \\
 &= N(B(1), C(1)) \\
 &\quad + \sigma(1) \sum_{i=1}^N \{ [D(R(i), T) - D(T, R(i))] + [D(B(i), C(i)) - D(C(i), B(i))] \}
 \end{aligned} \tag{9}$$

Under the full profit and loss sharing rule, the exposure of the Bundesbank through its participation in the Eurosystem would therefore be, with a 17-member Eurosystem, 27 percent of the Eurosystem balance sheet, excluding the value of the NCB’s assets and liabilities incurred for purposed other than the implementation of the common monetary, liquidity and credit policy.

Consider again the financial net worth of the Bundesbank, the NCB of country 1, when $\sigma(1) = 1$, which is one representation of the scenario where all countries except for country 1 exit the Eurozone. In this case

$$\begin{aligned}
 W(C(1)) &= N(B(1), C(1)) \\
 &\quad + \sum_{i=1}^N \{ [D(R(i), T) - D(T, R(i))] + [D(B(i), C(i)) - D(C(i), B(i))] \}
 \end{aligned} \tag{10}$$

In this case, the net worth of the central bank of Germany becomes the net worth of the Eurosystem, plus the net assets of the central bank of Germany that are not associated with the implementation of the common monetary, credit and liquidity policy of the ECB.

This assumes that the exiting central banks leave behind all their assets and liabilities and forfeit their share of the equity of the ECB, $\sigma(i)W(T)$, $i \neq 1$. Again in the worst case, all the assets of the exiting national central banks are worthless, while the liabilities have to be honoured at face value.

This is clearly not realistic. The Bundesbank would, should it be left as the only national central bank in the Eurosystem, be most unlikely to assume responsibility for the balance sheets of the central banks of the 16 nations that have left the euro area. If exiting NCBs were to repudiate their debts to Target2/ECB, then the remaining Eurosystem member NCBs (just the Bundesbank in our extreme example of an exit from the euro area by all current member states except for Germany) and the ECB would not be likely to honour their obligations to the exiting NCBs. In the next subsection, we consider a more plausible specification of the treatment of Target2 assets and liabilities and other Eurozone-related exposures by the both exiting NCBs and continuing Eurosystem member NCBs.

4.5b A unified representation of the no-break-up, partial and complete break-up scenarios

In our view, the appropriate representation of the no-break-up scenario is the comprehensive profit and loss pooling scenario with $\sigma(G) \approx 0.27$ analysed in Section 4.5a. The comprehensive break-up scenario, where Germany is the only country left in the Eurozone, is best represented by the limited profit and loss pooling case with $\sigma(G) = 1$, analysed in Section 4.4.

Both cases can be handled as special cases of a more general approach, represented for the 3-country case in Figure 14. The share of the central bank of country i in the equity of

the ECB continues to be denoted $\sigma(i)$, with
$$\sum_{i=1}^N \sigma(i) = 1$$

In addition to owning a share $\sigma(i)$ of the capital of the ECB, whose balance sheet remains the one presented as the fourth balance sheet on the first row of balance sheets in Figure 5, the NCB of country i also shares a fraction $\sigma(i,j)$, $j \neq i$ of the profits and losses incurred on the assets and liabilities held by the other central banks in the Eurosystem,

$j, j = 1, \dots, N, j \neq i$ for the purpose of implementing the common monetary, liquidity and credit policy (all assets and liabilities other than $N(B(j), C(j)), j \neq i$).

As long as country j remains a member of the euro area, the central banks from the other euro area countries will share the profits and losses of the central bank of country j according to their shares in the equity of the ECB, that is, $\sigma(i,j) = \sigma(i)$ if country j remains a member of the monetary union. Thus, as long as every member of the monetary union remains a member of the monetary union and honours its obligations, we are in the full profit and loss sharing case discussed in Section 4.5a. However, if country j leaves the monetary union (and $\sigma(j) = \sigma(j,i) = 0$, that is, the central bank of country j that has exited the monetary union ceases to be a shareholder of the ECB and also no longer participates in the profit and loss sharing arrangements with the NCBs of the monetary union), then the central banks of the countries remaining members of the euro area stop sharing the profits and losses of the central bank of country j , that is, $\sigma(i,j) = 0$ also for $i \neq j$. This ‘tit-for-tat’ behaviour results, if all but one country (Germany, say) has exited and defaulted on its commitments, in the limited profits and loss sharing configuration analysed in Section 4.4. The sectoral accounts under this generalised profit and loss sharing rule are given in Figure 11.

Figure 11. Target 2: Generalised Profit and Loss Pooling

German NCB C(G)		French NCB C(F)		Greek NCB C(H)	
Assets	Liabilities	Assets	Liabilities	Assets	Liabilities
$(1-\sigma(F,G))-\sigma(H,G)$	$(1-\sigma(F,G))-\sigma(H,G)$	$(1-\sigma(G,F))-\sigma(H,F)$	$(1-\sigma(G,F))-\sigma(H,F)$	$(1-\sigma(G,H))-\sigma(F,H)$	$(1-\sigma(G,H))-\sigma(F,H)$
$\times D(B(G),C(G))$	$\times D(C(G),B(G))$	$\times D(B(F),C(F))$	$\times D(C(F),B(F))$	$\times D(B(H),C(H))$	$\times \sigma(F,H)D(C(H),B(H))$
$(1-\sigma(F,G))-\sigma(H,G)$	$(1-\sigma(F,G))-\sigma(H,G)$	$(1-\sigma(G,F))-\sigma(H,F)$	$(1-\sigma(G,F))-\sigma(H,F)$	$(1-\sigma(G,H))-\sigma(F,H)$	$(1-\sigma(G,H))-\sigma(F,H)$
$\times D(T,C(G))$	$\times D(C(G),T)$	$\times D(T,C(F))$	$\times D(C(F),T)$	$\times D(T,C(H))$	$\times D(C(H),T)$
$\sigma(G,F)D(B(F),C(F))$	$\sigma(G,F)D(C(F),B(F))$	$\sigma(F,G)D(B(G),C(G))$	$\sigma(F,G)D(C(G),B(G))$	$\sigma(H,G)D(B(G),C(G))$	$\sigma(H,G)D(C(G),B(G))$
$\sigma(G,F)D(T,C(F))$	$\sigma(G,F)D(C(F),T)$	$\sigma(F,G)D(T,C(G))$	$\sigma(F,G)D(C(G),T)$	$\sigma(H,G)D(T,C(G))$	$\sigma(H,G)D(C(G),T)$
$\sigma(G,H)D(B(H),C(H))$	$\sigma(G,H)D(C(H),B(H))$	$\sigma(F,H)D(B(H),C(H))$	$\sigma(F,H)D(C(H),B(H))$	$\sigma(H,F)D(B(F),C(F))$	$\sigma(H,F)D(C(F),B(F))$
$\sigma(G,H)D(T,C(H))$	$\sigma(G,H)D(C(H),T)$	$\sigma(F,H)D(T,C(H))$	$\sigma(F,H)D(C(H),T)$	$\sigma(H,F)D(T,C(F))$	$\sigma(H,F)D(C(F),T)$
$N(B(G),C(G))$		$N(B(F),C(F))$		$N(B(H),C(H))$	
$\sigma(G)W(T)$	$W(C(G))$	$\sigma(F)W(T)$	$W(C(F))$	$\sigma(H)W(T)$	$W(C(H))$

German Banks B(G)		French Banks B(F)		Greek Banks B(H)	
Assets	Liabilities	Assets	Liabilities	Assets	Liabilities
$D(C(G),B(G))$	$D(B(G),C(G))$	$D(C(F),B(F))$	$D(B(F),C(F))$	$D(C(H),B(H))$	$D(B(H),C(H))$
$D(R(G),B(G))$	$D(B(G),R(G))$	$D(R(G),B(F))$	$D(B(F),R(G))$	$D(R(G),B(H))$	$D(B(H),R(G))$
$D(R(F),B(G))$	$D(B(G),R(F))$	$D(R(F),B(F))$	$D(B(F),R(F))$	$D(R(F),B(H))$	$D(B(H),R(F))$
$D(R(H),B(G))$	$D(B(G),R(H))$	$D(R(H),B(F))$	$D(B(F),R(H))$	$D(R(H),B(H))$	$D(B(H),R(H))$
	$N(B(G),C(G))$		$N(B(F),C(F))$		$N(B(H),C(H))$
	$W(B(G))$		$W(B(F))$		$W(B(H))$

German RoE R(G)		French RoE R(F)		Greek RoE R(H)	
Assets	Liabilities	Assets	Liabilities	Assets	Liabilities
$D(B(G),R(G))$	$D(R(G),B(G))$	$D(B(G),R(F))$	$D(R(F),B(G))$	$D(B(G),R(H))$	$D(R(H),B(G))$
$D(B(F),R(G))$	$D(R(G),B(F))$	$D(B(F),R(F))$	$D(R(F),B(F))$	$D(B(F),R(H))$	$D(R(H),B(F))$
$D(B(H),R(G))$	$D(R(G),B(H))$	$D(B(H),R(F))$	$D(R(F),B(H))$	$D(B(H),R(H))$	$D(R(H),B(H))$
$D(R(F),R(G))$	$D(R(G),R(F))$	$D(R(G),R(F))$	$D(R(F),R(G))$	$D(R(G),R(H))$	$D(R(H),R(G))$
$D(R(H),R(G))$	$D(R(G),R(H))$	$D(R(H),R(F))$	$D(R(F),R(H))$	$D(R(F),R(H))$	$D(R(H),R(F))$
$D(T,R(G))$	$D(R(G),T)$	$D(T,R(F))$	$D(R(F),T)$	$D(T,R(H))$	$D(R(H),T)$
$W(B(G))$		$W(B(F))$		$W(B(H))$	
$W(C(G))$		$W(C(F))$		$W(C(H))$	
$K(R(G))$	$W(R(G))$	$K(R(F))$	$W(R(F))$	$K(R(H))$	$W(R(H))$

Source: Citi Research

The consolidated balance sheets of the three countries are given in Figure 12, and the consolidated balance sheets for the Eurozone without Target2/ECB and including Target2/ECB in Figure 13. It should not come as a surprise that, when the three countries are consolidated in Figure 12, we get the same balance sheets that we had in the limited and full profit and loss sharing cases.

Figure 12. Consolidated Country and Eurozone Balance Sheets: Target 2 Generalised Profit and Loss Pooling

Germany S(G)		France S(F)		Greece S(H)	
Assets	Liabilities	Assets	Liabilities	Assets	Liabilities
$-(\sigma(F,G)+\sigma(H,G))\times$ $D(B(G),C(G))$	$-(\sigma(F,G)+\sigma(H,G))$ $D(C(G),B(G))$	$-(\sigma(G,F)+\sigma(H,F))\times$ $D(C(F),B(F))$	$-(\sigma(G,F)+\sigma(H,F))$ $D(C(F),B(F))$	$-(\sigma(G,H)+\sigma(F,H))\times$ $D(C(H),B(H))$	$-(\sigma(G,H)+\sigma(F,H))$ $D(C(H),B(H))$
$(1-\sigma(F,G))-$ $\sigma(H,G)D(T,C(G))$	$(1-\sigma(F,G))-$ $\sigma(H,G)D(C(G),T)$	$(1-\sigma(G,F))-$ $\sigma(H,F)D(C(F),T)$	$(1-\sigma(G,F))-$ $\sigma(H,F)D(C(F),T)$	$(1-\sigma(G,H))-$ $\sigma(F,H)D(C(H),T)$	$(1-\sigma(G,H))-$ $\sigma(F,H)D(C(H),T)$
$\sigma(G,F)D(B(F),C(F))$	$\sigma(G,F)D(C(F),B(F))$	$\sigma(F,G)D(T,C(G))$	$\sigma(F,G)D(C(G),B(G))$	$\sigma(H,G)D(T,C(G))$	$\sigma(H,G)D(C(G),B(G))$
$\sigma(G,F)D(T,C(F))$	$\sigma(G,F)D(C(F),T)$	$\sigma(F,G)D(T,C(G))$	$\sigma(F,G)D(C(G),T)$	$\sigma(H,G)D(T,C(G))$	$\sigma(H,G)D(C(G),T)$
$\sigma(G,H)D(B(H),C(H))$	$\sigma(G,H)D(C(H),B(H))$	$\sigma(F,H)D(T,C(H))$	$\sigma(F,H)D(C(H),B(H))$	$\sigma(H,F)D(T,C(F))$	$\sigma(H,F)D(C(F),B(F))$
$\sigma(G,H)D(T,C(H))$	$\sigma(G,H)D(C(H),T)$	$\sigma(F,H)D(T,C(H))$	$\sigma(F,H)D(C(H),T)$	$\sigma(H,F)D(T,C(F))$	$\sigma(H,F)D(C(F),T)$
$D(R(F),B(G))$	$D(B(G),R(F))$	$D(R(G),B(F))$	$D(B(F),R(G))$	$D(R(G),B(H))$	$D(B(H),R(G))$
$D(R(H),B(G))$	$D(B(G),R(H))$	$D(R(H),B(F))$	$D(B(F),R(H))$	$D(B(G),R(H))$	$D(R(H),B(G))$
$D(B(F),R(G))$	$D(R(G),B(F))$	$D(B(G),R(F))$	$D(R(F),B(G))$	$D(B(F),R(H))$	$D(R(H),B(F))$
$D(B(H),R(G))$	$D(R(G),B(H))$	$D(B(H),R(F))$	$D(R(F),B(H))$	$D(R(F),B(H))$	$D(B(H),R(F))$
$D(R(F),R(G))$	$D(R(G),R(F))$	$D(R(G),R(F))$	$D(R(F),R(G))$	$D(R(G),R(H))$	$D(R(H),R(G))$
$D(R(H),R(G))$	$D(R(G),R(H))$	$D(R(H),R(F))$	$D(R(F),R(H))$	$D(R(F),R(H))$	$D(R(H),R(F))$
$D(T,R(G))$	$D(R(G),T)$	$D(T,R(F))$	$D(R(F),T)$	$D(T,R(H))$	$D(R(H),T)$
$\sigma(G)W(T)$		$\sigma(F)W(T)$		$\sigma(H)W(T)$	
$K(R(G))$	$W(S(G))=W(R(G))$	$K(R(F))$	$W(S(F))=W(R(F))$	$K(R(H))$	$W(S(H))=W(R(H))$

Source: Citi Research

Figure 13. Consolidated Country and Eurozone Balance Sheets: Generalised Profit and Loss Pooling

Consolidated countries excluding Target2/ECB		Target2/ECB	
Assets	Liabilities	Assets	Liabilities
$D(T,C(G))$	$D(C(G),T)$	$D(C(G),T)$	$D(T,C(G))$
$D(T,C(F))$	$D(C(F),T)$	$D(C(F),T)$	$D(T,C(F))$
$D(T,C(H))$	$D(C(H),T)$	$D(C(H),T)$	$D(T,C(H))$
$D(T,R(G))$	$D(R(G),T)$	$D(R(G),T)$	$D(T,R(G))$
$D(T,R(F))$	$D(R(F),T)$	$D(R(F),T)$	$D(T,R(F))$
$D(T,R(H))$	$D(R(H),T)$	$D(R(H),T)$	$D(T,R(H))$
$W(T)$		$W(T)$	
$K(R(G))+K(R(F))+K(R(H))$	$W(S(G))+W(S(F))+W(S(H))=$ $W(R(G))+W(R(F))+W(R(H))$		
Consolidated Eurozone, including Target2/ECB			
Assets		Liabilities	
$K(R(G))+K(R(F))+K(R(H))$		$W(S(G))+W(S(F))+W(S(H))=W(R(G))+W(R(F))+W(R(H))$	

Source: Citi Research

It is easily checked in our three country example, that if no country exits the Eurozone, then

$$\begin{aligned}
 \sigma(G) &= \sigma(G, F) = \sigma(G, H) > 0 \\
 \sigma(F) &= \sigma(F, G) = \sigma(F, H) > 0 \\
 \sigma(H) &= \sigma(H, G) = \sigma(H, F) = 1 - \sigma(G) - \sigma(F) > 0
 \end{aligned}
 \tag{11}$$

and we are in the comprehensive pooling configuration of Section 4.5a.

If Greece were to exit the euro area, but Germany and France stay in, then

$$\begin{aligned}
\sigma(G) &= \sigma(G, F) = 1 - \sigma(F) > 0 \\
\sigma(F) &= \sigma(F, G) > 0 \\
\sigma(H) &= \sigma(G, H) = \sigma(F, H) = \sigma(H, G) = \sigma(H, F) = 0
\end{aligned} \tag{12}$$

If both France and Greece were to exit the euro area, but Germany were to remain, then

$$\begin{aligned}
\sigma(G) &= 1 \\
\sigma(F) &= \sigma(H) = \sigma(G, F) = \sigma(G, H) = \sigma(F, G) = \sigma(F, H) = \sigma(H, G) = \sigma(H, F) = 0
\end{aligned} \tag{13}$$

When only one country remains, we are, under the ‘tit for tat rules’ (don’t share the profits and losses of those who won’t share your profits and losses), back in the limited profit and loss pooling case of Section 4.4.

In the general case of an N -country monetary union, the tit-for-tat sharing rule can be written as follows:

$$\begin{aligned}
\sigma(i) &= \sigma(i, k) > 0 \text{ if both } i \text{ and } k \text{ remain members of the monetary union} \\
\sigma(j) &= \sigma(j, i) = \sigma(i, j) = 0 \text{ if } j \text{ has exited the monetary union,} \\
&\text{regardless of whether } i \text{ has exited} \\
i, j, k &= 1, 2, \dots, N
\end{aligned} \tag{14}$$

The financial net worth of the Bundesbank under the general profit and loss sharing rule is given by:

$$\begin{aligned}
W(C(G)) &= \\
&\left(1 - \sum_{j=2}^N \sigma(j, G) \right) \left[(D(B(G), C(G)) - D(C(G), B(G))) + (D(T, C(G)) - D(C(G), T)) \right] \\
&+ \sum_{j=2}^N \sigma(G, j) \left[(D(B(j), C(j)) - D(C(j), B(j))) + (D(T, C(j)) - D(C(j), T)) \right] \\
&+ N(B(G), C(G)) + \sigma(G)W(T)
\end{aligned} \tag{15}$$

From the definition of the financial net worth of Target2/ECB in equation (3), it follows that equation (15) can be rewritten as:

$$\begin{aligned}
W(C(G)) = & \left(1 - \sum_{j=2}^N \sigma(j, G) \right) \left[(D(B(G), C(G)) - D(C(G), B(G))) \right] \\
& + \sum_{j=2}^N \sigma(G, j) \left[(D(B(j), C(j)) - D(C(j), B(j))) \right] \\
& + \left(1 - \sigma(G) - \sum_{j=2}^N \sigma(j, G) \right) (D(T, C(G)) - D(C(G), T)) \quad (16) \\
& + \sum_{j=2}^N (\sigma(G, j) - \sigma(G)) (D(T, C(j)) - D(C(j), T)) \\
& + \sigma(1) \left(\sum_{j=1}^N D(R(j), T) - D(T, R(j)) \right) + N(B(G), C(G))
\end{aligned}$$

By applying the rule given in equation (14) to equation (15) or (16), we obtain the limited profit and loss sharing case by assuming that every country other than Germany has exited the monetary union and has reneged on its profit and loss sharing commitments for the Eurosystem. Germany too, in this case, reneges on its commitments to the countries that have exited. We obtain the full profit and loss sharing case by assuming that no country has exited. The general formulation also permits the consideration of exits by any number of countries (between 1 and $N-1$).

5. Potential Bundesbank losses from Eurosystem membership

5.1. Differences between Target2 and Eurosystem exposure in the conventional accounts

Our discussion of limited and comprehensive profit and loss pooling has highlighted that the net claims of the Bundesbank on Target2 bear no logical relation to the exposure of the Bundesbank to losses or profits from the rest of the Eurosystem member states under most circumstances. Net exposure of an economic entity (like the Bundesbank) to another (the rest of the Eurosystem), is given — in a conventional accounting sense — by the net ‘external’ investment position of the Bundesbank vis-a-vis the rest of the Eurosystem. We extend in what follows this net external investment position to include not only the conventional on-balance sheets external assets and liabilities, but also the fair value of off-balance sheet contingent external assets and liabilities.

The Target2 net balance ignores two key items that contribute to the net ‘external’ investment position of the Bundesbank. The first, in what we called the *limited profit and loss pooling* case, is the exposure of the Bundesbank to the profits and losses of the ECB (a result

of the share ownership of the Bundesbank in the ECB). The second, called the *comprehensive profit and loss pooling* case, is the exposure of the Bundesbank to the profits and losses of the rest of the Eurosystem (in the same proportions as those defining profit and loss sharing with the ECB), as long as these profits and losses were the result of the implementation of the common monetary, liquidity and credit policy, or, in certain cases, even when they are the result of ELA.

A partial reminder of this first channel of exposure, which is omitted in the Target2 net credit balance, is the historic value of the contribution of the Bundesbank to the paid-in capital of the ECB, the €1.7bn *Participating interest in the ECB*. As it is a historic cost measure of equity, it bears no relation to the net present discounted value of the future profits or losses associated with this equity stake in the ECB. The second omitted channel of exposure has not even a token historic-cost-based reminder of exposure to profit or loss in the Bundesbank balance sheet.

The Bundesbank recognises this first omitted channel of exposure to profit or loss in the clear and concise discussion of Target2 balances offered in Weidmann (2012).¹⁷ The same points are made in Deutsche Bundesbank (2012, p. 127): “*The Eurosystem TARGET2 claims could impact the Bundesbank’s risk situation via two transmission channels. With regard to the TARGET claim stated in the Bundesbank’s balance sheet, it should, however, be emphasised for the purpose of risk assessment that these claims are not on other national central banks, but always on the ECB. Second, as a shareholder in the ECB, the Bundesbank can be indirectly affected by those risks to which the ECB is exposed.*”

This study goes on to draw the important distinction between Bundesbank exposure to the rest of the Eurosystem when the Eurosystem is a going concern and when it is subject to exit by one or more member states. “*Alongside TARGET2 balances, such equity risks could occur in the hypothetical case of a country with a negative TARGET2 balance exiting the euro area and the central bank of the country in question not being able to meet its obligation to the ECB. The Bundesbank believes that the euro area will continue to exist in its current form. Hence Eurosystem TARGET2 claims do not pose an additional threat on top of those risks arising from operations to provide liquidity. Deutsche Bundesbank (2012, p. 127).*”

Following our theoretical discussion of partial and complete break-ups in Section 4, we now consider the quantitative significance of both the partial break-up scenarios and the

¹⁷ The discussion also provides a useful reminder that the counterparty of the Bundesbank in the Target2 system is always the ECB, never the individual 16 other NCBs of the Eurozone.

extreme break-up scenario where 16 EA member states exit, leaving Germany as the sole member of the EMU and the sole owner of the European Central Bank. Even in the extreme case where the Bundesbank is the sole remaining NCB in the Eurosystem, Target2 balances are a good proxy for the exposure of the Bundesbank as a member of the Eurosystem only if two additional key conditions are satisfied: First, none of the NCBs and sovereigns (including the Bundesbank and Germany) satisfy any of their obligations as part of the Eurosystem profit and loss sharing arrangement for monetary policy operations or as guarantors under ELA and the gross losses imposed are therefore equal to the net Target2 liabilities to the ECB of the 16 NCBs that have exited the Eurosystem. The net Target 2 claims of the ECB on the 16 NCBs that have exited are in turn equal to the net Target2 liability of the ECB to the Bundesbank, the sole remaining NCB member of the Eurosystem. Second, the ownership of the ECB does not provide any protection to the Bundesbank. These two conditions are highly unlikely to be satisfied even in a full break-up scenario.

Accounting is the beginning of all economic wisdom, but not the end. It is clear that the rest of the euro area will affect the value of both the conventional and the comprehensive balance sheets of the Bundesbank not just via their effect on the Bundesbank's claims (gross or net) on entities resident or domiciled in the rest of the euro area. It is also clear that events in a particular part of the rest of the EA will not only affect the Bundesbank's indirect gross or net Target2 claims on that particular part of the EA (indirect because Target2 claims of an NCB are claims on the ECB, which in turn has claims on the rest of the NCBs) plus the value of its equity stake in the ECB (the limited profits and loss pooling rule) plus its exposure to the other NCBs in the Eurosystem through the profit and loss pooling rule for monetary policy-related profits and losses — the comprehensive profit and loss pooling rule. In addition, events in the rest of the Eurozone will impact the domestic exposure of the Bundesbank (and also the exposure of the Bundesbank to foreign entities outside the euro area). For example, the value of the claims of Bundesbank on the German domestic economy through, say, collateralised loans to German banks, is likely to be reduced through a major adverse shock in another EA country. *Mutatis mutandis*, the same holds for the economic exposure as opposed to the accounting exposure of Germany Inc. vis-à-vis the rest of the euro area.

Our calculations below will, however, only focus on the implications for the value of the Bundesbank's indirect exposure, through Target2, to EA member states that are experiencing sovereign or bank debt restructuring or EA exit, plus the exposure through the limited or comprehensive profit and loss pooling rules.

5.2. No euro area break-up or exit

Our discussion of the maximum Bundesbank exposure under a no break-up or exit scenario can be brief, as it is given by the exposure of the Bundesbank in Figure 2. There, we highlighted that the Bundesbank exposure to the euro area from being part of the Eurosystem is currently around €423bn (16% of German GDP). In addition to the maximum exposure that would result from a doomsday scenario, in which all of these claims of the Bundesbank are defaulted upon with a zero recovery rate, a number of other scenarios are instructive, in our view. These include the plausible cases of sovereign and bank debt restructuring in a number of EA countries without EA exit by any member state. We consider three cases: First, the case of another Greek sovereign debt restructuring, with additional losses incurred on Eurosystem lending to Greek banks. Second, we consider the case of sovereign debt restructuring in Greece, Portugal and Ireland, again also with additional losses on Eurosystem lending in these countries. Third, we consider a scenario where the Italian and Spanish sovereign default in addition, and additional losses on lending to banks in these countries are incurred.

We emphasise the following further points: These three scenarios are not forecasts, but rather hypothetical examples for the purpose of illustration. Given the high interdependence of the European banking system and the close link between sovereigns and banks, the fact that sovereign debt restructuring is only associated with losses on lending to banks *in the same country* seems hardly plausible, particularly in the case of Italian and Spanish sovereign default. There would undoubtedly be losses by core EA central banks like the Bundesbank on their (collateralised) exposure to domestic banks. This could be because these domestic banks either are significantly invested in defaulted periphery sovereign debt, or have other direct exposures to the periphery EA member states through loans to households in the periphery and through loans to or other investments in financial and non-financial enterprises in the periphery, or because these domestic banks have indirect exposure to the periphery through loans to or investments in German enterprises that do business in the periphery. Nevertheless, these scenarios are instructive in our view, particularly in highlighting some aspects of sovereign and bank debt restructuring without euro area exit.

5.2a Another Greek (sovereign and bank) debt restructuring

In this scenario, we assume that Greek sovereign debt held by the ECB (through the SMP) suffers a 75% haircut, while Eurosystem lending (through the Greek Central Bank) to Greek banks (both for conventional Eurosystem lending and for ELA lending, which is

technically assumed to be an exposure of the Greek NCB, guaranteed by the Greek sovereign, but which we treat as a de facto exposure of the ECB and the 16 non-Greek Eurosystem NCBs) has a recovery rate of 50%. This recovery rate reflects the recovery by the ECB on its net Target2 credit position to the Greek NCB, from the Greek NCB and Greek sovereign, and thus allows for any recovery by the Greek NCB and sovereign from the Greek banks that had borrowed from the Eurosystem/Greek NCB.

As this is the simplest scenario we consider, it is useful to combine our assumptions with a narrative to illustrate some of the practical implications of these assumptions. As the Greek sovereign debt held by the rest of the Eurosystem is still under Greek law, the Greek government could potentially simply restructure the sovereign debt unilaterally, e.g. by writing down the face value by 75%.¹⁸ Another variant would be for the ECB and the Greek government to agree on writing down the debt by this amount, which may occur only after a lengthy period of negotiation. This second option is less plausible, because the ECB considers voluntary participation in sovereign debt restructuring (including extending maturities or rolling over interest due) to be akin to what they call ‘monetary financing’, by which they mean overdrafts for or loans to the sovereign or purchases of sovereign debt in the primary markets. Such monetary financing is against the Treaty.¹⁹

Although the ECB and the other NCBs can, of course, have the sovereign debt they hold defaulted on, like any other creditor, this interpretation of voluntary debt restructuring as monetary financing means that the ECB and the other NCBs would have to be holdouts in a sovereign debt restructuring involving sovereign debt held by them. They could be forced to participate if there were appropriate collective action clauses attached to the debt contracts, but they could not be seen to go willingly into that good night.

For the bank exposure, we need to distinguish between the exposure from the conventional Eurosystem operations and the exposure through ELA. For the conventional exposure, the usual Eurosystem arrangements apply, which imply that the losses are pooled and shared and then allocated to the individual NCBs according to their ECB capital share.

¹⁸ In practice, there may still be limitations to the room for manoeuvre of the Greek sovereign for unilateral debt restructuring, due to the fact that it could be seen as ‘expropriation of bondholders by legislative fiat and could have been challenged under the Greek constitution, the European Convention of Human Rights and perhaps even principles of customary international law’ (Zettelmeyer et al (2012)).

¹⁹ *Article 123 Treaty on the Functioning of the European Union* (ex Article 101 TEC)) states: 1. Overdraft facilities or any other type of credit facility with the European Central Bank or with the central banks of the Member States (hereinafter referred to as ‘national central banks’) in favour of Union institutions, bodies, offices or agencies, central governments, regional, local or other public authorities, other bodies governed by public law, or public undertakings of Member States shall be prohibited, as shall the purchase directly from them by the European Central Bank or national central banks of debt instruments.

We assume here that the collateral that was pledged by the Greek banks against their Eurosystem borrowing (through the Greek NCB acting as a member of the Eurosystem) as well as any other recovery would deliver a 50% total recovery rate. Since ELA is a Greek NCB exposure covered by an explicit government guarantee, the recovery on collateral pledged by Greek banks borrowing from the Greek NCB in its capacity as ELA manager should in principle be topped up by the sovereign. Since the sovereign is itself in default in this scenario, we assume that the supposedly lower quality of the collateral for ELA lending and the additional sovereign guarantee cancel each other out to yield the same recovery rate as for the conventional Eurosystem lending. We further assume that the Eurosystem deals with the resulting loss just as it does with conventional lending exposure, i.e. it allocates the losses according to ECB capital shares. The claim of the ECB and the rest of the Eurosystem against the Greek NCB/the Greek sovereign would likely persist even if the ECB/Eurosystem were to write down the value of their holdings. For the purposes of illustration, we assume that these losses are recognised and realised, even though we note that the ECB/Eurosystem may not be under any obligation to do so — an issue we briefly return to in Section 7.

In summary, we assume that no change in ECB paid-in capital shares takes place in this scenario, although we consider the case where Greece cannot meet its commitments under the Eurosystem's profit and loss pooling rule for monetary operations. We also assume that the value of the ECB's conventional assets and liabilities other than its claims and obligations under Target2 and under the SMP do not change as a result of the Greek sovereign and bank default. We also assume that there is no change as a result of the Greek sovereign and bank default in the value of the non-Greek NCBs' conventional assets and liabilities other than their Target2 claims and obligations and their SMP exposure. Finally, we assume that there is no change as a result of the Greek sovereign and bank default in the value of the non-Greek NCBs' unconventional assets and liabilities — those that occur in the comprehensive balance sheet or intertemporal budget constraint but not in the conventional balance sheet — including in the NPV of their share of the Eurosystem's seigniorage profits. Thus there are no additional capital gains or losses for the non-Greek Eurosystem NCBs from their ownership in the ECB.

Under this scenario, the loss to the Eurosystem on the Greek exposure would currently be €85.6bn (0.9% of EA GDP), of which €65.4bn would result from Eurosystem lending operations and ELA. The Bundesbank share of this €85.6bn loss would be €23.0bn or 0.9% of German GDP. This is much above the Bundesbank's regulatory capital position of €5.0, but comfortably below its on-balance sheet conventional loss absorption capacity or

CLAC (including provisions and revaluation accounts, which stands at €146.4bn), let alone its share of the Eurosystem's NILAC, which we estimate to be €866.1bn.

Assuming the Greek NCB and the Greek sovereign could not shoulder their share of the Eurosystem losses, the Bundesbank's effective share of total losses would go up by 0.7 points to 27.8% and consequently its losses to €240bn (0.9% of GDP).

5.2b GIP (sovereign and bank) default

In our second scenario, we make the same assumptions about losses on Greek exposure. In addition, we assume that the Eurosystem suffers a 50% haircut on Irish and Portuguese sovereign debt held on Eurosystem collateralised lending to banks in these countries.

We assume (1) that no change occurs in ECB paid-in capital shares (but consider the case where the GIP central banks cannot meet any of their commitments under the Eurosystem's profit and loss sharing rule), (2) that the value of the ECB's conventional assets and liabilities other than its claims and obligations under Target2 and the SMP does not change as a result of the GIP sovereign and bank default, (3) that the value of the non-GIP NCBs' conventional assets and liabilities other than their Target2 claims and obligations and the SMP does not change and (4) that there is no change in the value of the non-GIP NCBs' unconventional assets and liabilities — including in the NPV of their share of the Eurosystem's seigniorage profits.

Under this scenario, the loss to the Eurosystem would currently be €193.8bn, and the Bundesbank's share of this loss would be €52.4bn or 2% of German GDP. If we assume that the Greek, Irish and Portuguese NCBs do not absorb their respective share of the losses, the Bundesbank's effective share of total losses would be 29.1% and its losses would mount to €56.3bn (2.1% of GDP).

5.2c GIIPS (sovereign and bank) default

In our third scenario, we maintain the assumptions regarding the Greek, Irish, and Portuguese exposure, but further assume that 50% losses are also incurred on Spanish and Italian sovereign and bank exposure of the Eurosystem.

Again, we assume (1) that no change occurs in ECB paid-in capital shares (while considering the case where the GIIPS NCBs cannot meet any of their commitments under the Eurosystem's profit and loss sharing rule), (2) that the value of the ECB's conventional assets and liabilities other than its claims and obligations under Target2 and the SMP does not

change as a result of the GIIPS sovereign and bank default, (3) that the value of the non-GIIPS NCBs' conventional assets and liabilities other than their Target2 claims and obligations and their SMP exposure does not change and (4) that there is no change in the value of the non-GIIPS NCBs' unconventional assets and liabilities — including in the NPV of their share of the Eurosystem's seigniorage profits.

Here, Eurosystem losses would more than triple to €602.6bn, and the Bundesbank share of it would rise to €163.1bn (6.2% of GermanGDP).

Given the larger size of the Italian and Spanish NCBs in the ECB, the Bundesbank's effective share of total losses, if the GIIPS sovereigns do not absorb any losses, would rise to 42.7% and its share of the losses would rise to €257.4bn (9.7% of GDP).

Figure 14. Eurosystem – Illustrative Eurosystem Losses by Scenario (bn EUR)

	Greek debt restructuring			GIP default			GIIPS default		
	Eurosystem	BuBa	BuBa Adjusted	Eurosystem	BuBa	BuBa Adjusted	Eurosystem	BuBa	BuBa Adjusted
SMP	20.2	5.5	5.6	41.4	11.2	12.0	111.6	30.2	47.6
Lending*	65.4	17.7	18.2	152.4	41.2	44.3	491.1	132.9	209.7
Total	85.6	23.2	23.8	193.8	52.4	56.3	602.6	163.1	257.4

Note: BuBa is Bundesbank. *includes Eurosystem lending related to monetary policy operations in euro and Emergency Liquidity Assistance. BuBa Adjusted reflects losses if NCB of defaulting country does not cover its part of the losses. See the text above for further details and assumptions.

Source: ECB, National Central Banks and Citi Research Estimates

In none of these scenarios are Bundesbank losses logically or quantitatively related to its Target2 claims.

5.3 Grexit

Our Grexit scenario assumes that Greece leaves the Eurozone, but that all other current members of the euro area remain EA members and that no losses are incurred other than on Greek assets. The second assumption is somewhat implausible, as even if 'exit fear contagion' were contained in the aftermath of Grexit, additional sovereign and bank debt restructurings could easily follow in many EA countries, e.g. through mechanisms like political contagion.²⁰ For our calculations, there are three implications from our Grexit assumptions. First, recovery rates are likely to be even lower on Greek assets. In fact, under an extreme assumption, recovery rates would be zero, which includes an assumption that the Greek central bank does not absorb its share of the losses of the Eurosystem and that the Greek sovereign does not honour any of its guarantee for ELA. Second, we assume that the exposure of the Eurosystem to Greece is capped by its Target2 liabilities, and that the Eurosystem does not share any of the Bank of Greece's losses beyond the value of the Bank

²⁰ See Buiter (2012b)

of Greece's Target2 liabilities. Third, we assume that with Grexit the Greek NCB loses its equity stake in the ECB.

Under these assumptions, the gross loss from the Greek sovereign and bank default would currently be €135bn (1.4% of EA GDP) and €37bn for the Bundesbank (1.4% of German GDP), roughly 1 ½ times what it was under our first scenario above.

Against that, we have to take into account the change in the value of the ownership claims on the ECB of the remaining Eurosystem NCBs. Taking the current paid-in capital of the ECB of €6.5bn or the present on-balance sheet or conventional loss absorption capacity of the ECB (including provisions and revaluation accounts) of €37bn, the change in the conventional capital measures of the 16 continuing Eurosystem NCBs is rather small (the Greek portion of ECB paid-in capital and CLAC are only €0.2bn and €1.0bn, respectively) and so is the corresponding 'capital gain' if Greece leaves to the remainder of the euro area. For the Bundesbank, we would thus end up with a net loss of 37bn (1.4% of GDP).

However, if we take a comprehensive valuation of the ECB/Eurosystem, such as computed in Buiters and Rahbari (2012a) and assume, reasonably, that this value is unaffected by Grexit, the changes in the comprehensive capital holdings of the 16 remaining Eurosystem NCBs are more meaningful: Assuming a value for the NPV of seigniorage of the Eurosystem of €2.0bn, the capital gain for the Eurosystem ex-Greece would be €57bn and €16bn for the Bundesbank alone, reducing the Bundesbank's net loss in this scenario to €22bn.

5.4 Full euro area break-up

Under a full euro area break-up, the precise arrangements to realise and distribute losses (including the implied recovery rates) are hugely uncertain. Let us start with the extreme assumption that all EA countries other than Germany exit the euro area, lose their paid-in capital in the ECB and reject all their obligations under the Eurosystem's loss sharing rule. Further assume that Germany and the ECB respond by repudiating any remaining obligations of their own to the 16 former EA NCBs that have now exited. We view this a plausible 'tit-for-tat' assumption. It also gets us as close as one can to Target2 exposure as a metric of loss exposure — but 'as close as one can' is still not very close.

Regarding the SMP holdings, the Eurosystem does not publish the exact composition of purchases by NCB, but it is likely that purchases are carried out by the NCBs in rough proportion to their respective capital shares, with the ECB itself playing a relatively minor part. A reasonable assumption is therefore that the Bundesbank's loss from the SMP in this scenario would amount to its capital share times the Eurosystem's SMP holdings, or roughly

€56.6bn. Under this assumption, the gross loss of the Bundesbank could be up to the value of its Target2 net claim on the ECB (equal to the value of the aggregate net liability to the ECB of the 16 former EA member states, currently €708bn) plus the Bundesbank's share of the SMP holdings of EA sovereign debt (€56.6bn).

Note that we assume here that the recovery rates on all sovereign debt held by the Eurosystem (the ECB and the Bundesbank) as a result of the SMP are zero, as are the recovery rates by the ECB on its defaulted Target2 claims on the 16 NCBs that have exited the Eurosystem. We continue to assume that the value of the ECB's conventional assets and liabilities other than its net claims under Target2 and the SMP (both of which are reduced to zero) do not change as a result of the comprehensive EA breakup, that the value of the Bundesbank's conventional assets and liabilities other than its Target2 net claims and its SMP exposure (both of which are reduced to zero) do not change, and that there is no change in the value of the Bundesbank's unconventional assets and liabilities — including in the NPV of its share, now 100 percent, of the Eurosystem's seigniorage profits.

The combined Target2 and SMP losses could add to €74.7bn, or 28.8% of German GDP. However, several ingredients of this scenario are highly, highly unlikely.

First, a recovery rate of zero on all net Target2 claims of the Bundesbank and on all SMP obligations is a very extreme assumption both about the ability and willingness of the exiting countries and NCB to satisfy their legal (indeed their Treaty) obligations. In a limited number of countries, ability to pay is likely to be a tight constraint. Greece is probably the most obvious example of a country that during an exit scenario would struggle to satisfy a sizable part of its external obligations, including those to the ECB (Greece's Target2 liabilities and some Greek SMP debt) and to the Bundesbank (the rest of Greece's SMP debt).

The same, however, can probably not be said about many other members of the euro area — for the other hard-core member states, the soft-core member states, and many or even most of the periphery member states, the commitments to the Bundesbank and the ECB would either be met in full or a positive recovery rate is likely to be feasible.

The assumption of a zero recovery rate therefore must imply a subsidiary assumption that the exiting countries will willfully reject these foreign claims — not unthinkable in some scenarios under which euro break-up takes place, but not the most plausible outcome. More likely would be that such liabilities remain outstanding even in the case of the most economically and financially damaged exiting periphery country, that they will remain on the books of creditor and debtor at face value, with cumulative arrears added to the original

amount outstanding, and that they will get settled after a long, negotiated process at a heavy loss but with a strictly positive recovery rate.

But note that, as regards losses on Target2 exposures of the Eurosystem to the 16 exiting NCBs, it would be the ECB that takes the loss, not the Bundesbank. Although, because the Bundesbank would under the comprehensive break-up scenario own 100 percent of the ECB, the distinction between the Bundesbank and the Eurosystem (the consolidated Bundesbank and ECB) is of no fundamental economic interest, it would make a huge difference in terms of conventional accounting presentations of losses and gains.

The Bundesbank's claims under Target2 are claims on the ECB. The ECB has the monopoly of currency (legal tender) issuance in the EA and controls the issuance of the other components of the EA monetary base (overnight deposits with the Eurosystem by eligible counterparties, in our example, these would be German banks only). No doubt the ECB would be good for a net claim on itself under Target2 by the Bundesbank of €708bn. Even though the ECB would have suffered a capital loss of €708bn through the repudiation by the 16 exiting NCBs of their Target2 liabilities, it could make the Bundesbank as Target2 creditor whole, because the Bundesbank's claims are in euro and this is the stuff the ECB can print in any amount, now or in the future.

This would not require an immediate increase of €708bn in the monetary base. Base money would have to be created by the ECB to meet its obligations to the Bundesbank under Target2 only in amounts sufficient to meet interest and principal repayments due. If the base money issuance required to meet the ECB's obligations to the Bundesbank were to exceed the amount consistent with stable prices (2 percent HICP inflation for Germany, say), the excess over the non-inflationary base money issuance could be sterilised through the issuance by the ECB of non-monetary liabilities, such as term deposits with longer maturities, ECB bills or even ECB bonds.

Although it would always be possible for the ECB to meet its financial obligations under Target2 to the Bundesbank this way, whether it would be possible to do so without creating inflation at a higher rate than 2 percent depends on whether the NILAC of the new, much reduced, one-member state euro area, consisting exclusively of Germany, is greater or less than €708bn, say. If we add in the SMP losses under our scenario, the Bundesbank's claim under Target2 on the ECB could be met without creating inflation at a rate above 2 percent per annum only if the NILAC of the Eurosystem-as-Germany-only is larger than €765bn.

Note that, under this scenario, if the ECB were to recognise and realise the losses it suffered on its Target2 and SMP exposure to the 16 exiting NCBs and member state sovereigns, it would have negative conventional equity, capital or loss absorbing capacity (CLAC). This would not be of any consequence as regards the ECB's ability to meet its financial commitments, as long as these are denominated in euro. As long as the NILAC of the Eurosystem-as-Germany-only is sufficiently large (our calculations suggest just under €1trn would do), the ECB could meet all its financial commitments now and in the future without engaging in monetisation driving inflation above 2 percent.

So rational and well-informed market participants should not panic at the sight of an ECB with seriously negative conventional equity. As markets often are neither rational nor well-informed, there is a risk that a central bank with seriously negative conventional equity would take some getting used to. In that case, recapitalisation of the ECB by the German government (the ultimate beneficial owner of both the ECB and the Bundesbank) would be desirable. This would simply crystallise the losses suffered by the ECB (and by the consolidated Bundesbank and ECB) through their exposure to the rest of the Eurosystem and euro area. As regards the sovereign, the up-front recapitalisation of the ECB/Bundesbank worth just under €1trn would have the same value as the NPV of the reduction in the stream of future profits it would have received (via the Bundesbank as sole shareholder of the ECB) because of the ECB's reduced capacity to generate profits without creating undesirably high inflation, caused by its losses on its Target2 claims on the 16 vanished NCBs.

Even in this extreme circumstance, the CLAC of the ECB provides at least *some*, and more likely a lot of, protection to the Bundesbank. As its only remaining shareholder, it could now claim all of the €37.2bn of the ECB's CLAC, even though the value of other (non-Target2, non-SMP) assets on the ECB's balance sheet could be affected and the CLAC itself be reduced by break-up.²¹ Crediting the Bundesbank with the entirety of the ECB's CLAC would still only make a relatively minor dent in its loss calculation — €737.5bn (still 30% of GDP).

But as we have noted on various occasions, the on-balance sheet or conventional loss absorption capacity of a central bank is a poor measure of its fair value. If we take into account the NPV of the seigniorage, the Bundesbank's 'capital gain' from EA break-up could be much larger. We have calculated the presented discounted value of base money issuance of

²¹ For instance, the ECB is a net Target2 creditor itself. In addition, it has carried out an unspecified, but likely limited amount of SMP purchases. Finally, it carries some EA securities in its investment portfolio, the value of which may fall in a break-up scenario.

the Eurosystem to be around €2.0trn.²² The question is how large the value of base money issuance of a shrunken Eurosystem would be — one that in this scenario technically only has the right to base money issuance for Germany alone.

In our view, it is likely that the degree of euroisation, i.e. the external demand for euro currency and other euro base money, the issuance of other euro-denominated assets, as well as the continued use of the euro as the unit of account and invoicing currency, in the former Eurozone member states and other countries would be relatively high. The part that is relevant to the NILAC/seigniorage calculation is just the global demand for euro base money and especially for euro currency.

Could the Bundesbank enjoy a NILAC/seigniorage capital gain from its larger (100 percent) stake in a smaller Eurosystem? Let's try some illustrative numbers. Assume that the value of the Bundesbank's right to base money issuance would be equal to one third or one half of the value of the current Eurosystem's NPV of seigniorage profits (rather than its 27.1% current capital share in the ECB). This would imply that the single-member Eurosystem (Bundesbank's/ECB) base money issuance would be larger relative to the size of the German economy than it is for the 17 member Eurosystem and the euro area economy today. In that case, the NPV of future seigniorage gain for the Bundesbank would be equal to €127bn (4.8% of GDP) and €466bn (17.6% of GDP), respectively. In the most unlikely case where the Bundesbank inherited the entire value of the Eurosystem's base money issuance, its NPV of future seigniorage gain would be €1.5trn. The net seigniorage gain for the BuBa under the four different scenarios would range from -€764.7bn (29% of GDP) to €716.4bn (27% of GDP).

Figure 15 . Bundesbank – Illustrative Eurosystem Losses by Scenario (bn EUR)

	Grexit			EA break-up				
	Gross Losses	Net Losses including CLAC	Net Losses including NPV of seigniorage	Gross Losses	Net Losses including CLAC	Net Losses including (1/3) of NPV of seigniorage	Net Losses including (1/2) of NPV of seigniorage	Net Losses including (total) of NPV of seigniorage
SMP	7.6	7.6	7.6	56.6	56.6	56.6	56.6	56.6
Target2	30.0	30.0	30.0	708.1	708.1	708.1	708.1	708.1
Capital Gains		(0.3)	(15.9)		(27.1)	(127.3)	(465.7)	(1,481.1)
Total	37.7	37.4	21.8	764.7	737.5	637.4	298.9	(716.4)

Note: Brackets indicate negative values. CLAC is the conventional loss absorption capacity of the Eurosystem, NILAC the non-inflationary loss absorption capacity. See the text above for further details and assumptions.

Source: ECB, National Central Banks and Citi Research Estimates

²² There are two differences between the NILAC of the ECB and the NILAC of the Eurosystem. The first are the respective CLACs. The second is the different value of the ability to issue base money for the Eurosystem and for the ECB.

5.5 Are Target2 or central bank losses really losses in a fundamental/economic sense? Does the asset side of a central bank balance sheet matter?

This discussion is related to the point made by, among others, De Grauwe and Yuemei Ji (2012) and by Whelan (2012), that there are no inflationary consequences from even a large capital loss by the ECB/Eurosystem, because the value of non-redeemable, intrinsically valueless fiat money is determined by the private demand for real base money and the nominal quantity of base money outstanding, regardless of the degree of (in)solvency of the entity that issued it. This proposition is half true at best. It is of course correct that at least the currency component of the monetary base is irredeemable — the holder of currency cannot demand, at any time, that the issuer (the central bank) exchanges it for anything other than an equal amount of itself. So currency is an asset to the holder but not, in any meaningful sense, a liability of the issuer (see Buiter (2007)).

With a little effort, the irredeemability of currency can be extended to the whole monetary base. This irredeemability of base money is, however, largely irrelevant to the answer to the question as to whether a large enough capital loss for a central bank could create higher-than-desirable inflation.²³

There are two reasons why a large capital loss resulting, say, in serious negative conventional equity for the central bank, could matter for the value of money.

The first, and least compelling one, is the technical point that any economy with intrinsically worthless fiat money, be it paper currency or the pet rocks of the Isle of Yap, always has a non-monetary equilibrium or barter equilibrium in which money has zero value in each period. If everyone else believes a currency is valueless, I may as well treat it as valueless because I will never be able to exchange it either for anything with intrinsic value or for another store of value without intrinsic value, but which does have a positive valuation.

The point was made long ago by Frank Hahn (1965). The same economy that has an equilibrium with valueless money also will typically have one or more equilibria in which the value of money is positive in each period. How does a decentralised market economy choose between one of a number of possible equilibria? The brief answer is: we don't know. But one can at least make a plausibility argument that the zero-value-of-money-equilibrium may well be a natural focal point for equilibrium selection if the entity that has issued the money has a

²³ For the central bank, assuming an infinite horizon, its solvency constraint is not that the NPV of its terminal net financial liabilities be non-negative, but instead, because of irredeemability of the base money stock, that the NPV of its terminal net non-monetary financial liabilities be non-negative. The main difference this makes is that when base money is irredeemable, simple monetary policies suffice to rule out a permanent liquidity trap, in which the risk-free nominal interest rate at all maturities is zero (see Buiter (2007) and the references contained in that publication).

large hole in its (conventional) balance sheet and exhibits large negative conventional equity, and a fortiori, if it is about to violate its intertemporal budget constraint unless it issues additional base money.

A more relevant objection to the point that the value of the assets of the central bank has no impact on the value of its monetary liabilities is that the value of a unit of base money (the reciprocal of the general price level) does, in almost any approach to valuing money with a monetarist flavour, depend on the size of the nominal money stock, current, and/or past and/or anticipated for the future. In many new-Keynesian models, for instance, the value of money in any period can depend on past, present and (anticipated) future values of the base money stock. If the central bank responds to a significant capital loss by issuing more base money than it would otherwise have, it is likely that, sooner or later, the price level will be higher than it would have been without the capital loss.

Why would a central bank respond to a capital loss with increased base money issuance? The obvious reason is that the central bank cares about its solvency, and that a large enough capital loss on its assets might not just wipe out the equity on its conventional financial balance sheet, or even saddle the central bank with negative conventional equity (a matter of no fundamental importance for a central bank), but could cause the central bank to violate its intertemporal budget constraint unless it issued more base money.

In other words, a large enough capital loss could cause the 'equity' on the central bank's comprehensive balance sheet (which adds to the conventional balance sheet the NPV of future seigniorage as an asset and the NPV of the future cost of running the central bank as a liability) to become negative, unless the central bank raises the NPV of future seigniorage (or cuts the NPV of its operating costs). Assuming the central bank is on the upward-sloping segment of the seigniorage Laffer curve, a higher NPV of current and future seigniorage requires increased nominal base money issuance (see Buiter (2007)). Therefore, if a central bank cares enough about possible insolvency risk (that is, about violating its intertemporal budget constraint), a large enough capital loss could induce it to issue additional base money in amounts sufficient to meet its financial commitments. Through the usual monetary transmission channels, the increased nominal base money issuance would, sooner (in a New Classical model) or later (in a New Keynesian model) cause the price level to be higher than it would have been without the capital loss.

If the central bank is willing to walk away from its non-monetary liabilities and commitments, it is indeed true that there exists an equilibrium in which the value of the outstanding stock of base money is never affected by a capital loss for the central bank, no

matter how large. The policy-relevant question therefore is: how much does the central bank care about price stability relative to the financial solvency of the central bank, in the sense of the central bank's capacity to meet its financial and other contractual obligations? If the solvency of the central bank is sufficiently important to those who control the base money issuance decisions, a capital loss for the central bank can impact on price stability.

6. The quasi-fiscal actions of the Eurosystem – who benefited from them?

There can be no doubt that the ECB/Eurosystem has engaged in large-scale quasi-fiscal interventions and has taken on significant credit risk exposure to weak euro area sovereigns and banks since the beginning of the crisis (see Buiters (2008, 2010a, b, c, 2011), Buiters and Rahbari (2011, 2012a, b), Buiters, Michels and Rahbari (2011c, d), Whittaker (2011), Sinn (2011a, b, c, 2012a, b), Sinn and Wolmershaeuser (2011), Whelan (2011a, b)).

These quasi-fiscal interventions were prompted mainly by the absence of (badly needed) explicit fiscal interventions by the euro area fiscal authorities. This frequently left the ECB with the unenviable choice between violating its mandate (or at times its rather excessively restrictive interpretation of its mandate) and risking the collapse of the EMU, through chaotic sovereign defaults, a banking sector collapse and wider financial sector implosion, deposit runs, or even comprehensive 'sudden stops' on the external funding of banks, sovereigns and other non-government entities in countries deemed by the markets to be at risk of exit from the monetary union. Such exit fear-driven sudden stops on market funding can, of course, become self-fulfilling prophecies if the EA monetary and fiscal authorities cannot effectively ring-fence/firewall the affected sovereigns, banks and other systemically important entities. We have written extensively on the multi-player games of chicken played between the ECB, the fiscal authorities of the core EA member states, the fiscal authorities of the EA periphery and the original creditors of both sovereigns and banks about who will end up paying for the excessive sovereign debt accrued in many periphery countries, the excessive bank debt built up throughout the euro area, core and periphery, and the excessive household debt found in a number of EA member states, including the Netherlands, Ireland, Spain and Portugal, but excluding Germany and Italy (see Buiters (2010c, 2011), Buiters and Rahbari (2012a, b)).

To understand the redistribution effected by the Eurosystem through its credit and market operations, we need the counterfactual to the actions we are evaluating — what would have happened if the ECB had not engaged in these SMP operations, for instance (and, in the

future, what would have happened if the ECB/Eurosystem had not engaged in the OMT operations it is now ready to launch). It is also necessary to understand the formal and de-facto beneficial ownership structures of the ECB and the NCBs, allowing for the actual profit and loss sharing rules that govern their operations. As regards the NCBs, we will assume that, whatever the idiosyncratic details of their often archaic statutes of incorporation, the national Treasuries are their proximate beneficial owners. Behind these national Treasuries, the ultimate beneficial owners are the tax payers and beneficiaries of public spending in these nation states. The ECB is effectively owned (according to the shares given in the third column of Figure 1) by the NCBs of the 17 EA member states. Thus, indirectly, the national Treasuries and, ultimately, the national tax payers and beneficiaries of public spending in the EA member states are the beneficial owners of the ECB. The Eurosystem thus redistributes resources between the counterparties in its financial transactions (its creditors and debtors — lenders and borrowers, sellers and buyers of financial instruments) and the proximate and ultimate beneficial owners of the Eurosystem.

The assertion by the ECB that its proposed OMT scheme does not represent central bank funding of sovereigns (monetary financing, using the inaccurate language of Frankfurt) is disingenuous. Whatever the purpose or intention behind a purchase of sovereign debt (in the secondary market or in the primary market), the holder of sovereign debt securities funds the sovereign for the full value of his holdings, for as long as he holds those securities. The intention may be to restore the proper functioning of the monetary transmission mechanism in the euro area, or to reduce or even the eliminate euro area ‘convertibility risk’ or break-up risk, but the means is funding the sovereign in question. The fact that the maturity of the Eurosystem’s purchases of sovereign debt is likely to be short (one to three years) has no bearing on whether it represents budgetary financing of sovereigns. It is possible to provide permanent funding by rolling over a sequence of short-term loans. Of course OMT purchases are ‘monetary financing’ and, up to a point, this is a very good thing indeed. It is also perfectly consistent with the Treaty which (rather inconsistently) bans overdraft facilities and other forms of credit from the ECB and the NCBs to the sovereign, as well and primary market purchases of sovereign debt by the Eurosystem, but has nothing to say about - and therefore permits - secondary market purchases of sovereign debt in any amount.

The quasi-fiscal actions of the Eurosystem don’t just involve the redistribution of resources from the original creditors (mainly private) of the core EA to the original debtors (both public and private) of the EA. Examples of the winners include:

On the original debtors’ side:

- The banks from the EA periphery that have obtained subsidised access to the facilities of the Eurosystem (including the LTROs) and to the ELA facilities.
- The periphery sovereigns whose debt was purchased outright at above-fair-value prices in Securities Markets Programme (SMP) operations by the Eurosystem or accepted as collateral at the Eurosystem’s repo facilities at valuations in excess of fair value.
- If the alternative to the ECB taking this debt on its balance sheet (directly through outright purchases — in the past through the SMP and in the future through OMT operations — or indirectly by accepting it as collateral for loans to EA periphery banks) would be deeper and longer austerity in the periphery, then the ultimate beneficiaries are the tax payers and beneficiaries of public spending in the periphery, and those who, even if they are not directly affected as tax payers and public spending beneficiaries, are helped by the stronger economic activity.

On the original creditors’ side:

- The original creditors of the sovereigns and banks in the EA periphery. Most of these original creditors were financial institutions — many of them from the core EA nations. They are the excessive savers and reluctant domestic investors — counterparts in the core of the reckless borrowers in the periphery (sovereign and private) that built up the unsustainable debt. They are the reckless lenders and creditors from the core EA who, in search of yields in excess of the tame and disappointing levels available at home, believed for as much as 7 years (in the case of lending to Greece) and for as much as 9 years (in the case of lending to the rest of the periphery), that they had at last found ‘alpha’, when all they had found was ‘beta’ with a lag.
- Standing behind the core EA creditors were the tax payers and beneficiaries of public spending in the core EA, who might well be counted upon to bail out the core EA creditors should their investments fail, although few of them were aware of these risks before 2008.

As the above list illustrates, the redistribution effected by the Eurosystem is not just between the core and the periphery of the EA, but also between, on the one hand, the beneficial owners of the Eurosystem (in the core and periphery, according to the capital ownership shares of Figure 1, column 3), and on the other hand, not just the periphery sovereigns and banks but also the original (usually private) creditors in the core.

Consider the case where the Greek sovereign defaults on the ECB’s original holdings of €56.7bn (Zettelmeyer et al (2012)) value of Greek sovereign debt acquired through SMP purchases. Regardless of whether the losses are absorbed by the ECB itself or made good by

the shareholders (the NCBs) and the sovereigns (other than, in this case, presumably the Greek NCB and sovereign) that stand behind them, it is most likely the tax payers and beneficiaries of public spending in the EA who ultimately pay in NPV for these losses.

What is the counterfactual that permitted this conclusion? Could it be that without the SMP purchases the Greek sovereign would have been willing and able to honour that debt? Unlikely, in our view. More likely, the defaulted sovereign debt would have remained with the original private investors it was acquired from by the ECB in the secondary markets, and the financial cost of the default would have been borne by these investors. If these counterfactual investors had been either too big or too politically well-connected to fail, the burden of the default would have fallen on the tax payers and beneficiaries of public spending in the EA creditor nations. So, to the extent that German banks were overrepresented among those selling their Greek sovereign debt holdings to the ECB, the ECB's SMP purchases redistributed (a) to the original German investors from the tax payers in all the net contributing nations to the Greek bail-out programme (the EA 17 minus the Step-Out countries or countries on a troika programme, i.e. Greece, Ireland and Portugal), and (b) to the German tax payers from the tax payers in all the net contributing nations to the Greek bail-out programme.

7. Bundesbank exposure vs. Germany's exposure

The discussion in the previous subsection makes it clear that it is very important not to confuse the exposure of any core EA central bank, the Bundesbank, say, with the exposure of the nation, of which that central bank is just one (small) part.

It is clear from the balance sheet of Germany in Figure 10, reproduced below as Figure 16, that German exposure to the rest of the Eurosystem can be very different from Bundesbank exposure to the Eurosystem. In principle, both levels of and changes in German and Bundesbank exposure can differ in magnitude and in sign.

Figure 16: Consolidated German Balance Sheet under General Profit and Loss Sharing

S(G)	
Assets	Liabilities
$-(\sigma(F,G)+\sigma(H,G))D(B(G),C(G))$	$-(\sigma(F,G)+\sigma(H,G))D(C(G),B(G))$
$(1-\sigma(F,G)-\sigma(H,G))D(T,C(G))$	$(1-\sigma(F,G)-\sigma(H,G))D(C(G),T)$
$\sigma(G,F)D(B(F),C(F))$	$\sigma(G,F)D(C(F),B(F))$
$\sigma(G,F)D(T,C(F))$	$\sigma(G,F)D(C(F),T)$
$\sigma(G,H)D(B(H),C(H))$	$\sigma(G,H)D(C(H),B(H))$
$\sigma(G,H)D(T,C(H))$	$\sigma(G,H)D(C(H),T)$
$D(R(F),B(G))$	$D(B(G),R(F))$
$D(R(H),B(G))$	$D(B(G),R(H))$
$D(B(F),R(G))$	$D(R(G),B(F))$
$D(B(H),R(G))$	$D(R(G),B(H))$
$D(R(F),R(G))$	$D(R(G),R(F))$
$D(R(H),R(G))$	$D(R(G),R(H))$
$D(T,R(G))$	$D(R(G),T)$
$\sigma(G)W(T)$	
$K(R(G))$	$W(S(G)=W(R(G))$

Source: Citi Research

The German private sector and general government net external position vis-à-vis the rest of the euro area adds to the Bundesbank's net external position vis-à-vis the euro area the following expression:

$$D(T, R(G)) - D(R(G), T) + \sum_{j=2}^N \left[(D(R(j), B(G)) - D(B(G), R(j))) + (D(B(j), R(G)) - D(R(G), B(j))) \right]$$

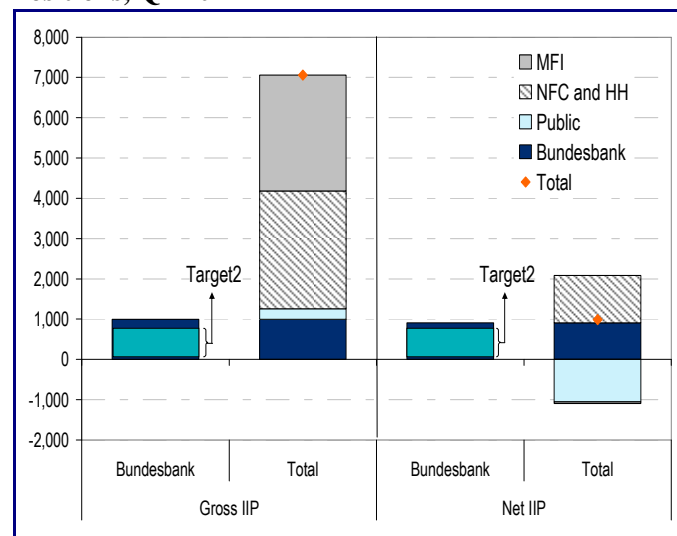
The first two terms in this expression are the net claims of the rest of the German economy (private sector exclusive of banks plus general government) on Target2/ECB. The other terms are the net claims of the German banking sector on the rest of the economy in the rest of the euro area, followed by the net claims of the rest of the German economy on the banks in the rest of the euro area. For notational simplicity we don't have any direct cross-border transactions between banks.

Germany's gross and net exposure to the rest of the world is given by its gross and net external investment position. The change in Germany's net investment position is the sum of Germany's current account surplus and the capital gains on its outstanding stocks of external assets minus the capital gains on its external liabilities.

The level and change in the gross and net exposure of Germany — the consolidated private and public sectors, including the Bundesbank — can be and has been very different from the level and change in the gross and net exposure of the Bundesbank. The difference between the gross and net external position of the Bundesbank and that of Germany vis-à-vis the EA is the gross and net external position of the German banks, the German non-bank private sector and the German general government vis-à-vis the EA.

7.1. German exposure to the GIIPS countries

Figure 17. Germany – International Investment Positions, Q2 2012



Note: IIP is international investment position
Source: Bundesbank and Citi Research

Figure 18. German External Assets Against the Euro Area (At End December 2011), Euro Bn

	MFI	Non-MFI firms & HHs	Private Sector	Public Sector*	Total
Belgium	43.8	97	140.8	0.8	141.7
Estonia	0.3	0.3	0.6	0	0.6
Finland	33.6	28.2	61.8	0.7	62.5
France	222.6	328.2	550.8	9.5	560.3
Greece	25.3	6.5	31.8	3.9	35.7
Ireland	82.8	74.2	157	45.5	202.5
Italy	125.2	88	213.2	20.6	233.8
Lux.	220.7	362.4	583.1	1.9	585
Malta	7	13.3	20.3	0	20.2
Neths.	159.7	251.5	411.2	7.5	418.6
Austria	85.8	108.6	194.4	3.1	197.5
Portugal	16.8	10.4	27.2	4.2	31.3
Slovakia	3.1	7.6	10.7	0.2	10.9
Slovenia	2.9	2.5	5.4	0.4	5.8
Spain	127.5	137.1	264.6	9.9	274.4
Cyprus	5.9	3.2	9.1	0.2	9.3
Overall	1,163.0	1,519.0	2,682.0	108.4	2,790
GIIPSC					
Countries	383.5	319.4	702.9	84.3	787

*Excluding claims of the Bundesbank with respect to the euro area. Reflect disbursed bail-out funds to Greece, Ireland and Portugal up to end-2011. MFIs – Monetary Financial Institutions, HHs – Households.
Sources: "After the Summit: Time for the Use of Long-term Solutions", Special Report on Economic Developments by the Council of Experts, 5 July 2012 and Citi Research

Figure 17 presents the gross and net international investment position of the Bundesbank and Germany as a whole. As the bars for the Bundesbank indicate, Target2 claims are now a large part of the gross and the net international investment position (IIP) of the Bundesbank — almost 80% of the gross IIP and even more of the net IIP. The Bundesbank’s gross IIP is, however, only a small part of Germany’s total IIP — it accounts for roughly one seventh of the total, which stood at just over €7tn, and is smaller than the gross external assets of German MFIs and the German non-MFI private sector. It is true, however, that the Bundesbank accounts for much more of Germany’s net IIP (more than 90%), as unlike the other major elements, its external liabilities are relatively small. However, the net external assets of the German non-MFI private sector are still larger than the BuBa’s net IIP.

There is therefore no strong reason to believe that the size or sign of changes in the gross or net exposure of the Bundesbank should bear close resemblance to those of Germany as a whole. Over the past few years, the sign of the change in gross and net external assets for the Bundesbank and Germany have been the same, but the sign has been larger for Germany as a whole for gross IIP, and for the Bundesbank for net IIP. Germany’s gross IIP rose by around €1.6trn between mid-2010 and Q2 2012, and the Bundesbank’s gross IIP grew by roughly €550bn (all sectors registered increases in gross external assets). Germany’s net external assets rose by €109bn, but the Bundesbank’s rose by around €475bn, as the net IIP of German MFIs, but also of the German government have fallen.

How large is Germany's exposure to the GIIPS countries and the EA as a whole? The latest comprehensive data we have is from the end of 2011 (Figure 18). At that point, Germany's exposure, excluding the Bundesbank, to the GIIPS countries was just under €780bn, of which roughly half was by German MFIs. Luxembourg, France and the Netherlands account for the largest share of external assets, followed by Spain, Italy and Austria. Total German exposure (ex-Bundesbank) to the EA stood at €2.7trn at end-2011.

Germany's gross and net exposure to the rest of the world is given by its gross and net external investment position. The change in Germany's net investment position is the sum of Germany's current account surplus and the capital gains on its outstanding stocks of external assets minus the capital gains on its external liabilities. The same applies to Germany's gross and net exposure to the euro area or to the euro area periphery specifically. Capital gains on external assets and liabilities are much harder to measure, especially for external assets and liabilities for which there is not readily observable market value, like FDI stocks. For what it's worth (that is, assuming that the net external investment position data indeed capture valuation changes accurately), the fact that the current account surpluses of Germany differ so much from the reported change in the net external investment position suggests that there have been years with major net capital gains (2005) as well as years with major net capital losses on the net external investment position (2007, 2008 and 2011).

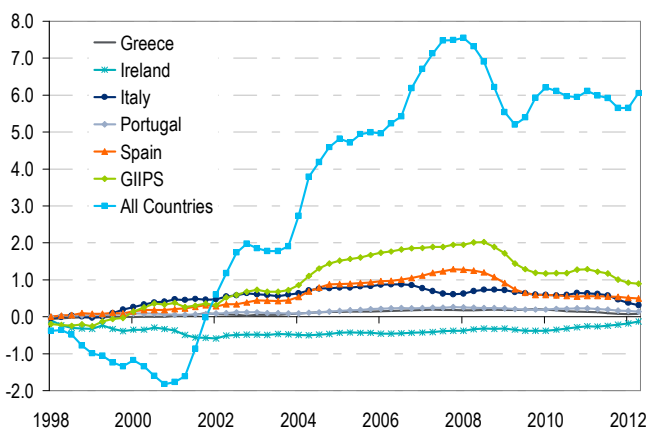
There is a strong presumption that, because Germany has run a global current account surplus every year since the euro started except for 1999 and 2000, the Germany's current account balances with the Eurozone and the EA periphery have also been persistently positive for the past decade. Indeed, Figure 19 shows that with the exception of Ireland, Germany has run bilateral current account surpluses with the GIIPS countries in each year over the last decade. However, the GIIPS share of the German current account surplus peaked at just over 2% of German GDP in 2008 and has not been a major element of the overall German current account surplus in recent years (it is below 1% of German GDP currently vs. an overall CA surplus of close to 6%).

On the other hand, Germany accounted for substantial parts of the sizable current account deficits in some GIIPS countries, notably Spain and Portugal. Spain's current account surplus with Germany was around 2-3% of Spanish GDP between 2004 and 2009 out of a total current account deficit that ranged from 5-10%. In Portugal, it was 2.5-4% of Portuguese GDP out of a total current account deficit of 9-13% of GDP. In Italy, Germany's share of Italy's current account deficit was higher, but Italy's overall current account deficit much lower (between 1999 and 2007, it never exceeded 1.5% of GDP, though it has risen

recently). In Greece, the CA deficit with Germany was 1.5-2% of Greek GDP in much of the last decade, but Greece's CA deficit peaked at around 15% of GDP in 2008, and has only come down slowly recently. Ireland, by contrast, has run a sizable CA surplus with Germany for at least 15 years.

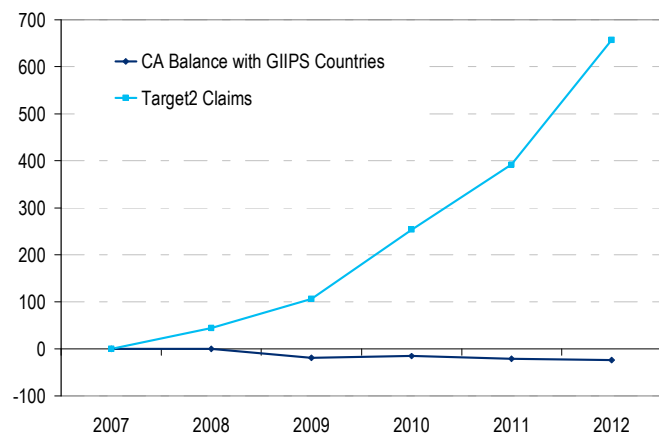
The contraction of domestic demand in the periphery over the last couple of years has reduced their combined current account deficit with Germany by about half from its peak in 2008, just as Target2 claims of Germany exploded, suggesting that EA periphery country current account deficits are not likely to be at the heart of the Target2 story (Figure 20).

Figure 19. Germany – Current Account Balance (% of GDP) – 1998-2012



Source: Bundesbank and Citi Research

Figure 20. Germany – Cumulative Change in Current Account Balance with GIIPS countries vs. Target2 Claims (bn EUR), 2007-2012



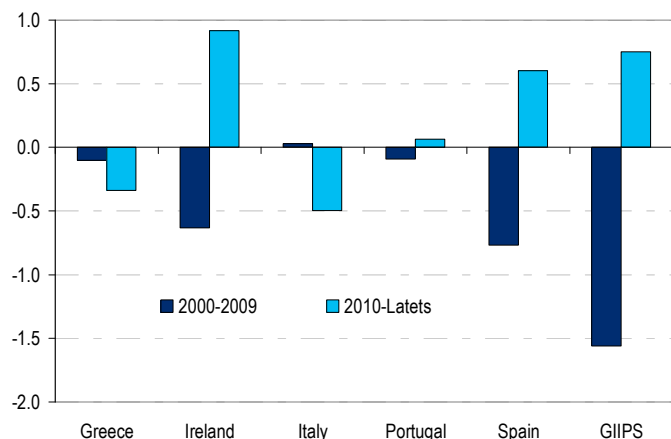
Note: 2012 values correspond to Jun-12.
Source: Bundesbank and Citi Research

The combination of German current account surpluses vis-à-vis the rest of the euro area and significant net reserve inflows from the rest of the euro area (as reflected in the rising Target2 net credit position) means that there have been strong private financial inflows, or strictly speaking strong non-euro area central bank financial inflows from the rest of the euro area into Germany.

The net private sector financial inflows either represent residents of the rest of the EA investing in Germany or German investors in the rest of the EA repatriating their investments. This is a sharp turn-around from the situation during most of the decade prior to 2010 when private capital flew out of Germany and into the periphery countries (see Figure 21). Ireland and Spain stand out in this regard. Between 1999 and mid-2010, German quarterly financial net outflows to Ireland were positive in 29 out of 46 quarters and summed to €204.6bn, while they have been negative in 5 out the 8 quarters between July 2010 and July 2012 (cumulating to a net financial *inflow* of €129.9bn). For Spain, 31 out of 46 quarters (between 1999 and

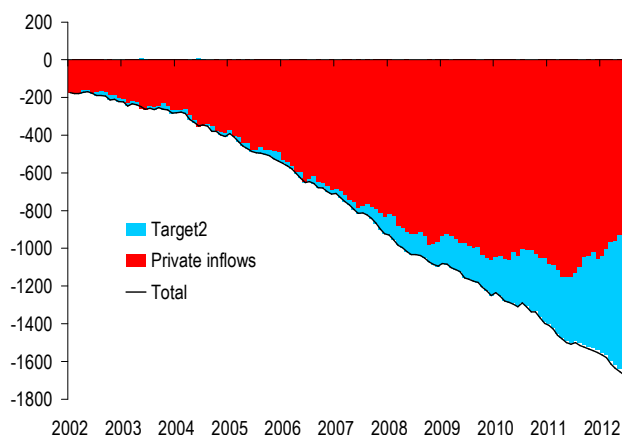
mid-2010) saw a financial outflow from Germany to Spain (totaling €260.2bn), while in the last 8 quarters there has been an inflow 6 times (of cumulatively €88.9bn).

Figure 21. Germany – Average Financial Account Balance with GIIPS countries (% of GDP) – 2000-2012



Note: Values correspond to the average quarterly bilateral financial account balance of Germany with each country.
Source: Bundesbank and Citi Research

Figure 22. Germany – Cumulative foreign inflows (€bn)



Note: The series is started from the net IIP in 2001 and the total cumulated foreign inflows are cumulated by adding the financial account balance for each year. Private inflows correspond to the difference between total and the stock Target2 claims.
Source: Bundesbank, ECB and Citi Research

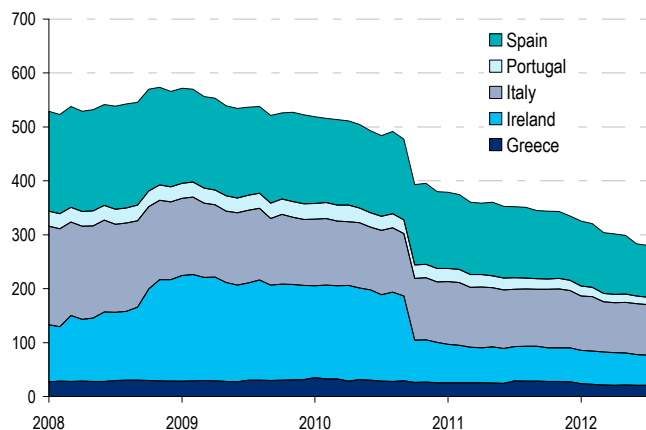
Figure 22 shows that total private capital of capital roughly matched total inflows until mid-2007. Even after 2007, German private capital outflows generally continued, with minor reversals until mid 2011, but were smaller than Germany's current account surpluses, with increasing Target2 balances making up the difference. Since mid-2011, however, Germany has been a net receiver of private capital flows, while its current account surplus has not fallen much, and Germany's Target2 balances have therefore ballooned. Total net private capital inflows into Germany have amounted to around €240bn to date (9% of GDP).

Some of the sources of this stark reversal are known. Thus, Figure 23 shows that German banks have dramatically reduced their exposure to the GIIPS countries, even though this chart does not allow us to distinguish between capital losses and financial outflows. German bank holdings have fallen strongly in all GIIPS countries, by 70% (between Dec-2008 and Jul-2012) in Ireland, 51% in Portugal, 46% in Spain, 35% in Italy and 26% in Greece according to Bundesbank data. The total decrease in bank claims on the GIIPS countries has been €250bn, even though this is a change in the stock value and therefore also reflects capital gains and not just flows.²⁴ On the other hand, claims of (private) non-banks in

²⁴ These data are on the immediate borrower basis. Bank data on an ultimate risk basis suggest much higher percentage decreases of exposure to Greece. Bank bail-outs, including the creation of a bad bank in Germany likely contributed to shifts in exposure to Greece between German banks and the German non-financial sector.

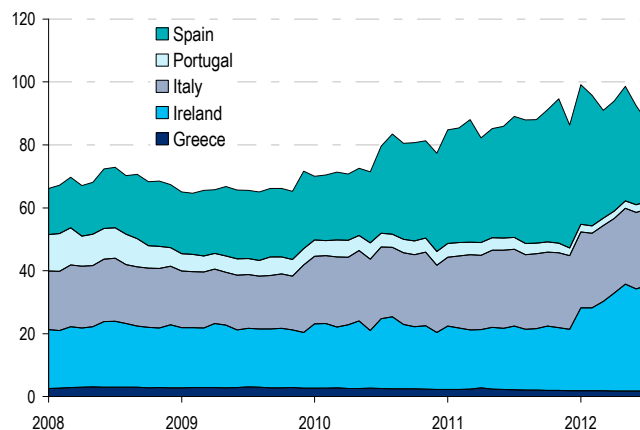
Germany on GIIPS countries have increased overall, even though they are much smaller in size, and have recently fallen, in particular in Spain (Figure 24).

Figure 23. Germany – External claims of banks, 2008 – 2012



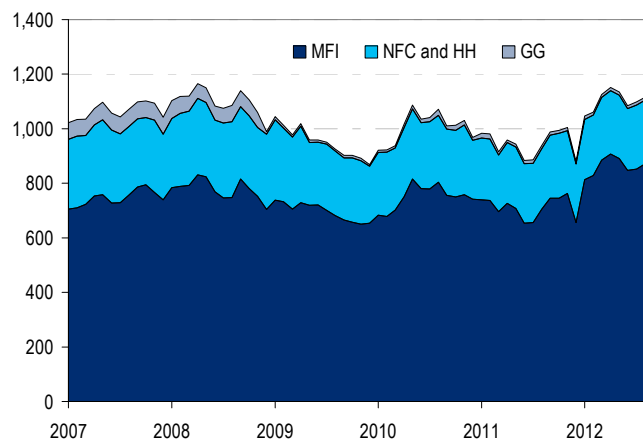
Note: Excludes direct investments.
Source: Bundesbank and Citi Research

Figure 24. Germany – External claims of non-banks, 2008 – 2012



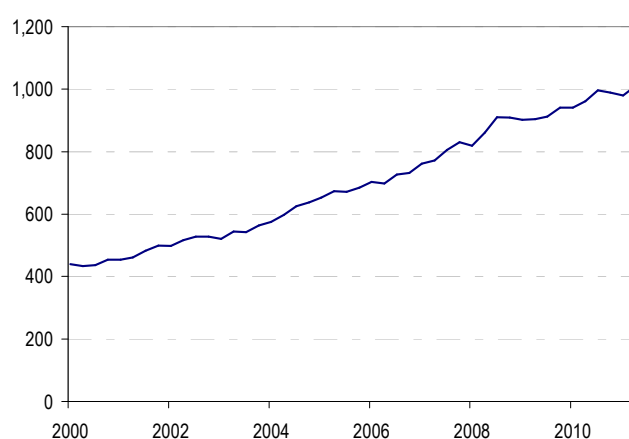
Note: Enterprises only. Excludes direct investments.
Source: Bundesbank and Citi Research

Figure 25. Germany – Outstanding Deposits by Foreign Sectors (EUR bn), 2007-2012



Source: Bundesbank and Citi Research

Figure 26. Germany – Foreign Ownership of Public Debt (EUR bn), 2007-2012



Note: German general government gross debt own by foreign creditors.
Source: Bundesbank and Citi Research

Foreigners have also increased their ownership of claims on Germany. Thus, foreign deposits of German banks have gone up by around €150bn, mostly through interbank deposits (Figure 25). Foreign ownership of German government debt has gone up steadily and substantially in the last decade, but has not accelerated in the past year (Figure 26).

7.2. Reducing German exposure through Target2

The reduction in private German claims abroad therefore suggests that Germany's net increase in exposure to the GIIPS countries has been smaller than suggested by the headline increases in Target2 claims of the Bundesbank. We have already discussed at length that the almost €708bn of Target2 liabilities are a poor measure of the German exposure to GIIPS countries and that the roughly €423bn that are Germany's share of the increase of the Eurosystem exposure to GIIPS countries are a better benchmark. To that we have to add the German official exposure through the 1st Greek troika programme as well as the EFSF/ESM, which currently amounts to €95.6bn.

It should be clear from the preceding discussion that a transaction or sequence of transactions that increases the Bundesbank's Target2 net credit balance could well reduce German loss exposure to the rest of the euro area or to the GIIPS (see also Dullien and Schieritz (2012)). Take the case where a German bank owns €1bn of Spanish government bonds and sells them to a Spanish bank that funds the purchase through increased borrowing from the Bank of Spain, which in turn borrows from Target2/the ECB. The German bank deposits the receipts of its Spanish sovereign bond sale with the Bundesbank, which lends to Target2/the ECB. Using the most likely example of a no break-up scenario (also the only kind of example that can describe the *actual* operation of Target2 since its inception), the Bundesbank's Target2 claims and the Banco de Espana's Target2 liabilities go up by €1bn each, while Spain's and Germany's gross external asset position remain unchanged. What happened to Germany's net exposure? In accounting terms, nothing. But in terms of credit risk, Germany now pools any losses on its exposure to Spain (which is now through Target2) with the remainder of the Eurosystem, while before it was the German bank that had to absorb losses on its foreign asset (the Spanish government bond). Taking the BuBa's ECB capital share of 27.1%, Germany's exposure would have fallen by a juicy 63%. Of course, this transaction has also transferred risk and exposure from the original creditor (the German bank) to the German taxpayer (as the ultimate owner of the Bundesbank), so the spoils from the trade include a windfall expected loss for the German taxpayer.

The repatriation of German capital may not have been the entire story in the build-up of Target2 balances, but it has clearly played a significant role in the build-up of the massive Target2 balances, as our discussion of the role of capital flows highlights.

7.3. Fear of no break-up, banking union and bail-in

In sections 4 and 5, we highlighted that the risks to Germany from GIIPS exposure in the event of a break-up are likely to be more limited than the Target2 accounting suggests.

This is both due to the fact that the profit and loss sharing arrangement of the Eurosystem is likely to work less smoothly but is unlikely to disappear entirely during a break-up scenario. Also, it is extremely unlikely that NCBs (and the governments that stand behind them) would be able to walk away completely and permanently from their Target2 liabilities, even if the Eurosystem's rules for loss and profit pooling for monetary operations were to be abandoned following a break-up. Finally, break-up may present the Bundesbank (and Germany) with a 'capital gain' through its (beneficial) ownership of the ECB and its full claim to the NPV of the seigniorage profits from the German euro. We have also argued that the increase in the German exposure to the EA periphery has been smaller than the increase in the Bundesbank exposure, as the latter was associated with a reduction in private exposure to the GIIPS countries.

Here, we stress that the risks and exposures without a break-up can still be substantial. First, mutualising exposure to high-risk countries is not only an option for Germany. To the extent that, say, French banks have reduced their exposure to periphery assets and those assets are now directly or indirectly funded by the Eurosystem, increased exposure for the Bundesbank, and therefore ultimately the German tax payer, results.²⁵

In our view, this prospect is likely related to a changed German position towards banking union and bail-ins for bank creditors.

Consider the following hypothetical scenario. Imagine that the periphery banking system is severely undercapitalised, and suffers from sizable and persistent deposit and other funding outflows which are replaced by increased recourse to Eurosystem facilities (and associated with rising Target2 balances). Eventually, the day of reckoning comes with a large number of defaults of these banks (and therefore losses on their outstanding Eurosystem borrowing) and/or the need for large-scale recapitalisation.

Looking at this not totally implausible scenario, three options present themselves to the German political leadership. First, realising the scale of the potential losses, Germany could walk away from the euro area before the increase in Eurosystem exposure materialises. If this option is unpalatable to the German leadership, two further options remain, but both of them have in common that they would require the system of intra-Eurosystem borrowing and lending to continue. The second option would simply be a continuation of the status quo, involving limited fiscal rescue measures here and there (including selective bank stress tests

²⁵ To the extent that the process of reducing exposure to the periphery is near-complete for German banks and other private investors, any further increase in the Bundesbank's share of Eurosystem liabilities is likely to represent true increases in Germany's net exposure to the GIIPS countries, especially since the rest of the German public sector is unlikely to reduce its exposure any time soon.

and recapitalisations), and would thus see German exposure to other EA banking systems rise substantially via the Eurosystem balance sheet.

Looking at these two rather unattractive scenarios, a third one suddenly looks much more attractive than it had for a long time: banking union, preferably with significant bail-ins for unsecured bank creditors when banks are threatened with insolvency. This means i.e. an arrangement whereby a supra-national EA (or possibly EU-) level institution could take on a sufficient degree of control over bank regulation, resolution, and recapitalisation to limit further increases in German exposure. Instead of Germany being the ultimate mutualiser of banking sector risk in the EA, the risks and possible losses would be shared by all still solvent EA member states and by the unsecured (mainly private) creditors of the banks. The change in the German attitudes towards bailing in bank creditors seems more understandable in this context, as bailing in bank creditors (other than the ECB) would reduce the need for public, most likely mutualised, bank recapitalisation of EA periphery banks. The move towards banking union would still include sacrifices on Germany's part, including gradually making more resources available to support banks in periphery countries, under strict conditions, but the rationale described above suggests that it is not only the political winds in Germany ahead of the general election in 2013 (including an opposition party that is likely to campaign on being tougher on banks and bank creditors) that favoured a change in the German position towards banking union and the bail-in of bank debt.

8. Other issues

8.1. Empirically, Target2 liabilities were and are not driven by current account deficits

Rising net debt of EA periphery central banks to Target2 is, in principle, consistent with surpluses, deficits and zeroes in the current account balance of their respective member states. For most of the period during which Target2 net debt levels of EA periphery NCBs have been rising, they have mostly reflected difficulties of the local banking system in obtaining private market funding. They may or may not be associated/correlated with current account deficits, and even when they are the causation may or may not run from current account deficits to Target2 financing. Current account deficits of EA periphery countries can be, and have been, financed from sources other than increasing Target2 net debt, and increases in Target2 net debt can result from transactions that do not fund the current account of the balance of payments or the trade balance. For instance, the largest increases in the Central Bank of Ireland's (CBI) net debt to Target2 were recorded in 2010, when the Irish current account was almost in balance. In 2008 and 2009, increases in CBI Target2 net

liabilities were also multiples of the level of the Irish current account deficit. In Spain, large current account surpluses coexisted with zero net Target2 balances for many years, while in 2011 the change in the Target2 net balance was a multiple of the current account deficit, and 2012 is likely to be even more extreme in this regard (see Figure 27 and Figure 28). Bornhorst and Mody (2012) also note that Target2 balances are much more related to private financial account movements, which have been much more substantial than changes in current account deficits.

Just as correlation does not imply causation, the absence of a correlation does not imply the absence of causation, but we interpret this evidence as at least suggestive of a no more than marginal role of current account deficits in the build-up of Target2 net liabilities. Deposit flight from EA periphery banking systems and more general funding difficulties of EA periphery banks and capital flight from the periphery are likely more relevant, if not less worrying. Having said that, it is likely that the existence of open-ended and in principle unlimited Target2 net borrowing as a substitute running down foreign exchange reserves — a process that comes to a halt when the stock of reserves is exhausted and no further reserves can be borrowed — has allowed current accounts in *some* EA periphery countries, such as Spain or Portugal, to adjust more slowly than would otherwise have been the case during the ongoing sudden stop in private market funding.²⁶

In principle, the central banks of the periphery countries could have slowed down or even prevented this increase in their Target2 net debit position by tightening collateral requirements for the domestic banks that borrow from them. In the same spirit, one could even envisage imposing the requirement that gross Target2 debit positions with the ECB be collateralised — something that is not the case today. With the ECB imposing appropriate collateral conditions on its NCB counterparties in Target2, the risk associated with large and growing Target2 imbalances could be minimised.

²⁶ See also Pisani-Ferry and Merler (2012), and King (2012).

Figure 27. Spain – Target2 Balance and the Current Account I (bn EUR), 2002-2012

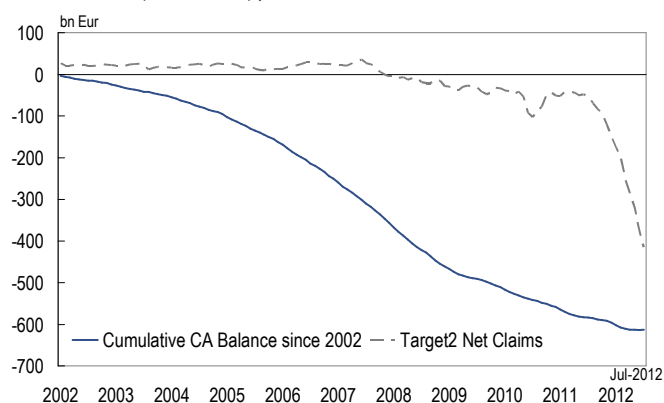
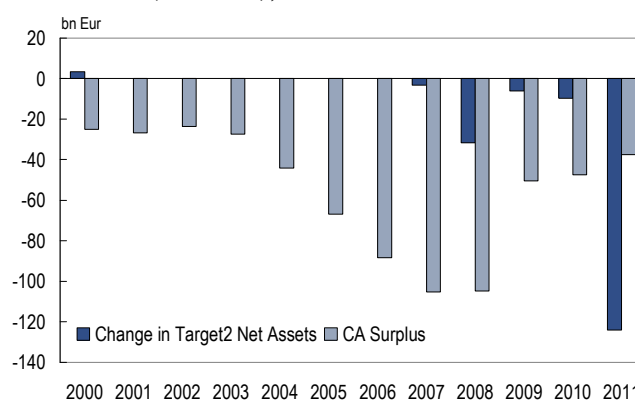


Figure 28. Spain – Target2 Balance and the Current Account II (bn EUR), 2000-2011



Source: Bank of Spain and Citi Research

8.2. Collateral within Target2

As noted, a case can be made for requiring the gross liabilities of the 17 NCBs to Target2/ECB to be collateralised. It makes no sense to require that the gross liabilities of Target2/ECB to the 17 NCBs (the gross assets/claims on Target2/ECB by the 17 NCBs) be collateralised. Unlike the NCBs, the ECB is the ultimate source of potentially unlimited euro liquidity. It is therefore free of default risk as counterparty in transactions involving euro-denominated claims. The positive net Target2 position of the Bundesbank with Target2/ECB therefore ought not to be collateralised, as the debtor is the ECB. Target2/ECB could demand collateral from those NCBs, including the NCBs of the periphery that have significant negative net credit positions with the ECB; they could, in fact, require every gross liability of an NCB with Target2/ECB to be collateralised (see also Bindseil and Winkler (2012)).

All this is the unfortunate byproduct of the decision to create a Eurosystem consisting not of one but of eighteen legal entities: the ECB and the 17 NCBs. If the NCBs had been turned into branches of the ECB, the intra-Eurosystem distribution of credits and debits would be a matter of supreme indifference. However, the major benefit does not arise from collateralizing Target2 imbalances per se. Rather, a benefit would result by streamlining the procedures and policies for accepting collateral in the Eurosystem and therefore cutting down on national differentiation that all too often create the suspicion that risks were buried out of sight, and often behind a sign that reads ‘due to national differences in financial systems’.

8.3. Target2 imbalances do not restrict bank or other credit in Target2 creditor countries, e.g. in Germany, and are only constrained by the availability of eligible collateral in Target2 debtor countries

Increases in the Target2 net liabilities of one NCB do not imply reduced central bank financing of or credit to the domestic banking system in another member state (one with a net claim on Target2, say). The ECB controls an interest rate (strictly a corridor defined by a triplet of interest rates, currently the rate on the marginal lending facility, the main refinancing operations fixed rate and the deposit facility rate) in the euro area. The stock of base money (currency plus central bank overnight credit to eligible banks and other deposit-taking institutions) and the stock of central bank credit are then determined endogenously, i.e. demand-determined by commercial banks.

This is true also when the ECB operates a partial allotment/limited tender regime (as it has done in the past), i.e. when it does not operate a full-allotment regime at all the maturities at which it provides central bank credit against collateral. Then, commercial banks may not obtain the desired amount of central bank liquidity in each facility (for each maturity), notably through the main refinancing operation (MRO), at the posted official (refi) rate. However, even then, the marginal lending facilities operate full allotment regimes for commercial banks to obtain overnight credit, as long as they have sufficient eligible collateral. An increase in the Central Bank of Ireland's or the Bank of Spain's Target2 net liabilities therefore does not imply a reduction in central bank credit availability for German banks.

Central bank credit to German banks has indeed fallen sharply (even though it has risen again more recently), but this more likely reflects less attractive funding conditions and higher costs of central bank credit and more attractive alternative funding sources rather than a scarcity of central bank credit in Germany.

Another misleading claim that is sometimes made is that Target2 lending cannot continue because the reduction in central bank credit to banks in Target2 creditor countries cannot fall anymore. It is the net and gross credit positions of the entire Eurosystem, the 17 NCBs and the ECB that add up to zero, not the net and cross credit positions of the 17 NCBs. The Eurosystem as a whole acts as a central bank: it can indeed create or destroy net credit in the aggregate. The size of Target2 imbalances is constrained on the debtor side by the availability of Eurosystem-eligible collateral.

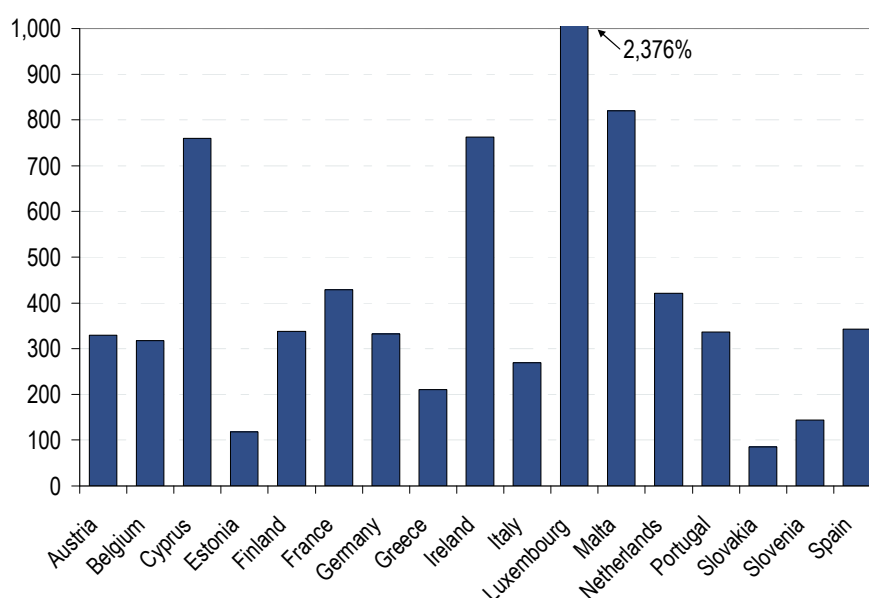
8.4. How big can the Eurosystem balance sheet and Target2 balances become?

As noted above, the Eurosystem balance sheet has continued to grow rapidly over the last 5 years. We do not see any reason for this trend to stop soon, let alone reverse. The reasons range from the continued undercapitalisation of parts of the European banking system, to continued fears of EA break-up, to the poor availability of private sources of bank

funding (deposit, interbank and wholesale), to the attractiveness of what is likely to be subsidised Eurosystem funding for a long time.

Total assets of EA MFIs are currently just over €34trn, and have come down barely 2% from the peak, even though decreases in some (mostly smaller) countries have been much more substantial. The current size of the Eurosystem balance sheet is thus still less than one tenth the size of the wider EA banking system. Eurosystem lending to EA financial institutions is less than 4% of total MFI assets in the EA. Collateral constraints may start to bind here and there until collateral eligibility criteria are loosened somewhat again, but we are unlikely to be anywhere close to the upper bound for the size of the Eurosystem balance sheet.

Figure 29. EA countries – Total Assets of Monetary Financial Institutions (% of GDP), Aug-2012



Note: MFIs excluding the Eurosystem.
Source: ECB, Eurostat, and Citi Research

What is the theoretical maximum Target2 balance for Germany? Assuming that all 16 other EA MFI sectors finance themselves exclusively through the Eurosystem, the theoretical maximum would currently be €25.5trn and could rise even further as the Eurosystem balance sheet expands. Of course, this upper bound is highly unlikely ever to be reached, for several reasons. First, even if the Eurosystem balance sheet grows it is unlikely to ever get close to fully fund the European banking system — other sources of funding, including deposits and equity would continue to be available. Second, the availability of collateral would constrain increases in the Eurosystem balance sheet. Even though we have learnt during the past few years that the meaning of the ‘adequate collateral’ is quite elastic, it is unlikely to be infinitely elastic.

The most recent available data suggest that eligible collateral (under the current collateral rules) in the EA amounted to €14.3trn in Q2 2012. These €14.3trn are likely to include an underestimate of the total amount of non-marketable eligible collateral (which was given at €621bn), as the coverage of non-marketable assets in these statistics is poor (but improving). They are likely to be an overestimate of the amount that could readily be pledged as collateral for the Eurosystem, as some of these assets are likely to already be encumbered in some form. Of the €14.3trn, €2.5trn are actually 'in use', against actual credit extended of €1.2trn.²⁷

As these numbers suggest, haircuts are applied to assets supplied as collateral, and such haircuts are generally applied to the market value of assets delivered, and even though these procedures are always subject to change (under crisis conditions this means subject to easing), it is likely that the amount of credit available will always fall short of the value of the collateral delivered.²⁸ Third, it is unlikely that Germany will be the only Target2 net creditor. Currently, at least Finland, Luxembourg and the Netherlands have positive Target2 net balances, to the tune of jointly some €300bn or so. Fourth (and weakest), German banks may continue to access the Eurosystem for some funding, particularly as funding rates remain highly subsidised.

8.5. What happens when the BuBa/Eurosystem make losses?

Neither the ECB nor the Bundesbank are subject to regulatory capital requirements or to national or international accounting rules (statutory or otherwise). That means that the ECB/BB could *choose* to realise losses and potentially run with negative regulatory equity should the losses exceed its on-balance sheet or conventional loss absorption capacity. Or the ECB/BB could *choose* to 'evergreen' its exposure indefinitely, for example, by recording assets at purchase prices even if these assets are non-performing or in default. The ECB/BB are exempt from the EU's Capital Requirements Directive (CRD).²⁹

²⁷ See http://www.ecb.europa.eu/paym/pdf/collateral/collateral_data.pdf?0d7cd79e59dfad7d794649a2fd2af843. The amounts of eligible collateral include collateral held by non-MFIs. Collateral in use is pledged collateral at values reflecting valuation and other haircuts.

²⁸ See Michels (2012)

²⁹ The ECB does have two obligations to submit to external auditing. One is to an independent external auditor recommended by the Governing Council and approved by the European Council to audit the ECB's accounts. But this audit is not consequential in the sense that even if the auditor did not sign off on the accounts, such a judgment would not carry any corrective or enforcement implications (though it may clearly have reputational effects). On top of that, Article 26 of the ECB's Statute makes clear that it is the ECB GC that determines the 'principles' according to which the annual accounts of the ECB are drawn up, and it is the GC that approves the accounts. The auditor is thus there to check that the ECB conforms to its self-imposed rules. The second auditing obligation is to the EU's Court of Auditors, but this obligation only applies for 'examination of the operational efficiency of the management of the ECB'.

Above, we calculated losses for the Bundesbank under various scenarios. We assumed such losses for two reasons. First, for illustrative purposes to highlight the difference between accounting and economic losses — even if losses are not realised in the ECB’s or the BB’s financial statements. Second, that negative equity or endless evergreening are possible for the BB/ECB does not mean that they are likely. Both the ECB and the Bundesbank have realised losses on their exposures in the past.

8.6. Exposure and accountability

The problem of core EA central banks’ exposure to the sovereigns and banks of the EA periphery is a real one. It is aggravated by the lack of information provided by the NCBs and the ECB about this exposure. Even after an appropriate time lag has passed between an ECB or NCB intervention (to allow for the possible commercially sensitive and market-sensitive nature of some of the information about the intervention), the ECB and the NCBs refuse to divulge what they bought, from whom and on what terms or what they accepted as collateral, from whom and on what terms.

Without detailed information on the identities of the counterparties in these transactions, on the terms and conditions on which securities were purchased or accepted as collateral (and specifically on the valuation/pricing of any illiquid instruments purchased outright or accepted as collateral), no proper accountability of the ECB and the rest of the Eurosystem to the European Parliament and the citizens of the euro area is possible. Regarding the actual use and availability of collateral, the only information that used to be made available was data on the total collateral by category pledged to the Eurosystem in the ECB’s Annual Reports.

Very recently, some very limited progress was made by providing the same information on a quarterly basis, but still without even providing a country split, let alone institution or asset-specific detail.³⁰ The information that will be provided about the ECB’s future OMT operations is likely to be somewhat less inadequate, as the aggregate purchases of each sovereign’s debt will be published with a lag of 4 weeks. However, the terms on which these purchases were made and the identities of the sellers are still not going to be in the public domain.

Having stressed the significance of the exposure of the core EA central banks to the EA periphery, it is important to measure this exposure correctly.

³⁰ See http://www.ecb.europa.eu/paym/pdf/collateral/collateral_data.pdf?0d7cd79e59dfad7d794649a2fd2af843

9. Conclusion

The Bundesbank's Target2 balances do not represent a reliable measure of the Bundesbank's exposure to the rest of the Eurozone (including the countries in the periphery). Instead, the Target2 net credit balance represents part of the exposure of the Bundesbank to the ECB, which should be treated as risk-free as long as the exposure is denominated in terms of euros. Losses of the consolidated Eurosystem will of course have to be absorbed by the beneficial owners of the Eurosystem's NCBs — the Treasuries of the EA member states, and ultimately by the tax payers and beneficiaries of public spending of the member states, now and in the future. When one or more NCBs and the sovereigns that back them are insolvent and cannot abide by the profit and loss sharing rules of the Eurosystem, we enter the uncharted water of NCB and sovereign resolution mechanisms.

There is no coherent and plausible set of assumptions under which the conventional accounting exposure of the Bundesbank to profits and losses resulting from its participation in the Eurosystem, including its participation in Target2, is equal to its net credit position in Target2. Under plausible assumptions, the accounting exposure can differ from the net Target2 balance in magnitude or in sign. The closest we can get to the net credit position in Target2 as the accounting measure of Bundesbank exposure to the rest of Eurosystem is the case where Germany is the only country left in the euro area, all 16 former EA member NCBs have reneged on their commitments to the Eurosystem's profit and loss sharing rule, and the Bundesbank and the ECB (which is now wholly owned by the Bundesbank) have likewise reneged on their commitment to the Eurosystem's profit and loss sharing rule. The recovery rate on the resulting exposures of the ECB to the 16 former Eurosystem NCBs is zero.

Even then, the accounting exposure of the Bundesbank is not just its net credit position in Target2, but its net Target2 position plus the value of the ECB. Among the unconventional assets of the Eurosystem — assets not found on the conventional balance sheet — is the NPV of future seigniorage profits. In the radical break-up scenario, the Bundesbank would be the owner of a much larger (100 percent) share of a smaller NPV of future seigniorage profits. Under not unreasonable assumptions, the Bundesbank's share of the NPV of future seigniorage profits would result in a capital gain on the comprehensive balance sheet of the Eurozone that could substantially compensate for other losses in a comprehensive break-up scenario.

Economic exposure differs from accounting exposure because economic exposure allows for the impact of events in the rest of the Eurozone on the value of the domestic assets

of the Bundesbank and on the value of its claims on foreign entities outside the Eurozone. It is likely to be larger than the accounting exposure to the extent that a comprehensive break-up of the Eurozone is likely to impair the value of the ECB's conventional assets other than its Target2 balances.

The accounting and economic exposures of the Bundesbank to the Eurozone can in principle differ from those of Germany as a whole, both in magnitude and in sign. Germany's losses on its comprehensive balance sheets are likely to much exceed the Bundesbank's as the value of both domestic and external assets are likely to suffer large falls in value that would exceed any gains made by the BuBa from its larger future seigniorage revenues.

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Appendix

Figure A1. ECB – Balance Sheet, 31 December 2011

Assets (EUR millions)		Liabilities (EUR millions)	
1. Gold and gold receivables	19,644	1. Banknotes in circulation	71,090
2. Claims on non-euro area residents denominated in foreign currency	41,428	2. Other liabilities to euro area credit institutions denominated in euro	205
2.1 Receivables from the IMF	664	3. Liabilities to other euro area residents	1,056
2.2 Balances with banks & security investments, external loans & other investments, external loans & other external assets	40,763	3.1 Other liabilities	1,056
3. Claims on euro area residents denominated in foreign currency	4,828	4. Liabilities to non-euro area residents denominated in euro	77,117
4. Claims on non-euro area residents denominated	1,456	5. Liabilities to non-euro area residents	407
4.1 Balances with banks, security investments and loans	1,456	6. Intra-Eurosystem liabilities	40,308
5. Other claims on euro area credit institutions denominated in euro	205	6.1 Liabilities equivalent to the transfer of foreign reserves	40,308
6. Securities of euro area residents denominated in euro	22,819	6.2 Other liabilities within the Eurosystem (net)	0
6.1 Securities held for monetary policy purposes	22,819	7. Other liabilities	2,744
7. Intra-Eurosystem claims	120,48	7.1 Off-balance-sheet instruments revaluation	869
7.1 Claims related to the allocation of euro banknotes within the Eurosystem	71,090	7.2 Accruals and income collected in advance	1,251
7.2 Other claims within the Eurosystem (net)	49,393	7.3 Sundry	624
8. Other assets	20,009	8. Provisions	6,408
8.1 Tangible and intangible fixed assets	441	9. Revaluation accounts	24,325
8.2 Other financial assets	16,041	10. Capital and reserves	6,484
8.3 Off-balance-sheet instruments revaluation	264	10.1 Capital	6,484
8.4 Accruals and prepaid expenses	1,862	11. Profit for the year	728
8.5 Sundry	1,401		
Total assets	230,87	Total liabilities	230,87

Sources: ECB (2012) and Citi Research

Figure A2. Consolidated Balance Sheet of the Eurosystem, 5 October 2012

Assets (EUR billions)	Balance	Liabilities (EUR billions)	Balance
Gold and gold receivables	479.1	Banknotes in circulation	894.4
Claims on non-EA residents denominated in foreign currency	257.8	Liabilities to EA credit institutions related to monetary policy operations denominated in euro	1,028.2
Receivables from the IMF	90.1	Current accounts (covering the minimum reserve system)	521.3
Balances with banks and security investments, external loans and other external assets	167.7	Deposit facility	296.5
Claims on EA residents denominated in foreign currency	39.7	Fixed-term deposits	209.0
Claims on non-EA residents denominated in euro	17.2	Fine-tuning reverse operations	0.0
Balances with banks, security investments and loans	17.2	Deposits related to margin calls	1.4
Claims arising from the credit facility under ERM II	0.0	Other liabilities to EA credit institutions denominated in euro	6.1
Lending to EA credit institutions related to monetary policy operations denominated in euro	1,162.3	Debt certificates issued	0.0
Main refinancing operations	102.9	Liabilities to other EA residents denominated in euro	128.7
Longer-term refinancing operations	1,058.8	General government	105.9
Fine-tuning reverse operations	0.0	Other liabilities	22.8
Structural reverse operations	0.0	Liabilities to non-EA residents denominated in euro	164.6
Marginal lending facility	0.7	Liabilities to EA residents denominated in foreign currency	4.8
Credits related to margin calls	0.0	Liabilities to non-EA residents denominated in foreign currency	7.1
Other claims on EA credit institutions denominated in euro	211.2	Deposits, balances and other liabilities	7.1
Securities of EA residents denominated in euro	596.9	Liabilities arising from the credit facility under ERM II	0.0
Securities held for monetary policy purposes	280.0	Counterpart of special drawing rights allocated by the IMF	56.2
Other securities	316.9	Other liabilities	234.1
General government debt denominated in euro	30.0	Revaluation accounts	452.8
Other assets	268.4	Capital and reserves	85.6
Total assets	3,062.6	Total liabilities	3,062.6

Sources: ECB and Citi Research

Figure A3. Balance Sheet of the Bundesbank (EUR mn), 31 December 2011

Assets	2011	2010	Liabilities	2011	2010
1. Gold and gold receivables	132,874	115,403	1. Banknotes in circulation	221,264	209,615
2. Claims on non-euro area residents denominated in foreign currency	51,730	46,697	2. Liabilities to euro area credit institutions related to monetary policy operations denominated in euro	228,873	146,431
2.1 Receivables from the IMF	22,296	18,740	2.1 Current accounts	76,408	71,407
2.2 Balances with banks and security investments, external loans and other external assets	29,433	27,957	2.2 Deposit facility	66,069	38,536
3. Claims on euro area residents denominated in foreign currency	18,128	0	2.3 Fixed-term deposits	86,395	36,489
4. Claims on non-euro area residents denominated in euro	0	0	2.4 Fine-tuning reverse operations	0	0
5. Lending to euro area credit institutions related to monetary policy operations denominated in euro	55,797	103,076	3. Other liabilities to euro area credit institutions denominated in euro	0	0
5.1 Main refinancing operations	8,635	68,376	4. Liabilities to other euro area residents denominated in euro	5,501	928
5.2 Longer-term refinancing operations	47,112	33,460	4.1 General government deposits	745	173
5.3 Fine-tuning reverse operations	0	1,240	4.2 Other liabilities	4,756	756
5.4 Structural reverse operations	0	0	5. Liabilities to non-euro area residents denominated in euro	46,552	14,460
5.5 Marginal lending facility	49	0	6. Liabilities to euro area residents denominated in foreign currency	7	15
6. Other claims on euro area credit institutions denominated in euro	8,464	9,610	7. Liabilities to non-euro area residents denominated in foreign currency	0	159
7. Securities of euro area residents denominated in euro	71,867	36,145	8. Counterpart of special drawing rights allocated by the IMF	14,311	13,955
7.1 Securities held for monetary policy purposes	66,981	30,899	9. Intra-Eurosystem liabilities	170,489	157,105
7.2 Other securities	4,886	5,246	9.1 Liabilities related to the issuance of ECB debt certificates	0	0
8. Claims on the Federal Government	4,440	4,440	9.2 Liabilities related to the allocation of euro banknotes within the Eurosystem (net)	170,489	157,105
9. Intra-Eurosystem claims	475,894	337,850	9.3 Other liabilities within the Eurosystem (net)	0	0
9.1 Participating interest in the ECB	1,722	1,407	10. Items in course of settlement	1	2
9.2 Claims arising from the transfer of foreign reserves to the ECB	10,909	10,909	11. Other liabilities	3,545	2,886
9.3 Claims related to the allocation of euro banknotes within the Eurosystem (net)	0	0	11.1 Off-balance-sheet instruments revaluation differences	418	0
9.4 Other claims within the Eurosystem (net)	463,263	325,535	11.2 Accruals and income collected in advance	641	443
10. Items in course of settlement	3	1	11.3 Sundry items	2,486	2,443
11. Other assets	18,447	18,036	12. Provisions	12,046	7,996
11.1 Coins	805	763	13. Revaluation accounts	129,411	110,502
11.2 Tangible and intangible fixed assets	938	968	14. Capital and reserves	5,000	5,000
11.3 Other financial assets	10,472	10,312	14.1 Capital	2,500	2,500
11.4 Off-balance-sheet instruments revaluation differences	0	0	14.2 Statutory reserves	2,500	2,500
11.5 Accruals and prepaid expenses	2,506	1,651	15. Profit for the year	643	2,206
11.6 Sundry items	3,725	4,343	Total liabilities	837,643	671,259
Total assets	837,643	671,259			

Sources: Bundesbank and Citi Research