

## Global Economics View

### The Euro Area: Monetary Union or System of Currency Boards?

- Absence of profit and loss sharing by national central banks (NCBs) in the Eurosystem now applies to emergency liquidity assistance (ELA) lending, lending by nine NCBs against inferior country-specific collateral and most public sector asset purchases under the ECB's QE programme.
- Individual NCBs do not control their future seigniorage revenues.
- Given limited risk sharing and absence of discretionary seigniorage revenue, individual NCBs are more like commercial banks than like a normal central bank. Capital adequacy matters for individual NCBs as they could become insolvent even if the Eurosystem as a whole remains solvent.
- Recapitalisation by the NCB's sovereign may not be feasible, particularly when the trigger for NCB insolvency is sovereign insolvency. Sovereign default remains likely in a handful of euro area member states.
- An insolvent NCB is not a credible counterparty for the private sector or for the rest of the Eurosystem (through Target 2).
- With diminishing risk sharing, the euro area (EA) is effectively becoming a system of currency boards.
- Either the country whose NCB is insolvent is effectively forced out of the Eurosystem, or there is ex-post profit and loss sharing.
- It is time for the euro area to recognise the minimum ex-ante fiscal burden sharing pre-requisites for an effective and long-term viable monetary union.

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**See Appendix A-1 for Analyst Certification, Important Disclosures and non-US research analyst disclosures.**

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## (1) Introduction: is the EMU metamorphosing from a monetary union into a system of currency boards?

**With growing restrictions on 'risk sharing', the Eurosystem now has 19 independent profit and loss centres.**

The Eurosystem is a system of central banks, consisting of national central banks (NCBs – nineteen at the moment) and the European Central Bank (ECB). The NCBs and the ECB have separate legal personalities. The ECB is owned by the NCBs, with each NCB owning a share of the ECB's equity given by its capital key (which is the average of the share of the respective country's GDP in Eurozone GDP and its population in Eurozone population).<sup>1</sup> With the steady retreat from profit and loss sharing by the NCBs since the beginning of the Great Financial Crisis (GFC) in 2007, the Eurosystem therefore has 19 independent profit and loss centres (the NCBs) and one wholly owned subsidiary of these 19 independent profit and loss centres – the ECB. A key contention of this note is that there should, at the very least, be a return to full profit and loss sharing from activities undertaken by the NCBs to implement the single monetary policy. Better would be to turn the Eurosystem into a conventional central bank, with a single legal entity, the ECB, and nineteen ECB branches – the current NCBs. Best would be to have a single legal entity, the ECB, with a smaller number of regional branches, none of which coincides, geographically with any of the existing NCBs.

A single legal entity (or unlimited profit and loss sharing) is necessary to remove an existential threat to the Eurosystem: the risk that – despite the consolidated Eurosystem being solvent – one or more of the NCBs could become insolvent and cannot be recapitalized by their national sovereign(s). This contingency could arise if the cause of an NCB insolvency were losses on its exposure to its sovereign – a sovereign that has defaulted on its debt. Further sovereign defaults in the euro area are likely – beyond the two sovereign debt restructurings through PSI that have already occurred in Greece and Cyprus and the four sovereign debt restructurings through OSI that have occurred in Greece, Ireland and Portugal.<sup>2</sup>

An irremediably insolvent NCB can no longer be an eligible counterparty for the rest of the Eurosystem through Target 2 – their net Target 2 debit position would be capped.<sup>3</sup> The ECB Governing Council would be unlikely to allow an irremediably insolvent NCB to extend new loans to the banks in its jurisdiction and to fund these loans by issuing additional non-Target 2 liabilities, as the rest of the Eurosystem would now be responsible for these liabilities. That irremediably insolvent NCB would cease to function as part of the Eurosystem and, although it could hang on for quite a while with capital controls, currency controls and the introduction of a parallel currency (scrip), the member state with the insolvent central bank would be eventually have to look for an alternative monetary arrangement.

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<sup>1</sup> Technically, the nine EU member states that are not participating in the monetary union also own equity in the ECB. They don't, however, share in the profits and losses of the ECB nor do they vote in its decision-taking fora. They will be ignored in what follows.

<sup>2</sup> PSI stands for 'private sector involvement', that is, NPV or face value haircuts for private creditors. OSI stands for 'official sector involvement'.

<sup>3</sup> TARGET 2 is the Trans-European Automated Real-time Gross settlement Express Transfer system 2. It is the large-value cross-border payments and settlement system for the Eurosystem. In 2013 there were 1003 direct participants, 862 indirect participants and 4,959 correspondents (see ECB <https://www.ecb.europa.eu/paym/t2/html/index.en.html>). The outstanding claims and liabilities of all the NCBs participating in TARGET 2 are transferred to the ECB at the end of the business day, where they are netted out. The TARGET 2 net balance of an NCB is therefore the net claim of that NCB on the rest of the Eurosystem, or for all practical purposes, the net claim of that NCB on the ECB. See e.g. Bundesbank [http://www.bundesbank.de/Redaktion/EN/Standardartikel/Tasks/Payment\\_systems/target2\\_balance.html](http://www.bundesbank.de/Redaktion/EN/Standardartikel/Tasks/Payment_systems/target2_balance.html)

**Without full profit and loss sharing, an individual NCB can become insolvent even if the Eurosystem as a whole is solvent.**

**Since 2007, loss sharing has been on the retreat in the Eurosystem.**

This forced exit of an insolvent central bank from the EMU is analogous to the central bank or monetary authority of a currency board running out of foreign exchange reserves (and exhausting its ability to borrow reserves) and thus being forced to abandon its currency peg and exiting the currency board. The logical end-point of the progressive abandonment of profit and loss sharing within the Eurosystem is to turn it from a monetary union into a system of currency boards.

## **(2) The Eurosystem's retreat from risk sharing**

The range and scope of Eurosystem activities for which there is no profit and loss sharing (sometimes called mutualisation, risk sharing or joint liability) has been growing. 'Own risk' asset purchases or collateralized lending have always applied to ELA lending, the scope of which has increased significantly since the start of the GFC.<sup>4</sup> On December 8, 2011, 'own risk' was assigned to certain loans made by NCBs willing to accept collateral that is not generally acceptable in the euro area. Nine NCBs have operated such a scheme.<sup>5</sup>

Finally, own risk applies to about €760bn worth of recent and future sovereign debt purchases under the Public Sector Purchase Programme (PSPP) as part of the recently announced €1.1 trillion ECB QE programme, and to €152bn worth of private securities purchases. Given the way the political winds are blowing, 'own risk' is likely to apply also to future NCB purchases under additional QE programmes, should the current one not deliver the desired results.

What the increased scale and scope of own risk activities means is that individual NCBs can become insolvent even if the consolidated Eurosystem is solvent.<sup>6</sup> The precise meaning (indeed the multiple meanings) of NCB insolvency are explored in the Appendix. The likelihood of this happening increases as the NCBs' balance sheets increase, there is growing concentration risk (exposure to a limited number

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<sup>4</sup> According to the ECB's website "ELA means the provision by a Eurosystem national central bank (NCB) of: (a) central bank money and/or (b) any other assistance that may lead to an increase in central bank money to a solvent financial institution, or group of solvent financial institutions, that is facing temporary liquidity problems, without such operation being part of the single monetary policy. Responsibility for the provision of ELA lies with the NCB(s) concerned. This means that any costs of, and the risks arising from, the provision of ELA are incurred by the relevant NCB." How the provision of central bank money can avoid being part of the single monetary policy, regardless of what the counterpart on the asset side of the central bank's balance sheet (lender-of-last-resort operations in the case of ELA) is a mystery. The mystery deepens when one notes that "...Article 14.4 of the Statute of the European System of Central Banks and of the European Central Bank (Statute of the ESCB) assigns the Governing Council of the ECB responsibility for restricting ELA operations if it considers that these operations interfere with the objectives and tasks of the Eurosystem." See ECB: [https://www.ecb.europa.eu/pub/pdf/other/201402\\_elaprocedures.en.pdf?e716d1d560392b10142724f50c6bf66a](https://www.ecb.europa.eu/pub/pdf/other/201402_elaprocedures.en.pdf?e716d1d560392b10142724f50c6bf66a)

<sup>5</sup> The nine NCBs that used the December 8, 2011 option to increase the availability of collateral by reducing the rating threshold for certain asset classes and allowing NCBs to accept additional performing bank loans (non-marketable assets) are the Central Bank of Ireland, the Bank of Greece, the Banco de España, the Banque de France, the Banca d'Italia, the Central Bank of Cyprus, the Oesterreichische Nationalbank, the Banco de Portugal and Banka Slovenije. See ECB: <https://www.ecb.europa.eu/paym/coll/standards/nonmarketable/html/index.en.html#assessment>. Before January 2007, the Eurosystem had two types or tiers of the collateral. Tier 1 consisted of marketable debt instruments with uniform eligibility criteria throughout the euro area, set by the ECB. Tier 2 consisted of assets that had particular importance for individual national markets, for which the eligibility criteria were set by the NCB and that were not generally acceptable as collateral in jurisdictions other than those of this NCB. In January 2007, the Eurosystem moved to a single collateral list of assets that were uniformly acceptable throughout the Eurosystem. The December 8, 2011 measure in substance restored the old two-tier system.

<sup>6</sup> For further discussions of whether, how and when central banks can go broke, see Buitier (2007, 2008, 2010a,b) and Buitier and Rahbari (2012a,b,c).

of domestic borrowers (including the domestic sovereign)) and growing differentiation between NCBs in the credit risk associated with the sovereign debt and private debt they purchase outright and with the collateralized loans they make. Central bank balance sheets can become vast – Switzerland's SNB balance sheet peaked (for the time being) at 85 % of annual GDP in early 2015. The quality of the assets on the balance sheet of the Eurosystem is highly variable. Some of it is concerning: in 2012 the Eurosystem avoided haircuts on its holdings of Greek sovereign debt acquired under the SMP only by *de-facto* turning itself into a senior or preferred creditor.<sup>7</sup>

**Only the consolidated Eurosystem looks like a central bank**

The Eurosystem looks like a normal central bank only when the accounts of the 19 NCBs and the ECB are consolidated. We show this formally in the Appendix. Consolidation can hide material weaknesses in the system when there is insufficient profit and loss (P&L) sharing and there are differences among the NCBs in insolvency risk. The disaggregated/unconsolidated accounts of the Eurosystem look instead like a system of 19 currency boards each of which pegs to the euro, which is administered by a central bank, the ECB, on whose decision-making body the 19 NCB governors each have (at best) one vote.

A central bank that has limited foreign currency-denominated and index-linked debt can always print (or create electronically) sufficient base money (currency plus bank reserves held at the central bank) to remain solvent. It is, of course, possible that to get the minimal amount of seigniorage (profits from base money creation) necessary to remain solvent, undesirably high inflation might result. Because the ECB's Governing Council could always decide to generate enough seigniorage, the ECB and the consolidated Eurosystem can therefore always be viewed as solvent (assuming they would, if all else failed, choose excessive inflation over insolvency).

**Individual NCBs don't control their seigniorage income – they can go bust.**

Each euro area NCB has only a minority vote (based on its capital share) when it comes to equity or capital decisions, and either one or zero votes out of 21 (6 Executive Board members plus 15 rotating NCB governors) in monetary policy decisions. Individual NCBs can therefore not control their own future seigniorage revenues.<sup>8</sup> Instead each NCB gets its ECB capital key-weighted share of the current and future profits or seigniorage of the Eurosystem as a whole. These capital keys are shown in Figure 1.

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<sup>7</sup> The press statement announcing the SMP and the legal document implementing it don't mention seniority, see <https://www.ecb.europa.eu/press/pr/date/2010/html/pr100510.en.html> and [https://www.ecb.europa.eu/ecb/legal/pdf/en\\_dec\\_2010\\_5\\_f\\_sign.pdf?586b8d9fc867110a94788fe073d2b3a7](https://www.ecb.europa.eu/ecb/legal/pdf/en_dec_2010_5_f_sign.pdf?586b8d9fc867110a94788fe073d2b3a7).

<sup>8</sup> See Euro Economics Weekly, Citi Research, Developed Markets Economics, 27 February 2015, Figure 3 for a list of non-voting Governing Council members for 2015, <https://www.citivelocity.com/cv2/go/Economics/X19OQVZJR0FUSU9OX0JBU0U2NF9fcmVuZGI0aW9uL2VvcHVibGJlL2RvY3VtZW50U2VydmljZS9kWE5sY2w5cFpEMW9UMGh6U1dVNWFUaHZabUpYWVhCe5rVkdORkpCL1pHOWpYmMxrUFRVMU9ETTBUUQ>

**Figure 1. Euro Area – NCB Contributions To ECB Capital (€Bn and % of Total), 2015**

National Central Bank	Capital Key (%)	Paid-Up Capital (€Bn)
Nationale Bank van België/Banque Nationale de Belgique (Belgium)	3.52	0.27
Deutsche Bundesbank (Germany)	25.57	1.95
Eesti Pank (Estonia)	0.27	0.02
Central Bank of Ireland (Ireland)	1.65	0.13
Bank of Greece (Greece)	2.89	0.22
Banco de España (Spain)	12.56	0.96
Banque de France (France)	20.14	1.53
Banca d'Italia (Italy)	17.49	1.33
Central Bank of Cyprus (Cyprus)	0.21	0.02
Latvijas Banka (Latvia)	0.40	0.03
Lietuvos bankas (Lithuania)	0.59	0.04
Banque centrale du Luxembourg (Luxembourg)	0.29	0.02
Central Bank of Malta (Malta)	0.09	0.01
De Nederlandsche Bank (The Netherlands)	5.69	0.43
Oesterreichische Nationalbank (Austria)	2.79	0.21
Banco de Portugal (Portugal)	2.48	0.19
Banka Slovenije (Slovenia)	0.49	0.04
Národná banka Slovenska (Slovakia)	1.10	0.08
Suomen Pankki – Finlands Bank (Finland)	1.78	0.14
<b>Total</b>	<b>100</b>	<b>7.62</b>

Note: The 9 non-euro area NCBs are excluded and the capital shares of the euro area NCBs rebased to sum to 100%.

Source: ECB and Citi Research

Because of this, an individual NCB could become insolvent even if the consolidated Eurosystem as a whole is solvent.<sup>9</sup> What happens when an NCB becomes insolvent? Recapitalisation by the NCB's sovereign may not be feasible if it was sovereign default that triggered the NCB insolvency (say because the NCB in question was very highly exposed to the debt of its sovereign – as some may be following the PSPP). Recapitalisation of an insolvent NCB by its own sovereign is not automatically possible if losses incurred by that NCB on its holdings (directly or as collateral in loans to domestic banks) of its own sovereign debt because of a sovereign default are the cause of the NCB's insolvency.

### Reminder: sovereign default remains likely in the euro area

Sovereign default in the euro area before the end of the decade remains quite likely, in our view, even though the next installment may well be postponed to the day that, after the cyclical recovery now under way in the euro area has run its course (say in a couple of years' time), the poor growth rates of *potential* output of a number of highly indebted euro area member states become clear for all to see.

The dynamics of the net general government debt-to-GDP ratio,  $d$ , is driven by the sum of the primary (net of interest payments and receipts) deficit of the general government as a share of GDP ( $-s$ , where  $s$  is the primary surplus of the general government as a share of GDP) and the 'snowball effect', given by the product of the difference between the effective real interest rate on the debt,  $r$ , and the growth

<sup>9</sup> We make two alternative definitions of central bank insolvency precise in the Appendix.

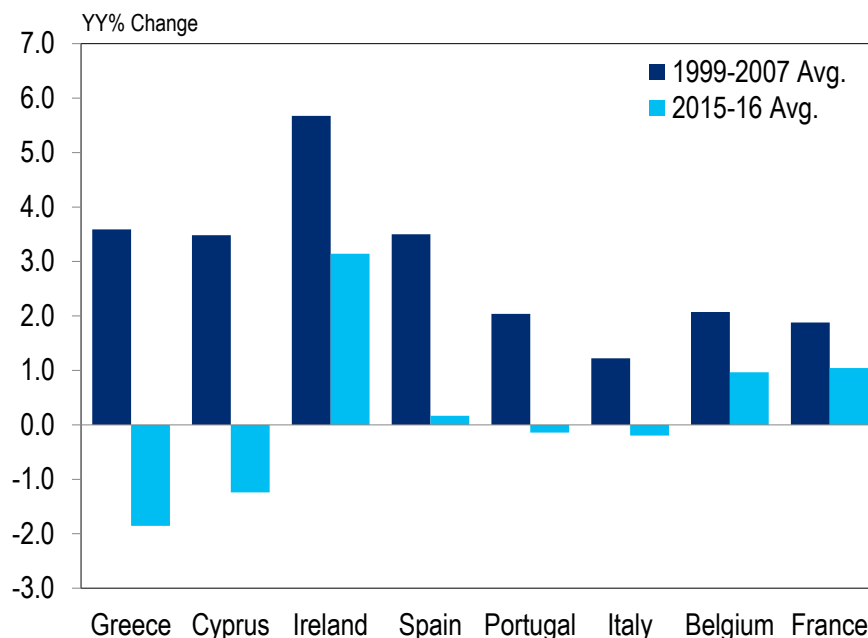
rate of real GDP,  $g$ , and the initial debt-to GDP ratio.<sup>10</sup> Letting  $\Delta$  stand for 'change in', the exact expression is

$$\Delta d \equiv -s + \left( \frac{r-g}{1+g} \right) d$$

In Figure 2, we show estimates of the 1999-2007 average of growth rates of potential real GDP for selected member states by the European Commission, and the predicted average growth rates for 2015 and 2016. The growth rate of potential output is a reasonable first approximation to the actual growth of output in the medium and longer term. The growth rates of potential real GDP attributed to Greece, Cyprus, Italy, Portugal and Spain by the European Commission are low.

Potential output growth rates in the periphery are weak

Figure 2. Euro Area - Potential Real GDP Growth (YY% Change), 1999-2016



Note: Data were published by the EC on 5 February 2015.  
Source: European Commission and Citi Research

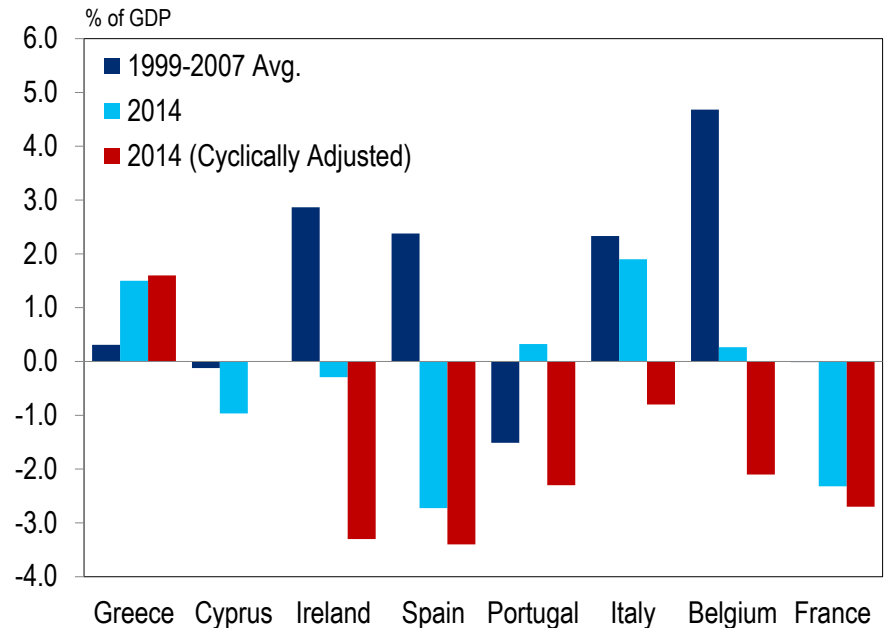
General government primary surpluses appear to have reached their political limits

Political developments in Greece, Spain, Portugal, France and Italy have made it clear, in our view, that the political limits on the sustainable primary surplus as a share of GDP are likely to have been reached in much of the euro area periphery. Figure 3 shows average primary surpluses actual primary surpluses as a share of GDP of the general government in selected euro area member states for the period 1999-2007 and the average for 2013-2014..

<sup>10</sup> The factor  $\frac{1}{1+g}$  in the snowball effect term disappears in the probably more familiar continuous

time version of the debt dynamics equation:  $\dot{d} \equiv -s + (r - g)d$ .

Figure 3. Euro Area – Primary Budget Balance (% of GDP), 1999-2014



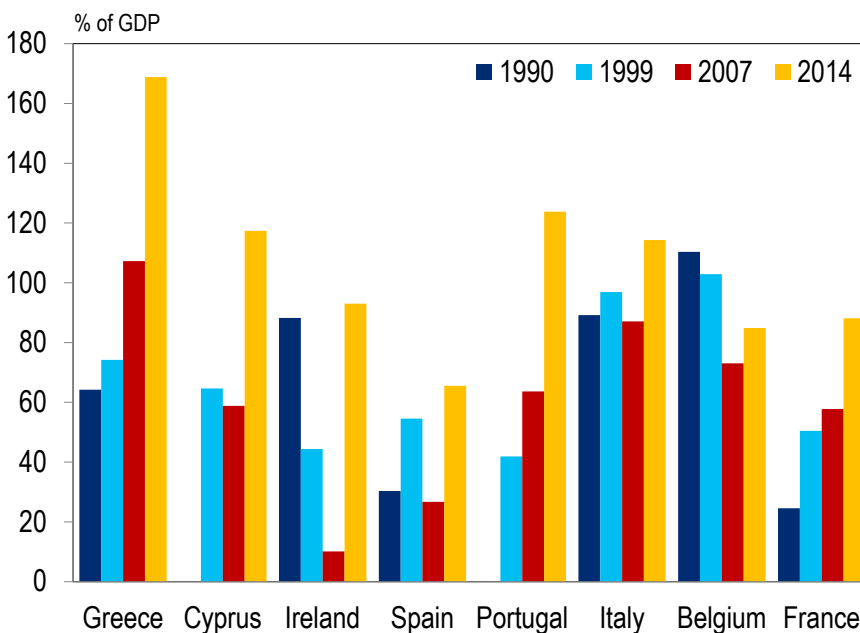
Note: The cyclically adjusted budget balance estimate for Cyprus is excluded due to data limitations.  
Source: IMF and Citi Research

**Net general government debt burdens are sizeable**

All countries in Figure 3 are rich, by historical and international standards. The political limits on the maximum sustainable primary surplus are therefore driven by a collective, political ‘won’t pay’ rather than a by a subsistence consumption level driven ‘can’t pay’ (see also Buiter and Rahbari (2014)). Primary surpluses of the magnitudes run by Belgium from 1990 till 2008, and in Italy from 1992 till 2008 are unlikely to be replicated in a euro area that is older, less dynamic, weighed down by austerity fatigue (in the periphery) and politically and politically hamstrung by the rise of populist movements of the left (in the periphery) and of the right (mainly in the core, but also in Greece and France).

The net debt to GDP ratios of the general government approaches 100% or exceeds it in much of the periphery, (see Figure 4).

Figure 4. Euro Area – Net General Government Debt (% of GDP), 1990-2014



Note: 1990 data for Cyprus and Portugal are excluded due to data limitations. All data for Cyprus refers to gross rather than net debt, due to data limitations.  
Source: IMF and Citi Research

The only thing that prevents the snowball effect overwhelming the primary surplus and causing steady rise in the debt-to-GDP ratio and inevitable sovereign debt restructuring, is the extraordinarily low level of real interest rates for all but the Greek sovereign. The effective real interest rate on the public debt is the sum of the risk-free real interest rate and the sovereign risk premium. Both are extraordinarily and unsustainably low.

**Real risk-free interest rates are abnormally and unsustainably low.**

The real risk-free rate in the euro area (proxied by the real interest rate on Bunds, say) is now negative at maturities of up to seven years. Larry Summers attributes the low level of real risk-free interest rates to an ex-ante saving glut that drove the 'neutral real rate of interest' – the real risk-free rate that would be necessary to balance ex-ante saving and investment at full employment – into deeply negative territory – more negative, in fact, than the observed risk-free real interest rates. Thus actual real risk-free rates, although unprecedentedly low, are still too high to achieve full employment. They are stuck above their 'neutral' levels because risk-free nominal interest rates are bounded from below (if not by zero then probably by -0.75%) and the saving glut shock that caused the neutral real rate to fall into deeply negative territory was itself contractionary and disinflationary. This is the new, inadequate demand-driven version of 'secular stagnation' developed by Summers (2014) (see also Buiter et. al. (2014)).

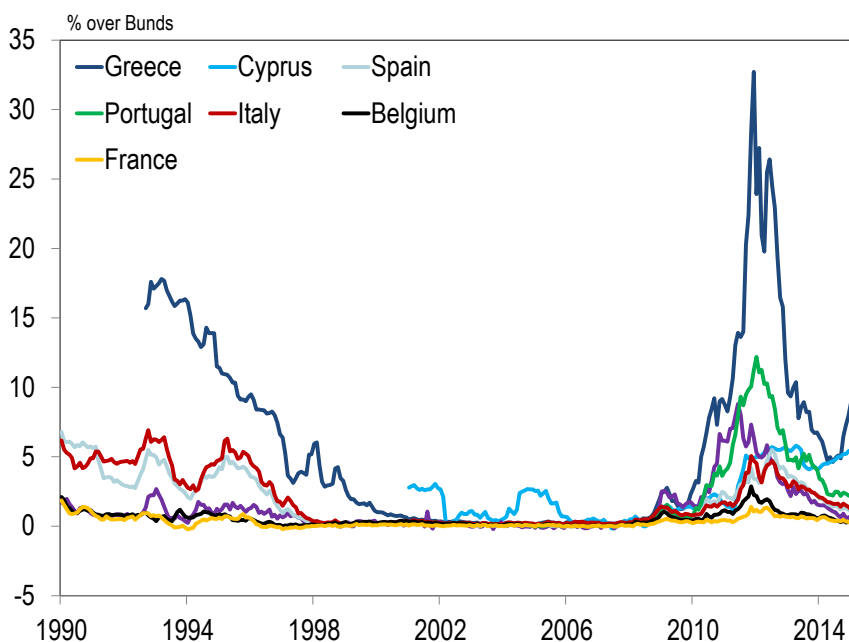
It seems likely that when the output gap in the euro area closes, in 3 to 4 years for most member states, perhaps longer for the worst-afflicted periphery countries, the euro area's domestic contribution to the global ex-ante saving glut will have been diminished. Rapidly ageing populations globally, except in Africa (especially Sub-Saharan Africa) and parts of South East Asia are also likely to reduce and even eliminate the ex-ante saving glut. A return of the euro area neutral real risk-free rate, even at short maturities to 1% or more no later than the end of this decade, is therefore plausible, in our view. This would still be well below the long-run historical average.



**Markets severely underestimate sovereign risk in the periphery**

Sovereign risk-premia in the euro area periphery, except for Greece (and in Greece only since November 2014) are strongly supportive of our view that markets get it wrong often and persistently. Figure 5 shows the spreads of the 10-years yields on the sovereign debt of Greece, Cyprus, Ireland, Portugal, Spain and Italy over Bunds since 1990. Before these countries joined the euro area (Ireland, Portugal, Spain and Italy on January 1, 1999, Greece on January 1, 2001 and Cyprus on January 1, 2008), these interest rate differentials reflected mainly differential expected depreciation of the periphery countries' currencies in terms of the DM (before January 1, 1999) and in terms of the euro (from January 1, 1999). Since they joined these interest differentials reflect some combination of sovereign default risk and euro-area-exit-plus-redenomination-and-new-periphery-currency-depreciation-risk. Because break-up, exit, the introduction of a new currency and redenomination of the sovereign debt into the new currency would undoubtedly constitute an act of default, the spreads since euro area membership can be interpreted as a proxy the markets' assessment of sovereign default risk.<sup>11</sup>

**Figure 5. Euro Area – 10-Year Sovereign Spreads (% over Bunds), 1990-2015**



Source: Haver Analytics and Citi Research

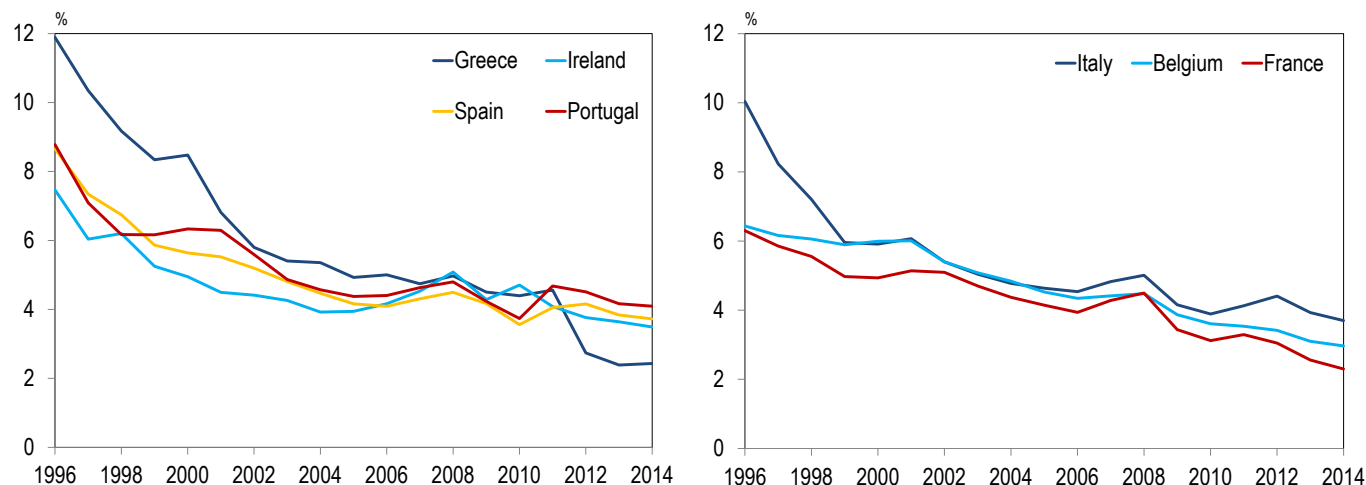
From the day the periphery member states joined the euro area till some time in 2008, the markets treated Greek sovereign debt as barely more risky than German sovereign debt. The same applied to Cyprus (the only other euro area member state to have PSI in a sovereign debt restructuring since the GFC). No sooner has Mario Draghi uttered the Magic Words – “Whatever it takes..... And believe me, it will be enough” – and the markets again sank into a stupor of risk-denial.

With a real risk-free rate in the medium and long-term of not less than 1 percent, a sovereign spread over the risk-free rate of not less than 2 percent for even the most creditworthy of the periphery sovereigns and an inflation target of below but close to two percent (successfully achieved by a determined ECB), it is hard to imagine a future after 2018 when the marginal cost of funding for the euro area periphery sovereigns (with the possible exception of Ireland) is less than 5 percent nominal.

<sup>11</sup> Liquidity premia likely also contribute to these spreads.

The current average effective nominal interest rates for the periphery sovereigns are shown in Figure 6. The highly concessional nature of Greece's debt to the other euro area and EU sovereigns (bilaterally or through the EFSF) is apparent from the very low figure for Greece's effective borrowing rate since 2012 – the year of the Greek sovereign debt restructuring.

Figure 6. Euro Area – Nominal Effective Borrowing Rates (%), 1996-2014



Note: The nominal effective borrowing rate is defined as gross government interest payments divided by gross government debt for a given year.  
Source: OECD and Citi Research

The notion that the ECB will bail out, by uncapped sovereign debt purchases and by taking losses on their sovereign positions in case of sovereign default, the insolvent sovereigns of the euro area is likely to prove a delusion. Purchases by the Eurosystem of sovereign debt under the OMT are conditional. The conditionality likely to be required to activate the OMT (fiscal austerity and structural reforms threatening vested interests in the labor markets, product markets, professions and government bureaucracies) is increasingly politically unacceptable. A government that signed off on such conditionality would likely fall and an election would follow that would turn into a referendum on austerity and structural reform first, then on debt repudiation and ultimately on continued Eurozone membership. The cap on Eurosystem sovereign debt purchases (a 25-percent cap on holdings of individual issues and an aggregate 33-percent cap on holdings of any national government's aggregate bond debt)<sup>12</sup> is high enough to get a number of central banks into trouble should the sovereign default, but not sufficiently high to take the pressure off the solvency-challenged sovereigns in their debt markets.

In addition, any open-ended purchases of high-risk sovereign debt by the Eurosystem would raise the risk of euro area break-up through the exit of the strong – Germany, the Netherlands, Finland, Estonia, Luxembourg, Slovakia, and perhaps Austria. Anti-bail-out sentiment is strong in the core and growing stronger. Anti-euro sentiment has risen sharply in these countries and now accounts for a plurality of respondents in opinion polls in countries like the Netherlands and France. The unwillingness of the financially stronger EA member states to allow large quasi-

<sup>12</sup> The 25% upper limit is to prevent the Eurosystem from being able to block the invocation of collective action clauses (CACs) that apply to all euro area sovereign debt with a maturity over one year issued since January 1, 2013. The 33% aggregate limit reflects the grandfathering of past sovereign debt purchases (under the SMP, for instance) by the Eurosystem that resulted, as in the case of Greece, of sovereign debt holdings in excess of the 25% limit. Clearly, in the long run, the 25% limit is the binding constraint.

fiscal transfers to the financially weaker member states through the ‘back door’ of Eurosystem sovereign debt purchases is also bound to be reflected in an even stronger unwillingness to engage in large ‘front-door’ fiscal transfers through the ESM or through bilateral grants.

We consider any spread of euro area periphery sovereign yields (with the possible exception of Ireland) over the corresponding German sovereign yield, at maturities over a year of less than 200 basis points to be evidence of the foolishness of crowds and of markets. Of course the past, present and anticipated future sovereign debt purchases of the ECB, and the expectation that the OMT would be triggered should a most likely solvent but liquidity-deprived sovereign be at risk of a fundamentally unwarranted default or a forced exit from the euro area have helped to compress sovereign risk spreads and probably lower the risk-free real and nominal interest rates as well. But such asset purchases, unless they are really unconditional and open-ended, ought not to have a lasting impact on yields in secondary markets if market participants had firmly held beliefs based on simple but powerful arithmetic. Instead there appear to be firmly held beliefs based on wishful thinking.

About the possible triggers of a widening of sovereign default risk spreads in the euro area periphery, it is hard to make any confident statement. As it is our view that the current risk spread compression is deeply irrational and inconsistent with fundamental analysis, it is rather difficult to provide a fundamentals-based scenario for the puncturing of this irrational credit risk bubble. Among the candidates for a sudden spread widening would, of course, be Grexit – a risk that all parties involved in the discussion between the Institutions (formerly known as the Troika) and the Greek government appear to be determined to maximize rather than to minimize. A Greek exit from the euro area would likely raise the ‘who’s next’ question in the minds of even the most soporific market participant. A sharp widening of periphery sovereign risk spreads could follow promptly.

**Sovereign insolvency is a material risk in the Eurozone. NCBs must be made sovereign-insolvency-proof.**

Putting together the data on net debt-to-GDP ratios and our best guesses about future growth potential, risk-free real interest rates, sovereign risk premia and political limits on the maximum sustainable general government primary surpluses, we were, are and will remain deeply concerned about the high risk of multiple sovereign defaults in the euro area in the years to come. Our desire to redesign the Eurosystem to make it sovereign default risk proof is therefore not just driven by aesthetics and principle, but by a very practical concern about national central bank insolvency in the Eurozone.

### **Will a national sovereign be able and/or willing to recapitalise its insolvent NCB?**

**Its own sovereign may not be able or willing to recapitalise an insolvent NCB**

Even if losses on the exposure of an NCB to debt its sovereign has defaulted on are the cause of the NCB’s insolvency, it may be possible for that same sovereign to recapitalise the NCB. It might be possible to impose higher loss rates on creditors other than its NCB to be able to recapitalise its NCB. There could, of course, be legal obstacles to effectively treating the NCB as a senior or preferred creditor of the sovereign, unless this were explicitly part of the terms and conditions on which the debt was issued. Indeed, in the PSPP the ECB has stated that the Eurosystem will be *pari passu* with other (private) purchasers of the same public debt instruments.

Quite apart from the legal feasibility of preferential treatment of the NCB, the public debt may be so high relative to the ability of the government to generate primary surpluses now and in the future, that recapitalisation of the NCB is not financially feasible. Even if the resources to recapitalise the NCB are in principle available to

the government, there may be no willingness on the part of the government to do so. This could happen if the government were engaged in a 'game of chicken' with the rest of the Eurosystem and/or the other euro area member states (or in some other form of brinkmanship) about who would pick up the tab for curing the insolvency of the NCB.

Figure 7. Eurosystem – Loss Absorption Capacity of Central Banks (€ billions), Year-End 2013

	Capital and Reserves	Revaluation Accounts	Provisions	Broad OBLAC	% of GDP	% of GG Debt	Broad OBLAC as % of NCB Assets	Narrow OBLAC as % of NCB Assets	Value of Seigniorage	Total CLAC	% of GDP	% of GG Debt
Austria	4.2	6.8	5.0	16.0	5.0	6.1	16.4	9.5	85.9	102.0	31.6	38.9
Belgium	4.6	6.3	0.0	11.0	2.8	2.7	14.2	6.0	108.5	119.4	30.2	28.9
Cyprus	0.2	0.4	0.4	1.0	5.4	5.3	6.9	4.2	6.6	7.6	42.0	41.1
Estonia	0.4	0.0	0.0	0.4	2.2	21.8	9.7	9.4	8.4	8.9	47.2	468.8
Finland	2.4	1.6	3.9	7.9	3.9	7.0	14.7	11.8	55.0	62.9	31.3	55.8
France	6.8	52.0	0.9	59.8	2.8	3.1	10.8	1.4	620.7	680.5	32.2	34.9
Germany	5.0	88.1	19.2	112.3	4.0	5.2	14.0	3.0	787.8	900.1	32.0	41.7
Greece	0.8	2.4	6.7	9.8	5.4	3.1	9.0	6.8	89.0	98.8	54.2	31.0
Ireland	2.4	3.3	0.4	6.1	3.5	2.8	5.9	2.7	50.8	56.9	32.5	26.4
Italy	23.5	54.2	8.0	85.7	5.3	4.1	15.2	5.6	538.9	624.6	38.6	30.2
Latvia	0.3	0.1	0.1	0.5	2.0	5.3	#N/A	#N/A	11.9	12.3	53.1	139.1
Lithuania	0.4	0.1	0.0	0.5	1.4	3.7	8.2	6.9	17.6	18.1	51.7	132.6
Luxembourg	0.2	0.2	1.0	1.4	3.0	12.9	1.2	1.0	8.9	10.3	22.7	96.2
Malta	0.3	0.0	0.0	0.3	4.6	6.6	9.5	9.3	2.8	3.2	42.4	60.7
Netherlands	7.8	16.8	0.0	24.7	3.8	5.6	15.6	4.9	175.3	199.9	31.1	45.3
Portugal	1.3	7.8	0.0	9.0	5.3	4.1	10.9	1.5	76.3	85.3	49.8	38.9
Slovakia	0.4	0.6	0.3	1.3	1.7	3.1	5.7	3.0	33.8	35.1	47.6	87.3
Slovenia	0.9	0.1	0.4	1.3	3.7	5.3	12.3	11.7	15.1	16.5	45.5	64.7
Spain	1.9	9.0	9.0	20.0	1.9	2.1	5.2	2.8	387.0	407.0	38.8	42.1
ECB	7.7	13.4	7.6	28.6	0.3	0.3	16.4	8.8	0.0	28.6	0.3	0.3
<b>Eurosystem (sum)</b>	<b>71.5</b>	<b>263.0</b>	<b>63.0</b>	<b>397.6</b>	<b>4.0</b>	<b>4.3</b>	<b>11.9</b>	<b>4.0</b>	<b>3080.4</b>	<b>3478.0</b>	<b>35.1</b>	<b>37.6</b>
<b>Eurosystem (consolidated)</b>	<b>95.5</b>	<b>330.9</b>	<b>63.0</b>	<b>489.4</b>	<b>4.9</b>	<b>5.3</b>	<b>22.2</b>	<b>7.2</b>	<b>3080.4</b>	<b>3569.9</b>	<b>36.0</b>	<b>38.6</b>

Note: All data refers to year-end 2013 except for the last row (the consolidated Eurosystem), which refers to financial accounts data for the consolidated Eurosystem on 8 March 2015. Year-end balance sheet data for 2014 were not available for most euro area countries (except Belgium and Germany) at the time this report's publication. Broad OBLAC refers to Capital and Reserves plus Revaluation Accounts plus Provisions, whereas Narrow OBLAC is just Capital and Reserves plus Provisions. CLAC includes here an estimate of the present value of future seigniorage based on Buiter and Rahbari (2012a).

Source: National Sources and Citi Research

### The conventional loss absorption capacity of the NCBs ranges from tiny to puny

The most generous measure of the total conventional loss absorption capacity, or on-balance-sheet loss absorption capacity (OBLAC) of the Eurosystem NCBs is shown in the fourth column of Figure 7. It is the sum of Capital & Reserves, the Revaluation Accounts and Provisions. Note that the Revaluation Accounts are questionable as unconditionally loss absorbing resources. *“Revaluation accounts includes unrealised gains related to price movements, foreign exchange rate movements and market valuation differences related to interest rate risk derivatives. Also includes the unrealised gains of euro area NCBs that have arisen due to the change from national accounting rules to harmonised accounting rules for the Eurosystem.”*<sup>13</sup> This suggests that the securities whose unrealized gains are recognized in the Revaluation Accounts entry could well be worth less than their Revaluation-inclusive value if they had to be sold in a hurry. A more prudent

<sup>13</sup> See ECB, <http://financialgraphart.com/ecbtool.html>

measure of conventional loss absorption capacity would therefore consist only of Capital and Reserves, plus Provisions, excluding the Revaluation Accounts.

Note that the ECB, and the NCBs of the Eurosystem live in a world of their own as regards accounting standards, statutory capital requirements etc. There is, as a matter of fact, no statutory capital requirement for the ECB. NCBs tend to have (national) statutory capital requirements. Neither the ECB, nor the NCBs follow the IFRS accounting standards or the IPSAS accounting standards.<sup>14</sup> The Governing Council of the ECB has the statutory power to set harmonized accounting standards and principles for all euro area NCBs, making it easier for the ECB to determine whether an NCB is meeting its commitment to do all it can, within the constraints of the NCB's total resources, to keep the ECB adequately capitalised.<sup>15</sup>

The conventional loss absorption capacity figures are relatively modest for most NCBs, if we include Revaluation Accounts, and very modest if we exclude Revaluation Accounts. For Italy, for instance, the OBLAC was €85.7bn at end-2013. With Italy's ECB capital key of 17.5%, Italian sovereign debt purchased under the €950bn PSPP would be €166bn.<sup>16</sup> The total amount to be spent under the current QE programme by NCBs on euro area public sector securities for their own risk is €760bn. Italy's capital-key weighed share of this would be €133bn. The ratio of Broad OBLAC to total NCB assets puts most NCBs into a leverage position that is more prudent than that of the commercial banks now supervised by the ECB. The ratio of Narrow OBLAC (capital and reserves) to total NCB assets puts all NCBs into a leverage position that is no better (and generally worse) than that of the commercial banks now supervised by the ECB. Yet, because individual NCBs have no control over their current and future seigniorage income, they are, as regards insolvency risk much more similar to commercial banks than to a normal central bank – one that has control over its seigniorage revenue.

In a number of publications, Ebrahim Rahbari and I have pointed out that the conventional, 'on-balance sheet' loss absorption capacity (OBLAC, Narrow or Broad) of a normal central bank is likely to be a material understatement of its true loss-absorption capacity and of its ability to meet its financial commitments now and in the future. The reason is that the conventional balance sheet (and OBLAC) omits the most important off-balance sheet asset of the central bank, the present discounted value (NPV) of its current and future seigniorage. For the NCB of the Eurosystem the omitted off-balance sheet asset is its capital-key weighted share of the NPV of the future seigniorage of the consolidated Eurosystem. We call this augmented, or comprehensive measure of the loss absorption capacity of a central bank – the sum of its OBLAC and (its share of) the NPV of future seigniorage – its

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<sup>14</sup> IFRS stands for International Financial Reporting Standards; IPSAS stands for International Public Sector Accounting Standards.

<sup>15</sup> Article 26.4. of Protocol 4 (ON THE STATUTE OF THE EUROPEAN SYSTEM OF CENTRAL BANKS AND OF THE EUROPEAN CENTRAL BANK) states "For the application of this Article, the Governing Council shall establish the necessary rules for standardising the accounting and reporting of operations undertaken by the national central banks."

<sup>16</sup> The total planned size of the Enhanced Asset Purchase Programme (EAPP) is €1,140bn or €60bn a month for 19 months. Of the €60bn monthly purchases, about €10bn will be spent by the NCBs on ABS and covered bonds, that is €190bn over the life of the programme. That leaves €950bn for public sector and supranational institutions debt, or €50bn each month – this is the PSPP part of the EAPP. Of the €50bn of PSPP monthly spending, 12 percent, that is, €6bn will be spent on selected supranational institutions, or €114bn over the life of the programme. This will be shared risk. Of the remaining €44bn to be spent each month mainly on sovereign bonds (with an unknown share going to other public sector entities), €4bn will be bought by the ECB (with shared risk), or €76bn total. The rest, €40bn per month or €760bn total (80% of PSPP purchases) will be bought by the NCBs, according to their capital keys, for their own risk (see Claeys et al. (2015)).

CLAC (comprehensive loss absorption capacity). Evidence in support of this view comes from the observation that the central bank of the Czech Republic, for instance, has managed quite nicely with negative conventional equity over a number of years.<sup>17</sup>

Clearly, that NPV can be anything (including infinite – in nominal terms), unless we impose constraints on the future rate of inflation. We therefore have estimated base money demand functions and calculated the NPV of future seigniorage on the assumption that inflation is 2% forever, and for a range of assumptions about real GDP growth (rather optimistic) and interest rates. Figure 7 includes a seigniorage column (and a CLAC column) based on a representative estimate of the Eurosystem's NPV of seigniorage over an infinite horizon at a 2 percent inflation rate – we have called this the non-inflationary comprehensive loss absorption capacity or NILAC.<sup>18</sup>

The numbers for seigniorage and CLAC are rather less discouraging than those for OBLAC. Italy has a CLAC of €625bn compared to an OBLAC in 2013 of €86bn. Greece has an OBLAC of €10bn and a CLAC of €100bn. Spain boasts a CLAC of €407bn but an OBLAC of a mere €20bn.

Does that mean all is well in the Eurosystem and that no NCB could ever become insolvent, even if its sovereign cannot come to its assistance, either by recapitalizing the central bank or by imposing a smaller haircut on sovereign debt held by the central bank than on that held by other creditors? That would be a tad too optimistic for two reasons.

First, Spain, say, may have a CLAC of €407, but its OBLAC is a mere €20bn. Any capital loss for the Banca d'España greater than €20bn would put it into negative (conventional) equity. How would markets (and fellow central bankers on the Governing Council of the ECB) respond to an NCB showing a negative OBLAC even though its CLAC remained healthy? In a rational, well-informed world, the markets, and the other members of the Eurosystem would be happy to lend to the NCB with negative OBLAC as long as its CLAC was positive. The resulting debt service could be taken care of out of the flow of future seigniorage income. Alternatively the NCB in question could borrow from well-informed, far-sighted markets against the expectation of its future seigniorage income. Is this the world that the majority of the Governing Council of the ECB or the markets inhabit? We doubt it.

Second, the scale of the exposure of an NCB to its (possibly risky) sovereign is not capped by the inherited stock of domestic sovereign bonds held by the NCB and the additional purchases mandated by the current QE programme. Should this first ECB QE programme not succeed in restoring inflation to its target level of below but close to 2 percent, further action will no doubt be initiated – both rate cuts (the ECB's deposit rate is, at -20bps, some distance above the tentative floor of -75bps that is being tested by the Swiss National Bank and the Danish National Bank) and further balance sheet expansion. Under the assumption that the 25% upper limit on the Eurosystem's share of any sovereign debt issue is binding, Figure 8 shows what, given unbridled QE, the maximum exposure of the various NCBs to their national sovereigns could become almost \$2trn if the stocks of marketable sovereign debt remained at their current levels. Furthermore, as time passes, the outstanding stocks of sovereign debt are likely to rise, as few euro area sovereigns

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<sup>17</sup> Czech National Bank (CNB) data report that capital and reserves of the CNB capital and reserves were negative from March 2002 to July 2014.

<sup>18</sup> See Buiter (2007, 2010a,b) and Buiter and Rahbari (2012a,b,c).

appear likely to run persistent budget surpluses in the foreseeable future. Finally, NCBs can make losses on their holdings of private securities and on their lending secured against private assets. The Central Bank of Luxembourg took losses in 2008 on its exposure to Luxembourg subsidiaries of Icelandic banks that offered each other's debt as collateral for central bank funding.<sup>19</sup>

We conclude that NCB insolvency, even under the generous 'no negative CLAC' definition of solvency, is a risk for a number of Eurozone NCBs. The risk is clearly greater if Revaluation Accounts are excluded from the definition of unconditional (conventional) loss absorbing capacity. It is a material risk if downward revisions of future potential output growth in the euro area lead to a downward revision of the NPV of future seigniorage revenues (the estimates in Figure 7 are based on the assumption of 1% p.a. real GDP growth for all time in the future).

**Figure 8. Eurosystem – Outstanding Government Bonds and Maximum ECB Can Purchase Under PSPP (€ Billions), 2015**

	Total Outstanding	Maximum ECB Purchases Under PSPP
Germany	1,207	301.8
Luxembourg	11	2.8
Austria	227	56.8
Finland	109	27.3
Netherlands	375	93.8
France	1,669	417.3
Belgium	384	96.0
Estonia	2	0.5
Slovakia	40	10.0
Malta	5	1.3
Cyprus	19	4.8
Ireland	204	51.0
Latvia	9	2.3
Lithuania	14	3.5
Slovenia	25	6.3
Portugal	218	54.5
Spain	1,003	250.8
Italy	1,909	477.3
Greece	321	0
<b>Total (ex Greece)</b>	<b>7,430</b>	<b>1,858</b>

Note: Figures refer to total outstanding marketable debt issued by each country's central government. The amount available for purchase is 25% of the total amount outstanding. We assume Greek debt is excluded for purchase, as it is already up against the 33% limit on aggregate debt holdings.

Source: Bloomberg and Citi Research

### What happens if an NCB goes bust?

As we noted above, an ordinary central bank that has only issued non-index-linked, nominal, own-currency-denominated liabilities cannot go bust in the sense that i) it cannot meet a payment due, ii) its comprehensive net worth is negative. However, even such a central bank can suffer losses that exceed its non-inflationary comprehensive loss absorption capacity (NILAC), even though they fall short of its unconstrained (by inflation) CLAC, which could be infinite in nominal terms. In such

<sup>19</sup> See Anne C. Sibert (2010).

a situation, we should expect some combination of two related developments, unless the central bank is recapitalized: a domestic and external reduction in the purchasing power of the base money issued by the central bank (i.e. inflation and currency depreciation) and a growing reluctance by the counterparties of the central bank to transact with it, and specifically to accept greater exposure to non-interest-bearing liabilities of that central bank or indeed to any fixed nominal interest rate liabilities. The counterparties may be official sector counterparties (e.g. other central banks) or private counterparties (domestic or foreign banks).

The situation is not all that different in the situation where a central bank has issued foreign-currency-denominated, real or index-linked liabilities and has suffered a large loss on its assets such that now even its unconstrained CLAC (and not just its OBLAC or NILAC) is negative: in such a situation, too, would we expect a rise in inflation, a depreciation of the currency and increasing difficulties for the central bank to find willing counterparties. In addition, it is conceivable that such a central bank may indeed default on its obligations or have its debt restructured.

It is clearly possible that, with limited P&L sharing, an NCB ends up with negative OBLAC and even with negative CLAC even if the consolidated Eurosystem shows positive OBLAC and CLAC. This risk increases greatly if the rules under which NCBs purchase sovereign debt for their own risk under the QE programme also require each NCB to purchase only its own sovereign debt (for its own risk). The NCB of a country with a sovereign that is at material risk of defaulting on its debt (Greece, Portugal and Italy, perhaps), could end up with significant holdings of high risk debt (up to 33 percent of the total marketable sovereign debt outstanding, and up to 25% of any individual bond issue). The rules governing the PSPP operations of the Eurosystem do indeed require that each NCB only buys the debt issued in its own jurisdiction (by the sovereign or other entities) under the 'own risk' part of the QE asset purchases.

What happens to an NCB in the Eurosystem that has negative CLAC? There are four possibilities:

1. The NCB may get recapitalized by its own sovereign.
2. It may get bailed out by other entities.
3. The debt issued the NCB gets restructured but it retains access to Target 2 for future funding.
4. It may lose the ability to transact with the rest of the Eurosystem.

#### **Can the Eurosystem avoid restructuring of its holdings of sovereign debt?**

#### **The ECB cannot participate in 'voluntary' sovereign debt restructurings.**

ECB Board member Benoît Cœuré has argued, as have others before him, that the ECB (and presumably NCBs as well) cannot voluntarily participate in a restructuring of any euro area sovereign debt they own.<sup>20</sup> Restructuring here includes any change in the debt contract that makes the debt less attractive to the holder, whether it takes the form of 'reprofiling' (extending the maturity of the debt instrument without changing the contractual interest rate or coupons or the principal to be repaid), other forms of NPV haircuts or face value haircuts. Voluntary participation in a sovereign debt restructuring is, according to this view, tantamount to 'direct monetary financing' of the sovereign, which is banned by Article 123 TEU.

<sup>20</sup> Interview with Benoît Cœuré, France24, 8 January 2015, [https://www.ecb.europa.eu/press/inter/date/2015/html/sp150110\\_1.fr.html](https://www.ecb.europa.eu/press/inter/date/2015/html/sp150110_1.fr.html)



Thus if the ECB were to hold a sufficiently large share (typically 25% + 1) of a sovereign debt issue under consideration for a 'voluntary' restructuring, it would have to block the collective action clause (CAC) from being invoked. The fact that the guidelines for QE include the condition that the Eurosystem does not hold more than 25% of any sovereign debt issue suggests that the ECB does not want to be in a position where it would be forced to block a voluntary restructuring of sovereign debt. As noted, the ECB also would not agree to include the sovereign debt holdings of the Eurosystem 'voluntarily' in the restructuring. Instead the ECB leaves open the option of the non-Eurosystem bond holders invoking the CAC and imposing an 'involuntary' restructuring on the dissenting minority, including the ECB.

**The Eurosystem is not a preferred or senior creditor**

This therefore does not rule out the ECB having an NPV or face value haircut imposed on its holdings of euro area sovereign debt. However, there is a widely held view that, despite the ECB claiming just pari passu status with private investors for the Eurosystem in the event of a forced restructuring of debt bought under the PSPP, the ECB would turn out to be either claim super-senior or preferred creditor relative to all private creditors, or to be the de-facto beneficiary of such super-senior creditor status. These are, as yet, untested waters likely to be tested in the years to come.

**Recap by own sovereign**

In a way recap by the own sovereign is the most straightforward way to deal with the insolvency of a Eurosystem NCB, at least as long as that sovereign is both willing and able to recapitalize the NCB. The ECB certainly believes that Eurozone member state governments are under an obligation to recapitalise their NCBs, should this prove necessary.

**The ECB opines that national sovereigns have a Treaty-derived duty to keep their NCBs properly capitalised**

The ECB bases its belief that member states of the monetary union have an obligation to keep their NCBs properly capitalised (at least up to the (national) statutory limit on the Treaty-based principle of NCB (and ECB) independence: *"The principle of financial independence requires an NCB to have sufficient means not only to perform its ESCB or Eurosystem-related tasks but also its national tasks (e.g. financing its administration and own operations). Financial independence also implies that an NCB should always be sufficiently capitalised. In particular, the ECB is of the view that the higher the level of capital, reserves and provisions against financial risks is, the higher the safeguards against future losses are. As mentioned in the ECB's Convergence Report 2010, any situation should be avoided whereby for a prolonged period of time an NCB's net (conventional) equity is below the level of its statutory capital or is even negative, including where losses beyond the level of capital and the reserves are carried over. Any such situation may negatively impact on the NCB's ability to perform not only its ESCB or Eurosystem-related tasks but also its national tasks. Moreover, such a situation may affect the credibility of the Eurosystem's monetary policy. Therefore, the event of an NCB's net equity becoming less than its statutory capital or even negative would require that the respective Member State provides the NCB with an appropriate amount of capital at least up to the level of the statutory capital within a reasonable period of time so as to comply with the principle of financial independence."*<sup>21</sup>

The ECB Opinion expressed in the previous paragraph is, however, just that: an opinion. The Treaty and the ECB/ESCB Statute, however, is silent on the obligation

<sup>21</sup> European Central Bank (2010), "OPINION OF THE EUROPEAN CENTRAL BANK of 9 December 2010 on the increase of Banque de France's capital and statutory reserve" (CON/2010/88), [https://www.ecb.europa.eu/ecb/legal/pdf/en\\_con\\_2010\\_88.pdf](https://www.ecb.europa.eu/ecb/legal/pdf/en_con_2010_88.pdf)

of a euro area sovereign to keep its NCB or the ECB properly capitalised.<sup>22</sup> The ECB can increase its own subscribed capital (currently €10.8 billion) or to make further calls for foreign reserve assets, but only within the limits and according to the conditions set by the EU Council. The Treaty does impose an obligation on the NCBs to use their monetary income to help keep the ECB properly capitalised.

Even for an unquestionably solvent sovereign, there may be a temptation to engage in bargaining and brinkmanship (*vis-à-vis* the rest of the Eurosystem and the other euro area sovereigns) over who should bear the burden of the recapitalization of its NCB or over the urgency and modalities of a recapitalisation. It is, after all, at least conceivable that other (foreign) parties share in bearing the burden, if the costs of deferred recapitalisation or non-remedied default fall at least in part on these other parties. If one of the consequences of non-remedied default is the exit of the insolvent NCB from the Eurosystem and a break-up of the EMU, pointing a gun at one's own head may be an effective negotiating ploy.

Such a temptation and tendency for brinkmanship may be magnified if said sovereign is *not* unquestionably solvent. It is certainly possible in such a scenario that the burden of recapitalizing the NCB could make the difference between a (most likely) solvent and an insolvent sovereign. Bailing out an NCB can tip a sovereign into insolvency just as bailing out private banks can.

Even an insolvent sovereign may be able to recapitalise her NCB by imposing a higher haircut on creditors other than its NCB (relative to the counterfactual where it did not have to recapitalize its NCB), up to a point. First, there may be legal obstacles in assisting the NCB financially following a default on sovereign debt held by that NCB. Recapitalizing an NCB following a default triggered by losses on the NCB's holdings of own sovereign debt looks substantively like granting the NCB preferred creditor status in the restructuring of that debt. In addition, there is of course a level of capital shortfall for the NCB that cannot be met by haircutting other private creditors. The limit on NCB recapitalization by an insolvent sovereign that can be funded by haircutting other (private) creditors of the sovereign is more likely to become a binding constraint the higher the level and share of domestic government debt held by the NCB. That is, if exposure to its own bust sovereign is the main reason for the insolvency of the NCB – as may turn out to be the case for some Eurozone NCBs as a result of the QE programme that started in March 2015 and its possible successor programmes – it may be more difficult for a sovereign to recapitalize its NCB following an NCB insolvency triggered by the default of that sovereign.

### **Recapitalisation by other entities**

If its sovereign is unable or unwilling to recapitalize an NCB, it may still get recapitalized by other entities, such as other NCBs, other sovereigns in the Eurozone (or outside the Eurozone), private sector institutions or international

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<sup>22</sup> Article 33.2. of Protocol 4 (ON THE STATUTE OF THE EUROPEAN SYSTEM OF CENTRAL BANKS AND OF THE EUROPEAN CENTRAL BANK) states: "In the event of a loss incurred by the ECB, the shortfall may be offset against the general reserve fund of the ECB and, if necessary, following a decision by the Governing Council, against the monetary income of the relevant financial year in proportion and up to the amounts allocated to the national central banks in accordance with Article 32.5." What happens if the ECB's loss exceeds its general reserve fund and the monetary income of the NCBs in the year the loss is incurred is not clear. There is no clear obligation for NCBs to satisfy a capital call by the ECB, even if the NCBs have the resources to do so. What happens if one or more NCBs are themselves under capitalised is not addressed either in the Treaties.

organisations such as the IMF. These entities may provide an *ex-post* bailout even if they did not make any such promise *ex-ante*, or, as in the case of the Eurosystem, explicitly ruled out profit and loss sharing between NCBs *ex-ante*. The most likely primary motivation in providing such an *ex-post* bailout would be to avoid Eurozone exit by the country whose central bank is bust, and to thereby avoid the uncertain, but potentially very significant negative consequences for that economy, but also for the Eurozone and the world economy more broadly. A special case of a bailout by the remainder of the Eurosystem would be if the Eurosystem increased aggregate base money issuance to such an extent (through further QE, for instance) that the insolvent NCB's ECB capital key-weighted share of the increased aggregate seigniorage is sufficient to cover its capital hole. Of course such a base money increase may potentially have inflationary consequences.

**If an insolvent NCB cannot be recapitalized by its (insolvent) sovereign, the classic European “fudge”: *ex-post* P&L sharing despite an *ex-ante* commitment to no P&L sharing is one possible outcome.**

It is possible, perhaps likely, that the rhetoric of no *ex-ante* P&L sharing would give way to the reality of *ex-post* P&L sharing, should push come to shove and an NCB were threatened with insolvency that could not be remedied by its sovereign: the other NCBs and/or their sovereigns could cave in and absorb these solvency-threatening losses. Other external entities with deep pockets could also come to the rescue. If such a classic European “fudge” is not served up in time, an irreparably insolvent NCB is not a credible counterparty for the rest of the Eurosystem (through Target 2) or for the private sector.

**An irreparably insolvent NCB is not a credible counterparty in Target 2.**

The irreparably insolvent NCB will be unable to obtain additional credit from the rest of the Eurosystem through Target 2 – no NCB, whether directly or through the ECB, could extend credit to an insolvent NCB and live with the political fall-out. That is in addition to the legal consequences of lending to a counterparty that is known to be in default. If the insolvency of the NCB also creates doubts in the mind of existing and potential future private creditors of the NCB about whether their exposure to the insolvent NCB (in the form of monetary or non-monetary liabilities of the NCB) is safe and secure, private creditors will not renew any credit to the insolvent NCB that matures and will not extend any new credit. Consequently that NCB effectively/operationally ceases to be part of the Eurosystem and the country dependent on it is effectively forced out of the monetary union. The question of who stands behind the monetary and non-monetary liabilities of an insolvent NCB will be discussed next.

### **NCB debt restructuring: who stands behind the liabilities of an insolvent NCB?**

**Most of the liabilities of an insolvent NCB would most likely be backed/guaranteed by the solvent members of the Eurosystem.**

The banknote component of the Eurosystem's monetary base is a competence of the ECB. Indeed, the signature of the President of the ECB is on all the currency notes, even though they are issued in all member states and printed in the majority of them and in the UK. The first character of each note's serial number identifies the printing facility – not necessarily the country it was issued in.<sup>23</sup>

Euro coins have a national side that shows the country of issuance (but not necessarily the country of minting). Euro coins, unlike euro banknotes, are a national competence – not a competence of the ECB, but the ECB approves the volume of euro coins that each nation can issue. In the case of banknotes, the ECB both approves the volume of the notes and issues them.<sup>24</sup> On February 6, 2015 the

<sup>23</sup> There are 17 printing works in Europe (two in the UK) that produce euro banknotes, see [http://en.wikipedia.org/wiki/Euro\\_banknotes](http://en.wikipedia.org/wiki/Euro_banknotes)

<sup>24</sup> See ECB, <https://www.ecb.europa.eu/euro/coins/html/index.en.html>

value of the banknotes in circulation was €1,005 billion. The value of euro coins in circulation was €25bn.<sup>25</sup>

It is all but certain that the euro bank notes and coins issued by an insolvent NCB would remain legal tender in the euro area. If such is the case, the existing holders of these financial instruments are in the clear. In addition, there would be no material risk of the solvent members of the Eurosystem being presented with demands for conversion of the monetary liabilities of the insolvent NCB into something else – something they cannot create (virtually costless) in unlimited quantities. Coin and currency are irredeemable instruments – the holder cannot demand that the issuer exchanges a euro note or euro coin for anything else other than, at best, an equivalent amount of itself. At best you may get two €5 banknotes in exchange for one €10 banknote. This means that euro banknotes and euro coins are only ‘pro forma’ liabilities of the issuer. They are an asset to the holder but not, in any meaningful sense, a liability of the issuer.

What about the other component of the monetary base – bank reserves (strictly speaking reserves held by deposit credit institutions and called current account holdings), required or excess, held as overnight deposits at the NCBs? It seems highly unlikely that the rest of the Eurosystem would not stand behind the bank reserves of an insolvent NCB. For the consolidated Eurosystem, ‘Liabilities to euro area credit institutions related to monetary policy operations denominated in euro’, aka bank reserves, stood at €270bn on February 6, 2015 (see Figure 9).

Figure 9. Conventional Balance Sheet of the Consolidated Eurosystem, as of Feb 6, 2015

Assets (€ millions)		Liabilities (€ millions)	
1. Gold and gold receivables	343,867	1. Banknotes in circulation	1,004,694
2. Claims on non-euro area residents denominated in foreign currency	273,069	2. Liabilities to euro area credit institutions related to monetary policy operations denominated in euro	269,510
2.1 Receivables from the IMF	79,881	2.1 Current accounts (covering the minimum reserve system)	233,704
2.2 Balances with banks and security investments, external loans and other external assets	193,187	2.2 Deposit facility	35,802
3. Claims on euro area residents denominated in foreign currency	34,233	2.3 Fixed-term deposits	0
4. Claims on non-euro area residents denominated in euro	19,827	2.4 Fine-tuning reverse operations	0
4.1 Balances with banks, security investments and loans	19,827	2.5 Deposits related to margin calls	3
4.2 Claims arising from the credit facility under ERM II	0	3. Other liabilities to euro area credit institutions denominated in euro	5,388
5. Lending to euro area credit institutions related to monetary policy operations denominated in euro	557,099	4. Debt certificates issued	0
5.1 Main refinancing operations	151,768	5. Liabilities to other euro area residents denominated in euro	88,426
5.2 Longer-term refinancing operations	404,788	5.1 General government	55,236
5.3 Fine-tuning reverse operations	0	5.2 Other liabilities	33,190
5.4 Structural reverse operations	0	6. Liabilities to non-euro area residents denominated in euro	75,904
5.5 Marginal lending facility	517	7. Liabilities to euro area residents denominated in foreign currency	1,479
5.6 Credits related to margin calls	26	8. Liabilities to non-euro area residents denominated in foreign currency	5,673
6. Other claims on euro area credit institutions denominated in euro	64,566	8.1 Deposits, balances and other liabilities	5,673
7. Securities of euro area residents denominated in euro	600,985	8.2 Liabilities arising from the credit facility under ERM II	0
7.1 Securities held for monetary policy purposes	226,599	9. Counterpart of special drawing rights allocated by the IMF	56,374
7.2 Other securities	374,386	10. Other liabilities	216,402
8. General government debt denominated in euro	26,665	11. Revaluation accounts	330,898
9. Other assets	229,901	12. Capital and reserves	95,464
<b>Total assets</b>	<b>2,150,212</b>	<b>Total liabilities</b>	<b>2,150,212</b>

Source: ECB and Citi Research

At that same date ‘Other liabilities to euro area credit institutions’ of the Eurosystem were €5.6bn, ‘Liabilities to other euro area residents denominated in euro’ were €111bn, ‘Liabilities to non-euro area residents denominated in euro’ were €76bn, the

<sup>25</sup> See ECB, <https://www.ecb.europa.eu/stats/euro/circulation/html/index.en.html>

Eurosystem had gross liabilities to the IMF (the counterpart of SDRs allocated by the IMF) of €56bn, and 'Other liabilities' came in at €216bn. 'Capital and reserves', at €95bn and 'Revaluation accounts' at €331bn together constitute the OBLAC of the consolidated Eurosystem. The item 'Debt certificates issued' is a reminder that, in the past, some of the Eurosystem NCBs have issued bills. The amount outstanding is modest: €0. Nevertheless, the ability to issue bills (and indeed bonds, on the reasonable premise and sound legal principle that what is not explicitly *verboden* is allowed) gives the Eurosystem an extra degree of freedom in non-monetary funding – something the Fed lacks.

Frankly, it is difficult to conceive of the rest of the Eurosystem not guaranteeing (*ex-post* if not *ex-ante*) all but a very limited amount of the liabilities of an insolvent NCB. The only exception would be liabilities incurred, say, by an NCB acting as an agent of its own government in some financial transactions, that is, activities undertaken by the NCB that were not part of the implementation of the common monetary policy, and in which the NCB was not acting as a member of the Eurosystem. This is good news, no doubt for the non-Target 2 creditors of the insolvent NCB, but it does nothing to mitigate the risk that an irreparably insolvent NCB will effectively be forced out of the Eurosystem.

**However, the solvent part of the Eurosystem would want to restrict further access to Target 2 to an insolvent NCB.**

It is the very logic of the argument that the rest of the Eurosystem will guarantee the (bulk of the) liabilities of any individual insolvent NCB (the 'stock guarantee') that makes it highly likely that the rest of the Eurosystem (through the Governing Council of the ECB) will deny an irrevocably insolvent NCB *additional* recourse to Target 2 and will presumably also prohibit that NCB from additional borrowing from other (mainly private) counterparties (future flow restrictions). By the time an NCB is insolvent, it can of course no longer engage in 'own risk' lending or asset purchase operations, so further lending by this NCB through its ELA facility would be stopped by the Governing Council. Other own-risk activities would also be truncated, including own-risk sovereign debt purchases under the PSPP. But an insolvent NCB could also not engage in monetary or credit policy-related asset purchases or lending operations to which risk pooling applies: that insolvent NCB would never be able to meet any claims made on it through the risk-pooling arrangements. It would therefore be cut off from additional credit from the rest of the Eurosystem (Target 2) and be prevented from borrowing from other counterparties. It is in any case doubtful that outside the Eurosystem new creditors for the insolvent NCB could be found, especially when the rest of the Eurosystem is limiting its exposure to the insolvent NCB by capping the insolvent NCB's Target2 net debit balance. Without further access to funding from the rest of the Eurosystem (through Target 2), the insolvent NCB can no longer provide the credit and other services provided by a normal central bank. Insolvency drives the NCB effectively out of the Eurosystem.

**The Eurosystem is becoming a system of currency boards rather than the operationally decentralized central bank of a monetary union.**

This is rather like a central bank that is a peripheral member of a currency board running out of foreign exchange reserves and, like Argentina in January 2002, being forced out of the currency board. The analogy is even clearer if it is recognized that a solvent central bank (that is also recognized as solvent by market players and by the authorities of the country whose currency defines the currency board) ought to be able to borrow reserves.

The country with the insolvent NCB could try to postpone the inevitable official exit from the Eurozone by introducing capital and currency controls, including limits on deposit withdrawals and on the use of domestic credit cards abroad, and it could issue scrip, or a shadow currency, say by paying its bills (including public sector wages) with deferred tax certificates – non-interest-bearing instruments with an endogenous market price in terms of euro – that would be acceptable in payment of taxes and other debts to the public sector, and that may also function as the unit of

**Exit of the country with the insolvent NCB from the Eurozone can be postponed through capital controls and the introduction of a shadow national currency.**

account and invoicing 'currency' in domestic transactions. As long as this scrip/shadow currency (let's call it the New Drachma or ND) is not officially designated as legal tender, this would not violate the Treaty.

Most likely, a country that cannot access the Eurosystem either through the normal liquidity and credit facilities or through the national ELA, will conclude sooner or later that turning the scrip into a full-fledged national currency is the least bad alternative to full membership in the EMU. Formal exit from the monetary union, accompanied by redenomination of euro-denominated contracts under domestic law into ND-denominated private contracts, a unilateral standstill on official debt service (or some combination of redenomination (an act of default) and outright repudiation) would follow.

Again, this is not inevitable. It would be possible to shut down or liquidate the insolvent NCB (with the rest of the Eurosystem taking on (the bulk of) its liabilities) and for the banks and other Eurosystem funding-eligible MFIs (deposit credit institutions) in the jurisdiction of the now defunct NCB to fund themselves at one of the other, still solvent, NCBs or at the ECB itself. There is, as far as we can tell, no Treaty obstacle to the ECB providing collateralised funding to banks in any euro area member state or engaging in asset purchases in any of them. It could even rent the premises of the defunct NCB to open an ECB branch office and provide central bank services to the counterparties of the defunct NCB. Alternatively, the insolvent NCB might continue to be treated (by the ECB, with the consent of the NCB governors and/or the Governing Council of the ECB) as an eligible counterparty in Target 2, despite it being insolvent. If this were legally and politically possible, this would restore the Eurosystem to a central banking system administering a proper monetary union. The system as a whole would effectively guarantee the liabilities of the consolidated Eurosystem, including those issued by insolvent individual NCBs. In the Appendix it is shown formally how individual national central banks can be insolvent (according to the OBLAC and the CLAC definitions of solvency) even though the consolidated Eurosystem is solvent and, subject to the usual caveat (no excessive foreign currency-denominated or index-linked liabilities), can always remain solvent.

**Ex-post P&L sharing – the European “fudge” – can take many forms.**

Thus either the country whose NCB is insolvent is effectively forced out of the Eurosystem, or there is ex-post profit and loss sharing by the Eurosystem, by the other euro area sovereigns or by deep-pocketed extra-euro area entities.

### **(3) The unavoidable enhanced (quasi) fiscal role of the Eurosystem**

**Central banks inevitably play a quasi-fiscal role**

In liberal democracies, the principle of 'no taxation without representation' matters. Decisions on public spending on goods and services and on taxation, transfer payments and subsidies are supposed to be taken by duly elected representative bodies (parliaments). Unfortunately, the actions of any central bank always have unavoidable fiscal consequences. These actions are sometimes called 'quasi-fiscal', because their fiscal nature is hidden and the entity performing the actions is not the Ministry of Finance, Treasury or other recognized fiscal government entity whose actions require parliamentary approval. Whatever the formal ownership arrangements of a central bank (and they are many, varied and at times bizarre), the national Treasury (Ministry of Finance) is usually the beneficial owner of a national central bank: it is the claimant to the bulk of the profits of the NCB.

**A policy rate increase redistributes from debtors to creditors**

Even the most routine of conventional central bank policy actions, an increase or reduction in one or more of the policy interest rates, involves an unavoidable redistribution between creditors and debtors. This is true regardless of whether the level of the policy rates in question happens to be positive or negative.

**Through the terms and conditions of asset purchases and lending operations, central banks can pay (opaque) subsidies and transfer payments**

Actions equivalent to taxation (unrequited payments – payments without an equivalent quid-pro-quo – from private entities to the state) are undertaken by the central bank when it imposes reserve requirements that are not remunerated at their ‘fair’ opportunity cost. Subsidies and grants (unrequited payments from the state to private entities) are given whenever the central bank buys securities outright from private counterparties at prices and on terms that are better than fair value and when collateralized loans are extended to private counterparties on terms and conditions that are better than fair value for the counterparty. During the financial crisis, the Eurosystem, the Fed and the Bank of England all engaged in such quasi-fiscal grants and subsidies on a large scale and without transparency (even when a suitable period of time had elapsed since the quasi-fiscal intervention). The Eurosystem has continued these quasi-fiscal grants and subsidies through the SMP, the LTRO, the TLTRO, the ABSPP and three CBPPs. No doubt the asset purchases under the ECB’s QE programme (the Expanded Asset Purchase Programme with its sub-component, the Public Sector Purchase Programme) will again involve material implicit transfers to the Eurosystem’s counterparties. Exhaustive public spending (spending on real goods and services), both current and capital, is undertaken by the central bank when it pays its staff without the budget for these payments having received parliamentary approval, and when it builds impressive new headquarters at a significant cost, again without parliamentary approval and appropriation of funds.

**Even helicopter money drops can technically be performed by the central bank on its own**

There even are those who recommend that ‘helicopter money drops’ (cash transfers to households or other economic entities paid for by borrowing from the central bank which permanently monetizes this transaction) be undertaken in the euro area not as a joint operation by the Eurosystem and the national fiscal authorities (or some Brussels agency) but by the central bank alone (Bossone (2015)). Technically, helicopter money drops by the central bank alone are simple. It is the legal and political obstacles to the central bank acting in such a blatantly fiscal capacity without parliamentary approval (presumably from the European Parliament, although that also includes MEPs from non-Eurozone member states) that would threaten to undermine the legitimacy of the central bank.

**Eurosystem operations redistribute between member states ...**

What is prima facie unique about the asset purchases and collateralized lending operations associated with the implementation of the monetary policy of the Eurosystem is that they can also redistribute resources between economic entities domiciled in, or residents of, different nations. With risk sharing (profit and loss sharing), losses on, say, German sovereign debt suffered by the Bundesbank as a result of a German sovereign default, are shared among the 19 Eurozone NCBs according to their ECB capital keys (see Figure 1).<sup>26</sup> Because national Treasuries and, ultimately, national tax payers and beneficiaries of national public spending are the beneficial owners of their NCBs, the majority (just under 75%) of these losses would be borne by the tax payers and beneficiaries of public spending in the 18 Eurozone member states other than Germany.<sup>27</sup>

<sup>26</sup> Germany (or rather, West Germany) was the last of the West-European nation states to default on its sovereign debt before Greece. This happened in 1948 (for the domestic debt) and in 1953 (for the foreign debt). A number of German Länder have been bailed out by the German Federal government since then.

<sup>27</sup> The German ECB capital key is, from Figure 1, 25.57%.

... just as conventional central bank operations redistribute between states, regions and provinces

The reason this potential cross-border redistribution between Eurozone nation states is less unique than it appears to be is obvious once we extend the concept of nation states in a monetary union to other regions within a (national) monetary union. The Fed can buy state debt and the debt of local authorities (including, in principle, Detroit) up to a maturity of 6 months.<sup>28</sup> The Fed (and the Bundesbank) can repo with banks domiciled/resident in different states, regions or Länder against securities issued by corporate entities domiciled or resident in different regions, states and Länder. Default by a counterparty and the issuer of the underlying security offered as collateral by that counterparty can cause interregional redistributions from Alaska to Texas or from Hamburg to Bavaria.

If we are going to have a monetary union rather than a system of currency boards for the euro area, profit and loss sharing is essential. In a first-best world, the national governments of the euro area would explicitly guarantee the losses of the Eurosystem incurred as part of the implementation of the single monetary policy, with losses shared and compensated according to the ECB capital key. Should one or more of the Sovereigns be insolvent and incapable of coming up with its share of the Eurosystem's losses, the capital keys of the remaining solvent sovereigns would be increased proportionally to make up for the missing contributions of the insolvent sovereigns. Such a procedure is of course equivalent to full profit and loss sharing by the NCBs – the rule that was supposed to govern the Eurosystem until it got perverted by the own-risk ELA construction, the admission of own-risk dodgy collateral and now the 80% own-risk PSPP.

The only way to run a monetary union without profit and loss sharing is for the NCBs to restrict the risk they take to a level that can be absorbed by their risk absorption capacity. That would severely limit the ability of the NCBs to take on exposure to sovereigns and to private counterparties (outright or collateralised), since all sovereign debt is, in principle, risky in a monetary union where no single sovereign controls the seigniorage tap. But even restricting all asset purchases and lending operations to the lowest risk instruments and counterparties would mean no or very limited purchases of public debt from the euro area periphery, no purchases of regional, provincial and local government debt, no repos with many of the euro area banks except against gold-plated collateral, and generally, a retreat of the Eurosystem to an irrelevant oasis of local tranquility while financial tempests rage in the rest of the euro area. The only way, without full risk sharing, to allow the NCBs to take material credit risk is to capitalize them much better, even if we take the CLAC definition of loss absorption capacity (probably without the Revaluation Accounts) as our metric – as we should.

If we are going to have profit and loss sharing, financial stability would be served by having *ex-ante* risk sharing announcements rather than *ex-ante* assertions that some or all monetary and credit operations undertaken by NCBs are at the NCBs' own risk followed, in extremis, by *ex-post* mutualisation of solvency-threatening losses. *Ex-ante* denial of risk sharing signals a lack of solidarity between the partners in a monetary union. Worse than that, it signals a lack of elementary understanding of the minimal fiscal prerequisites for a viable monetary union. Greater transparency of the quasi-fiscal actions of the Eurosystem and more stringent accountability of the ECB and the members of the Governing Council are essential if the Monetary Union is to gain the legitimacy necessary for it to survive.

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<sup>28</sup> The Federal Reserve Act (section 14, 2(b)), prohibits the Fed from purchasing muni debt with a maturity of more than six months. It also prohibits the purchase of any official debt issued by Puerto Rico.



It is time for the euro area to recognise the minimum *ex-ante* fiscal burden sharing pre-requisites for an effective and long-term viable monetary union. It is generally recognized that, without a strong Federal fiscal union (mutualisation of much of the outstanding sovereign debt and of future sovereign debt issuance, material discretionary Federal spending, taxation and borrowing capacity), the Eurozone needs the following merely to survive:

**Viable monetary union requires:**

- **An SDRM**
- **A mutualized conditional sovereign liquidity facility**
- **A mutualized backstop for recapitalizing SIFIs**
- **Profit and loss sharing among NCBs**

**Minimal fiscal conditions for a *viable* monetary union**

(1) A sovereign debt restructuring mechanism (SDRM) backed by a mutualized conditional sovereign liquidity facility. The ESM provides such conditional funding for sovereigns, albeit on far too small a scale. A readily accessible fund of, say €1 trillion, and an overdraft facility or credit line with the ECB, jointly and severally guaranteed by the euro area member states, would be a good start. There is no SDRM because the Eurozone political and central banking leadership refuses to recognize the material risk of future sovereign debt restructuring in the euro area. Why plan for something that is inconceivable – that you believe will never happen?

(2) A mutualized fiscal backstop for the recapitalisation of systemically important banks and other financial institutions that cannot be adequately recapitalized by bailing in, even to the fullest extent, their unsecured creditors or by drawing on their national bank recapitalisation facilities. Again the ESM fulfills this role, although again with woefully inadequate resources. A €55bn mutualized backstop (the SRF) is also envisaged in the fullness of time.<sup>29</sup> Adding a zero to this figure and, again providing an overdraft facility or credit line with the ECB would make banking union a reality.

This note argues that profit and loss sharing for all Eurosystem activities undertaken as part of the implementation of the single monetary and credit policies of the ECB is an essential component of a viable monetary union. We therefore add a third necessary condition for viability:

(3) Unrestricted profit and loss sharing among all NCBs for all actions undertaken to implement the single monetary and credit policy of the ECB

A common deposit guarantee regime backed by a common fund would be a useful, but not an essential part of the minimal fiscal union. With the Eurosystem acting as lender of last resort to euro area banks, deposit runs will not have material financial stability consequences, as the bank losing deposits can find alternative funding from its NCB. Under these conditions, deposit insurance is partly social policy (aimed at protecting small depositors from financial loss) and partly a policy to boost efficiency at the micro level: it represents an inefficient use of resources for small depositors to engage in the due diligence necessary to determine the creditworthiness of the bank(s) that they entrust their money to.

**Further conditions for an *effective* monetary union**

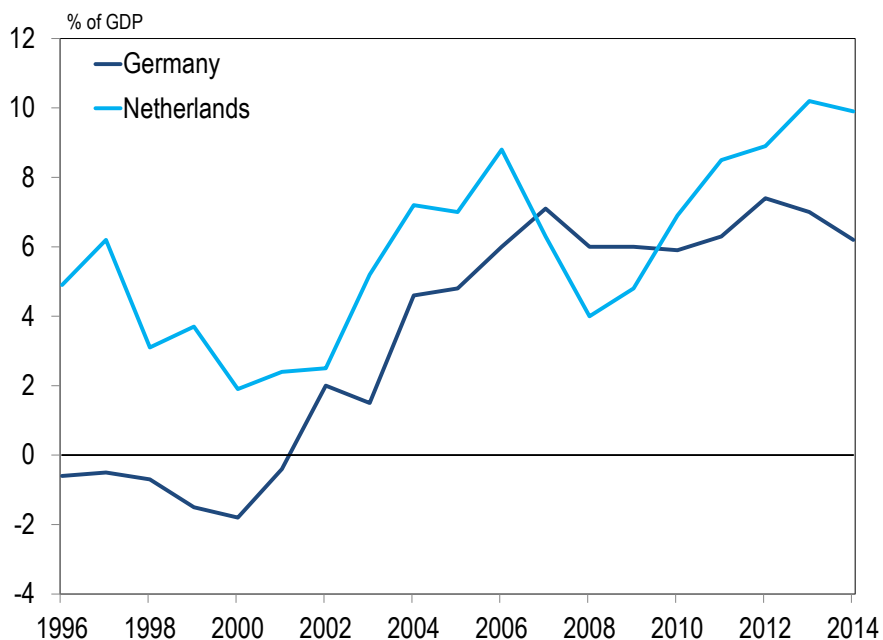
Viability – technical survival – is a necessary condition for keeping an institution. It is not sufficient. It has to work well – or at least better than the alternatives. The Eurosystem is part of such a badly designed and poorly functioning set of arrangements for the conduct of monetary and fiscal policy in the Eurozone, that it is difficult to envisage its political survival for very much longer unless radical changes are made.

**Effective monetary union requires:**

<sup>29</sup> The Single Resolution Fund will build up to its target €55bn level over an 8-year period after the adoption of the proposals on 24 November 2014.

- **Monetization of public debt and deficits at the discretion of the ECB**
  - (1) Get rid of Article 123. This is the so-called (and mis-labeled) 'prohibition of monetary financing of government deficits'. Monetary financing of government deficits can be the most effective way of dealing with the threat of deflation and persistent (or indeed secular) stagnation. Helicopter money drops work. Yes, it is possible to mimic helicopter money drops through sovereign debt purchases by the ECB or the NCBs in the secondary markets undertaken for exclusively 'monetary purposes' (whatever that means), purchases that happen to coincide with a (reluctant and apparently unrelated) relaxation of fiscal constraints by Brussels, but this is non-transparent and is unlikely to provide the confidence boost that a transparent combined, coordinated fiscal and monetary stimulus can provide.
- **A dual mandate for the ECB**
  - (2) Give the ECB a dual mandate: price stability and maximum sustainable employment/resource utilization.
- **Institutionalized cooperation and coordination of monetary and fiscal policies**
  - (3) Recognise that cooperation and coordination between monetary and fiscal authorities is not inconsistent with central bank independence. The prevailing Teutonic view on this issue is that central bank independence means not answering the phone when the Ministry of Finance calls. This is a logical nonsense, in our view. Only independent agents can choose to coordinate and cooperate. Dependent entities get told what to do. Independence means the right to say 'no'. It does not mean the absence of the right to say 'yes'. Monetization of deficits always requires the approval of the central bank (the Governing Council of the ECB in the case under consideration).
- **Institutions and rules to encourage symmetric countercyclical policy**
  - (4) Create rules and institutions that encourage symmetric countercyclical policy. This means stronger incentives to tighten fiscally during the upswing and not just to look for a fiscal stimulus in the downturn – a common political ailment. It also means the need to recognise that there can be no irresponsible borrower (creditor, investor) without there also being (at the same time and as part of the same transactions) an irresponsible lender (debtor, saver). The massive and persistent current account surpluses of Germany and the Netherlands over the past decade are monuments to macroeconomic mismanagement (see Figure 10).

Figure 10. Germany and the Netherlands -- Current Account Balance (% of GDP), 1996-2014



Source: IMF and Citi Research

Having a sovereign debt restructuring mechanism which makes fiscal sustainability prior to the provision of conditional funding to governments a necessary condition for disbursement may help greater fiscal restraint during the upswing. The body making the fiscal sustainability assessment ought not, however, to be populated by officials and politicians. The manifest failure of the Troika to require Greece to restructure its sovereign debt in 2010 before providing financial assistance is a warning that should not be forgotten. Independent bodies of experts like the UK's Office of Budget Responsibility should make the assessment.

- **End micro-management by Brussels: return control over public spending, taxation and structural reform to member states.**

- (5) Centralizing control over increasingly detailed national budgetary matters (and structural reforms) in Brussels will become a steadily growing threat to the survival not just of the Eurozone but of the EU itself. The European Commission lacks legitimacy, the Council is opaque and not accountable to European citizens, except through national or sub-national electoral processes that are too far from the issues decided by the Council. The proportion of those entitled to vote that actually bothers to vote in elections for the European Parliament shows how far we are from having a European demos. If macroeconomic issues have to be decided at the supranational level, they should be limited to issues of fiscal and macroeconomic sustainability, specifying targets, floors or ceilings to debt and (structural) deficits as ratios to GDP. They should not touch on individual public spending and taxation decisions, nor on structural reforms – matters that the principle of subsidiarity assigns naturally to national or sub-national governments.

- **Restrict supranational macroeconomic control to national public debt and deficits, coordinated by the ECB.**

Because coordinated monetary and fiscal policy is so important for macroeconomic stability, the ECB should take the lead in setting coordinated national budgetary targets, with the Commission acting in an advisory capacity. If we ever get a serious Federal budget, the role of the Commission (and the European Parliament) will of course have to increase materially. I am sure my great-grandchildren will be up to the task.

## Conclusion

In this note we ask what would happen if an individual NCB in the Eurozone were to become insolvent, most likely because it had incurred heavy losses on assets acquired in activities that are not subject to mutualisation, like collateralised lending under emergency liquidity assistance (ELA) or purchases of its own sovereign debt under the Public Sector Purchase Programme of the ECB and possible successor programmes.

Recapitalisation by the other Eurosystem members or by the other euro area or EU sovereigns is certainly possible (perhaps likely, if the integrity of the monetary union is a serious concern of the other member states), but it means that the supposed absence of (*ex-ante*) profit and loss sharing makes way for *ex-post* profit and loss sharing when the going gets tough. So either the Eurosystem is a sheep in wolf's clothing when it comes to P&L sharing – in which case it will survive but ought to be transformed into a single central legal entity (the ECB) with a number of national or regional branches – or it means what it says when it comes to the mutualisation of profits and losses. There is no room for constructive ambiguity when it comes to the management of NCB losses. If there is insufficient *ex-post* mutualisation, the Eurosystem is not a monetary union but a system of currency boards. Currency boards collapse.

Profit and loss sharing is essential for a viable monetary union. The Eurosystem's steady drift away from profit and loss sharing adds to the list of existential risks faced by the euro area during the coming years.

As Winston Churchill once said of America, you can always rely on the EMU, like all of the EU, to do the right thing, once it has exhausted the alternatives. We are hopeful that the Eurosystem will revise what we see as its increasingly dysfunctional arrangements for profit and loss sharing before they cause real harm. If the Governing Council cannot restore something close to full profit and loss sharing for all financial transactions undertaken by the NCBs (if necessary by eliminating the ability of NCBs to engage in transactions and perform roles that are not part of the design and implementation of the common monetary and credit policy or of the Eurosystem's lender-of-last-resort role), a revision of the Treaty that imposes full profit and loss sharing should be considered.

## Appendix: a closer look at the insolvency of a national central bank in the Eurosystem

In this note we aim to be precise about what is meant by insolvency of an NCB, of the ECB and of the consolidated Eurosystem. .

### Conventional and Comprehensive Central Bank Balance Sheets

In this section, we illustrate that a central bank's on-balance sheet loss absorption capacity (OBLAC) is a poor measure of its comprehensive loss-absorption capacity (CLAC). OBLAC can be negative, while CLAC remains positive.<sup>30</sup>

### An ordinary central bank

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<sup>30</sup> CLAC is closely related to NILAC, the comprehensive non-inflationary loss-absorption capacity of a central bank (see Buiter (2007, 2008, 2010a, 2010b), Buiter and Rahbari (2012a, b, c)). Basically, NILAC is CLAC when the actual future inflation rate equals the target rate of inflation.

The conventional balance sheet of a national central bank that is not part of the Eurosystem can be represented as in Figure A1 (all values are measured in terms of domestic currency). On its asset side are the stock of gold and foreign exchange reserves, Treasury debt held by the central bank and private debt and collateralised loans to the private sector held by the central bank,  $R$ ,  $B$  and  $L$  respectively, all in nominal acquisition values, and  $\ell^R$ ,  $\ell^B$  and  $\ell^L$  are the loss rates (profit rates if negative) incurred on these three asset classes as a fraction of their acquisition value. On the liability side are the stock of base money (or high-powered money)  $M$ , which consists of the sum of currency in circulation (which carries a zero nominal interest rate) and commercial bank reserves (overnight deposits) held with the central bank (required reserves and excess reserves) which can carry a positive, zero or negative nominal interest rate. Non-monetary liabilities,  $Z$ , include term deposits, reverse repos and central bank bills and bonds. Central bank conventional net worth, equity or OBLAC is denoted  $W^{cb}$ .

**Figure A1. Stylized central bank conventional balance sheet**

Assets		Liabilities	
$R(1 - \ell^R)$	Gold and foreign exchange holdings	Base money	$M$
$B(1 - \ell^B)$	Treasury debt	Non-monetary liabilities	$Z$
$L(1 - \ell^L)$	Private sector debt and loans to private banks	Central bank conventional net worth, equity or OBLAC	$W^{cb}$

Source: Citi Research

However, the stylized conventional balance sheet of a central bank omits two major items on the asset side of its balance sheet, as shown in Figure A2, which has a stylized comprehensive central bank balance sheet.<sup>31</sup> These two items are the net present value (NPV) of the interest saved by the central bank in the current period and in all future periods, by being able to issue base money, and the NPV of the terminal base money stock.<sup>32</sup> The safe one-period nominal interest rate on non-monetary financial instruments is denoted  $i$  and the one-period average nominal interest rate on base money is  $i^M$ .

<sup>31</sup> The derivation of Figure A2 from the budget constraint of the central bank and a no-Ponzi finance solvency constraint (the present discounted value of the terminal non-monetary liabilities of the central bank cannot be positive) can be found in Buiter (2007).

<sup>32</sup> The variable inside curly brackets denotes the entire sequence of current and anticipated future values of that variable.

Figure A2. Stylized comprehensive central bank conventional balance sheet

Assets		Liabilities	
$R(1 - \ell^R)$	Gold and foreign exchange holdings	Base Money	$M$
$B(1 - \ell^B)$	Treasury debt	Non-monetary liabilities	$Z$
$L(1 - \ell^L)$	Private sector debt and loans to private banks		
$NPV\left(\{(i - i^M)M\}\right)$	NPV of interest saved by central bank through issuance of base money		
$NPV(M^\infty)$	NPV of terminal base money stock		
		Central bank comprehensive net worth or CLAC	$\hat{W}^{cb}$

Source: Citi Research

$\hat{W}^{cb}$  is the comprehensive net worth of the central bank.

In a rational, well-informed world, a central bank can function with a negative OBLAC as long as the sum of the NPV of the future profits of the central bank (gross of any payments (dividends) to its beneficial owner(s)), often referred to as the NPV of its future seigniorage revenues, plus its (negative) OBLAC is non-negative. Central bank solvency requires that its comprehensive loss absorption capacity (CLAC) be non-negative, which is quite compatible with negative OBLAC (negative conventional equity). That is, for large enough,

$$NPV\left(\{(i - i^M)M\} + M^\infty\right), \hat{W}^{cb} \text{ can be positive even if } W^{cb} \text{ is not.}^{33}$$

This also means that a central bank that has control over its future base money issuance, cannot go bust (i.e. default on a contractual commitment because of inability to pay) unless it has foreign-currency-denominated or real/index-linked non-monetary liabilities. As long as it is willing to run the printing presses (or their electronic equivalents) on a sufficient scale in the future, it will always be able to meet all its contractual commitments. Of course, the amount of future base money creation required to keep the central bank solvent may be so large that undesirably high inflation is generated. In the special case where the central bank achieves its inflation target today and in every future period, the CLAC has been dubbed the Non-Inflationary Comprehensive Loss Absorption Capacity or NILAC by Buiter and Rahbari (2012a,b,c).

### The Eurosystem

As noted above, the Eurosystem is no ordinary operationally decentralized central bank (like the Federal Reserve System), and neither are its constituent national central banks or the ECB. In Figure A3 and Figure A4, we present the stylized conventional balance sheets of a typical NCB and of the ECB.

<sup>33</sup> An equivalent representation of the comprehensive balance sheet of the regular central bank can be obtained from Figure A2 by making use of the identity that

$$NPV\left(\{(i - i^M)M\}\right) + NPV\left(M^\infty\right) - M \equiv NPV\left(\{\Delta M - i^M M\}\right)$$

Figure A3. Stylized Eurosystem national central bank conventional balance sheet,  $j=1, \dots, N$

Assets		Liabilities	
$R_j(1 - \ell_j^R)$	Gold & foreign exchange holdings subject to P&L sharing	Base money	$M_j$
$\bar{R}_j(1 - \ell_j^{\bar{R}})$	Gold & foreign exchange holdings not subject to P&L sharing		
$B_j(1 - \ell_j^B)$	Treasury debt subject to P&L sharing	Non-monetary liabilities other than to Target2	$Z_j$
$\bar{B}_j(1 - \ell_j^{\bar{B}})$	Treasury debt not subject to P&L sharing		
$L_j(1 - \ell_j^L)$	Private sector debt and loans to private sector subject to P&L sharing		
$\bar{L}_j(1 - \ell_j^{\bar{L}})$	Private sector debt & loans to private sector not subject to P&L sharing		
$C_j$	Target2 gross credit position	Target2 gross debit position	$D_j$
$s_j W^{ecb}$	Share of ECB equity		
		NCB conventional net worth or OBLAC	$W_j^{ncb}$

Source: Citi Research

The conventional balance sheets of an NCB that is part of the Eurosystem can be represented as in Figure A3, with the country injected by subscript  $j$ , which can range from 0 to  $N$ , where  $N$  is the number of NCBs in the Eurosystem. At the moment,  $N = 19$  and the ECB will have subscript 0.

There are a number of differences between the stylized conventional balance sheet of a Eurosystem national central bank and that of other central banks. First, for each of the assets listed in Figure A1, the Eurosystem NCB has two entries, depending on whether profit and loss sharing applies to the asset or not (variables with overbars denote assets for which there is no P&L sharing). Second, each NCB (in our notation, excluding the ECB,  $NCB_j$  for  $j = 1, \dots, 19$ ) has non-monetary liabilities to Target 2 (we can think of Target 2, viewed as the counterparty of the NCBs in intra-Eurosystem transactions, as the ECB) but does not engage in financial transactions with the other 18 NCBs directly.<sup>34</sup> Its Target2 gross credit position is denoted  $C_j$  and its Target2 gross debit position  $D_j$ . Finally, the 19 NCBs each own a share  $s_j$  of the ECB's equity.<sup>35</sup> The OBLAC of each  $NCB_j$  is denoted by  $W_j^{ncb}$ .

The conventional balance sheet of the ECB is given in Figure A4. All its activities are subject to P&L sharing. It is the counterparty to the Target2 transactions of the 19 NCBs. The CLAC of the ECB is  $W^{ecb}$ .

<sup>34</sup> This is a simplification, as netting takes place only at the end of each trading day.

<sup>35</sup>  $0 < s_j \leq 1$  and  $\sum_{j=1}^N s_j = 1$ .

Figure A4. Stylized ECB conventional balance sheet

Assets		Liabilities	
$R_0(1 - \ell_0^R)$	Gold and foreign exchange holdings	Monetary base	$M_0$
$B_0(1 - \ell_0^B)$	Treasury debt	Non-monetary liabilities	$Z_0$
$L_0(1 - \ell_0^L)$	Private sector debt and loans to private banks		
$\sum_{j=1}^N D_j$	Target2 gross credit positions of the NCBs	Target2 gross debit positions of the NCBs	$\sum_{j=1}^N C_j$
		ECB conventional net worth, equity or OBLAC	$W^{ecb}$

Source: Citi Research

An NCB in the Eurosystem does not have control over its future base money issuance. Under the profit and loss sharing rules of the Eurosystem, each NCB gets its ECB capital key-weighted share of the mutualized profits or losses of the Eurosystem as a whole. Mutualized profits and losses are the profits and losses from financial operations that are subject to profit and loss sharing. This therefore excludes the profits and losses from Eurosystem activities that are not subject to profit and loss sharing, emergency liquidity assistance (ELA), the additional credit claims that were made eligible for 7 NCBs as collateral for Eurosystem funding operations on December 8, 2011, but not subject to profit and loss sharing, the 'own NCB risk' share (80%) of the QE purchases of sovereign instruments and those NCB activities that are not part of their Eurosystem monetary policy function.

Each NCB in the Eurosystem therefore has as its 'off-balance sheet asset' its ECB capital key share of the NPV of the future seigniorage profits (net of 'own risk' profits) of the Eurosystem as whole. It has as an off-balance sheet liability its share of the mutualized losses (which could be negative) on the outstanding conventional financial and real assets of the Eurosystem as a whole. The NPV of the future seigniorage of the Eurosystem as a whole is not under the control of any individual NCB. The monetary policy actions (interest rates, balance sheet size and composition) of the Eurosystem are decided collectively by the Governing Council of the ECB. It is therefore possible that, if the losses suffered by an NCB on its own risk activities are sufficiently large, that NCB's CLAC could become negative.

The stylized comprehensive balance sheet of a Eurosystem NCB is depicted in Figure A5 and that of the ECB in Figure A6.

For  $NCB_j$ , on the asset side, there are two differences to the conventional balance sheet shown in Figure A5: each NCB has its ECB capital-key weighted share of the comprehensive net worth or CLAC of the ECB, which is the sum of the conventional equity and the future seigniorage profits of the ECB. It also has a claim on its capital key-weighted share of the future seigniorage profits of the 19 NCBs collectively. On the liability side, it shares the losses (profits) on the existing assets of the 19 NCBs;  $\hat{W}_j^{ncb}$  is the comprehensive net worth or CLAC of  $NCB_j$ .



Figure A5. Stylized NCB comprehensive balance sheet

Assets		Liabilities	
$R_j(1 - \ell_j^R)$	Gold & foreign exchange holdings subject to P&L sharing	Base money	$M_j$
$\bar{R}_j(1 - \ell_j^{\bar{R}})$	Gold & foreign exchange holdings not subject to P&L sharing		
$B_j(1 - \ell_j^B)$	Treasury debt subject to P&L sharing	Non-monetary liabilities other than to Target2	$Z_j$
$\bar{B}_j(1 - \ell_j^{\bar{B}})$	Treasury debt not subject to P&L sharing		
$L_j(1 - \ell_j^L)$	Private sector debt and loans to private sector subject to P&L sharing		
$\bar{L}_j(1 - \ell_j^{\bar{L}})$	Private sector debt & loans to private sector not subject to P&L sharing		
$C_j$	Target2 gross credit position	Target2 gross credit position	$D_j$
$s_j \hat{W}_j^{ ECB }$	Share of ECB's comprehensive net worth		
$s_j NPV \sum_{k=1}^N \{(i - i^M) M_k\}$ $+ s_j NPV \sum_{k=1}^N M_k^\infty$	Share of NPV of interest through issuance of base money plus terminal base money stock		
		Losses though P&L sharing on NCB assets	$-(1 - s_j)(\ell_j^R R_j + \ell_j^B B_j + \ell_j^L L_j)$ $+ s_j \sum_{k=1, k \neq j}^N (\ell_k^R R_k + \ell_k^B B_k + \ell_k^L L_k)$
		National central bank comprehensive net worth or CLAC	$\hat{W}_j^{ ncb }$

Source: Citi Research

Figure A6 and Figure A5 thus highlight that unlike an ordinary central bank, a Eurosystem NCB *can* go bust, i.e. its comprehensive net worth CLAC (let alone its OBLAC) can be negative, even if it does not have any foreign-currency denominated, inflation-indexed/real liabilities, as it cannot independently issue base money. For an NCB to be solvent, what is required is that its comprehensive net worth or CLAC be non-negative:  $\hat{W}_j^{ ncb } \geq 0$ . As with a regular central bank, for a Eurosystem NCB,  $\hat{W}_j^{ ncb } \geq 0$  is certainly compatible with its conventional net worth, equity or OBLAC being negative ( $W_j^{ ncb } < 0$ ).

This is certainly compatible with its conventional net worth, equity or OBLAC being negative, since:

$$\begin{aligned}
 \hat{W}_j^{ ncb } &= W_j^{ ncb } \\
 &+ s_j NPV \sum_{k=0}^N \{(i - i^M) M_k\} + s_j NPV N \sum_{k=0}^{19} M_k^\infty \\
 &+ (\ell_j^R R_j + \ell_j^B B_j + \ell_j^L L_j) \\
 &- s_j \sum_{k=1}^N (\ell_k^R R_k + \ell_k^B B_k + \ell_k^L L_k)
 \end{aligned} \tag{1}$$

and

$$\begin{aligned}
 W_j^{ncb} \equiv & R_j(1 - \ell_j^R) + \bar{R}_j(1 - \ell_j^{\bar{R}}) + B_j(1 - \ell_j^B) + \bar{B}_j(1 - \ell_j^{\bar{B}}) + L_j(1 - \ell_j^L) + \bar{L}_j(1 - \ell_j^{\bar{L}}) \\
 & + C_j - D_j - M_j - Z_j \\
 & + s_j \left( R_0(1 - \ell_0^R) + L_0(1 - \ell_0^L) + B_0(1 - \ell_0^B) + \sum_{k=1}^N (D_k - C_k) - M_0 - Z_0 \right)
 \end{aligned}
 \tag{2}$$

The conventional accounts already have P&L sharing on the assets held by the ECB through the equity share of each NCB in the ECB,  $s_j W^{ecb}$ . The last two entries on the right-hand side of equation (1) are a correction for the sharing of the losses on  $NCB_j$ 's P&L pooled assets with the 18 other NCBs and the loss sharing by  $NCB_j$  on the assets of the other eighteen NCBs. In addition  $NCB_j$  has as an off-balance-sheet asset a claim on its ECB capital-key weighted share of the seigniorage earned by the entire Eurosystem.

The comprehensive balance sheet of the ECB in Figure A6 is self-explanatory.

**Figure A6. Stylized ECB comprehensive balance sheet**

Assets		Liabilities	
$R_0(1 - \ell_0^R)$	Gold and foreign exchange holdings	Monetary base	$M_0$
$B_0(1 - \ell_0^B)$	Treasury debt	Non-monetary liabilities	$Z_0$
$L_0(1 - \ell_0^L)$	Private sector debt and loans to private banks		
$\sum_{j=1}^N D_j$	Target2 gross credit positions of the NCBs	Target2 gross debit positions of the NCBs	$\sum_{j=1}^N C_j$
$NPV(\{(i - i^M)M_0\})$	NPV of interest saved by central bank through issuance of base money		
$NPV(M_0^\infty)$	NPV of terminal base money stock		
ECB comprehensive net worth or CLAC			$\hat{W}^{ecb}$

Source: Citi Research

Finally, we also present both the conventional and the comprehensive balance sheets of the consolidated Eurosystem as a whole, in Figure A7 and Figure A8, obtained by consolidating the balance sheets of the 19 NCBs and the ECB.<sup>36</sup>

<sup>36</sup> In the appendix we also present the conventional and comprehensive balance sheet of the ECB.

Figure A7. Stylized consolidated Eurosystem conventional balance sheet

Assets		Liabilities	
$\sum_{j=0}^N R_j(1 - \ell_j^R)$	Gold & foreign exchange holdings subject to P&L sharing	Base money	$\sum_{j=0}^N M_j$
$\sum_{j=1}^N \bar{R}_j(1 - \ell_j^{\bar{R}})$	Gold & foreign exchange holdings not subject to P&L sharing	Non-monetary liabilities	$\sum_{j=0}^N Z_j$
$\sum_{j=0}^N B_j(1 - \ell_j^B)$	Treasury debt subject to P&L sharing		
$\sum_{j=1}^N \bar{B}_j(1 - \ell_j^{\bar{B}})$	Treasury debt not subject to P&L sharing		
$\sum_{j=0}^N L_j(1 - \ell_j^L)$	Private sector debt and loans to private sector subject to P&L sharing		
$\sum_{j=1}^N \bar{L}_j(1 - \ell_j^{\bar{L}})$	Private sector debt & loans to private sector not subject to P&L sharing		
		Eurosystem comprehensive net worth or CLAC	$\sum_{j=1}^N W_j^{ncb}$

Source: Citi Research

Figure A8. Stylized consolidated Eurosystem comprehensive balance sheet

Assets		Liabilities	
$\sum_{j=0}^N R_j(1 - \ell_j^R)$	Gold & foreign exchange holdings subject to P&L sharing	Base Money	$\sum_{j=0}^N M_j$
$\sum_{j=1}^N \bar{R}_j(1 - \ell_j^{\bar{R}})$	Gold & foreign exchange holdings not subject to P&L sharing	Non-monetary liabilities	$\sum_{j=1}^N Z_j$
$\sum_{j=0}^N B_j(1 - \ell_j^B)$	Treasury debt subject to P&L sharing		
$\sum_{j=1}^N \bar{B}_j(1 - \ell_j^{\bar{B}})$	Treasury debt not subject to P&L sharing		
$\sum_{j=0}^N L_j(1 - \ell_j^L)$	Private sector debt and loans to private sector subject to P&L sharing		
$\sum_{j=1}^N \bar{L}_j(1 - \ell_j^{\bar{L}})$	Private sector debt & loans to private sector not subject to P&L sharing		
$NPV \sum_{k=0}^N \{(i - i^M) M_k\}$	NPV of interest through issuance of base money plus terminal base money stock		
$NPV \sum_{k=0}^N M_k^\infty$			
		Eurosystem comprehensive net worth or CLAC	$\sum_{j=1}^N \hat{W}_j^{ncb}$

Source: Citi Research

The conventional equity of the ECB,  $W^{ecb}$ , does not show up in the consolidated account because it is fully owned by the 19 NCBs. Although the ECB may have a net positive or negative Target 2 balance (that is, it is possible that

$\sum_{j=1}^N C_j \neq \sum_{j=1}^N D_j$ ) the consolidated Eurosystem of course has a zero net Target 2 balance.

In the consolidated comprehensive balance sheet of the Eurosystem, the comprehensive net worth of the ECB does not appear – again because it is owned by the 19 NCBs. Like the net Target 2 balance of the consolidated Eurosystem, all the loss sharing terms net out as well.

For the Eurosystem to be solvent, what is required is that its comprehensive net

worth or CLAC be non-negative  $\sum_{j=1}^N \hat{W}_j^{ncb} \geq 0$ . At this point, it will come as no

surprise that the CLAC of the Eurosystem can be positive even if its OBLAC is not. Furthermore, the Eurosystem in aggregate cannot go bust for willingness to pay, as long as it does not have significant real, inflation-indexed or foreign-currency-denominated liabilities. Yet a solvent consolidated Eurosystem is fully consistent with one or more individual NCBs being insolvent.

The difference between CLAC and OBLAC is not just theoretical. They vary hugely in size, as can be seen from Figure 7. We noted that the OBLAC of the Eurosystem is barely €400bn (4% of EA GDP). By contrast, in 2012 we estimated the Eurosystem's NILAC, which is its CLAC when the future actual rate of inflation is 2 percent, to be €3.4trn, ie almost seven times as large.<sup>37</sup>

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## Appendix A-1

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