

TARGET2 and Central Bank Balance Sheets

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Abstract: The euro area’s TARGET2 payments system has featured heavily in academic and popular discussions of the euro crisis. Some of this commentary has described the system as being responsible for a “secret bailout” of Europe’s periphery. Another common theme has been that the system has built up large credit risks for Germany should the euro break up. This paper discusses the TARGET2 system, focusing in particular on how it impacts the balance sheets of the central banks that participate in the system. It discusses the factors driving TARGET2 balances, considers some counterfactual cases in which euro area monetary policy operated differently, examines the risks to Germany and considers proposals for settlement of these balances.

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1. Introduction

One of the key challenges facing macroeconomists these days is understanding the roles played by central banks in a world where their involvement in the economy has moved far beyond the limited set of tasks prescribed for them by standard pre-crisis macro theory. A good illustration of these challenges is the ongoing debate about the euro area's TARGET2 real-time electronic payments system and its implications for central bank balance sheets.

The accounting system used by the Eurosystem for processing payments through TARGET2 has resulted in large claims and liabilities being recorded on the balance sheets of various euro area national central banks. Bank transfers from one euro area member state to another have resulted in balance sheet entries in which the central bank of the country transferring the money records a liability to the rest of the Eurosystem while the central bank of the receiving country records a credit. In particular, the Bundesbank's balance sheet has changed dramatically as it has built up a so-called "Intra-Eurosystem" credit equivalent to about one quarter of German GDP.

The balance sheet changes associated with TARGET2 transfers have provoked a significant outpouring of opinion pieces as well as articles by academics. Some of these contributions have contained highly critical comments or dire warnings. For instance, Hans-Werner Sinn (2011), who has done important work in bringing the increase in TARGET2 balances to the public's attention, has labelled the increase in these balances a "secret bailout" of the Eurozone's periphery and has characterised the system as playing a key role in enabling these economies to run large current account deficits. Another common theme has been the idea that Germany would face a huge bill should there be a breakup of the euro, with Michael Burda (2012), for example, warning that the TARGET2 system has made Germany "a hostage to the monetary union". In the same vein, the English translation of the title of Sinn's recent German-language book on this subject is *The Target Trap: Dangers for our Money and our Children*.

This paper aims to provide a relatively non-technical description of the macroeconomic implications of the TARGET2 system's operations, of the allocation of risks presented by these operations and the various policy issues raised by them.

The first part of the paper provides a description of the TARGET2 system and how the system combines with the euro area's monetary policy to affect the balance sheets of its central banks. It also discusses how monetary policy decisions are made within the Eurosystem and provides some comparisons with how the US payments system affects balance sheets of members of the Federal Reserve System.

The paper then examines the determinants of TARGET2 balances. It shows how changes in these balances have been largely determined by the Eurosystem's monetary policy operations while they have had only a very weak relationship with current account deficits. The crucial role played by capital flight from the periphery is emphasised.

The paper also considers a number of hypothetical scenarios involving both how the euro crisis would have played out if euro area monetary policy had limited TARGET2 balances and involving the potential outcomes from a breakup of the euro. The calculations reported here show that in the event of a full uncooperative euro breakup, the underlying costs to German taxpayers will be far

lower than the regularly-cited full value of the TARGET2 balance. This is partly because the rest of the Eurosystem has a claim of about €200 billion on Germany relating to banknote issuance and partly because the seigniorage powers of a post-breakup Bundesbank are likely to be considerably higher than at present.

Finally, the paper discusses proposals relating to annual settlements of TARGET2 balances. It argues that annual settlement procedures based on existing collateral used for monetary policy operations may be an improvement on current procedure but critiques proposals to settle these balances with senior sovereign bonds as inconsistent with the stability of the euro area.

2. TARGET2 and Monetary Policy in the Eurosystem

Like the Federal Reserve System, the euro area's system of central banks (known as the Eurosystem) has a hub-and-spoke structure with a centralised body (the ECB) working together with a group of decentralised district banks (the pre-existing national central banks or NCBs). There are some similarities in how tasks are assigned in these two systems but there are also important differences.

Like the Fed's district banks, the NCBs are charged with printing currency and operating payments systems. However, unlike the Fed, the legal statute underlying the Eurosystem requires that "to the extent deemed possible and appropriate" tasks should be decentralised to the existing NCBs.² This means that the NCBs undertake monetary policy operations, as directed by ECB policy and keep legal ownership of the assets acquired via these operations. Despite monetary union, the NCBs retain their distinct national identities and in many cases have additional powers relating to financial regulation or financial stability. Importantly, the NCBs, while required to be independent from national governments, are still expected to hand over their surplus profits to the fiscal authorities and are examined each year by national government auditors.

This section starts with a basic description of central bank balance sheets. It then discusses the TARGET2 payments system and how these payments impact the balance sheets of the NCBs, outlines the properties of TARGET2 balances and discusses how monetary income is shared and policy decisions are made in the Eurosystem. It concludes with a quick comparison with the Federal Reserve System.

2.1 Central Bank Balance Sheets

Unlike Milton Friedman's helicopter drop story, central banks create money either by issuing loans to banks or via open market operations to purchase financial assets. This means that central banks build up large stocks of assets over time. At any point in time, the value of a central bank's assets may exceed the amount of money they have created when acquiring these assets. This may be because acquired assets have risen in value, because some of the profits generated from the bank's

² See http://www.ecb.int/ecb/legal/pdf/en_statute_2.pdf

assets have been retained rather than passed over to governments or because the bank may have received assets independent of money creation.

To communicate their financial position to the public, central banks release a balance sheet that summarises the assets they own and the money they have issued. In a stylised example, such as the one below, assets are shown on the left-hand side while the right-hand side lists the amount of money that has been created as “Liabilities”. The difference between the current value of assets and liabilities is labelled “Capital”.

Table 1: Stylized Central Bank Balance Sheet

<i>Assets</i>	<i>Liabilities and Capital</i>
Assets acquired by making loans and buying securities	Money created by making loans and buying securities
	Central Bank Capital

A central bank’s “liabilities” are quite different from the liabilities of a private bank or indeed any private business. When a central bank operates a non-fiat currency regime such as the Gold Standard, it agrees to have sufficient “hard assets” of a particular kind so that it can swap its currency for these hard assets at an agreed conversion rate. However, it is ultimately the choice of the central bank to run such a regime and there is no inherent requirement that a central bank be willing to swap its currency for a pre-specified amount of gold or any other hard asset. In a modern fiat currency system, there is no promise to redeem notes for any particular amount of gold or other assets. The “liabilities” are essentially notional in this case.

While the idea of money creation conjures up images of printing of bank notes for most people, the reality is that most money creation in modern economies takes the form of the addition of credits to a bank’s reserve account. These reserve accounts can be used by banks to make orders for cash to be used in ATM machines, which in turn can be withdrawn by the public. For this reason, changes in the amount of currency in circulation generally do not affect the total amount of central bank liabilities because these changes just produce a reallocation of central bank liabilities away from reserve accounts and towards currency in circulation.

2.2 TARGET2

All commercial banks in the euro area are legally required to maintain a reserve account with their national central bank. This makes the Eurosystem the ideal body to handle large payments between banks because it can apply credits and debits to these reserve accounts to settle payments.

TARGET2 is the second version of the Eurosystem's real-time settlement system for payments between banks.³ ECB (2012) reports that the system handled over 90% of the total amount of large-value euro payments. In 2011, the system handled an average of 348,505 daily transactions with an average daily value of €2.4 trillion, equivalent to over one quarter of annual euro-area GDP. TARGET2 payment transactions are settled one by one on a continuous basis in "central bank money" i.e. credits and debits to reserve accounts.

Because reserve accounts are recorded as liabilities on central bank balance sheets, transfers implemented by TARGET2 impact these balance sheets. For example, consider the case in which Mr. A who has a bank account with Santander in Spain requests that €100 be transferred to Mr. B who has an account with Commerzbank in Germany.

Santander records a €100 reduction in its liabilities to Mr. A and also records a €100 reduction in its assets, as it informs the Banco de España to deduct this amount from its reserve account.

Commerzbank sees its assets increase by €100 as its reserve account with the Bundesbank is credited and its liabilities increase by €100 as it adjusts Mr. B's deposit account upwards by this amount.

If this is all that happens, then the net capital positions of the Banco de España and Bundesbank will have changed as a result of this transaction. The Banco de España would have the same asset position as before but its liabilities will be lower by €100. In contrast, the Bundesbank would have higher liabilities and unchanged assets.

Because TARGET2 is intended to facilitate private sector payments without causing any changes to the net capital positions of the various public organisations involved, it is necessary to offset these changes. One method that would achieve this outcome would be for the Banco de España to transfer some financial assets to the Bundesbank, so that its lower liabilities are matched by a decline in assets and the Bundesbank's increased liabilities are matched by an increase in its net financial assets.

A complication with a procedure of this type is it would require a protocol on which kinds of assets could be used in these transfers. Perhaps for this reason, the Eurosystem does not implement direct asset transfers. Instead, the system works by providing NCBs with credits and debits in the form of bilateral positions vis-à-vis the ECB, usually recorded on the balance sheets as either "Intra-Eurosystem Claims" or "Intra-Eurosystem Assets". Specifically, at the end of each day, all TARGET2 transactions are aggregated and netted out and each NCB has its position vis-à-vis the ECB adjusted.

This means that Eurosystem NCBs either have balance sheets that look like this.

³ TARGET stands for Trans-European Automated Real-time Gross settlement Express Transfer system.

Table 2: Stylised Balance Sheet of Central Bank with Negative Intra-Eurosystem Position

<i>Assets</i>	<i>Liabilities</i>
Assets acquired by making loans and buying securities	Central Bank Capital
	Money created by making loans and buying securities
	<i>Of which:</i>
	Reserve Accounts
	Bank Notes
	Intra-Eurosystem Liabilities

Or else they look like this

Table 3: Stylised Balance Sheet of Central Bank with Positive Intra-Eurosystem Position

<i>Assets</i>	<i>Liabilities</i>
Assets acquired by making loans and buying securities	Central Bank Capital
Intra Eurosystem Assets	Money created by making loans and buying securities plus money created elsewhere and transferred into the country.
	<i>Of which:</i>
	Reserve Accounts
	Bank Notes

Figure 1 summarises the transactions that occur when Mr. A transfers money to Mr. B, using a flow chart while Table 4 reports how each participant's balance sheet has changed. Crucially, the only participants who have had a change in their net asset position are Mr. A (who is €100 poorer) and Mr. B (who is €100 better off).

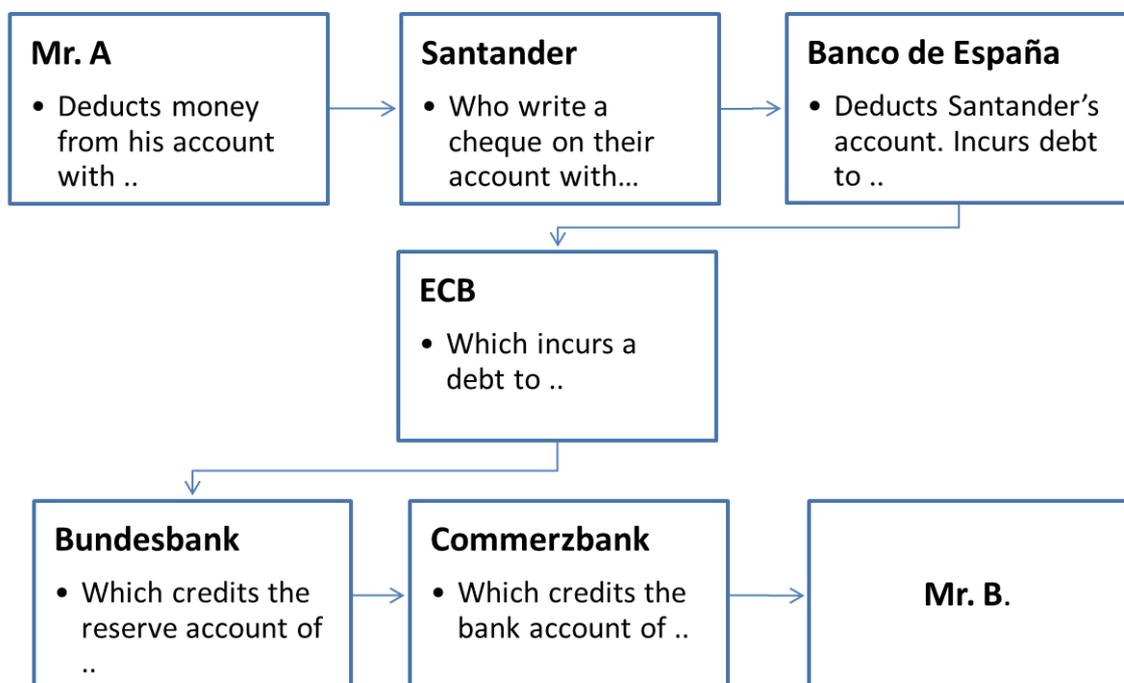
While this example provides a description of the mechanics of TARGET2, it is worth describing a slightly more complicated transaction that fits better with recent developments. The transaction just described could be occurring because Mr. B has provided Mr. A with goods and services. More

recently, however, we have seen money moving out of countries like Spain due to deposit flight or the unwillingness of bond market investors to continue financing Spanish banks due to fears of bank failure or a Spanish exit from the euro. In many cases, Mr. A and Mr. B have been the same entity, with money simply being moved from a person’s bank account in one country to the same person’s account in another country.

The magnitude of the loss of funding for banks in Spain, Italy, Ireland and elsewhere has made it difficult for banks in these countries to honour these withdrawals without seeking replacement funding from their central bank. Without such replacement funding, it is likely that banks in Spain and elsewhere would have had to engage in asset fire-sales that could have damaged their solvency.

Table 5 thus describes the alternative set of balance sheet changes that occur when Santander needs to obtain a loan from the Banco de España to come up with the funds to honour Mr. A’s request to have his money moved to Germany. Again, the only people who experience a change in net asset position are Mr. A and Mr. B. However, instead of having its balance sheet shrink, Santander’s total amount of assets remains unchanged. And instead of seeing the size of its balance sheet remain unchanged, the Banco de España sees its balance sheet expand as it takes on a new asset (its loan to Santander) to match its new Intra-Eurosystem liability.⁴

Figure 1: Example of a Payment Going from Spain to Germany



⁴ Bindseil and König (2011) provide more detailed examples of how balance sheets are altered by transfers via TARGET2.

Table 4: Impact of TARGET2 Transfer on Balance Sheets

Mr A	<ul style="list-style-type: none"> Reduced assets of €100
Santander	<ul style="list-style-type: none"> Reduced liabilities to Mr A of €100 Reduced reserve assets at Banco de España of €100
Banco de España	<ul style="list-style-type: none"> Reduced Liabilities to Santander of €100 Increased Intra-Eurosystem liabilities of €100
Bundesbank	<ul style="list-style-type: none"> Increased Intra-Eurosystem assets of €100 Increased reserve liabilities to Commerzbank of €100
Commerzbank	<ul style="list-style-type: none"> Increased reserve assets at Bundesbank of €100. Increased deposit liability to Mr B of €100.
Mr B	<ul style="list-style-type: none"> Increased assets of €100

Table 5: Example of Payment Going to Germany from Spain Using Central Bank Financing

Mr A	<ul style="list-style-type: none"> Reduced assets of €100
Santander	<ul style="list-style-type: none"> Reduced liabilities to Mr A of €100 Unchanged reserve assets at Banco de España Increased liabilities to Banco de España of €100
Banco de España	<ul style="list-style-type: none"> Increased assets via €100 loan to Santander. Increased Intra-Eurosystem liabilities of €100
Bundesbank	<ul style="list-style-type: none"> Increased Intra-Eurosystem assets of €100 Increased reserve liabilities to Commerzbank of €100
Commerzbank	<ul style="list-style-type: none"> Increased reserve assets of €100. Increased deposit liability to Mr B of €100.
Mr B	<ul style="list-style-type: none"> Increased assets of €100

2.3 Characteristics of TARGET2 Balances

There is no date set by which Intra-Eurosystem claims need to be settled. Rather the TARGET2 liabilities are honoured by making interest payments that are charged at the same rate charged to banks in the Eurosystem's Main Refinancing Operation (MRO). These interest payments are collected by the ECB and redistributed proportionately to those central banks that have positive TARGET2 claims.

In general, the interest flows due to TARGET2 assets and liabilities are associated with income flows on the other side of the balance sheet that wholly or partially offset their effect on net income. For example, consider a central bank that issues a loan to a bank which then leads to increase Intra-Eurosystem liabilities. The central bank receives interest on this loan at the MRO rate but then pays interest at the MRO rate on its new Intra-Eurosystem liabilities. Similarly, a capital inflow into a country leads to an increase in the interest income of its NCB because of higher Intra-Eurosystem assets but also adds to its interest costs if the corresponding change in liabilities is an increase in the amounts lodged in its deposit facility.

Because the interest rate paid on the ECB's deposit facility is lower than its MRO rate (usually by 100 basis points but by 75 basis points at the time of writing) this latter example might suggest that capital inflows tend to increase the profits of the NCB in the country receiving the inflow. However, it turns out that this is not the case. This is because the additional income made by that NCB is offset in the Eurosystem's annual operation to share its monetary income.

Monetary income is defined as the income earned on monetary-policy-related assets minus the income lost on compensating corresponding liabilities. All participants in the Eurosystem report their monetary income at the end of each year, the income is summed and then adjustments are made so that each NCB ends up with a share of total monetary income that is proportional to its capital key. Importantly, Intra-Eurosystem balances related to TARGET2 are included in the asset and liability bases used to calculate monetary income.⁵

For this reason, any increase in net profits that an NCB may obtain from an increase in its TARGET2 assets are offset when monetary income is reallocated. Once this adjustment is made, the monetary income received by a central bank is simply its capital-key-weighted share in total Eurosystem monetary income. This means TARGET2 balances are ultimately unrelated to the net income earned by NCBs.

Finally, it is worth emphasising that TARGET2 claims do not have any collateral associated with them. They are a claim on the ECB, which has a legal right to create euros and so collateral is not considered necessary. Steinkamp and Westermann (2012) have argued that TARGET2 liabilities are collateralised by government bonds that banks pledge to NCBs and thus these liabilities represent a form of "senior lending" to governments, equivalent to IMF loans. In fact, banks that pledge government bonds to NCBs as collateral for loans retain beneficial ownership and the bonds continue to be counted as assets on the balance sheets of these banks. There is no mechanism by which a central bank could be required to hand over these bonds to settle TARGET2 claims.

2.4 Decision-Making in the Eurosystem

We have described how increases in TARGET2 liabilities may be associated with increases in lending from NCBs. It is worthwhile also briefly outlining how decisions about money creation are made in the Eurosystem. All decisions about the conduct of Eurosystem monetary policy are taken by the Governing Council of the ECB which consists of the Governors of the central banks of each of the participating countries and the six members of the ECB Executive Board.

⁵ Decision of the ECB of 25 November 2010 on the allocation of monetary income of the national central banks of Member States whose currency is the euro (recast) (ECB/2010/23).

Until the 2008, the principal tool of euro area monetary policy was the weekly main refinancing operation (MRO) in which a fixed amount of credit was “auctioned” off to banks looking for loans. The key policy rate was the minimum bid rate set for this auction, i.e. participants seeking to borrow funds would be told there was a minimum interest rate that would be accepted and then would use this information to make an offer to borrow money at a specific rate. Those who were successful in these auctions then borrowed money from their local NCB. The loans were collateralised using bank assets, with a single list of eligible collateral approved by the Governing Council.

In recent years, the Eurosystem’s procedures have changed in a number of important ways. In particular, the weekly refinancing operation now offers credit at a fixed rate and provides banks with the full amount they request, subject of course to the requirements that they have sufficient eligible collateral. The guidelines relating to eligible collateral have also been revised to allow lower-rated and less marketable instruments to be included. For example, in February 2012, the Governing Council agreed to proposals from seven NCBs to accept as eligible collateral specific nationally-defined sets of credit claims (i.e. bank loans) from banks in these countries subject to specific risk control measures such as large haircuts (meaning the credit supplied by the Eurosystem has a far lower value than the face value of the collateral).

Some commentary, for example Tornell and Westermann (2012), has suggested that this development has produced a “tragedy of the commons” situation in which each NCB is able to pursue its own money creation policies without considering common Eurosystem interests. It is important to remember, however, that all decisions about collateral eligibility ultimately rest with the ECB Governing Council. Even so-called emergency liquidity assistance (ELA) programmes, in which NCBs make loans against non-standard collateral with all risk being taken by the NCB providing the liquidity, need to be approved by the ECB according to Article 14 of its statute.

This point is important when considering TARGET2 balances because it means these balances are largely dictated by private capital flows and the operational rules set by the ECB Governing Council. There is essentially no room for NCBs to operate independently from the Governing Council in ways that deliberately increase their TARGET2 liabilities.

Once NCBs make loans against eligible collateral, the Eurosystem’s practice is for any losses made on these loans to be shared across all participants in the system according to their capital key, i.e. the fraction of the ECB’s initial capital that they provided. Some of the commentary surrounding Germany’s large TARGET2 asset has suggested that this large claim leaves Germany particularly exposed to default on loans to peripheral banks. However, Germany’s share of these losses would be 27% (its share of the capital key) independent of the value of its Intra-Eurosystem assets or liabilities.

2.5 Some Comparisons with the Federal Reserve

For comparison purposes, it is worth describing how the US payments system works and how it affects balance sheets in the Federal Reserve system. Payments between banks in the US are handled by the Federal Reserve District Banks using a payments system known as Fedwire. This

system is comparable in size to TARGET2: In 2012, Fedwire handled a daily average of €2.4 trillion in payments.

This process generates Interdistrict Settlement Accounts that play the same role as TARGET2 balances in the Eurosystem. As with the Eurosystem NCBs, the Fed's District Banks have little control over their liabilities. Only the New York Fed carries out open market operations. These operations implement the instructions of the Federal Open Market Committee (FOMC) aimed at influencing the national supply of liquidity. They do not distinguish between counterparty banks on the basis of which Fed district they are based in and so make no attempt to control the allocation of the monetary base to different districts.

Despite these similarities, there is an important difference between the Fed and Eurosystem in relation to the internal balances generated by payments systems. In April of most years, the Interdistrict Settlement Accounts have been settled by re-allocating the ownership of the Fed's securities in its Systems Open Market Account (SOMA) among the various District Banks.⁶ For example, the Fed's H.4.1 statistical release shows that the New York Fed had built up an Intradistrict Settlement Account credit of €188 billion on April 11, 2012. On April 18, the New York Fed's Intradistrict credit had fallen to €1.4 billion and its ownership share of the system's assets had increased, with the largest transfer coming from the Richmond Fed. I will discuss possible settlement proposals for the Eurosystem in Section 6.

3. The Evolution of TARGET2 Balances

Having described how TARGET2 operates and how these operations affect the balance sheets of central banks participating in the Eurosystem, this section outlines how the TARGET2 balances have changed in recent years and the factors that have driven these changes.

3.1 Data on Intra-Eurosystem Balances

For figures that have been so widely discussed, the TARGET2 balances of Eurosystem central banks are surprisingly difficult to track down. They are not reported in the ECB's statistical releases. In fact, the only way to obtain consistent point-in-time balances for all seventeen NCBs is to go to the end-of-year financial accounts provided in annual reports. Even then, the specific TARGET2 figures are sometimes subsumed amongst other Intra-Eurosystem assets or liabilities in the reported balance sheets and may or may not be reported separately in the accompanying notes.

These other Intra-Eurosystem assets and liabilities have received very little attention in recent discussions about TARGET2 but they are worth describing. This is because the impact on balance sheets of an un-cooperative euro breakup would be determined not just by TARGET2 balances alone but also by a number of Intra-Eurosystem items that show up on the NCB balance sheets.

⁶ See Lubik and Rhodes (2012) and König (2012) for a detailed discussion of how Interdistrict Settlement Accounts work and some evidence on their behaviour in recent years.

- *Banknote-Related Claims:* Patterns of banknote issuance differ across the euro area member states. The Eurosystem accounting rules require, however, that assets and (notional) liabilities associated with these notes be allocated according to the “banknote allocation key” (which allocates 8 percent to the ECB and the remaining 92 percent in proportion to each country’s capital key). This item appears on the balance sheet of each NCB to adjust for the difference between the value of euro banknotes that has been allocated to each NCB and the value of the euro banknotes actually put into circulation. A country that has issued more banknotes (and thus acquired more assets via this channel) than its allocation key allows for is recorded as having an Intra-Eurosystem liability (effectively meaning they are sharing the excess assets acquired with the rest of the Eurosystem). As with TARGET2 balances, NCBs with banknote-related liabilities pay interest at the MRO rate with this interest being transferred to those countries that have banknote-related Intra-Eurosystem assets.
- *Foreign Exchange:* After the introduction of EMU, the NCBs transferred large amounts of foreign exchange reserves to the ECB. These are recorded as Intra-Eurosystem assets by the NCBs and as Intra-Eurosystem liabilities by the ECB and are also remunerated at the MRO rate.
- *Ownership of the ECB:* The NCB’s each record their contribution to the capital of the ECB as an asset.

Table 6 provides a full description of the Intra-Eurosystem positions of the various NCBs as well as the ECB for the years 2006, 2010 and 2011 with all figures taken directly from the annual financial accounts. The year 2006 is chosen as a pre-crisis benchmark for these positions.

TARGET2 balances among participating central banks sum to zero. The balances of the NCBs and ECB reported in the table sum to zero in 2006 but were non-zero in later years. This is because countries outside EMU joined TARGET2, using it to process euro-denominated payments.⁷ The various other Intra-Eurosystem balances in each year sum to slightly more than zero because of the positive claims for each NCB on the ECB’s capital. In 2006, the variation in these other Intra-Eurosystem balances was larger than for the TARGET2 balances, mainly because Germany had a large liability relating to banknote issuance, while France had a large claim relating to this same item.

By the end of 2011, the magnitude of TARGET2 balances had increased substantially in a number of countries. A very large positive German claim of €463 billion and other large positive claims for Luxembourg, Netherlands and Finland had as an offset a big build-up in liabilities for Italy, Spain, Ireland and Greece.

Higher frequency data for TARGET2 positions and other Intra-Eurosystem liabilities are only available for some countries. For example, the Banque de France publishes a monthly balance sheet as part of its sectoral financial accounts release but the format of this balance sheet differs from the format of the accounts published in the annual report, so only crude proxies for the TARGET2 positions are available for this and other countries. Thankfully, the Bundesbank and each of the so-called GIIPS

⁷ ECB (2012) reports that, at present, the central banks from six countries from outside the Eurozone use TARGET2 to process euro-denominated payments: Denmark, Poland, Latvia, Lithuania, Bulgaria and Romania.

countries (Greece, Ireland, Italy, Portugal and Spain) each publish either the TARGET2 balance or figures that are very close to them.

Figure 2 shows monthly developments from January 2010 up to the end of January 2013 for these six countries.⁸ Germany's TARGET2 asset continued to increase for most of 2012 and peaked at about €750 billion in August 2012. Since then, Germany's balance has declined back to €616 billion with corresponding reductions for nearly all the countries with TARGET2 liabilities.

Figure 3 shows that, taken together, the TARGET2 liabilities of the GIIPS central banks tracked the increase in the Bundesbank's claim very closely from mid-2010 until mid-2011. After that period, the combined GIIPS balances have increased more than the Bundesbank's claim, peaking at almost €1 trillion in August 2012. This reflected increases in the TARGET2 claims of other central banks such as those of Luxembourg, Netherlands and Finland.

Table 6: Intra-Eurosystem Net Positions (Billions of Euros)

	2006			2010			2011		
	Target	Other	Total	Target	Other	Total	Target	Other	Total
<i>Austria</i>	-21.2	17.0	-4.2	-27.5	26.2	-1.3	-34.6	34.1	-0.5
<i>Belgium</i>	-45.3	23.8	-21.5	-13.9	20.1	6.2	-52.9	18.0	-34.9
<i>Cyprus</i>	N/A	N/A	N/A	-6.4	0.4	-6.0	-7.9	0.7	-7.2
<i>Estonia</i>	0.1	0.0	0.1	0.1	0.0	0.1	0.6	1.7	2.3
<i>Finland</i>	1.2	4.7	5.9	19.7	4.2	23.9	66.0	4.3	70.3
<i>France</i>	10.6	71.9	82.5	-28.4	86.0	57.6	-53.2	87.6	34.4
<i>Germany</i>	5.3	-71.4	-66.1	325.5	-144.8	180.7	463.3	-157.9	305.4
<i>Greece</i>	-8.2	-0.1	-8.3	-87.1	-6.4	-93.5	-104.8	-16.9	-121.6
<i>Ireland</i>	-2.5	-8.8	-11.4	-145.2	-14.2	-159.4	-120.4	-14.6	-135.1
<i>Italy</i>	22.8	-6.2	16.6	3.4	1.3	4.7	-191.4	1.3	-190.1
<i>Luxembourg</i>	5.2	-39.7	-34.5	67.9	-64.9	3.0	109.3	-69.9	39.4
<i>Malta</i>	N/A	N/A	N/A	-1.2	-0.1	-1.3	-0.4	-0.1	-0.5
<i>Netherlands</i>	9.9	11.0	20.9	40.2	25.6	65.8	152.5	30.0	182.5
<i>Portugal</i>	-6.6	10.8	4.2	-59.9	20.2	-39.7	-60.9	23.0	-38.0
<i>Slovakia</i>	N/A	N/A	N/A	-13.3	2.3	-11.0	-13.6	1.5	-12.1
<i>Slovenia</i>	0.0	1.9	1.9	-2.1	2.7	0.6	-2.7	2.7	0.0
<i>Spain</i>	25.1	-19.4	5.7	-50.9	20.9	-29.9	-174.8	32.2	-142.6
<i>ECB</i>	3.5	10.5	14.0	-21.2	27.0	5.7	49.4	30.8	80.2
<i>Total</i>	0.0	6.0	6.0	-0.3	6.7	6.4	23.4	8.4	31.8

⁸ The figures for Spain are an average of monthly balances rather than an end of month balance. The Banco de España publishes an end of month balance sheet but, at the time of writing, does not release a time series of these data or even make historical versions of this balance sheet available. The figures for Ireland are arrived at by making an adjustment to the series "Other Liabilities". This series includes the liabilities related to banknote issuance and I have subtracted off the end-2011 value of these series to arrive at an estimate of the TARGET2 balance.

Figure 2: TARGET2 Claims and Liabilities for Selected Countries Since 2010

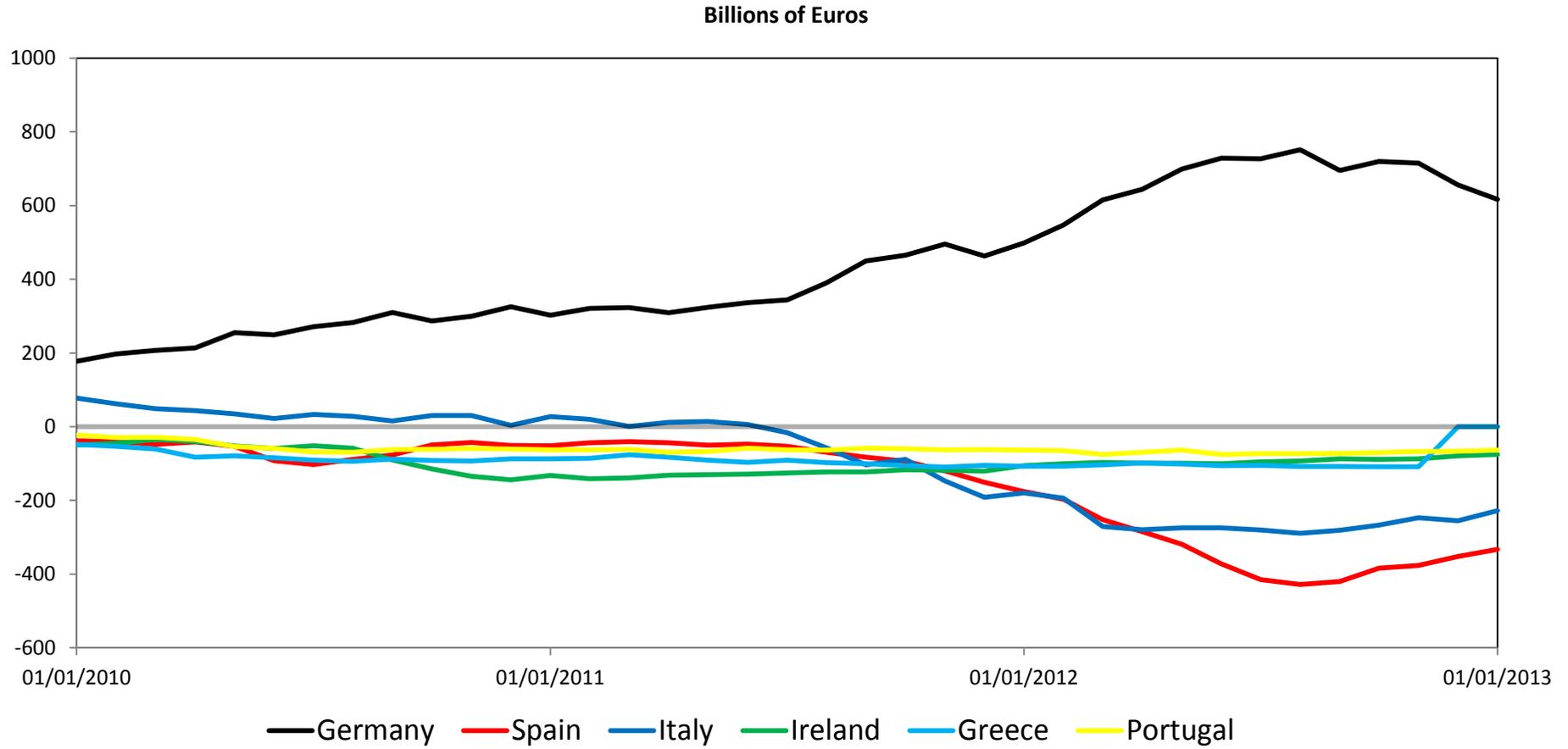
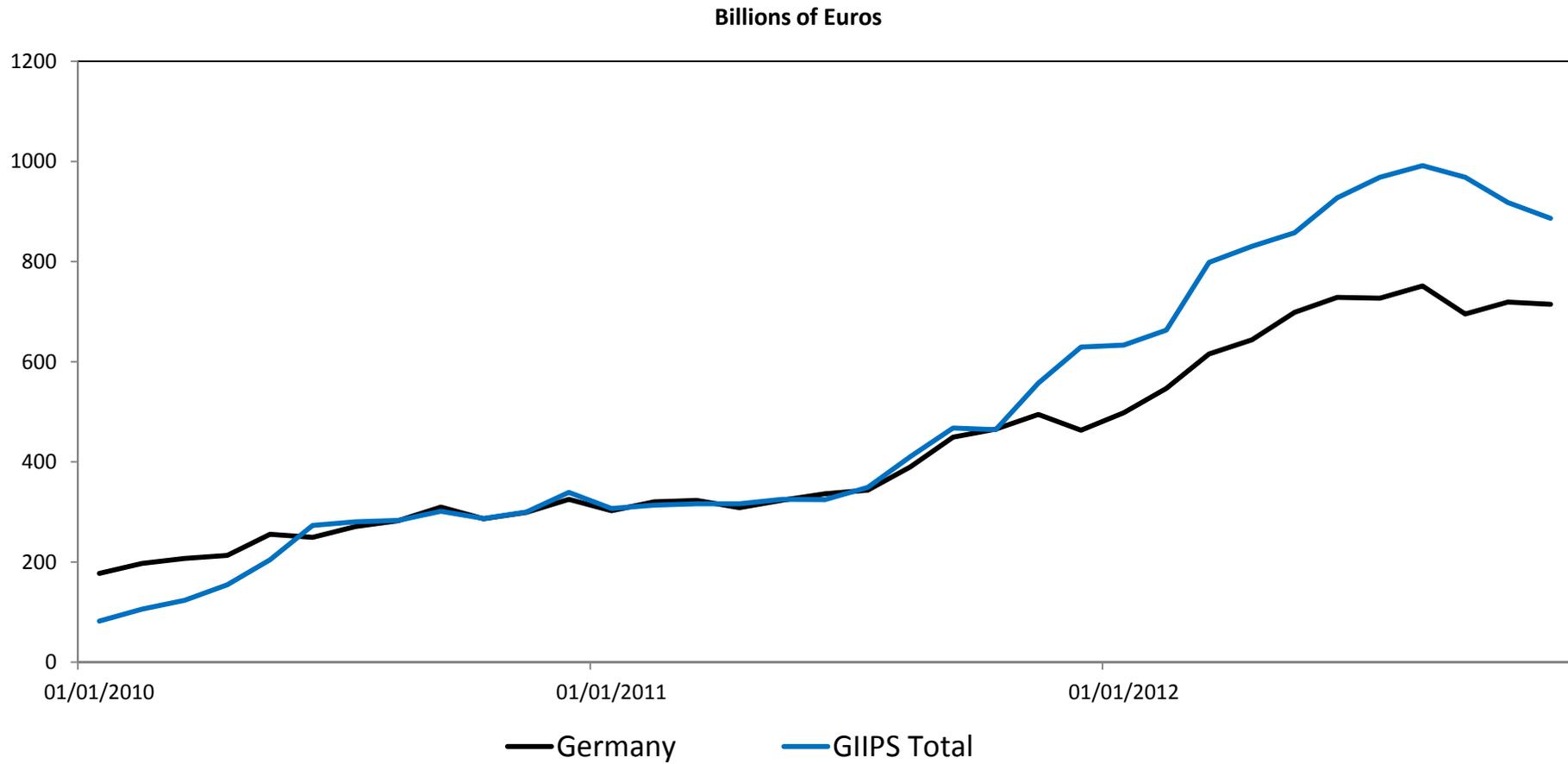


Figure 3: TARGET2 Claims of Germany & Combined Liabilities of GIIPS NCBs



3.2 TARGET2 Balances and Monetary Policy Operations

The discussion in the previous section described two different patterns that could be observed as a country's TARGET2 liabilities increased. In one example, the balance sheet of the commercial banking sector contracted while the balance sheet of the central bank remained at the same size. In the other example, the balance sheet of the commercial banking sector remained unchanged in size and the balance sheet of the central bank expanded as it made new loans to banks. A quick examination of the balance sheets of Eurosystem NCBs over the past few years suggests that the second pattern has described the events of the past few years.

Figure 4 illustrates the relationship between central bank lending and TARGET2 liabilities for the four countries that account for most of the build-up since 2010: Spain, Italy, Portugal and Ireland.⁹ The figure shows a very strong relationship between changes in the TARGET2 balances and lending operations by the NCBs. An examination of the timing of the movements in TARGET2 balances instead shows a clear linkage between these movements and events related to banking crises or fears related to the potential for a euro breakup.

Portugal's TARGET2 liability recorded its big increase after April 2010 amid fears that the Greek crisis would spread to other European countries. Ireland's TARGET2 liabilities built up rapidly during late summer of 2010 through to the end of that year as international investors lost faith in the Irish government's abilities to rescue its banks, leading to deposit flight and a failure to roll over bond market funding. Spain and Italy's balances did not start to build up until the crisis intensified during the summer of 2011 amid widespread concerns that the Eurosystem would break up. The balances have declined in size since August 2012 as the introduction of the OMT programme has calmed fears relating to a Euro breakup.

Table 7 reports the results from monthly regressions using data from January 2010 to January 2013 of the change in the TARGET2 balance on the change in monetary policy lending. For each of these countries, there is a strong and statistically significant relationship with a coefficient close to one. A pooled regression has an R-squared of 0.75 and a coefficient of 0.93.

Table 7: Target2 Balances and Changes in Central Bank Lending

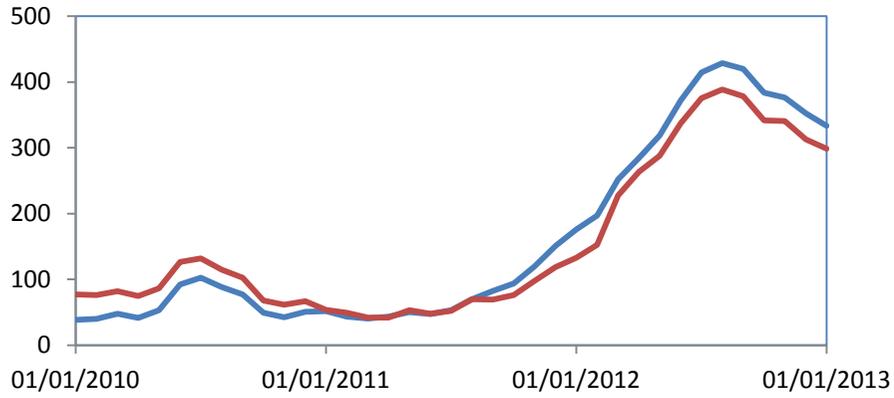
	<i>Dependent Variable: Change in Target2 Balance.</i>			
	<i>Independent Variable: Change in CB Lending</i>			
	Coefficient	T-Statistic	R2	Durbin-Watson
Spain	0.91	21.57	0.93	1.56
Italy	0.92	6.20	0.52	2.25
Ireland	0.92	12.66	0.82	2.05
Portugal	1.04	8.32	0.66	2.34
Pooled	0.93	19.78	0.73	2.22

⁹ I have excluded Greece because there have been changes over time in their recording of Emergency Liquidity Assistance lending that makes it difficult to construct a consistent time series for total lending by the Bank of Greece.

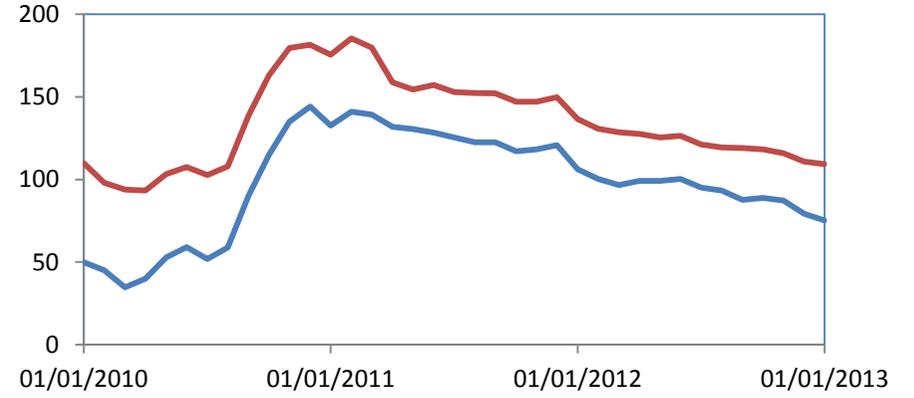
Figure 4: Target2 Liabilities (Blue) and Loans from Central Banks (Red)

Billions of Euros

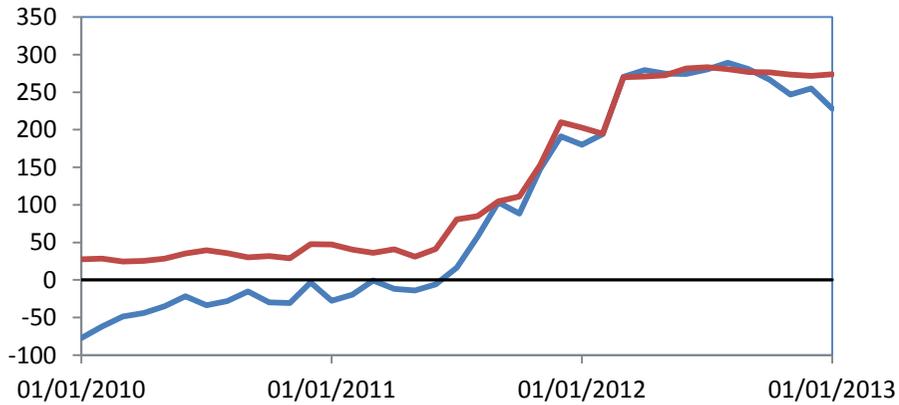
Spain



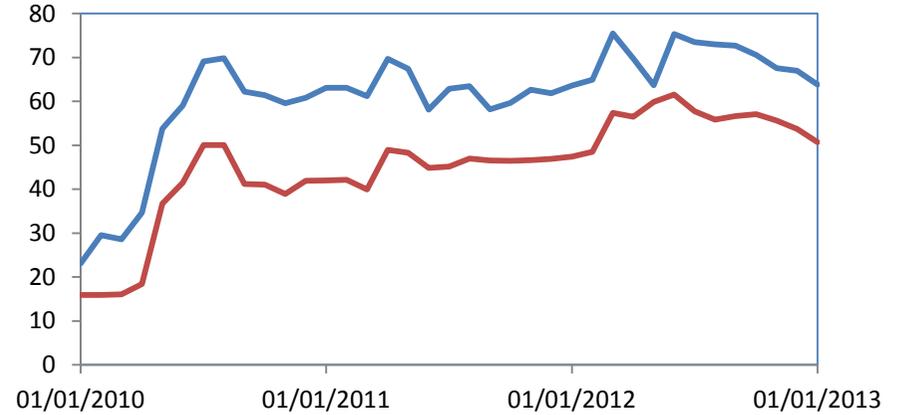
Ireland



Italy



Portugal



In light of this evidence, it is perhaps worth considering some of the terminology that has been used regularly in the recent discussion of TARGET2 balances. For example, a common viewpoint has been that increases in TARGET2 balances represent a “bailout for the periphery” with Tornell and Westermann (2011b) characterising the build-up of the balances as reflecting the Bundesbank “lending funds to strapped governments”. When considering this characterisation of events, it is useful to describe the ways in which the build-up of TARGET2 balances don’t line up well with previous examples of official bailouts.

Official sector bailouts involve governments in crisis-hit countries actively choosing to take on new debts that are owed to the provider of bailout funds. In relation to both of these elements (active choice and taking on new debts) the increase in TARGET2 liabilities differs from official sector bailouts. The build-up of these balances has largely been a consequence of NCBs carrying out the Eurosystem’s monetary policy as set out by the ECB Governing Council. The income associated with these new assets is shared across the Eurosystem as is the credit risk on any loans secured against standard eligible collateral, so the credit issuance that has generated these balance is the result of jointly agreed Eurosystem policies. The TARGET2 balances are probably best seen as a by-product of the Governing Council’s monetary policy decisions rather than as a bailout requested by national governments.

In addition, the process of changing TARGET2 balances does not imply a change in the net capital positions of the central banks that take part in the system. A central bank that creates money to allow a bank to honour capital flight out of the country ends up with an equal-sized increase in its assets and liabilities. As I discuss in Section 6, these NCBs are not “strapped for cash” and could use their newly-acquired assets to settle their TARGET2 balances at any time if a settlement procedure was introduced.

The Eurosystem’s lending guidelines in recent years certainly raise many questions. In particular, one can debate whether the full-allotment policy and weakening of collateral guidelines have represented either an appropriate lender of last resort strategy or an overly generous policy towards risk creditors that encouraged moral hazard. However, the characterisation of the increases in TARGET2 balances as a stealth bailout of the citizens of the euro area’s periphery is largely misleading.

A related point on terminology concerns the phrase “TARGET loans” to describe TARGET2 assets (as used, for example, by Sinn and Wollmershäuser, 2012). Because these assets represents a claim on the rest of the Eurosystem that can be settled by payments made at a later date, this terminology can be considered reasonable. However, the analogy with loans made by banks is imperfect. In particular, the Bundesbank’s position differs from a situation in which a bank with a fixed supply of funding makes new loans and an increase in one class of loans comes at the expense of a reduction in other asset holdings. This has not been the situation in relation to the Bundesbank’s TARGET2 claims. Instead, they have represented an expansion of its balance sheet and have not required a reduction in other asset holdings. Despite some commentary suggesting the opposite, the Bundesbank has not had to sell any assets to “fund” its TARGET2 claims.

3.3 TARGET2 Balances and Current Accounts

Moving away from terminology and back to substance, there have been a number of contributions, most notably Sinn and Wollmershäuser (2012), that have discussed the relationship between TARGET2 balances and current account deficits. For a number of countries, Sinn and Wollmershäuser argue that increased TARGET2 balances have effectively financed current account deficits in the periphery in recent years.

The rationale for there being a relationship between TARGET2 balances and current account deficits is simple enough. If TARGET2 is used to process payments for goods and services and one country purchases more goods and services from another than it sells back, then *ceteris paribus* these transactions will lead to a change in Intra-Eurosystem balances.

However, the logic of the balance of payments means that a current account deficit is accompanied by offsetting financial transactions involving either increased foreign claims on the deficit country or reduced claims of the deficit country on foreign assets. These transactions (whether they be bank loans or acquisitions of bonds or equity) will imply a corresponding financial inflow that will generally flow through TARGET2. So in general, one shouldn't necessarily expect any relationship between TARGET2 balances and current accounts.

Indeed, a casual examination of the data on TARGET2 and current account balances over the history of the euro reveals the lack of any clear relationship. As Figure 5 shows, during the period prior to the Eurozone debt crisis, the GIIPS countries had low TARGET2 balances despite the fact (with the partial exception of Italy) they were running large current account deficits. In contrast, the emergence of large TARGET2 liabilities occurred during a period when Spain, Greece and Portugal were lowering their current account deficits and Ireland had returned to surplus.¹⁰

Still, the debate in recent years has related to the relationship between TARGET2 movements and current account balances since the beginning of the crisis and most of the countries that have run up large TARGET2 liabilities have also run current account balances. To illustrate the potential relationship, Figure 6 repeats and updates charts similar to some presented by Sinn and Wollmershäuser (2012) to illustrate the linkages between TARGET2 balances and current accounts. The black lines show quarterly TARGET2 balances for Greece, Italy, Ireland, Portugal and Greece. The blue lines show cumulated current account balances starting at zero at the end of 2006 and ending in 2012:Q2.¹¹ As noted by Sinn and Wollmershäuser, by 2012, the level of TARGET2 liabilities for Spain, Italy, Portugal and Greece are relatively close to the cumulated current account balances starting in 2007.

One conclusion that could be drawn from these charts is that TARGET2 liabilities, which feature on capital side of the balance of payments, have financed the current account deficits of these countries. There are two reasons to be wary of these conclusions. The first relates to a general problem when comparing net and gross flows. By definition the current account can be equated with the enabling capital flows but one needs to be careful in picking one sub-category of those

¹⁰ The figures for 2012 in Figure 6 are European Commission estimates taken from the AMECO database.

¹¹ The quarterly current account figures come from the Eurostat database.

capital flows and assigning it a primary role. For example, consider a government that runs an average budget deficit of 3 percent of GDP and which has also spent an average of 3 percent of GDP on education. One could say that education spending has accounted for all of the increase in government debt over this period and, as a matter of accounting, it would be true. But one could also pick any number of other items of the budget and also assign the blame to them and it may turn out that variations in other items would better explain changes over time in the budget deficit. In the same way, assigning a special role to changes in TARGET2 as the key factor driving current accounts may also be misleading.

The second concern about charts like those in Figure 6 is the standard econometric one involving trending time series. For four of these countries, cumulative current accounts and TARGET2 balance move in the same direction and, for some periods (though not others) the levels of these series are quite close. But for other periods the series are not close and these figures don't necessarily show TARGET2 changes correlating with current accounts. In fact, regression results reported in Table 8 show there is no statistically significant relationship between current accounts and changes in TARGET2 balances for any of these countries. The R-squared for a pooled regression of this sort is about 0.01 while Figure 7 shows a scatter plot of the underlying data.¹² These calculations make it clear that there has not been any period-by-period relationship between TARGET2 balances and current accounts.

Some of the countries that have built up large TARGET2 liabilities release sufficiently detailed balance of payments data to allow for a decomposition of the factors driving the monthly movements in these balances. Figure 8 uses data provided by the Banco de España to describe how changes in Spain's TARGET2 liabilities is determined by the other flows in the balance of payments. Specifically, it shows how a number of series contribute to this change: The financial account (which is principally determined by the current account), three types of net financial flows (portfolio, direct, and other) and a residual item.

The figure shows the key driver of changes in the TARGET2 balance in Spain since mid-2011 has been the large movements in "other investment", a category that is mainly accounted for by deposits. Swings due to portfolio investment (meaning stocks, bonds and other financial instruments) have also been important with the reversal in this category particularly significant from mid-2012 onwards. Movements in the financial account have had essentially no relationship with changes in TARGET2 balances (a simple regression has an R-squared of zero).

These calculations show that TARGET2 balances have been primarily driven by capital flight from the periphery with loans to commercial banks facilitating investors from transferring their money out of these economies. Movements in current account balances have had little impact on the pattern of TARGET2 balances.

¹² Cecioni and Ferrero (2012) also argue there is little relationship between current account balances and change in TARGET2 liabilities. Auer (2012) reports a significant relationship between changes in TARGET2 balances and current accounts using a panel regression approach. However, he notes that his findings are driven by country effects rather than the ability of such a model to explain variation over time within each country.

One could, however, ask a different question: What would have happened to the peripheral economy current account balances (and indeed every other aspect of their economies) had the Eurosystem been unwilling to extend large amounts of credit? I turn to this and other counterfactuals in the next section.

Table 8: Target2 Balances and Changes in Current Account Balances

Dependent Variable: CA Balance
Independent Variable: Change in Target2 Balance.
Sample: 2007:Q1 to 2012:Q3

	Coefficient	T-Statistic	R2	Durbin-Watson
Spain	0.09	1.89	0.15	0.53
Italy	0.01	0.39	0.01	1.38
Ireland	-0.00	-0.05	0.00	0.73
Portugal	-0.04	-0.84	0.03	0.75
Greece	-0.06	-0.78	0.03	1.01
Pooled	-0.01	-0.24	0.01	0.39

Figure 5: Current Account Balances as a Percent of GDP

Source: European Commission AMECO Database (2012 figures are estimates)

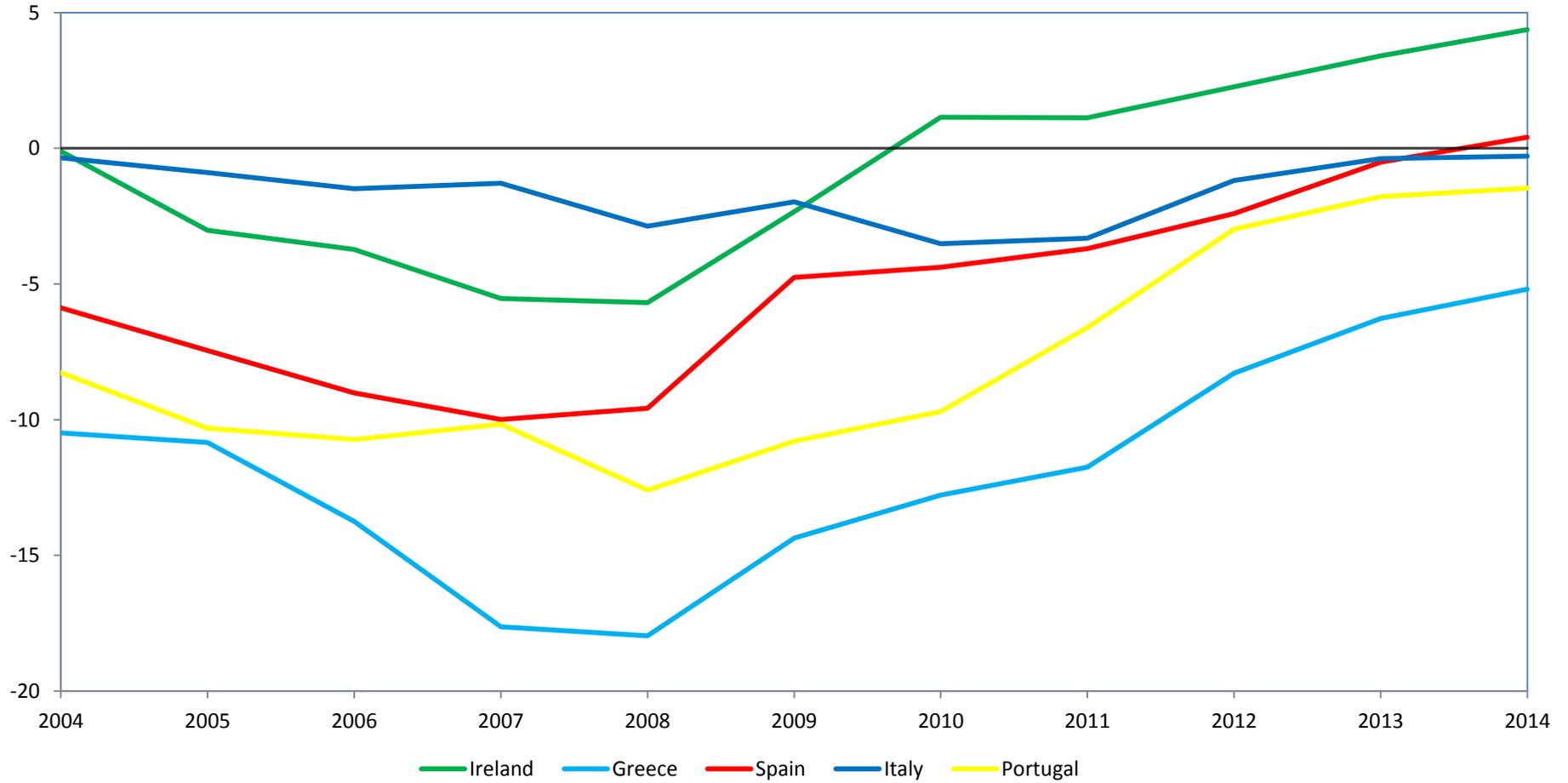


Figure 6: Target2 Liabilities (Black) and Cumulated Current Accounts from 2007 Onwards (Blue)
Billions of Euros

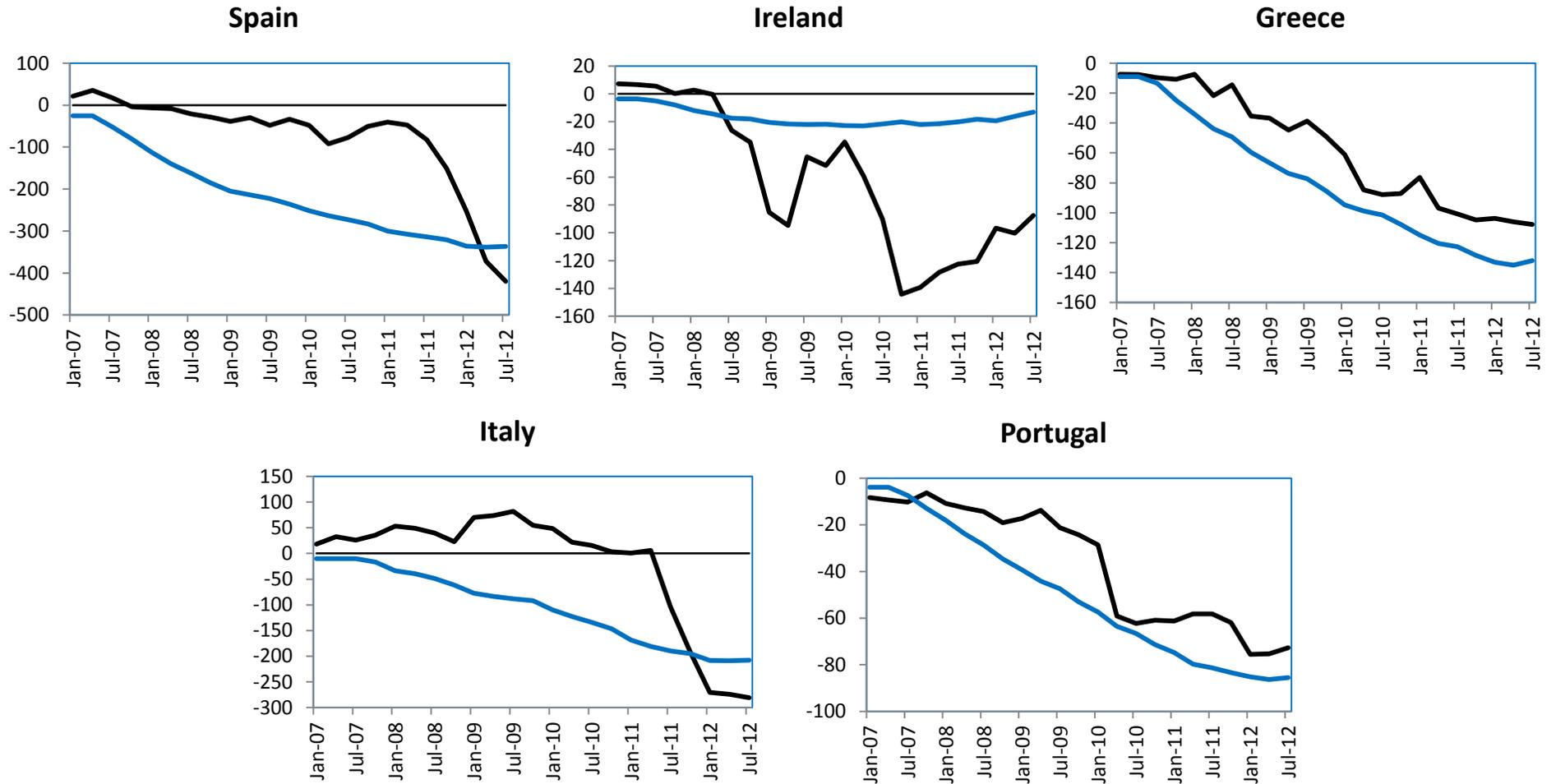


Figure 7: Scatter Plot of TARGET2 Balance Changes and Current Accounts

Data for Spain, Ireland, Italy, Portugal and Greece from 2007:Q1 to 2012:Q3

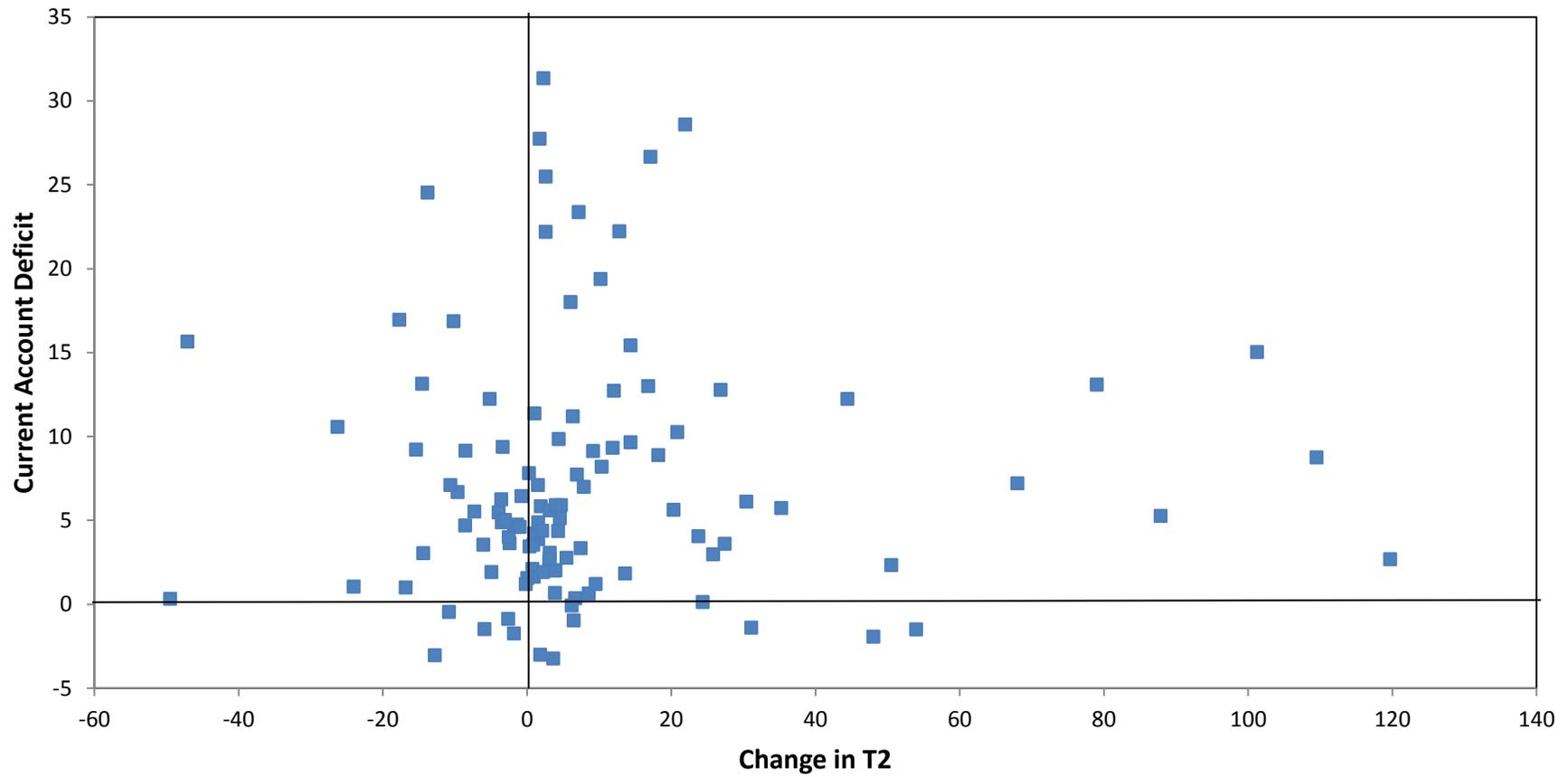
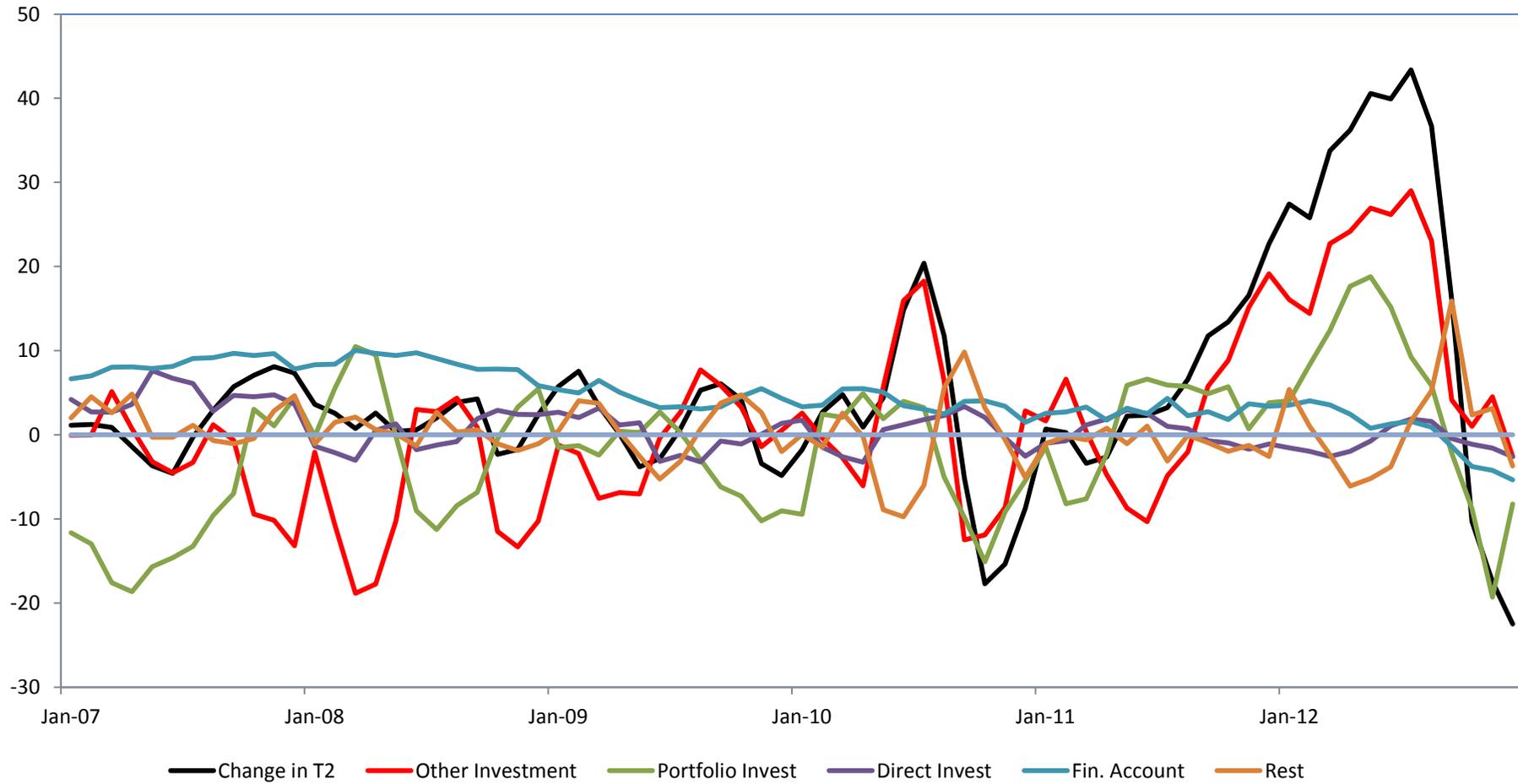


Figure 8: Contributions to Changes in Spanish Target2 Balance Up to August 2012

Billions of Euros, Three-Month Moving Average



4. Some Counterfactuals

Having documented the patterns underlying the evolution of TARGET2 balances, it is useful to consider some counterfactuals that can help to explain the roles of the TARGET2 system, of the Eurosystem's monetary policy and of the common currency over the past few years.

4.1 *Turning Off TARGET2*

Much of the commentary about recent events has focused on how “the TARGET2 channel” has affected outcomes in the Eurosystem. It's worth remembering, however, that TARGET2 itself is simply a payments system and the controversial elements have related to how central banks have handled the accounting associated with their roles in processing these payments. In fact, the changes in Intra-Eurosystem balances reflect the workings of a monetary union with free movement of capital rather than the operation of the TARGET2 electronic payments system.

To explain why this is the case, consider the scenario in which, at some point in 2010, the Eurosystem decided to turn off the TARGET2 system, thus refusing to process large-scale electronic payments. Even if a decision of this sort had not cause chaos, it would probably not have prevented a build-up of Intra-Eurosystem balances.

To give a concrete example, consider the case of a depositor that wanted to move money from Spain to Germany. Faced with the inability of their bank to use an electronic transfer facility to move this money, depositors and investors could simply have requested cash. If the Banco de España still agreed to follow the monetary policy laid down by the ECB Governing Council, thus lending to banks facing a deposit run, then this would have resulted in large-scale banknote issuance.

The banknote issuance generated by this capital flight would still have generated a large Intra-Eurosystem liability for the Banco de España. This is because, as described above, the Eurosystem requires NCBs to share the assets and notional liabilities associated with banknote issuance. For example, when an NCB with a banknote allocation key of $x\%$ issues banknotes, it retains the assets acquired but records only $x\%$ of the banknotes issued as liabilities. The remaining $(100-x)\%$ of the liabilities are recorded as an Intra-Eurosystem liability for the issuing bank with corresponding credits showing up on the balance sheets of the other NCBs.

It is also likely that the act of turning off the TARGET2 payments system would have triggered a significant increased demand for withdrawals as depositors worried about the absence of electronic transfers looked to get their money back. These considerations suggest that a shutdown of the TARGET2 system could have generated even larger Intra-Eurosystem balances than those observed.

A TARGET2 switch-off combined with the imposition of capital controls preventing people from moving money between states would have prevented this build-up. These controls are generally illegal within the European Union according to Article 63 of the European Treaty which states that all restrictions on payments are prohibited. Article 65 does qualify this provision by saying it does not prejudice the rights of member states “to take measures which are justified on grounds of public policy or public security” so this may represent a legal loophole. In all likelihood, however, if such

controls were ever introduced across the euro area it would be difficult to ever lift them as people became concerned that their money could become “trapped” in certain countries. The introduction of these capital controls would very possibly be the beginning of the end of the euro.

4.2 Limiting Refinancing Operations

Given that central bank lending has played a crucial role in building up Intra-Eurosystem balances, any argument that these balances are somehow excessive amounts to a position that NCBs in the euro area’s periphery should not have been allowed to make such large quantities of loans to their commercial banks.

One method of implementing restrictions on TARGET2 balances would be to restrict the amount of refinancing operations that could be undertaken by each NCB. However, such a policy would run counter to one of the ECB’s espoused core principles of its operational framework which is that “credit institutions must be treated equally irrespective of their size and location in the euro area”.¹³ Even if the ECB was willing to give up this core principle, given the ability of banks to operate across borders, there may be limits to how effective such a restriction would be, as banks in countries with NCBs that could not make further loans could open new subsidiaries in other countries and obtain the required credit there.

An alternative way to restrict credit would have been to end the full allotment policy and/or to introduce objective criteria raising the cost of funding for banks viewed as being in higher-risk categories. Policies of this sort would reduce the ability of under-pressure banks to honour deposit withdrawals via borrowing from their national central bank.

How would current accounts have behaved if restrictions of this had been implemented? It may be natural to assume that if the NCBs were not able to accumulate TARGET2 liabilities, then the funds to honour the capital flight would have come from the firms and households that were spending more than their incomes (and thus generating a current account deficit) i.e. that by definition the current account balance would have had to decline in the absence of increased TARGET2 liabilities. However, the direct alternative to the funding of capital flight through the NCBs would have been a large-scale programme of assets sales by peripheral banks. These “fire-sales” would likely have generated large losses for peripheral banks and resulted in significant creditor write-downs.

As with the scenario in which TARGET2 was turned off, the counterfactual in which funding to peripheral banks was limited or made prohibitively expensive would likely have greatly accelerated the scale of deposit withdrawals. With investors knowing the ECB was unwilling to provide sufficient liquidity to honour withdrawals without significant assets sales, creditors would have been running for the doors in even greater numbers than occurred over the past few years. A full-scale bank run on the periphery would likely have resulted in the imposition of capital controls which, as noted above, would cause severe problems for re-establishing the euro as a common currency.

¹³ See page 94 of ECB (2011).

A banking meltdown of this type would certainly have resulted in a far greater turnaround in the current account of the peripheral euro-area economies than actually occurred because these countries would have experienced a far more severe banking credit crunch. Importantly, however, the damage from such a peripheral bank run would not have been restricted to the citizens of the GIIPS countries. Beyond the wider macroeconomic implications of such an event, the creditor losses involved would have hit many citizens outside the countries directly affected.

For example, the Spanish balance of payments figures also allow for a breakdown of changes in the TARGET2 balance in terms of the contribution of the financial account as well as the capital movements of domestic and foreign investors. Figure 9 shows that the capital flight from Spain was mainly driven by foreign investors (with the TARGET2 balances telling us much of this money was moved to Germany). If a full-scale peripheral bank run and creditor write-downs had been allowed in 2011, investors from outside the GIIPS countries would have been hit hard.

4.3 The Role of Monetary Union

A final counterfactual is what would have happened if the Eurosystem had been a fixed exchange rate system rather than a common currency. In this case, outward capital flows of the type that occurred in recent years would likely have produced multiple large devaluations in the periphery.

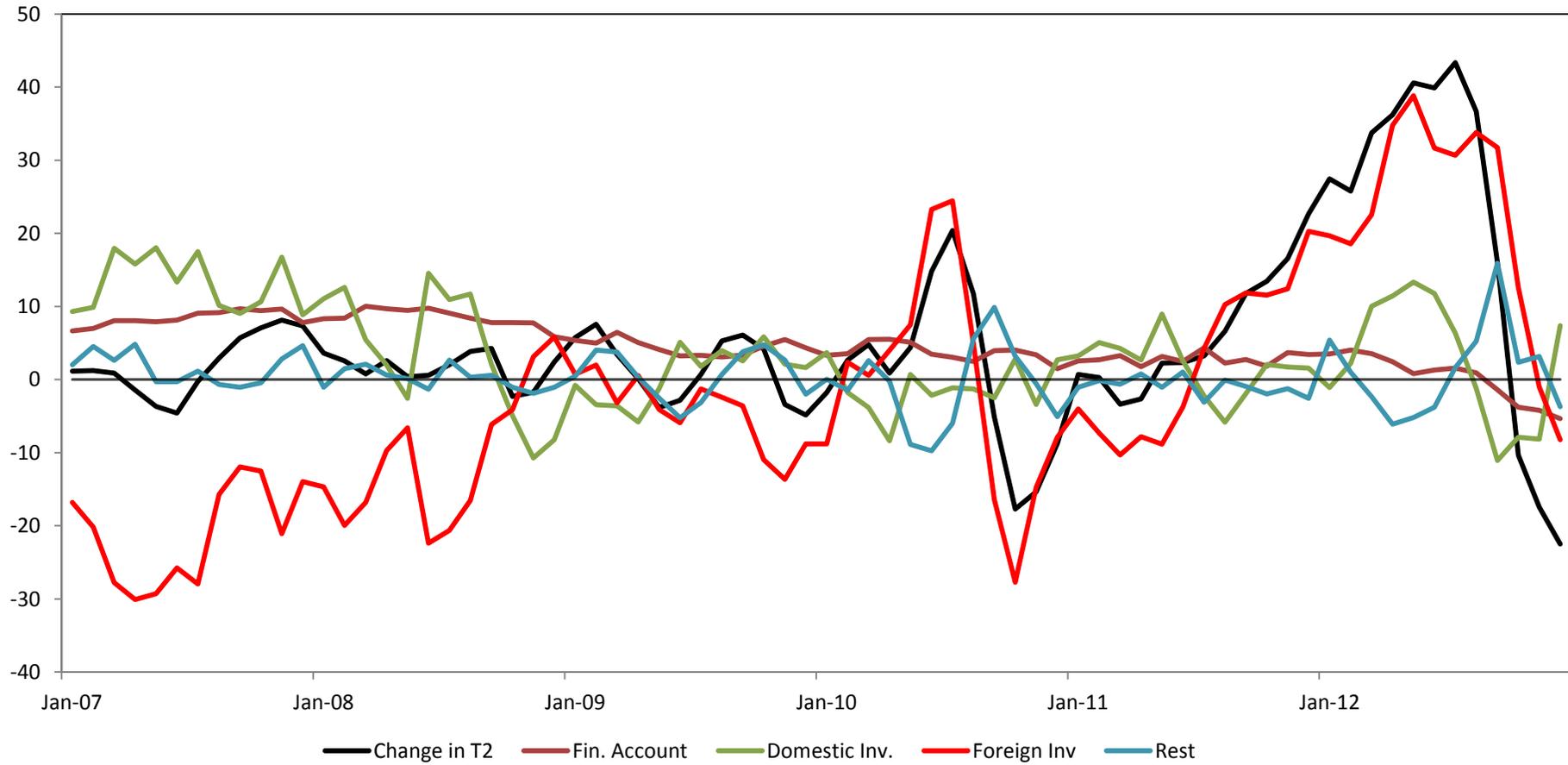
The NCBs of these countries would only have had the power to give out loans in their own national currency and capital flight could only have been honoured by swapping deposits denominated in that currency for foreign currency. Rather than run up TARGET2 liabilities, these NCBs would have had to run down their foreign currency reserves or arrange currency swap loans with foreign central banks. Given the magnitudes of the TARGET2 liabilities—Ireland's balance reached almost 100% of GDP while Greece's reached 50 % and Spain's reached one-third—it is likely that foreign exchange reserves would have been exhausted and questionable whether other central banks would have provided foreign exchange swaps on the scale required.

Given the uncertainty about whether participants in a fixed-exchange rate system could withstand significant amounts of capital flight, these systems are vulnerable to self-fulfilling runs and regular realignments. Indeed it was the dissatisfaction with the instability of the EMS exchange rate band regime that prompted much of the backing for the common currency.

The fact that NCBs cannot, by definition, run out of the currency of their fellow euro-area countries has greatly increased their ability to cope with capital flight. However, events of recent years have shown that monetary union has not prevented speculative runs altogether. Speculation about bank insolvency and euro exits has replaced speculation about devaluations as the mechanism driving capital flight.

It is also worth noting that the debate about TARGET2 may in itself play a role in exposing the Eurosystem to speculative runs. In a remarkable 1999 paper, Peter Garber noted that the euro could come under pressure if there was scepticism about the willingness of some members to run up large TARGET claims or incur large liabilities. It is hard to know to whether such scepticism played a role in recent capital flight but the debate about limits on TARGET2 balances may contribute to it being a bigger factor in the future.

**Figure 9: Contributions of Domestic and Foreign Investment Flows
to Changes in Spanish Target2 Balance Up to August 2012**
Billions of Euros, Three-Month Moving Average



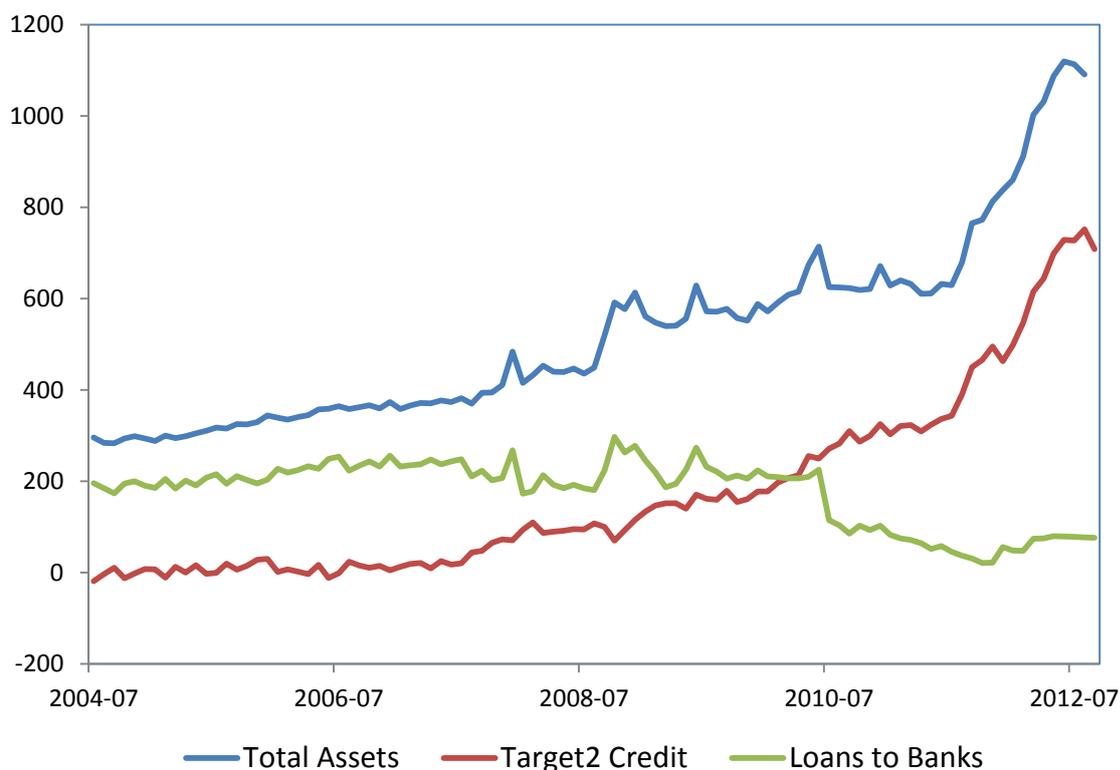
5. Risks to Germany

Having described how Germany's TARGET2 claim has built up, we now discuss the risks to German citizens represented by this claim. First, we look at how German exposure to the periphery has built up in recent years. We then consider the implications for Germany's TARGET2 claim of a single country leaving the Eurozone before considering a full breakup scenario

5.1 Germany's Risk Exposure

Of all the central banks in the euro area, the one that has had the most dramatic change in its balance sheet is the Bundesbank. As Figure 10 illustrates, the TARGET2 claim has grown to the point where it accounts for the majority of the assets of the Bundesbank. In contrast, loans to German banks, which had accounted for the most of the Bundesbank's assets until recent years, have fallen noticeably. These banks had previously been significant users of the ECB's refinancing programmes but their borrowing has significantly declined as they have become cash-rich due to deposit inflows. These substantial changes to the Bundesbank's balance sheet have prompted a lot of public commentary about how Germany has built up a very large exposure to the risk of a euro breakup.

Figure 10: The Bundesbank's Balance Sheet



Before discussing the possible consequences for Germany of various euro exit scenarios, it is worth first noting that the increase in the combined exposure of the German public and private sectors over the past few years has been fairly modest. There are two reasons for this.

The first reason is that accounting for the Bundesbank's liabilities to the rest of the Eurosystem in relation to banknote issuance makes a non-trivial change to the assessment of the build-up of risk exposures. If one is assuming that a euro breakup scenario involves TARGET2 liabilities being reneged on, then consistency requires assuming the Bundesbank will also renege on these liabilities which have grown from €84 billion at the end of 2006 to €199 billion in January 2013.

The second reason is that much of the build-up of TARGET2 claims has been offset by falling claims of German commercial banks on the Eurozone periphery, assets that would be at severe risk should the euro break up. According to data from the Bundesbank, claims of German banks vis-à-vis residents of the GIIPS countries declined from €538 billion in August 2008 to €290 billion in January 2013 as these banks gradually unwound their investments in these countries.¹⁴ The most notable declines over this period were a drop in claims on Spanish banks from €198 billion to €92 billion and on Irish banks from €157 billion to €64 billion.

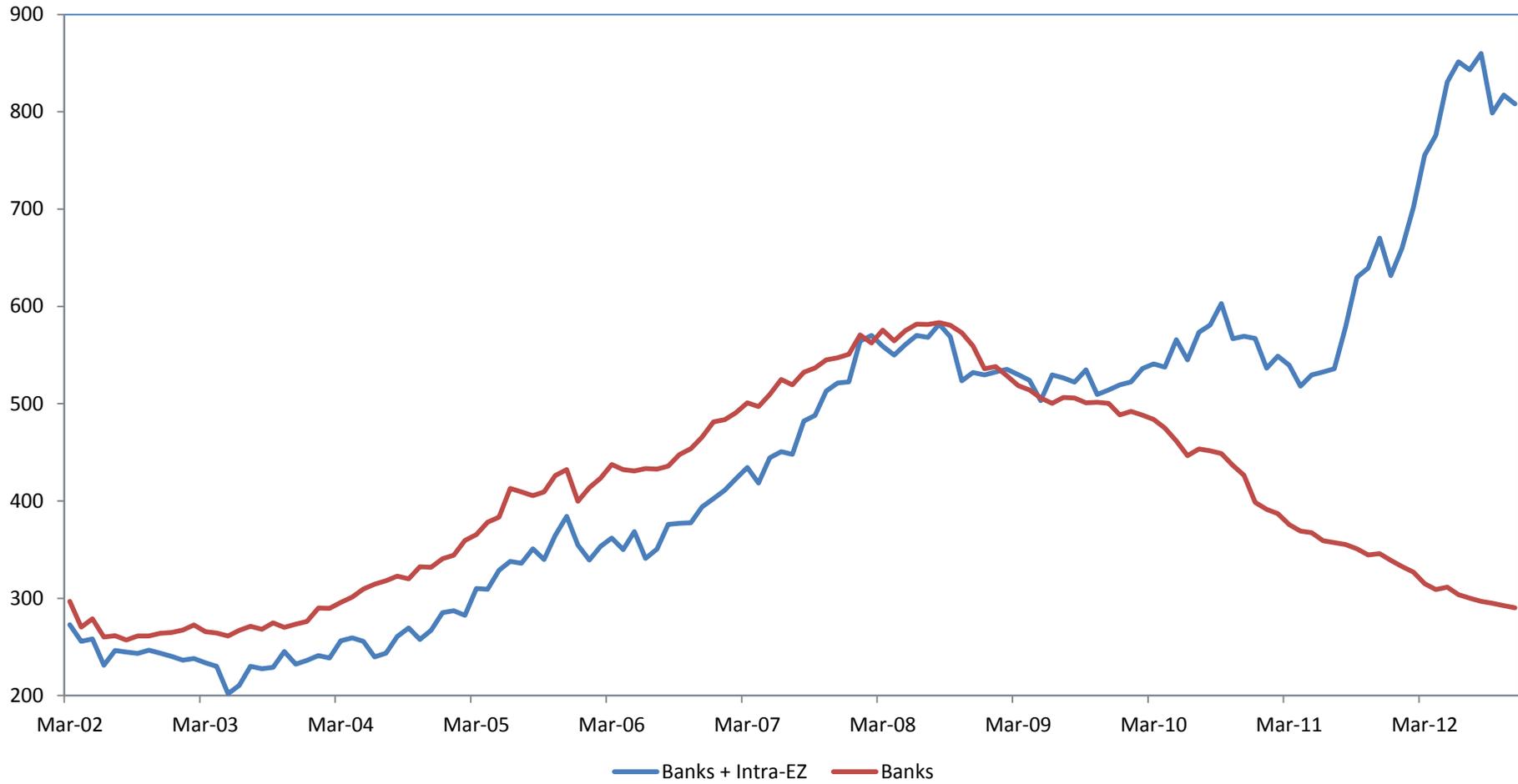
Figure 11 shows the exposure of German banks to the GIIPS countries (the red line) and combines this with the Bundesbank's net Intra-Eurosystem position (incorporating TARGET2, banknote-related liabilities and some other elements) to obtain the blue line as an estimate of the total exposure of German citizens to the Eurozone periphery and a breakup of the euro, whether it be via TARGET2 or via direct exposure of commercial banks to the GIIPS.

While the TARGET2 claim has gone from zero to one-quarter of German GDP over a short period, the combined exposures remained stable at about €600 billion for much of the crisis period, from late 2007 until mid-2011, with the rise in Intra-Eurosystem liabilities almost exactly offsetting the decline in German bank exposure. Only from mid-2011 onwards did the combined exposure start to rise. As of January 2013, these stood at €807 billion, about one-third higher than the level sustained from 2007 until 2011.

It is fair, of course, to argue that German citizens didn't necessarily agree to allow public funds to be used to facilitate privately-owned banks to unwind their investments in the euro area's periphery. However, as discussed above, if the Eurosystem had allowed peripheral banks to fail and German banks had incurred large creditor losses, it is likely that much of the cost of these losses would have been born by German taxpayers. Certainly, these calculations show that the increase in risks to Germany as a whole from a euro breakup has been more modest than would be realised from an examination of the TARGET2 figures.

¹⁴ These data are available at http://www.bundesbank.de/Navigation/EN/Statistics/Time_series_databases/Macro_economic_time_series/macro_economic_time_series_node.html?anker=AUSSENWIRTSCHAFTBANKEN

Figure 11: Total German Exposure to GIIPS\Euro Breakup
Billions of Euros



5.2 A Single Country Exit

We now consider the case in which a single country exits the euro. To be concrete, we consider the case in which Greece leaves the euro. What are the implications of such an exit for the Bundesbank's TARGET2 claim? In addition to its TARGET2 liabilities of €87 billion as of January 2013, the Bank of Greece also had a liability relating to banknote issuance of €13 billion, so their combined debt to the Eurosystem stands at €100 billion. What would be the implications for Germany of a decision by Greece to renege on these liabilities after an exit?

Because the Bundesbank's Intra-Eurosystem claims are on the ECB there would be no alteration of this claim after a Greek renegeing on its liabilities. However, this development would have implications for the ECB's balance sheet as well as its profit and loss account. In terms of its balance sheet, writing off its Intra-Eurosystem claim on the Bank of Greece would result in the sum of its Intra-Eurosystem claims and liabilities being negative rather than zero. In terms of its profit and loss account, the interest payments it receives from Intra-Eurosystem debtors would no longer cover its interest obligations to Intra-Eurosystem claimants.

At the end of 2011, the ECB had capital and revaluation accounts (representing increases over time in the value of its assets) of about €30 billion. The loss of its claim on Greece would see the ECB's liabilities exceed its assets. At the current MRO rate of 0.75%, the ECB would lose interest income of €750 million, which would have wiped out its 2011 profits of €728 million.

The question of what would happen after such a loss is a bit murkier than is often believed. While the ECB's legal statute outlines its initial capital amount and states that the ECB can retain some of its income related to banknote issuance to offset losses, it does not consider the case in which the ECB has assets that are lower than its liabilities. That said, the spirit of the statute would suggest that the NCBs would likely be called upon to recapitalize the ECB to compensate for the loss of its Greek TARGET2 claim. Because Germany has a 27% ECB capital key, this would imply a one-off cost of €27 billion or 1 percent of German GDP.

These calculations assume that countries that leave the euro will automatically exit the TARGET2 system and renege on their liabilities. It is not clear, however, this is the approach that exitors would take. Greece would still have a need to be able to settle international payments in euro after a new currency has been established. Currently, six countries that do not use the euro as their currency are current members of the TARGET2 system and meet the euro-denominated interest obligations implied by the balances owed to the Eurosystem by their central banks, so an exit from the TARGET2 system does not mechanically follow from leaving the euro.

Some commentators have focused on the size of Greece's TARGET2 obligations as implying an inevitable default after an exit. The Bank of Greece's assets would largely have been redenominated into the new currency and the TARGET2 debt would be over 50 percent of Greek GDP. Crucially, however, because there is no maturity date for TARGET2 liabilities, the claims can be honoured simply by making the necessary interest payments. The cost of making these payments would be

relatively low even when adjusting for the decline in the value of Greek nominal GDP after a currency devaluation.

At the current MRO rate and GDP level, these payments would cost Greece about 0.3 percent of its GDP per year. In the case of any exit, it is likely that Greece would need official external support from the IMF and EU to cope with a major balance of payments crisis. Honouring its TARGET2 interest obligations would be very likely to be a condition of such a programme. On balance, the TARGET2-related risks to Germany associated with a Greek exit appear to be very low.

5.3 A Full Breakup Scenario

This leaves the far more complex case of a full breakup of the euro. It is possible that such a breakup would result in a co-operative agreement in which the former euro area states continue to use TARGET2 to settle payments and the central banks with liabilities generated by TARGET2 continue to pay interest on them in some agreed legacy euro currency. A non-cooperative outcome is also possible. While Germany, and possibly some other member states, might continue to use the euro (effectively taking ownership of what's left of the ECB) and insist on being repaid in that currency, other states would be likely to pass laws redenominating all assets and liabilities into their new currencies. Against such a background, the various central banks involved could insist that they owe liras, pesetas, punts etc. or else renege on the liabilities altogether.

The probability of this scenario is difficult to assess. For all the euro's problems, a full breakup of this sort is still a low enough probability event over the next few years. As Barry Eichengreen's (2010) classic paper outlines, the legal and institutional difficulties with re-introducing new currencies are profound. This makes that it almost impossible to start making calls about how countries will behave during such an event. Still, let's consider for now the case in which such a breakup occurs and a lack of co-operation on TARGET2 balances leads to the loss of all or most of the Bundesbank's claim. What would the implications be?

In discussing this issue, it is best to break the discussion into two parts. First, what would be the impact on revenue flows of the loss of the Bundesbank's TARGET2 claim? Second, would the loss of the TARGET2 asset on the Bundesbank's balance sheet affect its ability to control inflation?

5.3.1 Revenue Effects of the Loss of the TARGET2 Claim

Let's consider the income flows of a post-breakup Bundesbank. As described in Section 2.3, the net income from monetary operations currently earned by the Bundesbank does not depend on the size of its TARGET2 asset because the sharing of income from monetary operations includes the flows related to Intra-Eurosystem balances. So the relevant loss in revenues for the Bundesbank doesn't relate to its net Intra-Eurosystem revenues but rather to the change in the amount of monetary income that it receives after a breakup.

Consider income related to regular monetary policy lending operations. With lending to banks in the Eurosystem at €1.13 trillion as of March 2013, a refinancing rate of 0.75% and a zero interest rate

being paid on excess reserves and deposits with the system, this implies total annual monetary income of about €8 billion. Germany's share of this income is about one-quarter, so at present the Bundesbank is set to receive about €2 billion in monetary income from these operations, equivalent to under 0.1 percent of German GDP. This figure is unlikely to increase much over the next few years and will probably fall. While the MRO rate may rise, this will likely be accompanied by an increase in the interest paid on reserves and deposits. And the total amount of lending is likely to fall over time as European banks deleverage and obtain alternative sources of funding so the net interest margin is likely to be applied to a lower stock of assets and liabilities.

After a breakup, however, the Bundesbank would be left with reserve liabilities owed to the German banks but would no longer be sharing the income on assets held at other central banks. As Table 9 shows, the Bundesbank's balance sheet at the end of 2012 shows €668 billion in liabilities other than the banknote-related Intra-Eurosystem item. These consist of €227 billion in banknotes, €300 billion in reserves and deposits and €140 billion in other liabilities. On the asset side, it shows €357 billion in non-Eurosystem liabilities of which only €73 billion is lending to German banks.

Table 9: Bundesbank Balance Sheet, End of 2012
Billions of Euros

<i>Assets</i>		<i>Liabilities</i>	
Gold	137.5	Banknotes	227.2
Claims in foreign currency	54.5	Current accounts and deposits	300.0
Claims on EZ credit institutions	75.5	Other	140.7
Securities	67.5	Intra-Eurosystem liabilities	200.3
Intra-Eurosystem claims	667.9	Capital, Provision, Reserves	157.1
Other assets	23.4		
Sum	1025.3	Sum	1025.3

In 2012, the small amount of net interest from its lending operations at €618 million almost covered the €778 million paid out on reserves and deposits. However, this is because interest paid on the deposit facility has been reduced to zero. A post-breakup Bundesbank would likely wish to raise interest rates in the future and this would raise the cost of its monetary-policy-related liabilities relative to its assets.

For example, if the Bundesbank chose to set an average interest rate of 3% on its reserves and deposits and charge an average interest rate of 4% on its loans, this would imply a loss of €6 billion per year on monetary policy operations given its current balance sheet configuration. A turnaround of this sort from €2 billion in shared monetary income on operations to €6 billion in losses would represent an annual loss of 0.3 percent of German GDP relative to the case where the euro stays intact. While lower than might have been thought given some of the commentary on this issue, this would still amount to a sizeable loss over time.

This projection, however, ignores another important factor: Revenues from seigniorage. As Buiter (2007) and Reis (2013) discuss, the principal source of economic revenues that governments obtain from central banks stems from the issuance of the zero-interest perpetual liabilities called banknotes.

At present, the Bundesbank has been pooling this revenue with its Eurosystem partners according to a pre-specified formula. Because it produces significantly more banknotes than is called for by these sharing rules—at the end of 2012, it had issued 44 percent of all euro banknotes compared with its banknote allocation key of 25 percent—the Bundesbank has been incurring significant liabilities to the rest of the euro area each year. This liability has increased from €147 billion at the end of 2009 to €200 billion at the end of 2012, an average increased liability of €13 billion. A post-breakup Bundesbank would not continue to incur these increased liabilities as it would be able to keep this revenue for itself.

These calculations suggest that the annual seigniorage-based gains for the Bundesbank would offset losses on monetary policy operations even if patterns of banknote issuance in Germany remained unchanged after a breakup. However, it seems likely that if the euro were to break up, leading to the re-introduction of 17 new national currencies, there would likely be a substantial re-allocation of the demand towards currencies that were seen as a good store of value. Given that issuance of euro banknotes has averaged about €60 billion a year between 2002 and 2012, such a re-allocation of hard currency demand towards the new DM would not have to be large for the gains from future seigniorage to be significantly greater than the calculations just reported.

Once these factors are considered, I think there are strong arguments that rather than incurring large annual losses, the Bundesbank may generate greater economic revenues after a breakup.

5.3.2 *Bundesbank's Balance Sheet and Control of Inflation*

The calculations just reported focused on the flow of revenues of the Bundesbank. However, much of the commentary surrounding the risks to Germany focuses on its balance sheet and the fact that its stock of assets could end up lower than its stock of liabilities. For example, Burda (2012) argues that “Germany has now become a hostage to the monetary union, since a unilateral exit would imply a new central bank with negative equity.”

Despite a lot of commentary on this issue, it is unlikely that changed balance sheet of the Bundesbank would have much impact on the German economy, particularly once one takes into account the considerations about revenue flows just presented.

Despite the common belief that central banks need to have assets that exceed their notional liabilities, there is no concrete basis for this position. As discussed above, a central bank operating a fiat currency could have assets that fall below the value of the money it has issued – the balance sheet could show it to be “insolvent” – without having an impact on the value of the currency in circulation. A fiat currency's value, its real purchasing power, is determined by how much money has been supplied and the factors influencing money demand, not by the central bank's stock of assets.

Some of the commentary on this issue has focused on the costs associated with a fiscal recapitalisation of the Bundesbank. However, even if it is decided after a breakup that the Bundesbank should be provided with assets from the Federal government for recapitalisation purposes, rather than being hugely costly, this recapitalisation would have no impact on either the net asset position of the German state or its flow of net income. Let's assume the German government recapitalises the Bundesbank by providing it with an interest-bearing government bond. While the government's gross debt will increase, the government bond becomes an asset of the Bundesbank, so the total public net debt does not change, while the higher net interest income arising from these assets would increase the amount the Bundesbank could return in dividends to the German government by the same amount, resulting in no change in the total flow of income for the public sector.

A more relevant concern about the loss of a large stock of assets is that it may have operational implications. Specifically, one could argue that a central bank needs to have a sufficient stock of assets that can be sold in order to conduct contractionary open market operations to control inflation. This is not really an argument for the need for positive central bank capital per se but rather an argument about the need for asset holdings of a certain size, irrespective of liabilities. However, the most detailed study on the operational implications of central bank capital, by Bindseil, Manzanares and Weller (2004) failed to find any evidence that negative central bank capital could prevent monetary policy from meeting its goals.

As monopoly issuers of currency, central banks can control market interest rates by offering to pay whatever interest rate they choose on deposits. Hall and Reis (2013) express concerns that a central bank that expands the stock of reserves via a policy of compensating them with higher interest rates could cause inflation via the resulting increase in the monetary base if it is not draining the stock of reserves with corresponding income received on its assets. Economic theory and recent experience provide little reason, however, to believe there is a strong relationship between the price level and the monetary base. Alternatively, the idea that inflation can be controlled through the influence of interest rates on economic activity underlies the operational strategies of all modern central banks. On balance, the evidence does not suggest the loss of its TARGET2 asset would lead to the Bundesbank losing control of inflation.

6 Proposals for Settling TARGET2 Balances

While the calculations just presented suggest that the risk to Germany associated with the potential loss of its TARGET2 claim may not be as large as sometimes presented, it is clear that many people are nervous about the existence of such large unsettled balances between the central banks of the Eurosystem. This raises the question of whether there are alternatives to the current approach that would reduce the level of ongoing controversy over the balances. Here I discuss proposals for settlement of the balances and the impact they would have on NCB lending policies

6.1 Settlement with Monetary Policy Assets

In a number of contributions, Hans-Werner Sinn has proposed alternative arrangements. In Sinn (2011), he proposed putting a cap on TARGET2 balances. However, as discussed in Section 4.2, it is likely that caps of this sort would be highly disruptive and effectively trigger the end of the euro as a true common currency. A more constructive proposal for reducing the size of TARGET2 balances, discussed in Sinn and Wollmershäuser (2012), is to settle the liabilities generated by the system each year by debtor central banks handing over assets to creditor central banks.

As noted earlier, there is a precedent in the Federal Reserve System for this approach. The vast majority of assets in the Fed's SOMA account have been built up over time via money-creating open market operations. The sharing of ownership of these assets sets a clear model that the Eurosystem could follow for settlement of TARGET2 balances.

Each NCB has a defined portfolio of assets associated with its monetary policy operations. These assets are mainly collateralised loans to banks but also include government bonds purchased in the Securities Market Programme. Each year, the NCBs with positive net Intra-Eurosystem liabilities could hand over the legal ownership of some of these assets to the ECB to settle these positions. The ECB would then re-allocate them proportionately to TARGET2 creditors. This would see all TARGET2 balances set to zero each year.

At first sight, it might appear that this settlement process would increase the exposure of the Bundesbank to credit risk associated with loans to Spanish or Italian banks. However, because these assets have been acquired via agreed Eurosystem monetary policy operations, the usual risk-sharing rules would apply. In other words, while the Bundesbank would own these assets and receive interest income from them, it would only be exposed to 27 percent of the credit risk.

Of course, if there were to be a Eurosystem breakup, then it is likely that the Bundesbank would be left holding loans to Spanish and Italian banks that have been redenominated into a new depreciated currency. While this could lead to credit losses for the Bundesbank, their outcome is still likely to be better than would occur in the case of an un-cooperative euro breakup in which the various NCBs refuse to honour any of their TARGET2 liabilities.

At this point, it is worth commenting on the idea that the current controversy is merely a consequence of the decision not to abolish the NCBs when the euro came into existence. It is true that the balance sheet of the integrated Eurosystem doesn't show any TARGET2 balance and, without any NCBs in existence, there would be no record of any such balances. However, should a euro breakup and reinstatement of the NCBs be considered, the same questions would have arisen in a different form.

For example, the reserve accounts the German banks would be holding with a fully-integrated ECB would have exceeded the amount of monetary policy assets based on claims on German citizens. A co-operative breakup of an integrated Eurosystem could have allocated portfolios of loans to non-German banks to the Bundesbank in a breakup. However, an un-cooperative breakup could have seen non-German governments assign these assets to their own new central bank. The current

institutional set-up of the Eurosystem has made the tensions surrounding ownership of assets clear but these tensions would not have disappeared in a more integrated structure.

6.2 Settlement with Collateralised Sovereign Bonds

While there are some arguments for settling annual TARGET2 balances with assets accumulated via monetary policy operations, it is unlikely that following the Fed's procedures would have much effect on the practice of monetary policy in the euro area. Sinn (2012a) has argued that the annual settlement of Intradistrict accounts acts to restrict the District Feds from creating too much credit.¹⁵ In reality, as noted above, the Fed's District Banks have almost no control over their liabilities. Similarly, even with an annual settlement of assets acquired during monetary policy operations, as long as NCBs continued to operate the monetary policy procedures set out by the ECB Governing Council they would have little control over their TARGET2 balances before or after settlement dates.

Interestingly, despite recommending that the euro area should follow the Fed's settlement procedures, Sinn and Wollmershäuser's actual settlement proposals are fundamentally different to the procedures employed in the US. They propose settlement via "national government bonds backed by real estate property" a proposal that Sinn (2012a) has amended so that the bonds can be collateralised by "state-owned real estate or senior rights to future tax revenue." No such system operates in the US because the District Feds have no corresponding fiscal entity that could provide them with such collateralised bonds.

It is worth teasing out the implications of this proposal by revisiting our earlier example of Misters A and B and money being sent from Spain to Germany. Table 10 shows how such a proposal would affect the balance sheets of all parties after the annual settlement via a collateralised government bond. An additional player becomes involved in the form of the government of Spain. The gross public debt of Spain increases but the net debt of the public sector is unchanged because the Central Bank has increased its net capital position by taking on a new asset (the loan to Santander) without increasing its liabilities.

This proposal would likely have extremely negative immediate implications for TARGET2 creditor states. It would result in many of these countries experiencing a large rise in their gross government debt to GDP ratio in some cases over 50 percentage points. Of course, the public sectors in these countries would also have gained offsetting assets in the form of additional loans to banks that total the same amount. However, these assets would carry credit risk while the collateralised senior debt would be designed to be honoured even in the case of a default (or at least honoured as long as the country remained a member of the Eurosystem.) Sovereign bond investors would view the bonds issued by these countries as having greatly increased their loss-given-default because they would be moved significantly further back in the queue and the prospect of sovereign default would be greatly increased.

¹⁵ Specifically, he argues that "it is not attractive to take on Interdistrict Settlement Account liabilities, which prompts the deficit District Feds to try to reduce their liabilities in order to avoid, come April, losing part of their titles in the Fed's clearing system."

Table 10: Balance Sheet Implications of Settlement with Government Debt

Mr A	<ul style="list-style-type: none"> • Reduced assets of €100
Santander	<ul style="list-style-type: none"> • Reduced liabilities to Mr A of €100 • Unchanged reserve assets at Banco de España • Increased liabilities to Banco de España of €100
Banco de España	<ul style="list-style-type: none"> • Increased assets via €100 loan to Santander.
Government of Spain	<ul style="list-style-type: none"> • Increased liabilities via €100 collateralised bond.
Bundesbank	<ul style="list-style-type: none"> • Increased assets via €100 collateralised Spanish bond. • Increased reserve liabilities to Commerzbank of €100
Commerzbank	<ul style="list-style-type: none"> • Increased reserve assets of €100. • Increased deposit liability to Mr B of €100.
Mr B	<ul style="list-style-type: none"> • Increased assets of €100

Sinn and Wollmershäuser have argued that the requirement to use collateralised sovereign bonds for settlement would reduce TARGET2 balances by discouraging central bank lending.¹⁶ While they view this as an advantage, this approach to settlement would likely place serious strains on the ability of the ECB Governing Council to continue running a common monetary policy in the euro area. States with central banks that were required to provide large amounts of loans to their banks would see their sovereign credit risk rising because of the need to issue new senior government debt. The ECB Governing Council issuing instructions that lead to automatic issuance of senior debt that puts pressure on sovereign credit assessments would likely be another factor putting pressure on states to leave the euro.

It is also questionable whether the senior debt proposal would necessarily provide Germany with a better outcome during an uncooperative euro breakup. Why should we assume that states would walk away from their TARGET2 liabilities and yet still honour what may well be seen as “odious” debts issued to settle these same liabilities? A proposal of this sort seems likely to make a euro breakup less cooperative rather than more.

¹⁶ The actual language used by Sinn and Wollmershäuser is somewhat more colourful, e.g. the requirement to settle with these bonds would “eliminate the incentive to solve the payment difficulties by resorting to the printing press” and mean “the GIIPS would no longer have an interest in overexerting their money-printing presses in order to satisfy their internal credit demand”.

7. Conclusions

Despite its new-found celebrity status as a threat to German money and children, closer examination of the TARGET2 payments system generally reveals it to be innocent of most of its accused crimes. The large balances that have built up on the balance sheets of the euro area's central banks have largely been a by-product of an agreed Eurosystem approach to monetary policy and have not reflected discretionary actions by peripheral central banks or governments. The characterisation of the TARGET2 balances as representing a bailout of these countries or being driven by current account deficits are also largely inaccurate.

While the build-up of a large TARGET2 claim on the rest of the system does represent a risk to the balance sheet of the Bundesbank, an examination of the likely income flows of a post-breakup Bundesbank suggests that it may earn higher net revenues after a breakup than if the euro stays together. Even if particular aspects of the calculations reported here may be open to dispute, the threat to German citizens due to the TARGET2 balance that has featured in a lot of public commentary still appears to have been over-hyped.

This is not to say at all that Germany has nothing to lose from a breakup. In fact, it is likely that Germany would face serious problems after a breakup because of the appreciation of its currency. Its export-oriented economy would suffer badly and many of its commercial banks would find that their assets—much of which would now be denominated in weaker foreign currencies—no longer cover their liabilities. German taxpayers would likely have to pay a serious price to maintain both a hard currency and a solvent private banking system. It is these genuine risks that German citizens and policy makers should be focusing on when debating the future of the euro, not balance sheet items relating to TARGET2.

Many of the criticisms of the Eurosystem's approach to TARGET2 balances turn out, on closer examination, to be criticisms of the implementation of a common monetary policy across the euro area. However, the ECB has operated on a principle that credit institutions must be treated equally irrespective of their location and proposals that they abandon this principle (or that they restrict the operation of payments systems in certain countries) are likely to be incompatible with the continuation of the euro as a common currency.

A final conclusion is that the debate about TARGET2 has exposed a number of weaknesses in the communications strategies of the ECB and its affiliated national central banks. Their failure to make data on Intra-Eurosystem balances easily and regularly available in a harmonised fashion has contributed considerably to the flawed "secret bailout" story. Rectifying this mistake would take little time and should be done as soon as possible.

Finally, while Europe's central bankers are loath to ever talk about the breakup of the euro, their reluctance to do so has allowed others to fill the gap and there has been a strong demand for stories of massive TARGET2-related losses for Germany in a breakup scenario. A willingness to address these arguments and to provide a greater focus on the real and significant risks associated with a euro breakup would be welcome.

References

- Auer, Raphael Anton (2012). What Drives Target2 Balances? Evidence From a Panel Analysis, Working Papers 2012-15, Swiss National Bank.
- Bindseil, Ulrich, Andres Manzanares and Benedict Weller (2004). The Role of Central Bank Capital Revisited. ECB Working Paper No. 392.
- Bindseil, Ulrich and Philipp Johann König (2011). The Economics of TARGET2 Balances. Working paper Humboldt University, SFB 649 Discussion Paper 2011-035.
- Buiter, Willem (2007). Seigniorage. NBER Working Paper No. 12919.
- Burda, Michael (2012). "Hume on Hold?" Vox EU, 17 May 2012.
- Cecioni, Martina and Giuseppe Ferrero (2012). Determinants of TARGET2 Imbalances, Banca d'Italia, Questioni di Economia e Finanza (Occasional Papers) 136.
- Eichengreen, Barry (2010). "The Breakup of the Euro Area" in *Europe and the Euro*, edited by Alberto Alesina and Francesco Giavazzi, University of Chicago Press.
- European Central Bank (2011). *The Monetary Policy of the ECB*.
- European Central Bank (2012). TARGET Annual Report 2011.
- Garber, Peter (1999). "The TARGET Mechanism: Will it Propagate or Stifle a Stage III Crisis?" *Carnegie-Rochester Conference Series on Public Policy*, Volume 51, pages 195-220.
- Goodhart, Charles (1998). "The Two Concepts of Money: Implications for the Analysis of Optimal Currency Areas", *European Journal of Political Economy*, Volume 14, 407-432.
- Hall, Robert E. and Ricardo Reis (2013). Maintaining Central-Bank Solvency under New-Style Central Banking. Working paper, Columbia University.
- Koning, John Paul (2012). The Idiot's Guide to the Federal Reserve Interdistrict Settlement Account. Blog post available at <http://jpkoning.blogspot.ie/2012/02/idiots-guide-to-federal-reserve.html>.
- Thomas A. Lubik and Karl Rhodes (2012). TARGET2: Symptom, Not Cause, of Eurozone Woes. Richmond Fed, Economic Brief 2012-08.
- Tornell, Aaron and Frank Westermann (2011a). "Greece: The sudden stop that wasn't", Vox EU, 28 September.
- Tornell, Aaron and Frank Westermann (2011b). "Eurozone Crisis, Act Two: Has the Bundesbank reached its limit?" Vox EU, December 6.
- Tornell, Aaron and Frank Westermann (2012). "The tragedy of the commons at the European Central Bank and the next rescue" Vox EU, 22 June.
- Reis, Ricardo (2013). The Mystique Surrounding the Central Bank's Balance Sheet, Applied to the European Crisis. NBER Working Paper No. 18730, forthcoming, *American Economic Review*.

Sinn, Hans-Werner (2011). "The ECB's Secret Bailout Strategy", Project Syndicate, April 29.

Sinn, Hans-Werner (2012a). "Fed versus ECB: How Target Debts Can Be Repaid", Vox EU, March 10.

Sinn, Hans-Werner (2012b). Die Target-Falle: Gefahren für unser Geld und unsere Kinder (The Target Trap: Dangers for our Money and our Children) Hanser: Munich.

Sinn, Hans Werner and Timo Wollmershäuser (2012). "Target Loans, Current Account Balances and Capital Flows: The ECB's Rescue Facility". *International Tax and Public Finance*, Volume 19, Issue 4, pages 468-508.

Data Appendix

Sources for the 2011 National Central Bank balance sheets are as follows.

Belgium	http://www.nbb.be/doc/ts/Publications/NBBReport/2011/EN/T2/report2011_T2_H2.pdf
Germany	http://www.bundesbank.de/Redaktion/EN/Downloads/Publications/Annual_Report/2011_annual_report.pdf
Estonia	http://www.eestipank.ee/sites/default/files/publication/ep2011_5.pdf
Ireland	https://www.centralbank.ie/publications/Documents/Central%20Bank%20Annual%20Report%202011.pdf
Greece	http://www.bankofgreece.gr/BogEkdoseis/Summary_Annrep2011.pdf
Spain	http://www.bde.es/f/webbde/SES/Secciones/Publicaciones/PublicacionesAnuales/InformesAnuales/11/Fich/balancee.pdf
France	http://www.banque-france.fr/fileadmin/user_upload/banque_de_france/publications/accounts-of-the-Banque-de-France-2011.pdf
Italia	http://www.bancaditalia.it/pubblicazioni/relann/rel11/rel11en/en_rel_2011.pdf
Cyprus	http://www.centralbank.gov.cy/media//pdf/ENGLISH_ANNUALREPORT_2011_.pdf
Luxembourg	http://www.bcl.lu/en/publications/rapports_annuels/Annual_report_2011/188214_BCL_ANNUAL_REPORT_2011_EN.pdf
Malta	http://www.centralbankmalta.org/updates/downloads/pdfs/AR-2011.pdf
Netherlands	http://www.dnb.nl/en/binaries/AR2011_tcm47-270450.pdf
Austria	http://www.oenb.at/en/img/ar_2011_screen_tcm16-247638.pdf
Portugal	http://www.bportugal.pt/en-US/Publicacoes/Intervencoes/Banco/RelatConselhoAdministracao/Tumbnails%20List%20Template/Activities%20and%20Financial%20Statements%202011%20%28Complete%20version%29.pdf
Slovenia	www.bsi.si/library/includes/datoteka.asp?Datotekaid=4740
Slovakia	http://www.nbs.sk/_img/Documents/_Publikacie/AnnualReport/ARNBS11.pdf
Finland	http://www.suomenpankki.fi/en/julkaisut/vuosikertomus/Documents/vk_2011_en.pdf
ECB	http://www.ecb.int/pub/pdf/annrep/ar2011en.pdf