The Eurozone and Target2: The Sudden-Stop that Wasn't*

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Abstract

The Eurozone periphery has been suffering a protracted crisis since 2008. It still needs major financial infusions to cover current account deficits and capital outflows. Here, I document several patterns observed in the Eurozone periphery, and present a political-economy model that accounts for these patterns and that puts the Targe2 mechanism in perspective. First, in the wake of sudden-stop in 2008, Greece, Italy, Portugal and Spain (GIPS) have received ample official flows that have allowed for persistent current account deficits. Second, the brunt of these official inflows has come via the ECB. In fact, the GIPS have witnessed a more than 1000% increase in central bank credit since 2007. This massive liquidity injection has lead to an explosive path of their Target2 liabilities. Third, prior to 2008, private capital inflows fueled lending booms and current account deficits. Even though imbalances were growing at an alarming pace, bond yields were driven to the level of German yields. Fourth, during the boom, while gross national debts were growing to unsustainable levels, GIPS's residents were privately accumulating gross assets abroad. Finally, after the reversal of private capital inflows to the GIPS, those private assets abroad have—puzzlingly—not been repatriated to the Eurozone periphery. The resulting financing gap has been covered mainly by the increase in Target2 liabilities. We account for these facts in a model with a dual tragedy-of-the-commons: an inter-country commons-problem which acts mainly via the Eurosystem; and a within-country commons-problem.

1 Introduction

The Eurozone periphery has witnessed a more than 1000% increase in central bank credit to banks since 2007. This massive increase in domestic central bank credit has been associated with the explosive path of the Target2 liabilities of the periphery national central banks vis-à-vis the Eurosystem.[1] Unfortunately, after four years, the Eurozone periphery still needs major financial infusions to cover current account deficits and capital outflows.

Prior to the 2008 crisis, private capital inflows into the Eurozone periphery fueled lending booms and current account deficits. Even though imbalances were growing at an alarming pace, periphery bond yields were driven to the level of German yields.

Interestingly, at the same time that gross national debts were growing in the Eurozone periphery, their residents' gross assets held abroad were also growing. In fact, the cumulative current account deficits of Greece, Italy, Portugal and Spain–the GIPS–are significantly smaller than the increase in their gross national debts. The so-called 'Lagarde List' in Greece is a sad example of this pattern of accumulation of private assets abroad, while the country's debt is growing to unsustainable levels.

In the wake of the 2008 crisis, private capital inflows to the periphery reversed. Puzzlingly, those private assets abroad have not been repatriated to the Eurozone periphery. The resulting financing gap has been covered mainly by the increase in the national central banks' credit to banks alluded to above. Because this injection of liquidity has lead to an increase in Target2 liabilities to the Eurosystem rather than an abrupt loss in international reserves, the adjustment process has been more protracted than in the typical emerging market.

These expansionary monetary policies have not been the design of a central planner. Rather, they have been the haphazard response to threatening situations, with ugly consequences for inaction. Unfortunately, there has been no long-lasting adjustment yet. The current account–the excess of spending over national income–is still negative in the GIPS.

In this paper, we present a minimal political-economy model that accounts for these

[1] Target2 liabilities are automatic loans from the Eurosystem to a national central bank within the Eurozone. See Tornell and Westermann (2011) and the references therein.

facts and that puts the Target2 mechanism into perspective. The main driver in the model is a dual tragedy-of-the-commons: an inter-country commons-problem which acts mainly via the Eurosystem of central banks; and a within-country commons-problem. The former problem arises from the interaction of the Target2 mechanism with the power that each national central bank (NCB) has over extension of credit to domestic financial institutions. The latter problem arises because there are interest groups that have power to extract fiscal resources and induce bailout guarantees.

The Target2 mechanism plays two key roles. First, it supports an implicit systemic bailout guarantee that ensures investors are repaid during a sudden-stop. Second, it allows for a slower current account adjustment. During a private capital flow reversal, Target2 allows NCBs to expand massively credit to banks without risking a loss in international reserves. This NCB liquidity injection allows domestic banks to stay afloat, which in turn allows domestic agents–e.g., local governments, firms–to continue borrowing from banks. It also allows (foreign) investors to sell their assets at no major loss: This is, de-facto, a bailout of investors.[2]

Target2 also played a role prior to 2008: Because of the implicit bailout guarantee, bond yields in the periphery were as low as German ones despite the deteriorating competitiveness and the unsustainability of their gross national debts.

Decision-makers in our setup are neither benevolent central planners nor small-competitive agents, but rather interest groups with the power to extract resources from the rest of the economy. These powerful groups include both foreign investors–such as large banks–as well as domestic elites, such as Papaconstantinou's cousins and Baltar's associates in Galicia.[3]

In equilibrium both domestic elites and foreign investors are content with the unsustainable buildup of gross national debt, and with the slow adjustment in the wake of the sudden-stop. Because powerful groups have de facto common-access to the rediscounting window of the NCB, there is overexploitation of the commons: available NCB credit. In

[2]Without Target2 NCBs would suffer speculative attacks on their international reserves if they were to increase domestic credit beyond a limit.

[3]George Papaconstantinou was Greece's finance minister to whom Mrs. Lagarde handed the list of around 2000 offshore banking accounts in 2010. Mr. Baltar has been Orense's political boss since the beginning of the democratic regime in Spain.

equilibrium, even though the common-pool is not depleted abruptly, it is gradually depleted. Furthermore, as national debt increases to unsustainable levels, gropups accumulate private assets abroad even though their rate of return is inefficiently low. This is because in order to smooth consumption, groups find it optimal store their appropriations safely abroad.

A unitary decision-maker would not over-exploit available NCB credit. Under divided control, however, this cannot be part of an equilibrium path: if one group were to refrain from overexploiting the common-pool, other groups would increase their overexploitation.

Our tragedy-of-the-commons view is not inconsistent with the multiple-equilibria view, under which bond markets grossly overestimate the risk that a country will break away from the Eurozone. However, an important implication of our analysis is that if EU and ECB policies are designed to solely eliminate the multiple-equilibria syndrome, they will exacerbate the tragedy-of-the-commons syndrome. As a result, such policy stance would make more likely the horrific outcome it is meant to avoid in the first place. In other words, our analysis implies that "doing whatever is necessary to save the Euro" cannot only mean an unwavering commitment to a never-ending process of central bank credit expansion in the Eurozone periphery. It must mean that–in addition to support policies–strict conditionality is imposed concurrently, not mañana.

The structure of the paper is as follows. In Section 2 we present the stylized facts. In Section 3 we describe institutional characteristics of the Eurosystem and monetary instruments that have been used in the Eurozone. In Section 4 we present a dynamic game that captures such institutional characteristics and derive the interior Markov perfect equilibrium of the commons-problem. Finally, we present the conclusions in Section 7.

2 Eurozone's Periphery Stylized Facts

In this section, we list several stylized facts that have characterized the Eurozone periphery over the last decade. The stylized facts we document below correspond to aggregate data for Greece, Italy, Portugal and Spain. We will refer to them as the 'GIPS.'

Domestic Credit Expansion. Typically, in the run-up to a Balance-of-Payments crisis in an emerging market, one observes massive central bank credit creation in a desperate attempt

to avoid a recession or a meltdown. Mexico, prior to the Tequila crisis in 1994, is a canonical example. In in early 1994, when it became obvious to markets that the exchange rate peg was unsustainable, Banco de Mexico increased its credit to domestic financial institutions by around 500%. This strategy failed to stem a crisis because the central bank's domestic credit creation was reflected almost one-to-one in loses in its international reserves, as shown in Figure 1.[4] As is well-known, in December 1994, Mexico suffered a speculative attack and was forced to terminate the peg. A huge–unwanted–depreciation resulted, followed by a sharp but short-lived, recession. Growth resumed in 1996.

Can we see such a massive central bank's domestic credit creation in the Eurozone? Not at the aggregate level. In fact, the ECB's balance sheet expansion since 2007 is of the same order of magnitude as that of other major central banks.[5] If we dig deeper, however, we find that the aggregate masks a huge cross-country asymmetry: in the GIPS, the credit of national central banks to domestic financial institutions has increased by more than 800bn Euro between 2007:I and 2012:I, as shown in Figure 2.[6] This more than 1000% increase is massive and unprecedented in the post-war period. Even Mexico's infamous 500% domestic credit blow-up in the run-up to the Tequila crisis pales compared with this massive increase.

Stylized Fact 1. Explosive Central Bank's Domestic Credit in GIPS The credit of GIPS's national central banks (NCBs) to domestic financial institutions has increased ten-fold since 2008.

The Mexican case is typical. Historically, massive central bank credit creation–in the name of avoiding a recession–is a well established *sin* and its punishment is swift because there is a natural limit imposed by a depletion of international reserves. In the Eurozone, these natural limits have been muted, and so the massive NCB credit creation in the GIPS has not met a corresponding full-blown Balance-of-Payments crisis. The reason for this anomaly is that GIPS's NCBs have been able to finance such domestic credit creation by borrowing—indirectly—from other Eurozone NCBs rather than by drawing down their own gold and

[4] For the details of this argument see Sachs, Tornell and Velasco (1995).

[5] During this period the balance sheet of the ECB has increased by around 170%, that of the US Fed by 220%, and that of the Bank of England by 350%.

[6] For details see Tornell and Westermann (2012).

international reserves. Such borrowing has been facilitated by the Target2 mechanism, which takes place via the Eurosystem of Central Banks.[7]

To analyze Eurozone dynamics, we must add a new item to the standard textbook central bank's balance sheet: Target2 balances.

Balance Sheet of a National Central Bank in the Eurozone

Assets	*Liabilities*
Credit to Domestic Agents	*Money Balances*
Gold & Reserves	*Target2 Liabilities*
Target2 Claims	

Stylized Fact 2. Sharp Increase in Target2 Imbalances The counterpart of the massive increase in NCB's domestic credit in the GIPS has been a massive increase in their Target2 net liabilities vis-à-vis the Eurosystem. The corresponding massive increase in Target2 net claims vis-a-vis the Eurosystem has been concentrated in four countries: Finland, Germany, Luxembourg and Netherlands (FGLN).

Figure 3 shows the evolution of the Target2 net liabilities of the GIPS and the Target2 claims of FGLN. As we can see, there is a remarkable similarity between the increase in NCB domestic credit and Target2 liabilities. Meanwhile, the GIPS's international reserves have not changed significantly.

As we explain in Section 3, in the by-laws of the Eurosystem of Central Banks there are no de-jure limits to the Target2 liabilities that an NCB can accumulate. Furthermore, there is no time limit by which such liabilities must be repaid. This lack of formal limits may arguably be important for the smooth functioning of the currency union because it facilitates trade in goods and services and may serve as an implicit insurance against idiosyncratic shocks.

[7] For a description of the Target2 mechanism see Garber (1998), Sinn and Wollmershäuser (2011), and Tornell and Westermann (2011).

However, like in any family, the persistence of large imbalances may create political tensions across countries in the union.

The Sudden-Stop and the Adjustment. In the wake of the 2008 financial crisis, the GIPS have experienced a de-facto "sudden-stop": private capital flows into GIPS have reversed and a massive exodus of private capital has been taking place.[8] Typically, in response to a sudden-stop, there is a sharp reduction in national spending so that the current account deficit–the excess of spending over national income–is eliminated immediately. In most cases the current account has jumped from deficit to surplus within a year. An example of this sharp-and-abrupt elimination of the current account deficit is depicted in Figure 4, which shows the adjustment of Korea and Thailand during the 1997 Asian crisis, as well as Mexico's adjustment during the Tequila 1994 crisis. The former exhibit an adjustment of more than 10% of GDP in one year; the latter of more than 5% in one year.

In contrast, in the GIPS, there has been an anomalous response pattern: the current account deficit has not been eliminated yet, several years after the private capital flow reversal. This slow adjustment can be seen in Figure 5.

Stylized Fact 3. Persistence of Current Account Deficits The GIPS experienced a 'sudden-stop' of private capital inflows following the 2008 financial crisis. The anomaly, relative to the historical norm, is that the GIPS have not adjusted spending so as to eliminate their current account deficits in a fast enough manner.

Consider the Balance-of-Payments identity: *Current Account Deficit* $\equiv$ *Financial Account + Capital Account + Errors and omissions,* and let us break-up the financial account into its private and official components

$$\begin{matrix}\textit{Current Account}\\ \textit{Deficit}\end{matrix} = \begin{matrix}\textit{Net Private}\\ \textit{Financial inflows}\end{matrix} + \begin{matrix}\textit{Net Official}\\ \textit{Financial inflows}\end{matrix} + \begin{matrix}\textit{Capital}\\ \textit{Account}\end{matrix} + E\&O$$

Figure 6 shows that when private capital inflows reversed, the current account deficits in the GIPS have been associated mainly with official inflows.[9]

[8] This term has been coined by Guillermo Calvo. See, for instance, Calvo, et al. (200X).

[9] For the case of Greece, this point has been made by Tornell and Westermann (2011a).

Stylized Fact 4. The Sudden-Stop that Wasn't The failure of the GIPS to eliminate their current account deficits in the face of a sudden-stop has been facilitated by a massive increase in official capital inflows into the GIPS

We would like to emphasize that the massive increase in official financial inflows in the wake of a sudden-stop is unprecedented. Historically, private capital flow reversals are not accompanied by large capital inflows from official sources. Typically, when a country like Mexico or Korea has experienced a sudden-stop, international organizations–such as the IMF–have imposed strict spending-reduction conditions and official loans have mainly been directed to repay creditors.[10]

Where did the massive official financial inflows come from? Most of these inflows has been neither parliament-approved loans from Eurozone governments nor stabilization-packages from official institutions, such as the IMF or the EU. Instead, official inflows have come mainly through the Eurosystem of Central Banks via the so-called *Target2 mechanism*.

Figures 3 and 6 show that the sharp increase in Target2 liabilities of the GIPS NCBs coincides quite closely with cumulative net official financial inflows. This coincidence is remarkable given that these two series come from different data sources. As we discussed earlier, the mechanism that has transmitted the official financial inflows into the GIPS is the increase in GIPSs' NCB domestic credit. The sharp increase in GIPS NCB domestic credit (depicted in Figure 2) moves closely with both cumulative net official financial inflows and with the increase in Target2 liabilities of the GIPS.

Capital Flight. In standard one-good representative-agent models, the increase in the economy's total external gross debt over a period of time equals the cumulative current account deficit over that time period. Not so in the GIPS: between 2005 and 2012, the increase in total external debt of the GIPS has been nearly €2 trillion, while the cumulative current account has been only around €1 trillion, as shown in Figure 7.[11]

[10] In fact, Calvo identifies sudden stops by looking at reversals in the so-called financial account, which includes private as well as official flows.

[11] In theory, there are circumstances under which it may be optimal for such an economy to increase its external debt. Because of the standard no-Ponzi condition, the higher debt is expected to be financeable over

Where did the missing €1 Trillion go? It is not to be found in the so-called "errors & omissions" accounts. Rather, it is to be found in the gross assets held abroad by GIPS's residents–"gross private assets abroad" for short. Using data from the BOP statistics we have computed the gross private assets held by GIPS residents abroad. As Figure 8 shows, the GIPS's private assets abroad have increased by roughly €1 Trillion over the period 2005-2012.

Stylized Fact 5: Capital flight from GIPS Between 2005 and 2012, the GIPS's total external gross debt has increased by €2 Trillion, while the cumulative current account deficits add to only €1 Trillion. This missing gap can be accounted for by the €1 Trillion increase in the GIPS's residents gross private assets abroad.

It would seem that while the GIPS have been fastly accumulating gross external debt, a subset of the GIPS's residents has been rapidly increasing its gross assets in other countries. Surely, it will not escape to the reader that the additional €2 Trillion gross external debt will ultimately be the responsibility of the taxpayer–of either the GIPS or the rest of the Eurozone. Meanwhile, the €1 Trillion gross private assets abroad will quite likely be out of the reach of the GIPS tax authorities. To the extent that the €1 Trillion private assets abroad is owned by a small share of the GIPS population, such an asymmetric tax burden might have regressive effects on income distribution. This resembles a situation of the 1% versus the 99%.[12]

This stylized fact suggest that a political-economy model, rather than a representative-agent model, is called for to rationalize certain aspects of the Eurozone's evolution.

The Lending Boom Preceding the Crisis. An internally consistent account of the Eurozone crisis should also explain the lending boom that preceded the crisis. It is well-known that the inception of the Euro led to a sharp reduction in the interest-rate spreads across the Eurozone government's bonds. This spread compression came to an abrupt end in the wake

the long-run because the higher investment or consumption–associated with the current account deficits–reflect news of higher expected future productivity.

[12]This taxonomy need not refer to income differentials, but to the greater ability of certain agents to appropriate fiscal funds–directly or indirectly.

of the 2008 financial crisis. As we can see in Figure 9, yields on GIPS bonds fell to almost the same level as those of German Bunds. It would seem that in the run-up to the crisis, investors attached the same degree of riskiness to German bunds than to Greek bonds.

Stylized Fact 6. Convergence of bond yields. Following the inception of the Euro, yields on the GIPSs' government bonds converged to the yields on German Bunds. After the 2008 crisis, however, the yield spread increased abruptly.

The low interest rates in the GIPS were associated with a lending boom, which was fueled by private capital inflows (shown in Figure 6). As is typical, the lending boom lead to large current account deficits in the GIPS.

3 Institutional Characteristics of the Eurozone: A Dual Common-Pool Problem

The reader may wonder, how come the ECB has allowed domestic credit to follow such an explosive path in the GIPS? How come Target2 imbalances across NCBs in the Eurozone have grown so precipitously? As we argue below, one should view these explosive processes as part of a systemic bailout guarantee. That is, an implicit guarantee across members of a currency union: when a country is hit by a negative shock–either real or to expectations–the currency union makes transfers to the country to smooth out the effect of the shock.

In this paper, we investigate the consequences of such a bailout guarantee in a tragedy-of-the-commons environment. In particular, we analyze the interaction of two common-pool problems in an economy with bailout guarantees: an inter-country problem and a within-country problem. We consider each in turn.

3.1 Inter-country Common-Pool Problem

There is a commons-pool problem among the countries in the Eurosystem because each NCB can indirectly access the money demand of the entire Eurozone and because the domestic credit decisions of NCBs in the Eurosystem are not made by a *unitary decision-maker.*

Instead, they are the result of decisions taken by the ECB governing board in Frankfurt and by 17 NCBs that are in many ways independent from the ECB. In this subsection we explain how this problem arises from the interaction of the Target2 mechanism, the power that each NCB has over its credit to domestic financial institutions, and the full-allotment tenders used in the Eurosystem.

3.1.1 The Target2 Mechanism

The Target2 mechanism is an automatic payments system that permits NCBs to send and receive transfers across countries within the Eurozone. The objective of this mechanism is to ensure a seamless monetary union by allowing the smooth financing of inter-bank and trade imbalances. Furthermore, the Target2 mechanism is necessary to anchor exchange rate expectations across the Eurozone: having a Euro deposit in Spain should the same thing as having a Euro deposit in Finland. Without such mechanism, a rumor may lead to a run on the banking system of a country.

BOX. Illustration of the Target2 mechanism.

Suppose someone wires funds from her bank account in Spain to a bank in Finland.

Add: entries in the balance sheets of banks and NCBs.

In principle, Target2 balances should be netted out in the medium-run. This was the case until 2007. However, following the 2008 financial crisis the Target2 liabilities of the GIPS shut up. The reason for this is the following. As private capital inflows to the GIPS reversed, there was a risk of generalized bank failures. Faced with this threatening situation, the NCBs increased dramatically their credit to domestic financial institutions. This is the ten-fold increase in NCB domestic credit shown in Figure 2.

When agents requested domestic banks to wire funds abroad, domestic banks borrowed from their NCBs using their assets as collateral, instead of selling their assets in the market. In order to complete the transfer to another country in the Eurozone (say country X), the GIPS's NCBs borrowed from the Eurosystem via the Target2 mechanism. Once the wire to a bank in country X was completed, the NCB of country X increased its Target2 claims on the Eurosystem. In other words, when the newly created liquidity by the GIPS NCBs is

transferred to other countries in the Eurozone, it generates higher Target2 liabilities of the GIPS NCBs vis-à-vis the Eurosystem.

A comparison with emerging markets is illustrative. Typically, in emerging markets when an NCB increases its domestic credit to finance fiscal deficits or to backstop banks so as to avoid an imminent crisis, the NCB experiences a loss of its international reserves. When reserves reach a critical level, a speculative attack occurs. Therefore, there is a natural limit to unsustainable NCB domestic credit creation in emerging markets; a crisis makes the unsustainable path come to an abrupt end. Of course, there is no presumption that such an abrupt end is optimal.

Because of Target2, this reserve-loss process is not operative in the Eurozone. An NCB can increase its domestic credit without risking a loss of its international reserves. When agents decide to transfer the newly printed money abroad, there is an increase in the Target2 liabilities of the NCB rather than a depletion of its international reserves. In plain language, it is *as if* an NCB could borrow–without asking for anyone's approval–from other NCBs, via the ECB. It is the interaction of this mechanism with the tragedy-of-the-commons that exists within countries that generates the inter-country imbalance problem.

In principle, even with Target2, there are limits to the ability of an NCB to increase its domestic. These limits are imposed by the solvency of domestic banks and the availability of eligible collateral that banks can pledge at the NCB. As we explain in the next subsection, such natural limits have been blurred in the Eurozone.

3.1.2 Central Bank Domestic Credit Creation

In the short-run, each NCB in the Eurozone has de facto power over its domestic credit. The ECB has only indirect control over this process via interest rates and eligibility criteria on its refinancing operations.[13] There are several reasons for this:

- The Eurosystem uses so-called *full allotment tenders,* under which the ECB announces the interest rate at which it is willing to satisfy any amount of banks' loan demands. Every bank can then borrow as much as it wants from its NCB, as long as the bank:

[13] See Tornell and Westermann (2012) for more details on the inter-country commons-problem and the relaxation of collateral rules.

1. Is financially sound and
2. Has eligible collateral.

A key institutional characteristic that gives rise to the inter-Eurozone common pool problem is that:

- The regulatory power to decide whether a bank is financially sound rests with national authorities, not with the ECB in Frankfurt.

Moreover, the ECB has not the legal right yet to audit the books of the banks in the Eurozone.

Even though the above institutional setup is lax, ceteris paribus, the availability of eligible collateral imposes a natural limit on an NCB domestic credit expansion. However, not all else has remained equal:

- The ECB has relaxed significantly the criteria for eligible collateral since 2008. So much so that currently national authorities have significant leeway in determining what is eligible collateral. In particular, the rating-agency grading requirement has been eliminated. Now even private loans count as eligible collateral–against appropriate haircuts.

In the Fall of 2011, GIPS were hit by a liquidity squeeze. A scarcity of additional eligible collateral, and the fact that the Bundesbank had hit a limit, lead the ECB to shoot its big bazooka in November 2011. It announced a drastic relaxation of collateral rules and announced two long-term refinancing operations. These so-called LTROs offer 3-year loans to banks, a much larger maturity than the typical MROs.

BOX. Calendar of the ECB's relaxation of collateral rules.

If all of the above fails to generate enough eligible collateral, an NCB has recourse to emergency liquidity assistance:

- ELAs. An emergency loan agreement allows a bank, with no collateral eligible for standard refinancing operations, to borrow from its NCB. The eligible collateral in this case comes from a government guarantee to repay the loan.[14]

The ECB bylaws forbid the funding of fiscal deficits. This prohibition, however, can be circumvented in several ways. First, an NCB can lend money to banks, who in turn can use that money to buy government bonds. This setup allows a government to issue new bonds to finance its deficit and sell them to banks, who in turn use these bonds as collateral to borrow from the NCB.[15] Second, another channel that has indirectly helped governments finance fiscal deficits is the SMP:

- SMP. Under the secondary market purchase program, government bonds have been purchased in the secondary market.

By promising to buy bonds in the secondary market, the ECB provides implicit guarantees to private investors that bond yields will not increase significantly. Investors, in turn have more incentives to buy government bonds in primary Treasury auctions, making it easier for governments to run fiscal deficits. Therefore, this program has been controversial.

In the Summer of 2012 pressure mounted on the ECB as the yields on Italian and Spanish bonds increased significantly. In response–and despite the opposition of the Bundesbank to government bond purchases–on September 6 the ECB announced a new government bond-buying program of potentially unlimited size

- OMT. Under the "Outright Monetary Transactions" program the ECB has stated it is prepared to purchase unlimited amounts of government bonds of up to three-year maturities, provided the country requests a bailout from the Eurozone bailout funds (the ESFS and the ESM). That is, if the country accepts the conditionality entailed by the approval for such a bailout.

[14] This mechanism was used heavily in Greece in the run-up to the 2012 elections. Greek banks suffered a huge deposit flight, which was financed via ELAs. ELAs have also been used in Ireland, Portugal. During 2012 they have been used in Spain.

[15] Such a process has been going on in Spain.

ESFS and ESM. The ESFS and its successor–the ESM–are bailout agencies that give periphery country's access to fiscal resources subject to conditionality. The capital of these agencies come from governments not from the ECB. However, there are proposals to give a banking license to the ESM, which will allow it to de facto tap ECB credit.

In sum, as long as a country is considered solvent by the ECB, its NCB has ample leeway in extending domestic credit–i.e., printing Euros. The extra Target2 liabilities, that may result, can in principle be open-ended. Three institutional characteristics make this open-ended transfer mechanism possible in principle:

1. The ECB bylaws do not impose any upper limit on the size of an NCBs Target2 liabilities.

2. There is no explicit upper bound on the maturity of Target2 liabilities. Unlike standard debt contracts, when a Target2 liability is incurred, it is not specified when it has to be repaid.

3. Decisions at the ECB are made by majority voting and one-country one-vote applies.

Since creditor countries in the Target2 mechanism–Finland, Germany, Luxembourg, and Netherlands–are a minority, they can easily be outvoted by deficit countries. Therefore, Target2 imbalances can, de jure, grow indefinitely. However, as Tornell and Westermann (2011b) have argued, there are de facto limits to the accumulation of Target2 liabilities. For instance, in order to fund Target2 loans, the Bundesbank reduced its credit to domestic financial institutions to practically zero. When this limit was hit in the fourth quarter of 2011, the ECB launched the famous LTRO which increased significantly the ECB's balance sheet. Although this process may continue for a relatively long time, political limits will be hit in creditor countries. Of course, political limits can be circumvented for a while, but political opposition to Target2 imbalances will rise over time. The model we present below captures this implicit limit.

3.1.3 Target2 in the USA

The USA has a mechanism analogous to Target2. Note, however, that the common-pool problem at the Eurosystem of central banks is not operative in the Fed system in the USA. The Federal Reserve Bank of San Francisco cannot buy bonds from the State of California. There are other common-problems in the USA, but not this one.

3.2 Within-Country Commons Problem

Arguably, if there only was a inter-country common-pool problem, but countries had unitary governments, there would not be an imbalance problem in the Eurozone, and unsustainable national gross debt levels would not coexist with large stocks of gross assets abroad. A unitary government with a long-horizon would internalize the cost of unsustainable debt and would refrain from following unsustainable spending paths.

Unfortunately, as it is well-known, country-level decisions, such as bank-solvency and fiscal deficits, are not decided by a unitary agent–a dictator–but are determined by the interaction of several powerful rent-seeking groups within a country. In other words, even a nominally strong media-mogul running the government needs to satisfy the interests of powerful groups, and cannot act as a benevolent dictator with a long-horizon.

The within-country commons-pool problem arises because NCBs and regulators do not act in a vacuum, but tend to respond to domestic political pressures. In particular, in the face of a catastrophic situation, that threatens generalized bankruptcies, there are strong pressures for central bank financing of fiscal deficits and for regulatory forbearance. The latter includes decisions such as not declaring a bank insolvent when it is de facto insolvent and allowing banks to refinance de facto non-performing loans.

Puzzlingly, the ample power that NCBs and domestic regulators have over domestic credit expansion, makes them politically weak. It generates strong temptations for powerful groups to influence–or capture–the regulators. In the typical small economy, this temptation is checked by the NCB's stock of gold and internal reserves. In the Eurozone, Target2 has weakened such discipline. It has opened the possibility for an NCB to borrow from the Eurosystem and extend domestic credit beyond the limit imposed by its stock of gold and

international reserves.

Interest groups with the power to influence policy include: local authorities, unions, industrial groups, and banks. Importantly, they also include foreign investors.[16]

3.3 Systemic Bailout Guarantees.

The pre-sudden-stop boom in private capital inflows and the corresponding dirt-cheap interest rates suggest that investors were either irrationally over-optimistic or that investors believed a bailout guarantee was in place. A model of the current Eurozone crisis should also explain these stylized facts. Two classes of models that could account for these two stylized facts are models with bounded-rationality and models where the provision of inter-country insurance in a currency union plays center-stage. In this paper we focus on the latter perspective and consider a model with *systemic bailout guarantees*. Namely, a model where there is an–implicit–guarantee whereby if a shock were to hit a certain country and this country were unable to repay its debts, then other countries in the Eurozone would come to the rescue. Such a bailout would allow the country hit by the shock to both smooth out the effects of the shock and repay foreign investors.[17]

In our view, the Target2 mechanism is the Eurozone's institutional arrangement that provides automatic systemic bailout guarantees. Target2 is an automatic mechanism that needs not go through uncertain and slow-moving parliamentary approval processes across the Eurozone countries. An abrupt increase in the Target2 liabilities of countries that suffer a sudden-stop would take place even if a handful of countries were to oppose it. This is because there is one-country one-vote rule at the Eurosystem of Central Banks.

The NCBs play center-stage in the mechanism that implements the bailout payments. An important share of the bailout is handled by the NCBs via the increase in NCB credit

[16] As Enda Kenny, prime minister of Ireland, puts it: "Because of the fact that the country that I lead politically was the only one that had a policy imposed on it from Brussels and from Frankfurt at that time–*that a bank would not be allowed to fail*–we've had to shoulder a unique burden from any other country in Europe." Quoted in the Finnacial Times, Decemeber 18, 2012, pg 4.

[17] One can view such an insurance scheme from two perspectives: (i) as the design of a benevolent central planner whose objective is to smooth the effects of shocks and avoid a shift to a 'bad-equilibrium;' or (ii) as the result of unplanned policymakers' responses that try to avoid a catastrophic crisis.

to domestic institutions, which is depicted in Figure 2.

4 Model

We present a minimal dynamic-game to analyze the developments in the Eurozone as the outcome of the interaction of powerful interest groups. In particular, the model characterizes the within-country commons-pool problem and analyzes how it is affected by the commons-pool problem across countries. Our objective is to present an internally consistent mechanism that accounts for the stylized facts discussed in Section 2.

The model has three key ingredients that capture institutional characteristics of the Eurozone:

1. Decisions that determine the level of public debt are not made in a unitary fashion, but rather are made in a divided fashion by interest-groups that have power to appropriate–directly and indirectly–fiscal resources.

2. There are–implicit–systemic bailout guarantees throughout the Eurozone that promise investors they would be repaid in case of a systemic crisis in a member country. During hardships, these bailouts are operated by national central banks, who are compelled to extend credit to domestic banks in order to avoid a meltdown.

3. In the short-run, the Eurozone's central bank–the ECB–does not have the power to directly restrain the ability of NCBs to extend credit to domestic agents. The ECB can only influence the upper bound of the NCB's liabilities.

4.1 Setup

We consider a periphery economy that belongs to a monetary union, which we will refer to as the Eurozone (EZ). This economy is small, open, and it has a single consumption good, which is perfectly tradable across the Eurozone. Because the economy is open and purchasing power parity holds, the domestic price level equals that in the rest on the Eurozone. Because the country is small it does not affect the Eurozone's price level, which we set to one (i.e.,

there is no inflation in the Eurozone). We consider a setup where the country will never break away from the Eurozone, and so the price level in the country is expected to be constant over the entire horizon.

The economy is populated by rent-seeking groups, domestic banks, foreign investors, a private competitive sector, and a national central bank (NCB).[18]

Rent-seeking groups. These groups are agents with the power to extract resources from the rest of the economy. They include public sector actors–government agencies, subnational governments, unions, NGOs–as well as private actors, such as banks and industrial groups in protected industries. They also include foreign investors, which have shown to wield power across the Eurozone.

A group obtains funds by borrowing ($g_{i,t}$) from domestic banks at an interest rate ρ_t. The gross debt of groups evolves according to

$$\Gamma_t = \Gamma_{t-1}\left[1+\rho_{t-1}\right] + \sum\nolimits_{i=1}^{n} g_{i,t-1}, \qquad \Gamma_0 = 0. \tag{1}$$

As is well known, elites in the GIPS–the model's powerful groups–have the ability to invest their assets abroad to keep them safe from tax authorities and from expropriation. In order to allow for this possibility, we decuple a group's fiscal appropriation $g_{i,t}$ from its consumption $c_{i,t}$.[19] To do so we allow each group to save its assets safely from appropriation by others by storing them in a core Eurozone country, rather than consuming it immediately.[20]

Groups have no access to a domestic investment technology. Thus, groups simply issue bonds and use the proceeds to either consume or store safely abroad.

The resources that a group invests safely abroad earn a rate of return β, which can be set to either a positive or non-positive number. Thus, the group i's "safe assets abroad" evolve

[18] The setup is similar to that in Tornell and Velasco (2000), where the government consists of a national central bank that passively responds to the demands of a fiscal authority. Here, the domestci banks play the role of the fiscal authority.

[19] There is another standard channel for capital outflows, via a fall in m_t. This channel is not operative in this paper as we concentrate on the case where the Eurozone will stay intact forever.

[20] This is a realistic setup as we see it happening currently in the Eurozone. Alternatives may be storing the Euros behind the mattress or buying gold and forex, all of which entail risk.

according to

$$b_{i,t+1} = (1+\beta)b_{i,t} + g_{i,t} - c_{i,t}. \tag{2}$$

The parameter β can be thought of as the Eurozone safe interest rate net of the minus the costs of keeping it effectively private for latter consumption.

The objective function of a group is the standard discounted value of utility derived from consumption

$$U_{i,s} = \sum_{t=s}^{\infty} \frac{1}{\delta^{t-s}} \log(c_{i,t}), \qquad \delta \equiv 1 + r. \tag{3}$$

Domestic Banks. Banks are passive agents controlled by interest-groups that make loans to the groups. Banks fund such loans by either selling one-period bonds to foreign investors or by borrowing from the NCB. The one-period bonds promise a return $1 + \rho_t$ and enjoy a bailout guarantee from the NCB.

Foreign Investors. Are competitive risk-neutral agents with an opportunity cost r. Regulation allows an investor to buy domestic bonds only of good-standing issuers and only if the country is deemed investment-grade. An issuer is said to be be in good-standing if it has never defaulted in the past. A country is deemed to be investment-grade if its government has the ability to provide a bailout guarantee over all the outstanding bonds' promised repayments.

The National Central Bank (NCB). The NCB is a passive actor that provides a systemic bailout guarantee to foreign bond-holders and to domestic banks.

Systemic Bailout Guarantees If a majority of domestic banks is at risk of bankruptcy, the NCB extends credit to them so that: (i) they honor the promised repayment on all their outstanding bonds and (ii) they fund new loans demanded by groups. If a majority of domestic banks is *not* at risk of bankruptcy, the NCB does not make any loans to any bank.

There are two states of the world: good and bad.

Good State. Investors believe that a *bailout guarantee* is in place.

Bad State. Investors don't believe that bailout payments will be made next period by the NCB.

The bad state is absorbing: once the economy falls into the bad state, it is stays there forever.

The Private Competitive Sector. It is a mass of measure one of competitive infinitely-lived agents that derive utility from consumption of the single good and from real money balances

$$\sum_{t=s}^{\infty} \frac{1}{\delta^{t-s}} \left[\log(c_t) + \log(M_t)\right]. \tag{4}$$

During every period, the representative private agent receives an endowment of the consumption good y_t, pays a tax ϕy_t and consumes. Since she can accumulate her wealth in either money or an internationally traded bond (b_t) that pays a real interest rate $\delta - 1$, it follows that her budget constraint is

$$y_t[1-\phi] - c_t = b_t + \delta b_{t-1} + M_t - M_{t-1} \tag{5}$$

4.1.1 The NCB's Budget Constraint

In a small-open economy, the extent of an NCB's domestic credit creation is constrained by its international reserves and its seniorage. In the Eurozone, an NCB does not face such a tight constraint because it has recourse to the Target2 mechanism, as we described in Section 2. That is, in the Eurozone, the change in the NCB's domestic credit (ΔD_t^a) must correspond to either an increase in its Target2 net liabilities ($\Delta Tg2_t \equiv Tg2_t - Tg2_{t-1}$), a reduction in its international reserves or an increase in seniorage. Thus, to analyze the Eurozone, the standard textbook NCB constraint should be replaced by the following equation.[21]

$$\Delta D_t^a = \Delta Tg2_t - \Delta IR_t + \Delta M_t. \tag{6}$$

The ECB by-laws allow Target2 balances to have infinite maturity and to grow without bound. Not withstanding this formal unboundedness, it is important to recognize that an

[21] Notice that we have set to zero the return on international reserves. Furthermore, notice that there is no inflation revenue because inflation is zero.

NCB cannot increase domestic credit without bound indefinitely for at least two reasons. First, as we discussed in Section 2, the ECB requires that NCBs lend only against eligible collateral, and that appropriate haircuts be applied to the collateral pledged by banks. Second, even if there was plenty of eligible collateral, the large increase in Target2 liabilities vis-a-vis other NCBs, that would result from an unlimited increase in NCB's domestic credit, would give rise to political opposition in creditor countries (we see that happening in Germany and Finland).

In order to capture this upper-limit on NCB domestic credit expansion, it is useful to track the "NCB's shadow domestic credit" which is the contingent bailout obligation of the NCB. That is, the bailout payments that the NCB would have to make if the current state were a bad state. Let's denote such shadow NCB's domestic credit by D_t–distinct from D_t^a, which is the *actual* NCB domestic credit. We capture the implicit constraint on the NCB's domestic credit expansion by imposing an upper bound $\overline{D}_t$ on D_t.

$$D_t \leq \overline{D}_t \tag{7}$$

In order to analyze the effects of policy changes in the Eurozone, we allow the upper bound on the NCB's contingent obligations $\overline{D}_t$ evolve over time. We parametrize this dynamic constraint as follows

$$\overline{D}_{t+1} - \overline{D}_t = \lambda \left[\overline{D}_t - D_t\right] + rD_t, \qquad \lambda \geq 0. \tag{8}$$

That is, the smaller the gap between the NCB's contingent obligations and its upper bound, the smaller the growth of the upper bound on the NCB's contingent obligations. In the limit, when the NCB has hit its limit–the gap $\overline{D}_t - D_t$ is zero–the Eurosystem increases the upper bound $\overline{D}_{t+1}$ just enough so as to allow the NCB to cover the interest payments on the existing pile of debt, but no more. Like with credit cards, consumers with lower credit card balances–relative to their credit limit–have greater FICO scores and so have easier access to higher credit limits and to new credit cards.

Notice that in the context of consumer credit, we observe rules similar in spirit to (8). Consumers with lower credit card balances–relative to their credit limit–have greater FICO scores and so are more likely to see their credit limit increased and to have easier access to

new credit cards and revolving credit.

In other words, the more an NCB uses the printing press, the more tension with other members of the monetary union, and the less likely the ECB will implement policies that would allow the NCB to extend domestic credit indefinitely. The parameter λ indexes such tension: it captures Eurosystem policies that determine the ability of an NCB to extend domestic credit indefinitely. For instance, an increase in λ may reflect a decision by the ECB to relax collateral rules in this particular country and in this way increase the availability of collateral pledgeable at the NCB.

4.2 The Groups' Bond Issuance Game

Because the path of the NCB's shadow domestic credit is determined by the bond issuance of the banks, who in turn are controlled by the groups, it follows that groups have de-facto access to a common-pool resource: available NCB domestic credit. Each group knows that its bond issuance–essentially, its fiscal appropriation–as well as the issuance of the other $n-1$ groups, will ultimately have to be financed by the NCB via 'money printing' and also knows that there is an upper bound to such money printing.

To make this common-pool characteristic explicit, let us rewrite the NCB's constraint (7) in terms of "available NCB domestic credit"

$$L_t \equiv \overline{D}_t - D_t \geq 0. \tag{9}$$

Then the NCB's dynamic constraint (8) can be reexpresed as follows

$$L_t = [1+\lambda]L_{t-1} - \sum\nolimits_{i=1}^{n} g_{i,t-1}, \qquad\qquad L_t \geq 0. \tag{10}$$

Each group maximizes its utility (3) subject to the NCB's dynamic constraint (10) and its private assets accumulation equation (2). Furthermore, each group takes as given the strategies of the other *n-1* groups. The resulting set of n interdependent problems constitutes a dynamic game.

We will use Markov perfect equilibrium (MPE) as the solution concept in this issuance game among groups. In an MPE, the strategies depend only on the value of the payoff-relevant state variables $(L_t, b_t^1, ...b_t^n)$. We allow groups to choose appropriation policies from

the class of continuously differentiable functions of these payoff-relevant state variables

$$\hat{g}_{j,t} = g_j(L_t, b_{j,t}) \in C^1, \qquad g_j(0, b_{j,t}) = 0. \tag{11}$$

As is standard in dynamic models of common-access (e.g., Benhabib and Radner), we impose an upper bound on bond issuance to ensure that there is enough NCB's available domestic credit to cover the bailout associated with the promised debt repayments of all groups

$$g_{i,t} \in [0,\ \overline{g} L_t], \qquad \text{with } \overline{g} < \frac{1+\lambda}{n}. \tag{12}$$

The upper bound on the appropriation rate $\overline{g}$ is set low enough so as not to deplete available NCB credit.[22]

In an MPE, each group i takes as given the strategies of the other groups. Thus, in order to derive the MPE, let's consider n optimization problems–one for each group–and in each Problem-i let's consider the strategies of the other $n-1$ groups as undetermined functions of the state variables, satisfying (12): $\hat{g}_j(L_t, b_{j,t})$ for $j \neq i$.

Problem of Group i. Taking as given the appropriation strategies of the other $n-1$ groups (11), choose $\{g_{i,t}, c_{i,t}\}_{t=s}^{\infty}$ to maximize utility function (3), subject to the private assets accumulation equation (2), the upper appropriation bound (12) and the NCB's dynamic constraint

$$L_{t+1} = [1+\lambda]\, L_t - g_{i,t} - \sum_{j \neq i} \hat{g}_j(L_t, b_{j,t}), \qquad t = s, s+1, ... \tag{13}$$

An equilibrium of the groups' issuance game is defined as follows.

Definition 4.1 (Markov Perfect Equilibrium of the Issuance Game.) *An MPE is a collection n pairs of bond-issuance policies and consumption policies* $\{\hat{g}_{i,t}(L_t, b_{j,t}),\ \hat{c}_{i,t}(L_t, b_{j,t})\}_{t=s}^{\infty}$, $i = 1, ..., n$, *such that taking as given the* $n-1$ *policy pairs of the other* n-1 *groups* $\{\hat{g}_{j,t}(L_t, b_{j,t}),$ $\hat{c}_{j,t}(L_t, b_{j,t})\}_{t=s}^{\infty}$, $j \neq i$, *the solution to the Problem of group* i *is* $\{\hat{g}_{i,t}(L_t, b_{j,t}),\ \hat{c}_{i,t}(L_t, b_{j,t})\}_{t=s}^{\infty}$.

[22] If the country were to hit the lower bound on its net debt with the rest of the Eurozone, then the ECB would stop accepting the country's collateral, and so the country will have to let its exchange rate float. If such a crisis event were to occur at τ, then all groups would get zero transfer forever after ($g_{it}^j = 0$ for all $t \geq \tau$).

4.3 Discussion of the Setup

Here we discuss some assumption we have made.

Accumulation Equation for Private Assets Abroad. Interest groups have two asset-accumulation equations: a common-pool equation (10) and a private-access equation (2). This structure will allow the equilibrium to exhibit a simultaneous increase in national public debt and private assets abroad observed in the data. Furthermore, it captures the ability of elites in the GIPS to invest their assets abroad safe from tax authorities. An example is the 'Lagarde List' tax-evasion scandal in Greece. In 2010, Mrs. Lagarde, the French finance minister, passed on a list of around 2000 Greek tax dodgers to the former Greek finance minister, George Papaconstantinou. He then handed the list to Greece's financial police, which amounts to around €1.5 billion held in Swiss accounts. The squad failed to prosecute tax dodgers as Greek authorities have treated it as stolen data, which makes it illegal to pursue the case.[23] This drama took a turn in December 2012 as it was revealed that 3 cousins of Mr. Papaconstantinou were deleted from the Lagarde list that he handed to the financial police. Mr. Papaconstantinou negotiated Greece's first international bailout and presided over its first austerity round.[24]

The NCBs constraint. Throughout this paper we take the upper bound (7) and the associated dynamic constraint (8) as exogenously given. One can interpret (7)-(8) in terms of available collateral pledgeable at the NCB or in terms of an implicit upper-bound on the Target2 liabilities that an NCB can have with the rest of the Eurosystem. Let's consider each in turn.

[23] On December 2012, a report prepared by the International Monetary Fund and the European Union said that Greece will miss five out of 10 goals set for December in relation to audits and tax collection. "Considerable arrears remain on the books—€53 billion—of which most likely 15% to 20% could be paid," the report said. Furthermore: "The mission expresses concern that work being conducted is falling idle and that the drive to fight tax evasion among the very wealthy and the self employed is at risk of weakening." According to Margarita Tsoutsoura, tax evasions costs Greece E28bln yearly (around 15% of GDP).

[24] This story has been reported in several articles in the Wall Street Journal: "Tax-Evasion Allegations Dog Greece," October 25, 2012; "Greece Urged to Get Tough on Tax," December 24, 2012; "Scandal Deepends over Greece's Lagarde List," December 28, 2012.

First, let $\overline{\varsigma}_t$ be the total amount of bank collateral–net of haircuts–pledgeable at the NCB and let ς_t be the collateral that banks have already pledged at the NCB. Because the NCB can extend credit to domestic banks only against pledgeable collateral we can identify $\overline{\varsigma}_t$ with the upper-bound on shadow NCB domestic credit $\overline{D}_t$ and ς_t with D_t. In this case, (8) would describe how pledgeable collateral evolves over time. An increase in λ would reflect the relaxation of collateral rules that the ECB has implemented. Notice that the key aspect of the ECB's December 2011 big-bazooka was the relaxation of collateral rules, not the LTRO announcement per-se. It was an emergency response to the inability of periphery banks to get credit from their NCBs in the face of a reversal in the interbank funding market.

Second, suppose there is an–implicit–upper bound $\overline{Tg2}_t$ on a periphery NCB's Target2 net liabilities vis-a-vis the Eurosystem. Because along the equilibria we will characterize, the change in the actual NCB's domestic credit equals the change in the Target2 liabilities, we can replace $\overline{D}_t$ by $\overline{Tg}2_t$ and D_t by $Tg2_t$. In a more elaborate political-economy model one could make explicit the structural game across countries that determines the evolution of the upper-bound $\overline{Tg2}_t$.

The Role of the NCB and of Banks. In our model the NCB simply provides a systemic bailout guarantee to banks, who in turn tunnel such guarantees to the groups. In a more elaborate setup–but essentially the same mechanism–one could introduce a fiscal authority that hands out transfers to groups and makes bailout payments. To finance such transfers the fiscal authority issues bonds that are purchased by banks who then rediscount them at the NCB. Furthermore, in addition to lending to groups, the Banks would also lend to the private competitive sector.

The model should be considered only as a building block in a more elaborate political-economy analysis of the Eurozone. In particular, the model is designed to account for phenomena such as the simultaneous accumulation of gross private assets abroad and unsustainable gross national debt. While the model can be used to analyze the effects of Eurozone policy on *adjustment*, it is silent on the issue of structural reform.[25] Furthermore, the model leaves out several aspects of the Eurozone crisis such as nominal rigidities. Finally, our

[25] I consider the issue of reform in a forthcoming paper with Ranciere.

setup is consistent with the view exposed by many GIPS citizens that austerity measures undertaken by government officials have struck disproportionately at the poor, and that governments have done little to crack down on tax evasion by some or tackle corruption by the country's business and political elite.

4.4 The Tragedy-of-the-Commons Equilibrium

We characterize equilibria in which the country will remain in the monetary union forever, and this is known by all agents in the economy.[26] Thus, there are no expectations of explosive inflation that would result from a break away from the Eurozone. Inflation is equal to that in the rest of the Eurozone, which we have set equal to zero.

The representative private agent maximizes (4) subject to (5). The solution is

$$\begin{aligned} c_t &= \overline{c} \\ M_t &= \frac{\delta}{\delta - 1}\overline{c} \end{aligned} \tag{14}$$

Since inflation is zero, it follows from the private agent's problem that $\Delta M_t = 0$.

Consider next foreign investors. If the bad state realizes at time t, foreign investors expect that a bailout will not be granted at *t+1* and so are not willing to hold any amount of domestic bonds. Since the bad state is absorbing, domestic banks–and the groups that control them–will not find it profitable to repay the loans at $t + 1$.

In the good state, investors are willing to hold domestic bonds only if they are promised a rate of return no lower than their opportunity cost r. Since a bailout guarantee is in place, whereby the NCB pays the promised bond repayment in full in the bad state, investors will receive the promised interest rate ρ_t in both states: in the good state they will be repaid by the banks, who will be able to roll-over their debts; in the bad state, they will be repaid by the bailout. Since investors are competitive, it follows that they are willing to accept an interest rate equal to the Eurozone rate

$$\rho_t = r \tag{15}$$

[26] If this country were to break appart from the monetary union, its inflation rate would be time-varying.

Investors buy bonds only up to the present value of the maximum bailout the NCB will be able to make at $t+1$

$$F_t \leq \overline{F}_t \equiv \frac{\overline{D}_{t+1} - \sum_{i=1}^{n} g_{i,t}}{1+r} \tag{16}$$

If $F_t \leq \overline{F}_t$, the country is deemed investment-grade because the NCB has enough resources to repay foreign investor at *t+1*. It follows that the stock of domestic debt vis-a-vis foreign investors evolves according to

$$F_t = \begin{cases} [1+r]\, F_{t-1} + \sum_{i=1}^{n} g_{i,t-1} & \text{if } S_t = good \\ 0 & \text{if } S_t = bad \end{cases}, \quad F_0 = 0. \tag{17}$$

Consider next the balance sheet of the NCB. There are three cases. First, if the state is good at t, the NCB extends zero credit to banks. Second, if the state shifts from good at *t-1* to bad at t, investors sell all their holding of domestic bonds and refuse to buy new domestic bonds. In this case the NCB extends credit to domestic banks so that they can make the promised repayment $[1+r]\, F_{t-1}$ to foreign investors, and can make the new loans to groups $\sum_{i=1}^{n} g_{i,t-1}$. Third, if the state is bad at t and it was bad in *t-1,* then at time t the NCB (i) rolls over the loans it made to domestic banks the previous period $[1+r]\, D^a_{t-1}$ and (ii) gives to banks new credit so that they make new loans to the groups $\sum_{i=1}^{n} g_{i,t-1}$. Because the NCB carries out full-allotment auctions, the credit from the NCB to domestic banks carries the same interest rate as the Eurozone interest rate r. It follows that the actual stock of NCB domestic credit evolves according to

$$D^a_t = \begin{cases} 0 & \text{if } S_t = good \\ [1+r]\, F_{t-1} + \sum\limits_{i=1}^{n} g_{i,t-1} & \text{if } S_t = bad \ \& \ S_{t-1} = good \\ [1+r]\, D^a_{t-1} + \sum\limits_{i=1}^{n} g_{i,t-1} & \text{if } S_t = bad \ \& \ S_{t-1} = bad \end{cases} \tag{18}$$

In order to derive the equilibrium we need to track the stock of the NCB's shadow domestic credit, which is the contingent bailout obligation of the NCB

$$D_t = [1+r]\, D_{t-1} + \sum\nolimits_{i=1}^{n} g_{i,t-1}, \qquad D_0 = 0. \tag{19}$$

The NCB's shadow domestic credit equals F_t if the state is good, while it equals D^a_t if the state is bad. That is, even though during good times the NCB does not issue any domestic credit, it must provide a bailout guarantee to support the demand of foreign investors.

Finally, consider the groups. In order to capture the gradual deterioration of the NCBs' balance sheets in the Eurozone periphery–as distinct from an explosive pattern associated with an imminent break-down of the Eurozone–we will construct an 'interior MPE,' in which all groups find it optimal to set their bond issuance in the interior of the appropriation set: $\hat{g}_{i,t} < \overline{g} L_t$ for all i and all t.[27]

Recall that the bond-issuance strategies are undetermined functions of the state variables $g_{j,t}(L_{t+1}, b_{j,t+1})$. The next Proposition states that in an interior MPE these functions are uniquely determined and characterizes them in closed-form.

Proposition 4.1 (Interior Equilibrium) *There exists an interior MPE of the common-pool bond issuance game if and only if*

$$\beta < \lambda < \beta + [1+\beta][n-1] \tag{20}$$

The interior MPE is unique and symmetric. In this equilibrium, each group appropriates a constant share of the National Central Bank's available credit to domestic banks

$$\hat{g}_i(L_t) = \frac{\lambda - \beta}{n-1} \cdot L_t, \qquad i = 1, 2, ..., n \tag{21}$$

Each group consumes a constant share of the stock of assets to which it has access

$$\hat{c}_{i,t}(L_t, b_{i,t}) = r \cdot \left[\frac{1+\beta}{1+r}\right] \cdot [L_t + b_{i,t}], \qquad i = 1, 2, ..., n \tag{22}$$

In an interior solution to the problem of group i, three optimality conditions must be satisfied. First, group i must find it optimal to set its appropriation in the interior of the appropriation set: $\hat{g}_{i,t} < \overline{g} L_t$. This condition holds only if the equilibrium strategies of the other $n-1$ groups satisfy

$$\hat{g}_{i,t} < \overline{g} L_t \text{ only if } \sum_{j \neq i} \frac{\partial \hat{g}_{j,t}(L_{t+1}, b_{j,t+1})}{\partial L_{t+1}} \leq \lambda - \beta. \tag{23}$$

To see the intuition for appropriation strategy (23) notice that from group i's 'private' perspective the rate of return on the L-asset is $\lambda - \sum_{j \neq i} \hat{g}_j(L_t, b_{j,t})/L_t$, while that on the b-asset is β. Thus, group i expects a return on the L-asset no smaller than on the b-asset, i.e.,

[27] There are other "catastrophic MPEs" where $g_{i,t} = \overline{g} L_{t-1}$.

$\lambda - \sum_{j \neq i} \hat{g}_j(L_t, b_{j,t})/L_t \geq \beta$, if and only if the other *n-1* groups set their appropriation rates as in (23).

Notice that the optimality condition (23) of group i imposes restrictions on the bond-issuance policies of the other *n-1* groups, but does not impose any restriction on the $\hat{g}_{i,t}$ policy of group *i*. Notice, however, that the same is true for each of the other *n-1* groups. Thus, group i must set its appropriation rate such that each of the other groups finds strategy (21) optimal. In other words, if an interior MPE exists, the following set of n conditions must hold simultaneously

$$\sum_{j \neq i} \frac{\partial \hat{g}_{j,t}(L_{t+1}, b_{j,t+1})}{\partial L_{t+1}} \leq \lambda - \beta \qquad \text{for } i = 1, 2, ..., n. \tag{24}$$

This set of n equations holds simultaneously only if $\frac{\partial \hat{g}_{j,t}(L_{t+1}, b_{j,t+1})}{\partial L_{t+1}} = \frac{\partial \hat{g}_{i,t}(L_{t+1}, b_{i,t+1})}{\partial L_{t+1}}$ for all i and all j. Thus, (24) holds only if $[n-1]\frac{\partial \hat{g}(L_{t+1}, b_{j,t+1})}{\partial L_{t+1}} = \lambda - \beta$. Integrating we have $\hat{g}(L_{t+1}, b_{j,t+1}) = \frac{\lambda - \beta}{n-1} L_{t+1} + \textit{constant}$. Since bond issuance must be zero whenever $L_{t+1} = 0$, i.e., $g_{i,t+1}(0, b_{i,t+1}) = 0$, the constant in $\hat{g}(L_{t+1}, b_{j,t+1})$ must be zero. This is the optimal policy (21).

It is straightforward to verify that the optimal policy is indeed in the interior of the issuance set (i.e., $\hat{g}_{i,t} < \overline{g}_t$) if and only if (20) holds: $\hat{g}_{i,t} = \frac{\lambda - \beta}{n-1} L_t < \frac{1+\lambda}{n} L_t = \overline{g} \Leftrightarrow -n\beta > n - 1 - \lambda$. To see that the last condition is equivalent to (20) notice that $\lambda < \beta + [1+\beta][n-1]$ can be rewritten as $\lambda < n\beta + n - 1$.

The second optimality condition is the familiar Euler condition: along the optimal path consumption growth equals the ratio of the return on investment to the discount factor. In order to determine the equilibrium return on investment notice that, if every group follows equilibrium bond issuance policy (21), then each group perceives a private rate of return β on its two investment opportunities (the L-asset and the b-asset). Thus, along the interior equilibrium path the Euler condition is

$$\frac{\hat{c}_{i,t+1}}{\hat{c}_{i,t}} = \frac{1+\beta}{\delta}. \tag{25}$$

The third optimality condition is the transversality condition, which requires the marginal discounted value of both assets (L_t and $b_{i,t}$) to converge to zero.

$$\lim_{t \to \infty} \frac{\hat{L}_t}{\delta^t \hat{c}_{i,t}} = 0, \qquad \lim_{t \to \infty} \frac{\hat{b}_{i,t}}{\delta^t \hat{c}_{i,t}} = 0. \tag{26}$$

Integrating forward Euler condition (25) and using the transversality condition (26) yields equilibrium consumption policy (22).

Lastly, we derive the equilibrium path of the shadow state variable L_t : the available NCB credit to domestic banks. By substituting equilibrium appropriation policy (21) in the NCB's dynamic constraint (13) we get

$$\hat{L}_t = [1+\lambda]L_{t-1} - n\frac{\lambda-\beta}{n-1}L_{t-1} = \left[1+\frac{n\beta-\lambda}{n-1}\right]L_{t-1}. \tag{27}$$

The condition on parameters for existence of equilibrium (20) ensures that L_t is positive in equilibrium. Along the equilibrium path L_t may be increasing if $\lambda \in (\beta, n\beta)$ or decreasing if $\lambda \in (n\beta, n\beta+n-1)$. In either case, along the equilibrium path, L_t does not hit zero in finite time. That is, the interior equilibrium is consistent with a situation where a break-up of the Eurozone will never occur. We may refer to the first case as the optimistic-path and the second as the gloomy-path, in which groups know that the loans the will be able to get will asymptotically fall to zero. This latter scenario might be gloomy, but not catastrophic.

5 From the Equilibrium Path to the Stylized Facts

Here, we link the equilibrium path of our model economy to the stylized facts documented in Section 2.

NCB's Domestic Credit and Target2 Liabilities. In Section 2 we show that in the wake of the sudden-stop–when private capital inflows into the GIPS reversed–the credit of GIPS NCB's to domestic banks started an exponential path. This path has been associated with an exponential growth of GIPS Target2 liabilities vis-a-vis the rest of the Eurosystem. In our model, these two variables are captured by the *actual* NCB's domestic credit (D_t^a) and by the Target2 net liabilities of the NCB ($Tg2_t$).

In our model, a 'sudden stop' occurs at time t if the state was good up to time $t-1$ and the state is bad at t. Because the bad state is absorbing, there is only one sudden stop. We will denote the sudden-stop date by τ.

When a sudden stop occurs, foreign investors do not buy new domestic bonds and do not roll-over their domestic bond holdings $\hat{F}_{\tau-1}$. Thus, at τ, domestic banks must repay foreign

investors $[1+r]\,\hat{F}_{\tau-1}$. In addition, domestic banks must fund the new loans committed to groups $\sum_{i=1}^{n}\hat{g}_{i,\tau-1}$.

Since the stock of domestic banks' debt is the compounded sum of previous bond issuances, along the equilibrium path we have that

$$\begin{aligned}\hat{F}_{\tau-1} &= \sum_{j=1}^{\tau-2}\delta^{\tau-2-j}\left(\sum\nolimits_{i=1}^{n}\hat{g}_{i,j}\right), \qquad \tau\geq 2 \\ &= \frac{1-(\Upsilon/\delta)^{\tau-1}}{1-\Upsilon/\delta}\delta^{\tau-2}\Gamma L_0 \\ &= \frac{\delta^{\tau-1}-\Upsilon^{\tau-1}}{\delta-\Upsilon}\Gamma L_0, \quad \text{with } \Gamma\equiv\frac{n\left[\lambda-\beta\right]}{n-1}, \quad \Upsilon\equiv 1+\frac{n\beta-\lambda}{n-1}\end{aligned} \tag{28}$$

In the equation above we have used $\hat{g}_{i,t}=\frac{\lambda-\beta}{n-1}\hat{L}_t$ and replaced the equilibrium value of the shadow available NCB credit to domestic banks $\hat{L}_t$.

When a sudden-stop occurs, the NCB comes to the rescue: it makes loans to domestic banks so they can repay the obligations to foreign investors and also make new loans to the groups. Thus, at τ the NCB's domestic credit jumps from zero to $\hat{D}^a_\tau=[1+r]\,\hat{F}_{\tau-1}+\sum_{i=1}^{n}\hat{g}_{i,\tau-1}$. Thereafter, it increases by $\hat{D}^a_{t+1}-\hat{D}^a_t=r\hat{D}^a_t+\sum_{i=1}^{n}\hat{g}_{i,t}$.[28]

In order to link the equilibrium path of NCB domestic credit to the path of Target2 net liabilities notice that the interior equilibrium is consistent with a situation in which the periphery country never breaks away from the Eurozone, and private agents do not expect a future increase in inflation above the Eurozone inflation (which is zero). Thus, $\Delta M_t=0$. It follows from the NCB's budget constraint that in equilibrium the change in Target2 liabilities equals the change in NCB domestic credit: $\Delta Tg2_{t+1}=\Delta D^a_{t+1}$. We can then state the following Corollary.

Corollary 5.1 *Along the equilibrium path, Target2 liabilities and domestic credit extended by the NCB are constant during good times, jump during a sudden-stop, and are increasing in the bad times thereafter.*

[28] Notice that the first term is the "evergreening component" of domestic credit.

- *For any sudden-stop time $\tau \geq 2$, Target2 liabilities evolve according to*

$$\widehat{Tg2}_t = \widehat{D}_t^a = \begin{cases} 0 & \text{if } t = 1, ..., \tau - 1 \\ \frac{\delta^{\tau-1} - \Upsilon^{\tau-1}}{\delta - \Upsilon} \Gamma L_0 + \Gamma \Upsilon^{t-1} L_0 & \text{if } t = \tau \\ \delta Tg2_{t-1} + \Gamma \Upsilon^{t-1} L_0 & \text{if } t \geq \tau + 1, \tau + 2, ... \end{cases} \tag{29}$$

where

$$\Upsilon \equiv 1 + \frac{n\beta - \lambda}{n - 1}, \quad \Gamma \equiv \frac{n\left[\lambda - \beta\right]}{n - 1}. \tag{30}$$

If $\tau = 1$, Target2 liabilities evolve according to $\widehat{Tg2}_t = \delta Tg2_{t-1} + \Gamma \Upsilon^{t-1} L_0$.

- *In the wake of a sudden-stop, Target2 liabilities are increasing. Their growth may vanish asymptotically if $\lambda \in (\beta, n\beta)$ or may increase if $\lambda \in (n\beta, n\beta + n - 1)$.*

To see why equilibrium Target2 liabilities and actual NCB domestic credit are necessarily increasing notice that an interior equilibrium exists only if $\lambda > \beta$ and $\lambda < n\beta + n - 1$. These conditions imply that Υ and Γ in (29) are positive. Their growth may vanish asymptotically because the shadow available NCB credit L_t is decreasing if $\lambda \in (n\beta, n\beta + n - 1)$.

Figure 12 shows, for specific countries, how the NCB's domestic credit jump-started when private capital inflows started to reverse in 2008. Furthermore, Figure 12 makes clear that Target2 liabilities increased in tandem with NCB domestic credit. This is the pattern that Corollary 5.1 tries to account for. In Greece, for instance, NCB domestic credit remained practically constant until the end of 2008, while private capital was flowing in. However, from the end of 2008 to the beginning of 2012, NCB domestic credit increased more than €100 billion, while cumulative private capital outflows have reached more that €100 billion. Moreover, the increase in Target2 liabilities has been around €100 billion over that period.

The Current Account and Private Assets Abroad. Section 2 showed that over the last decade, increasing unsustainable gross national debt in the GIPS has coexisted with increasing gross private assets abroad. In fact, since 2005 the increase in GIPS total gross external debt is €1 trillion greater than their cumulative current account deficits.

The equilibrium of our model economy can help us account for the simultaneous increase in gross national debt and gross private assets abroad. In equilibrium, powerful groups find it

optimal to save abroad the difference between their new loans–de facto fiscal appropriations– and their consumption. This is true even if the return on their assets abroad β is lower than the interest rate on their loans r or even if β is negative. Therefore, it is an equilibrium outcome to have an 'unsustainable' increasing national gross external debt path coexist with an increasing path of private assets abroad. Furthermore, because the current account deficit reflects groups' consumption and net interest income, having a cumulative current account deficit smaller than the increase in gross external debt can be part of an internally consistent story.

To determine the conditions under which these stylized facts occur in equilibrium let us derive the equilibrium path of the current account, private assets abroad and total national debt.

The current account–the excess of national income over spending–in our model economy equals the net interest payments to foreigners, minus rent-seeking groups' consumption, plus the difference between the private competitive sector's flow-endowment and its consumption. The net interest payments equal the difference between the return on gross private assets abroad minus the interest on gross national debt

$$CA_t = \beta \sum_{i=1}^{n} b_{i,t} - rD_{t-1} - \sum_{i=1}^{n} c_{i,t} + Y_t - c_t^p. \tag{31}$$

Recall that in good times, the gross debt of groups to domestic banks equals the stock of bonds issued by the latter, while in the wake of the sudden-stop they equal the Target2 liabilities of the NCB

$$D_{t-1} = \begin{cases} F_{t-1} & \text{if } t < \tau \\ Tg2_{t-1} & \text{if } t \geq \tau \end{cases}$$

In our simple economy, the path of $Y_t - c_t^p$ is independent of whether the state is good or bad. Thus, the response of the current account to a sudden-stop is determined by the consumption of groups.

In order to characterize the current account along the equilibrium path we need a closed-form representation of the groups' consumption policy and the path of their private assets abroad. The groups' consumption policy is given by (22). Replacing this consumption policy and bond issuance policy (21) in accumulation equation (2), we have that the safe private

assets abroad of each group evolve according to

$$\begin{aligned} \hat{b}_{i,t} &= (1+\beta)\hat{b}_{i,t-1} + \hat{g}_{i,t} - \hat{c}_{i,t} \\ &= \left[\frac{1+\beta}{\delta}\right]^t [b_{i,0} + L_0] - \left[1 + \frac{n\beta - \lambda}{n-1}\right]^t L_0 \end{aligned} \tag{32}$$

The stock of private assets abroad might increase or decrease depending on the size of L_t relative to $b_{i,t}$ and on parameter values. To capture the fact that it is costly for groups to keep their assets abroad 'safe' we set $1+\beta \leq 1+r \equiv \delta$. This restriction implies that the first term in (32) is either constant or decreasing over time. Consider two cases depending on the sign of $\lambda - n\beta$. The case $\lambda > n\beta$ is empirically the relevant for the GIPS as the available NCB credit (L_t) shrinks over time, i.e., the size of the second term in (32) decreases over time and converges to zero. In this case, private assets abroad follow an increasing path if β is near to r. In the case $\lambda < n\beta$, the second term in (32) increases over time, and so private assets abroad become negative.

National debt D_t might take the form of domestic banks' debt to foreign investors in good times or Target2 liabilities of the NCB vis-a-vis other NCBs. However, regardless of the form it takes, it grows at a constant rate in equilibrium: (28) and (29) imply that national debt evolves according to

$$\hat{D}_t = \delta^{t-1} \sum_{j=0}^{t-1} \left(\delta^{-j} \sum_{i=1}^{n} \hat{g}_{ij} \right) \;=\; \delta^{t-1} \Gamma \left[\frac{1 - (\Upsilon/\delta)^t}{1 - \Upsilon/\delta} \right] L_0 \tag{33}$$

where Υ and Γ are defined in (30).

Figure 11 exhibits the equilibrium paths of private assets abroad of domestic residents (32), total external debt (33), and the cumulative current account (31).[29] As we can see the paths of these variables conform to those we documented in Figures 6 and 7: the increase in private assets abroad equals the gap between the increase in total debt and the cumulative current account.

Persistence of the Current Account Deficit. The GIPS's current accounts have remained persistently negative since the onset of the sudden stop, as shown in Figure 5. This pattern stands in contrast to the typical jump in the current account from deficit to surplus in the wake of a sudden-stop.

[29] In this Figure we set $\lambda = 0.1$, β =0.01, r=0.01, n=3, and L_0=1000000.

In the equilibrium of our model, the current account deficit does not disappear in the wake a sudden stop because none of its components is affected by the sudden stop. First, groups' consumption is unaffected because (i) it is financed out of their private assets abroad and (ii) the equilibrium rate of return perceived by each group is unaffected by the sudden-stop: it equals β both before and after the shift from the good to the bad state. Notice that even though the date of the sudden stop is uncertain, the equilibrium consumption policy (22) does not prescribe a jump at the time of the sudden stop. This is because the set of investment-opportunities of the groups is not affected by the sudden-stop: the strategies are functions of the shadow variable L_t, which in equilibrium does not jump at the time of the private capital inflow reversal. At time *0* groups know the loan amounts they will be able to get over the entire horizon, and they also know that loans may vanish asymptotically if $\lambda > n\beta$. It is immaterial to the groups whether those loans are financed by foreign investors–supported by a systemic bailout guarantee–or directly by the NCB.

Second, interest payments on national debt are the same with and without a sudden stop. Those interest payments are financed by borrowing from other NCBs rather than foreign investors. Third, interest income on private asset abroad is unaffected. Lastly, in our model the private competitive sector's current account remains unchanged because it is de-linked from the interest-group's sector, by construction. This feature of the setup can be modified if one would like to generate an improvement in the current account.

Interest rates. As Figure 9 shows, the spread between GIPS and German bond yields contracted to almost zero after the introduction of the Euro. After the 2008 crisis, these spreads jumped to levels not observed since the early 1990s. In the equilibrium of our model, such spread contraction reflects the likelihood of a bailout guarantee rather than fundamentals. In the setup we consider, the Target2 mechanism is an essential part of the bailout guarantee. Ex-ante, Target2 ensures investors that if a sudden-stop were to occur, the NCB would have the ability to increase credit to domestic financial institutions without facing the constraint imposed by the availability of international reserves. Ex-post, Target2 allows for the bailout orchestrated by the NCB to take place without generating a speculative attack on its international reserves, as is typical of emerging markets' crises.

Structural changes have occurred in the GIPS since the Euro was introduced. However, changes in fundamentals do not seem sufficient to account for the contraction of yield spreads prior to 2008. It is revealing that on December 18, 2012 Standard & Poor's raised its rating on Greece to B-minus from selective default. The reason for this upgrade was a strong and clear commitment from members of the Eurozone to keep Greece in the Eurozone. It is the highest rating S&P has given Greece since June 2011 as the country continues to face a deep recession and debt crisis. In other words, the revised rating reflects the likelihood of the bailout guarantee, not fundamentals.

6 The Target2 Mechanism as a Systematic Bailout Guarantee

The Target2 mechanism should be view as playing two roles: (i) a systematic bailout guarantee to investors, as well as (ii) a crisis-times transfer mechanism to domestic agents (via the banks).

Typically, when there is a sudden-stop, i.e., a private capital flow reversal, and the NCB responds by jacking up credit to domestic financial institutions to avoid a meltdown, it experiences a drain on its international reserves. Often such policy ends with a speculative attack on the NCB's reserves and a Balance of Payments crisis.

The Target2 mechanism eliminates such constraint on domestic credit creation. It allows the NCB to lend funds to domestic banks without risking a loss in international reserves. This is because as agents send the newly created liquidity to other Eurozone countries via Target2, there is an increase in the Target2 liabilities of the NCB rather than a run-down of its international reserves.

Because, in principle, Target2 liabilities are open-ended, the NCB can offer a open-ended NCB backstop to banks. In the absence of such an open-ended NCB backstop, banks would be forced to liquidate their assets at fire-sale prices. The resulting large capital losses might bankrupt many banks. In contrast, if instead of attempting to sell their assets in the market at fire-sale prices, banks use them as collateral to borrow from the NCB, banks do not have

to recognize any capital losses at present and so a meltdown does not occur.[30]

Because domestic assets are transferred to the NCB's balance sheet rather than sold in the market, investors are able to sell their domestic assets without incurring major capital losses. This is point (i) above. Because domestic banks do not go bust, as they can borrow from the NCB, they can roll-over domestic loans and even extend new credit. This transfer avoids a collapse in aggregate spending, which in turn prevents the abrupt elimination of the current account deficit typically observed in sudden-stop. This is point (ii) above.

In order to link the increase in GIPS Target2 liabilities to the funding of domestic expenditure and the bailout of investors, consider the back-of-the-envelope calculation in the table below. We approximate the former with the cumulative current account deficit (i.e., the excess of spending over national income), and the latter with the reduction in the claims of French and German banks on the GIPS. As we can see, between 2009:I and 2012:I, the Target2 liabilities of the GIPS increased approximately €680bn. Meanwhile, over this period the GIPS's current account deficit is around €370bn and the net outflows of French and German banks is around €370bn. Notice that the repatriation of capital by GIPS residents is tiny during this period (around €5bn).

Taget2 and the Bailout (2009-2012)

$\underbrace{\uparrow \text{Target2 GIPS liabilities}}$	$\rightarrow$	$\underbrace{\downarrow \text{French \& German banks' claims on GIPS}}$
€680bn		€280bn
		$\underbrace{\text{Cumulative Current Account deficit of GIPS}}$
		€370bn
		$\underbrace{\downarrow \text{Gross GIPS residents' private assets abroad}}$
		€5bn

The preceding calculations indicate that the sharp increase in the GIPS's Target2 liabilities is not simply directed to finance the excess of spending over income in the GIPS. A big share can be adjudicated to German and French Banks. This fact would suggest that some groups in northern Europe are benefiting from the abrupt increase in Target2

[30] See Schneider and Tornell (2004) for a formal treatment of this feedback-loop mechanism.

liabilities. A political-economy analysis would therefore suggest that there should not be a unanimous opposition to Target2 in countries with high Target2 claims on the Eurosystem, like Germany. Interestingly, in her speech after wining her party's nomination for a third term, Mrs. Merkel said "We have brought Germany through the crisis stronger than the country was when it began." Referring to the same event, Joachim Poss, a senior lawmaker of the opposition party SPD, said "With her speech at the Party convention, Frau Merkel has shown once again that she is the guardian angel of the high earners and the wealthy."[31]

Importantly, notice that even if one observes low Target2 balances in a particular country, one should not conclude that the Target2 mechanism plays no role. To the contrary, it plays an essential role because it acts as a systematic bailout guarantee. First, it helped fuel the lending boom: the possibility that Target2 liabilities could jump supports the demand of foreign investors for domestic bonds and also the near-zero interest rate spreads between GIPS's bonds and German Bunds prior to 2008. Second, in the wake of the sudden stop the Target2 mechanism has also played an essential stabilizing role: its presence ensures investors and depositors that they will be able to transfer funds to other Eurozone countries at an exchange rate of one. Without it banks would risk a run on deposits and the NCB would risk a speculative attack.

7 Conclusions

In the wake of the 2008 crisis, the Eurozone periphery has suffered a sharp reversal of private capital inflows. However, in contrast to emerging markets, the GIPS–Greece, Italy, Portugal and Spain–have been slow in closing their current account deficits. Such slow adjustment has been made possible by the Target2 mechanism and the ECB non-conventional policies that have de facto supported a continuous and ongoing path of central bank credit extension in the GIPS.

We argue that a tragedy-of-the-commons is behind such a slow adjustment and that the main beneficiaries are domestic interest groups and foreign investors.

Target2 by itself does not generate the tragedy-of-the-commons in the Eurosystem. It is

[31] Quoted in the Wall Street Journal, December 5, 2012 "Merkel Launches Bid for Third Term."

the interaction with the other institutional characteristics of the Eurozone that generates a commons problem across countries. The inter-country common-pool is overexploited because decisions within countries are made by powerful interest groups, not by a unitary decision-maker.

We would like to emphasize that imposing limits on Target2 imbalances is *not* the solution:

1. The Target2 mechanism is *necessary* for the smooth functioning of the monetary union in a financially globalized world. Segmented financial markets would arise without the possibility of infinitely large NCB's liabilities for an infinitely long period.

2. Large Target2 imbalances are the symptom, *not the cause* of the problem in the Eurozone. The problem is excessive creation of central bank credit to financial institutions. That is, the essence of the problem is not the payments system–Target2–but rather the political distortions that induce excessive domestic credit creation in the GIPS.

3. Centralized accounting of central bank balances across the Eurozone does not imply large Target2 imbalances.

4. Elimination of Target2 imbalances does not mean the Eurozone crisis will be over: (i) It is possible to have a large expansion in central bank credit and an increase in outflows, with not increase in Target2 liabilities, and still have a problem; (ii) It is possible for creditor countries to join the party and increase central bank credit to the same tune as in the GIPS. In this event Target2 imbalances will fall, but such event may be destabilizing for the Eurozone as a whole.

5. An increase in Target2 imbalances is the result of previous central bank liquidity creation. It is impossible to transfer liquidity that has not previously created.

We recognize that the tragedy-of-the-commons is not the only problem in the Eurozone. There are also multiple-equilibria and nominal rigidities. However, concentrating solely on the latter may exacerbate the former. These points have been made by Mario Draghi: "you may have self-fulfilling expectations that feed upon themselves and generate very adverse

scenarios. So, there is a case for intervening, in a sense, to "break" these expectations, which, by the way, do not concern only the specific countries, but the euro area as a whole. And this would justify the intervention of the central bank. But then, we should not forget why countries have found themselves in a bad equilibrium to start with. And this is because of policy mistakes. That is why we need both legs to fix this situation and move from a bad equilibrium to a good equilibrium. If the central bank were to intervene without any actions on the part of governments, without any *conditionality*, the intervention would not be effective and the Bank would lose its independence. At the same time, we see that we are in a bad equilibrium and, therefore, policy action, though convincing, does not seem to produce–at least not in the relatively medium term–the results for which it is geared. So that is why we need both legs for this action."[32]

To address the Target2 imbalance problem over the long-run it is necessary to address the sources of the distortion: the power of interest-groups to extract fiscal resources and exploit bailout guarantees via easy access to NCBs refinancing operations. To ameliorate this political distortion there should be a framework–an objective rule that applies to all NCBs–that imposes a relation between an NCB's refinancing credit and an objective measure of its assets.

[32] Draghi's press conference, September 6, 2012.

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Appendix. Data sources and Definitions

Target2 balances. We use the net claims on the Eurosystem from the IFS.

Domestic Credit. We use NCB credit to MFIs (narrow definition). The sources are the NCBs balance sheets.

Current account, Financial account, and Capital account. The source is the Balance of Payments statistics from the IMF.

Official Capital Flows. We obtain it from the IMF Balance of Payments statistics by adding the following components: Reserve assets + (Other investment: Other Debt Instruments: Net incurrence of liabilities, Central bank (with Fund Record) - Other investment, Net acquisition of financial assets, Debt instruments, Central bank) + (Other investment, Other equity, Net incurrence of liabilities, General government - Other investment, Net acquisition of financial assets, Debt instruments, General government) - Portfolio Investment, Net acquisition of financial assets, Debt securities, Central bank - Portfolio Investment, Net acquisition of financial assets, Debt securities, General government.

Private Capital Flows. We define it as financial account – Official Capital Flows.

Private Assets Abroad. We obtain it from the IMF Balance of Payments statistics by adding the following components: (Direct Investment, Net acquisition of assets, Equity and investment fund shares - Direct Investment, Net incurrence of liabilities, Equity and investment fund shares) + (Portfolio Investment, Net acquisition of financial assets, Equity Securities - Portfolio Investment, Net incurrence of liabilities, Equity Securities) + (Financial Derivatives (Other Than Reserves) And Employee Stock Options, Assets - Financial Derivatives (Other Than Reserves) And Employee Stock Options, Liabilities) + (Direct Investment, Net acquisition of assets, Debt instruments, Direct investor in direct investment enterprises + Portfolio Investment, Net acquisition of financial assets, Debt securities, Deposit-taking corporations, except central bank + Portfolio Investment, Net acquisition of financial assets,

Debt securities, Other sectors + Other investment, Net acquisition of financial assets, Debt instruments, Deposit-taking corporations, except the central bank + Other investment, Net incurrence of liabilities, Debt instruments, of which: Other financial corporations, of which: Other financial corporations - Errors and Omissions).

Total External Debt. We obtain it from the IMF Balance of Payments statistics by adding the following components: Direct Investment, Net incurrence of liabilities, Debt instruments + Portfolio Investment, Net incurrence of liabilities, Debt Securities + Other investment, Other equity, Net incurrence of liabilities, Other debt instruments.

Claims of Foreign Banks. We add the external loans and deposits of reporting banks vis-à-vis individual countries. The source is the BIS.

Figure 1

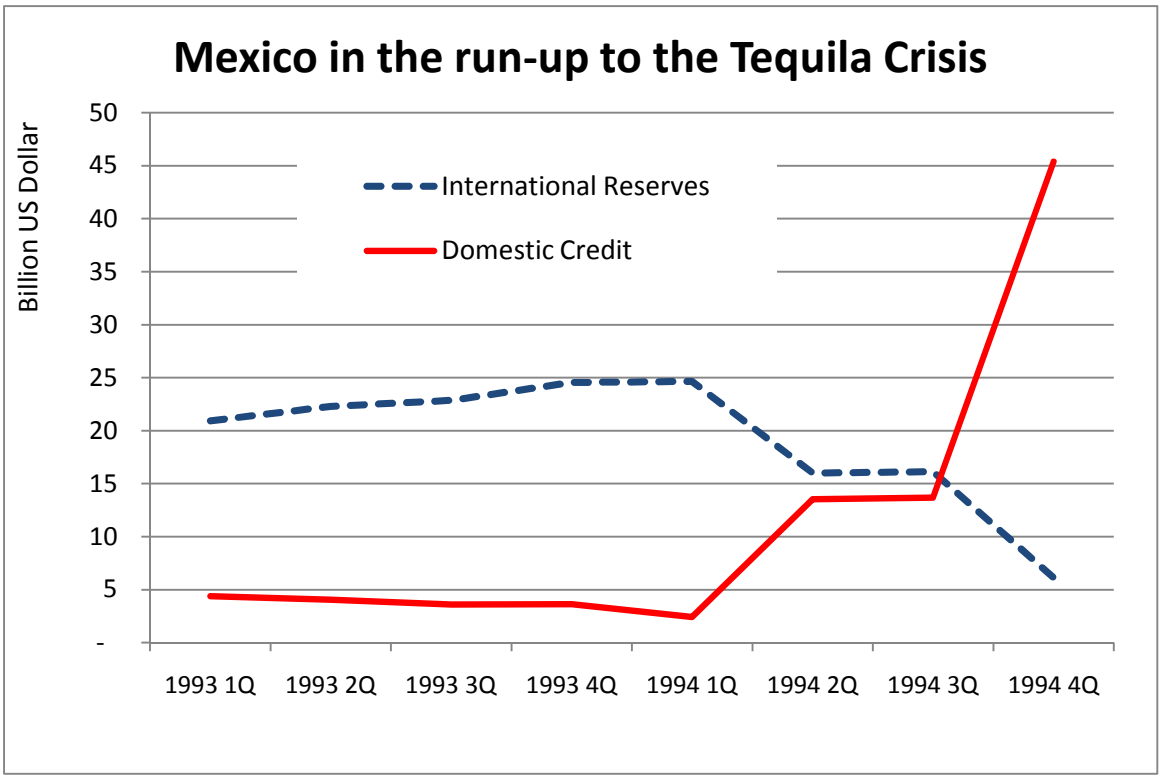

Mexico in the run-up to the Tequila Crisis
Billion US Dollar
50
45
40
35
30
25
20
15
10
5
-
International Reserves
Domestic Credit
1993 1Q
1993 2Q
1993 3Q
1993 4Q
1994 1Q
1994 2Q
1994 3Q
1994 4Q

Figure 2

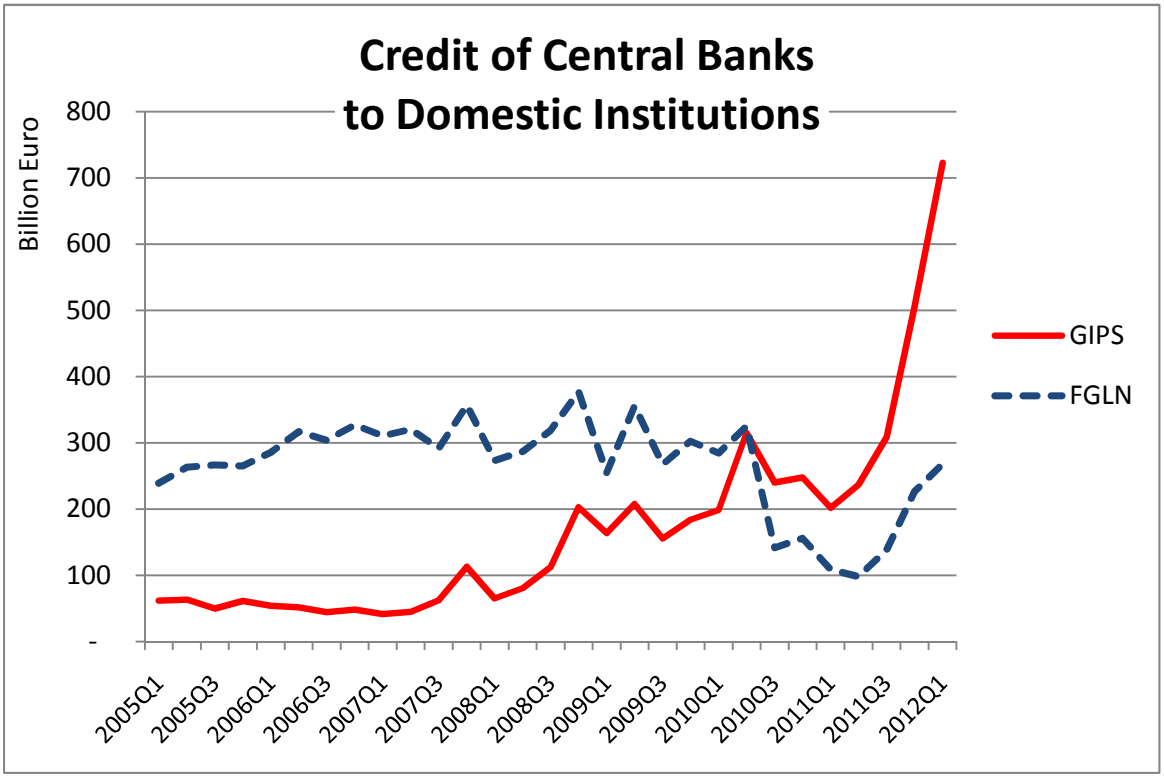


Figure 3

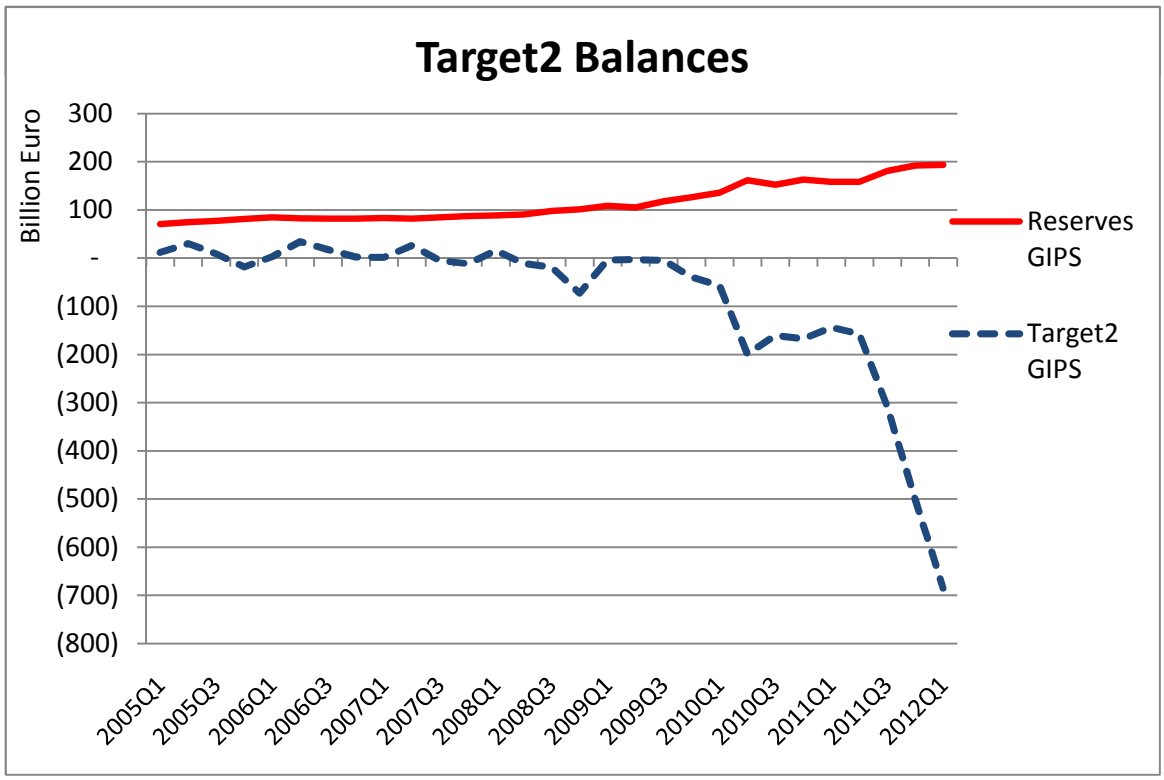


Figure 4

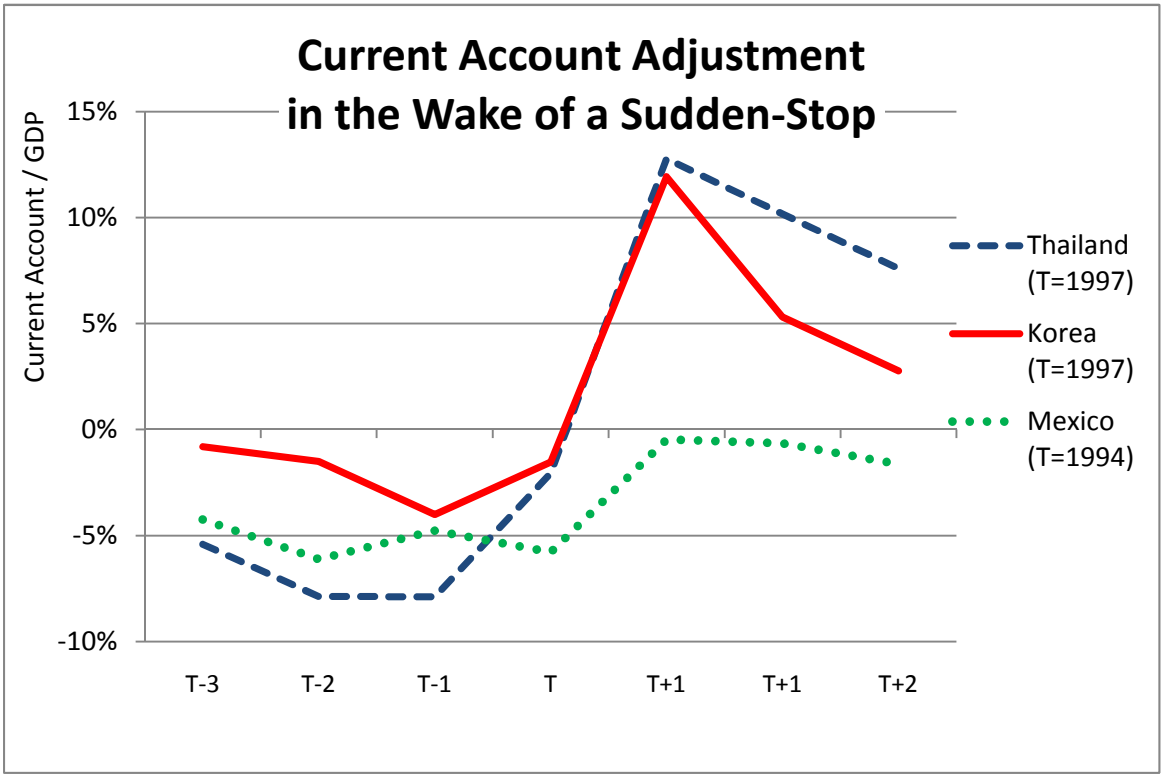


Figure 5

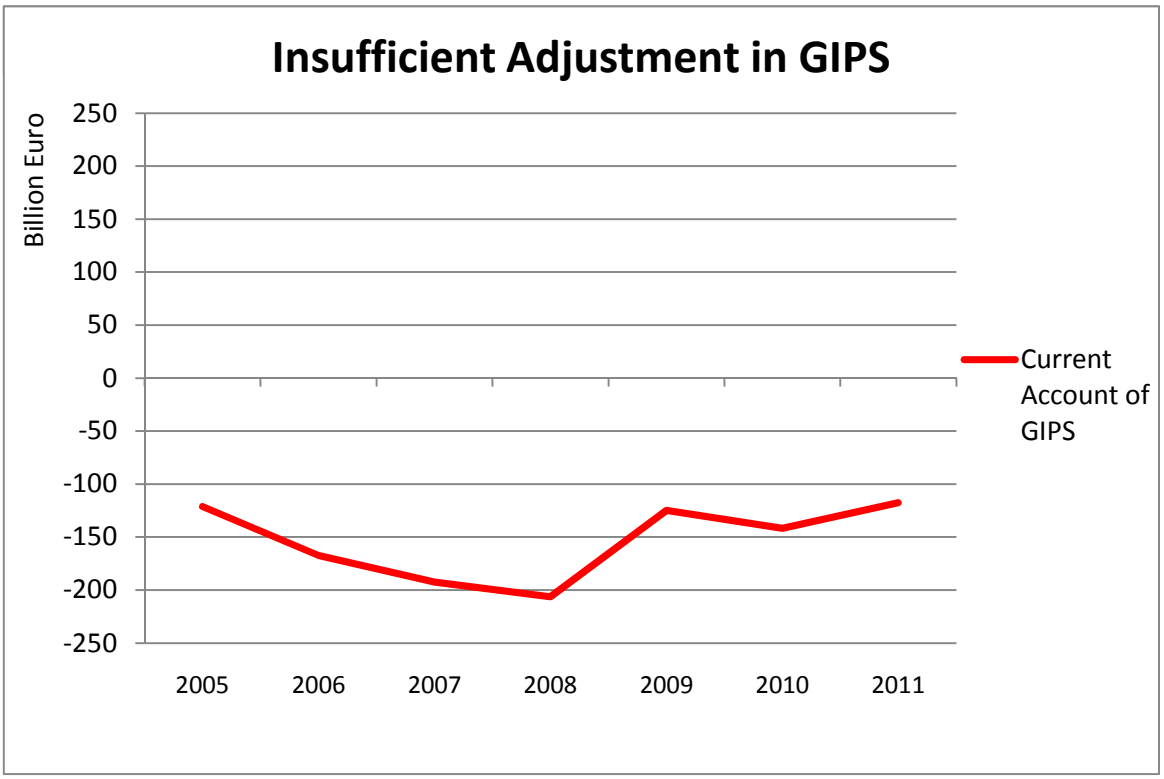


Figure 6

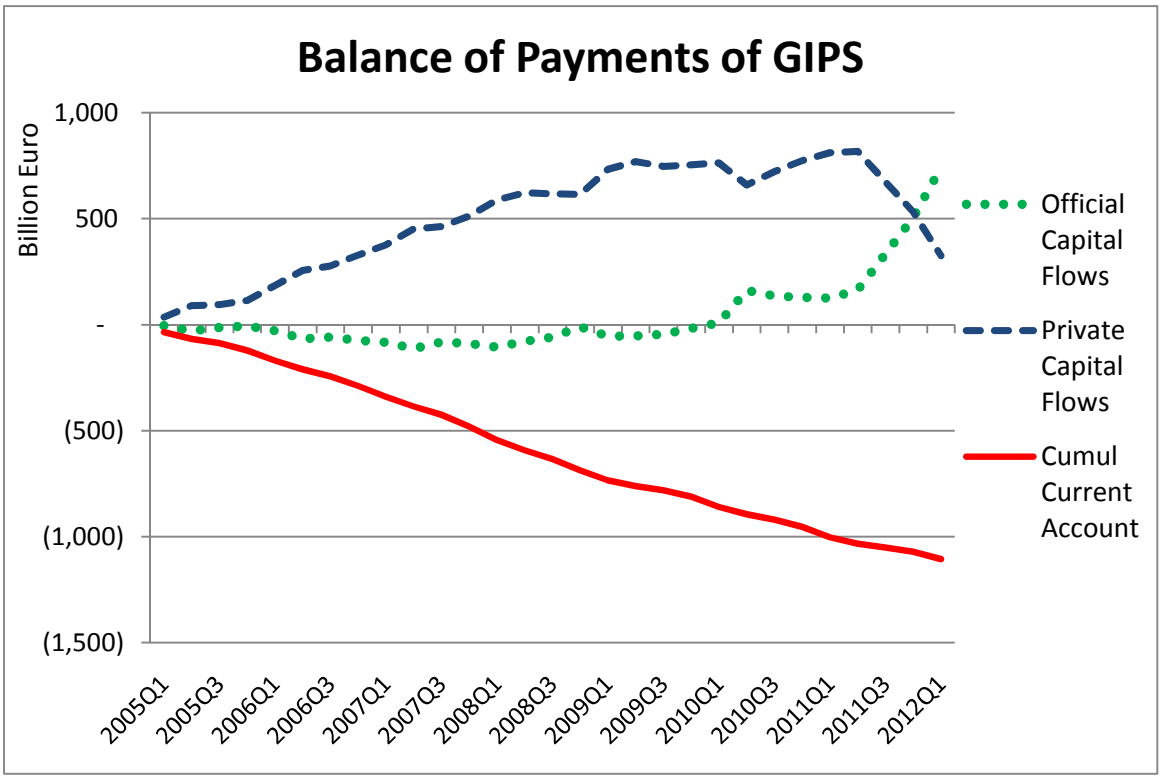

Balance of Payments of GIPS
Billion Euro
1,000
500
-
(500)
(1,000)
(1,500)
2005Q1
2005Q3
2006Q1
2006Q3
2007Q1
2007Q3
2008Q1
2008Q3
2009Q1
2009Q3
2010Q1
2010Q3
2011Q1
2011Q3
2012Q1
Official Capital Flows
Private Capital Flows
Cumul Current Account

Figure 7

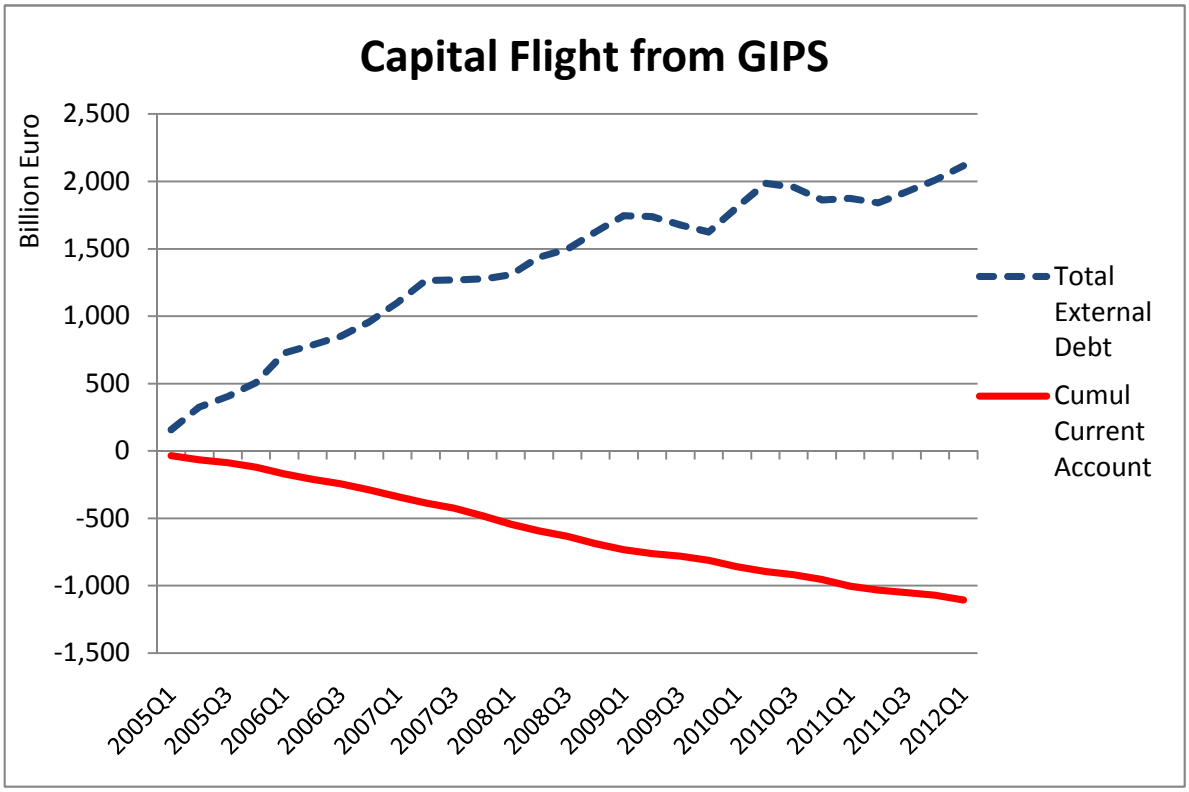


Figure 8

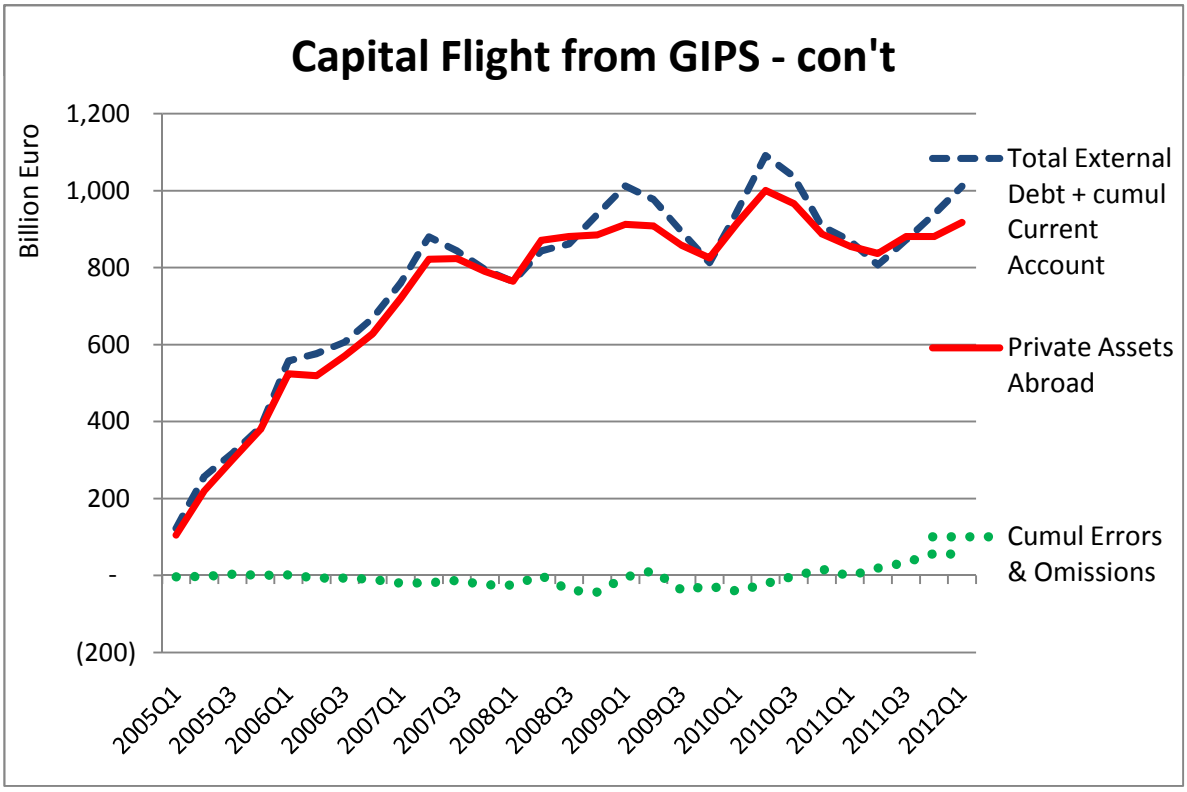


Figure 9

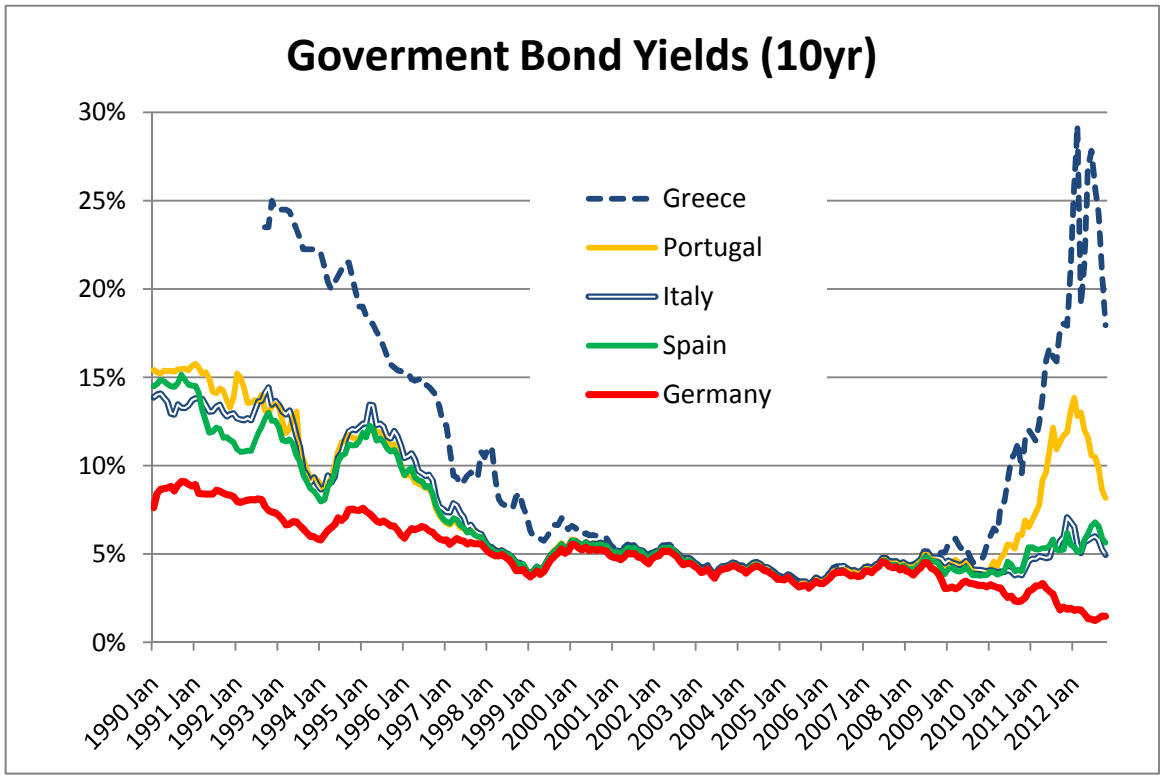
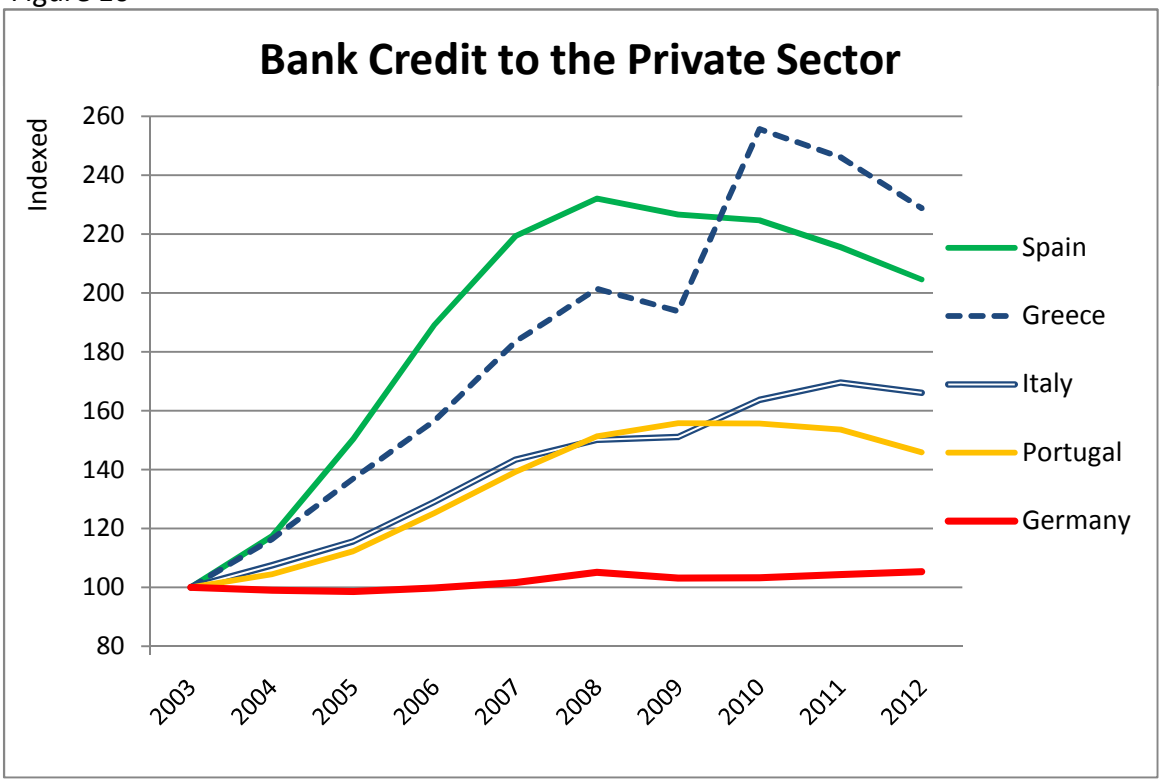
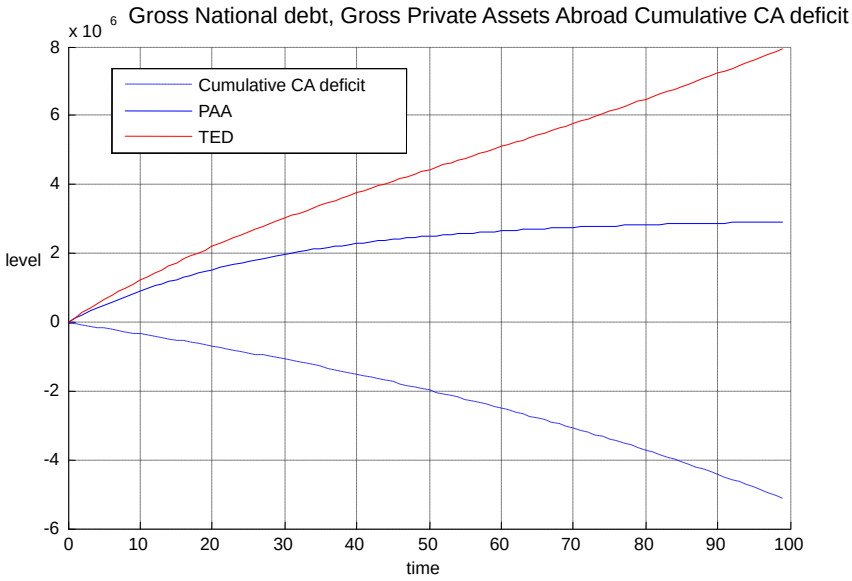


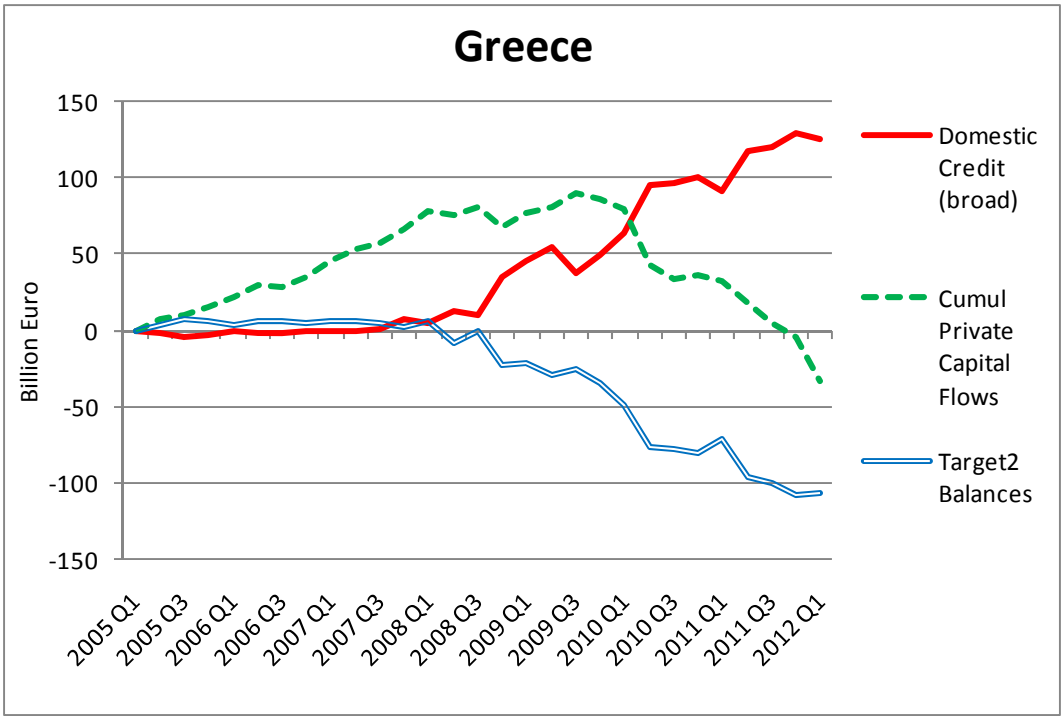
Figure 10

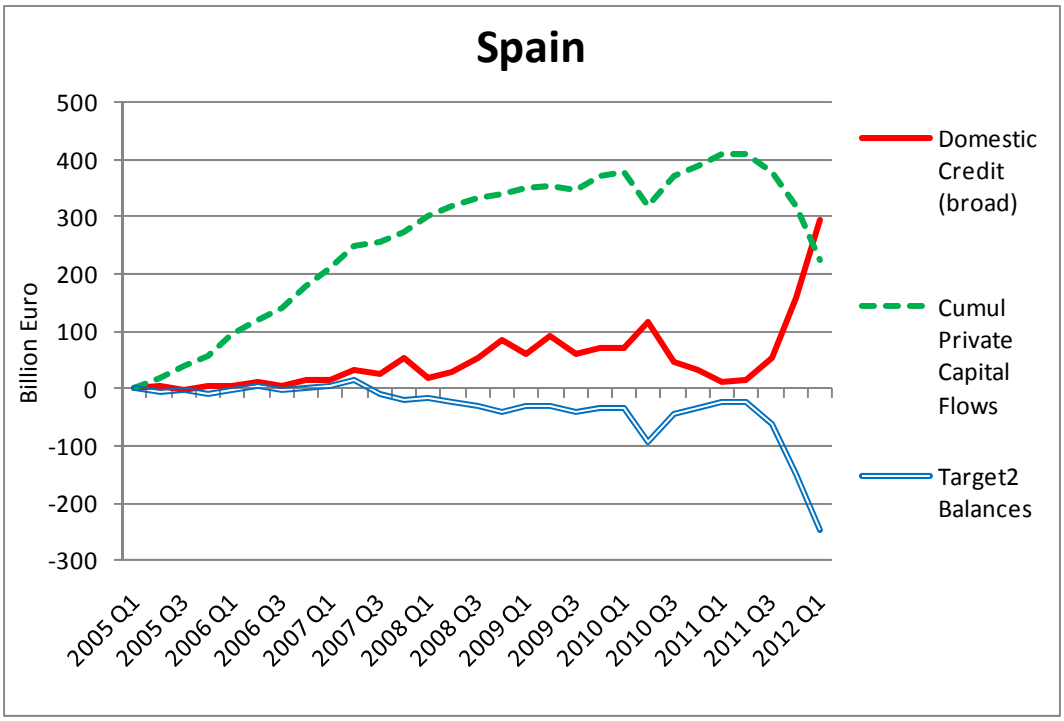


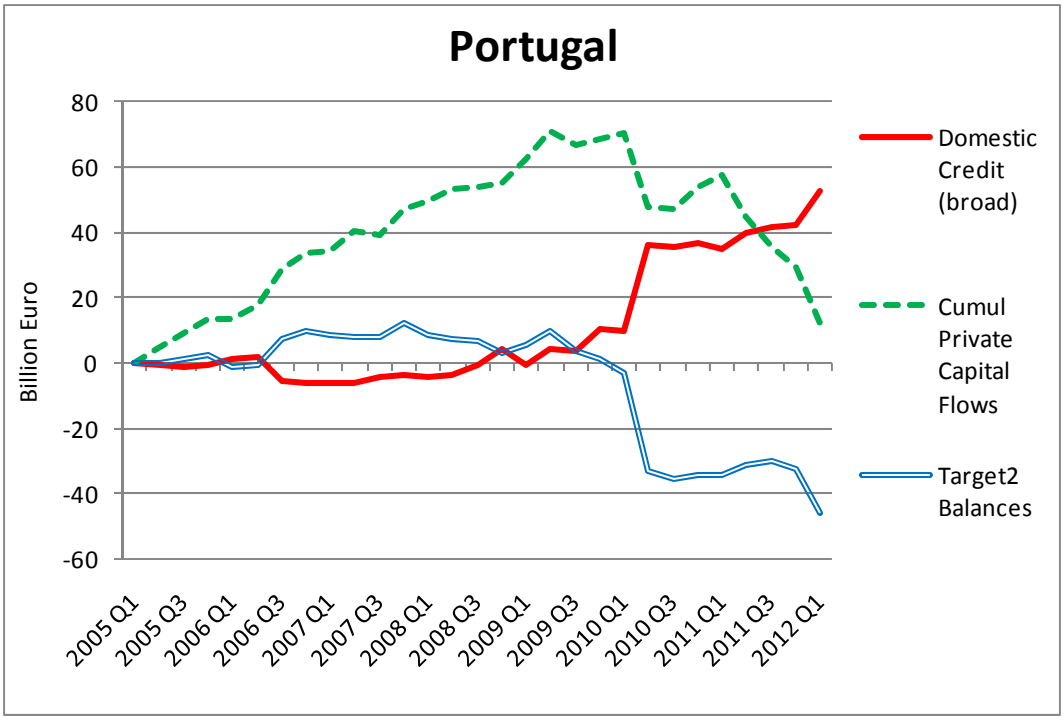


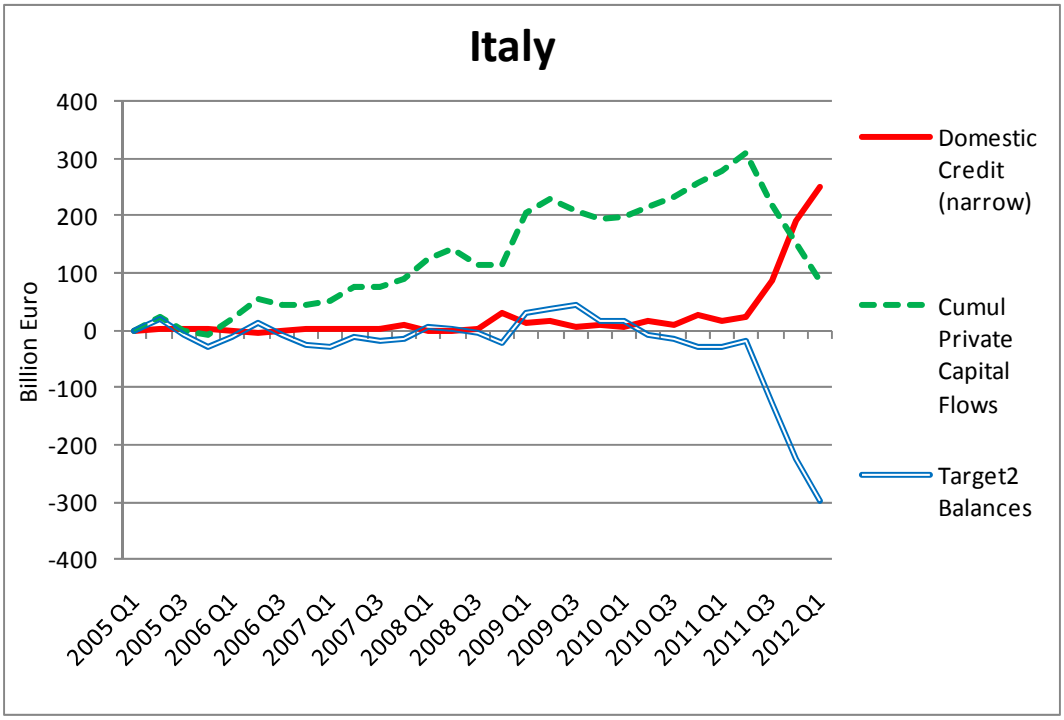
λ = 0.1, r=0.01, β = 0.01, n= 3, L(0) = 1000000

Figure 12


Greece
150
100
50
0
-50
-100
-150
Billion Euro
2005 Q1
2005 Q3
2006 Q1
2006 Q3
2007 Q1
2007 Q3
2008 Q1
2008 Q3
2009 Q1
2009 Q3
2010 Q1
2010 Q3
2011 Q1
2011 Q3
2012 Q1
Domestic Credit (broad)
Cumul Private Capital Flows
Target2 Balances


Spain
500
400
300
200
100
0
-100
-200
-300
Billion Euro
2005 Q1
2005 Q3
2006 Q1
2006 Q3
2007 Q1
2007 Q3
2008 Q1
2008 Q3
2009 Q1
2009 Q3
2010 Q1
2010 Q3
2011 Q1
2011 Q3
2012 Q1
Domestic Credit (broad)
Cumul Private Capital Flows
Target2 Balances


Portugal
Billion Euro
80
60
40
20
0
-20
-40
-60
2005 Q1
2005 Q3
2006 Q1
2006 Q3
2007 Q1
2007 Q3
2008 Q1
2008 Q3
2009 Q1
2009 Q3
2010 Q1
2010 Q3
2011 Q1
2011 Q3
2012 Q1
Domestic Credit (broad)
Cumul Private Capital Flows
Target2 Balances


Italy
Billion Euro
400
300
200
100
0
-100
-200
-300
-400
2005 Q1
2005 Q3
2006 Q1
2006 Q3
2007 Q1
2007 Q3
2008 Q1
2008 Q3
2009 Q1
2009 Q3
2010 Q1
2010 Q3
2011 Q1
2011 Q3
2012 Q1
Domestic Credit (narrow)
Cumul Private Capital Flows
Target2 Balances