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The Importance of Trade and Capital Imbalances in the European Debt Crisis

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Abstract

The current debate on the European crisis has highlighted the role of fiscal imbalances in explaining the turmoil that has dominated Europe in the past few years. This paper adopts a different point of view by suggesting that intra-European payments imbalances are crucial for the survival of the Economic and Monetary Union (EMU). Indeed, payment imbalances between the North and South have contributed to the accumulation of large stock of foreign debt, while flows of foreign capital ceased to finance productive investments that might have contributed to debt repayments—being used instead to finance consumption and real estate. The *dynamic* interplay between current account imbalances and the accumulation of foreign debt reveals that, once the system is driven into disequilibrium by a real exchange rate misalignment, the longer a payments imbalance persists and the harder the eventual adjustment will be. Capital reversals, by shifting portfolio balances, then lead the system toward instability, sovereign default, and the collapse of the exchange rate regime. Replacing private with public creditors can temporarily help us to stay away from the point where the system breaks down. But this is only a temporary expedient because the underlying imbalances will need continuing and increasing financing until equilibrium is restored by other means. One permanent solution is the European Central Bank's (ECB) official monetary transactions program, if the potential expansions to the central bank's balance sheet can be tolerated.

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Keywords: External debt, trade space, real exchange rate adjustments, official financing, OMT

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INTRODUCTION

In a decade the Economic and Monetary Union has been able to create increased trade space and to deliver both monetary policy credibility and price stability. But its functioning has been hampered by serious flaws in institutional design. The asymmetry between the strength of the "monetary" pillar and the weakness of the fiscal and institutional framework has become only too apparent in the European crisis. In particular, the surveillance mechanism based on fiscal rules has failed to provide or enforce virtuous behavior.[1]

While mainstream analysis has placed the main emphasis on fiscal imbalances, the intra-European current account imbalances add a further, and more thorough, dimension to the problem. In this vein, the introduction of the euro allowed the interest rates in the South[2] to converge on lower interest rates in the North,[3] encouraging spending and credit expansion. This generated an increase in borrowing in both private and public sectors and contributed to investment distortions, with overinvestment recorded in certain sectors such as real estate. Different demand patterns between the North, where there were no interest rate falls, and the South where there were such falls, created diverging inflation rates and hence a fast growing competitive advantage in the Northern euro countries.

The interplay between current account imbalances and the implied accumulation of foreign debt can be described by a dynamic model of current account and portfolio balances. These models show that if the system gets into disequilibrium, the longer the imbalances persist, the larger and more painful will the eventual adjustment be. This is because an accumulated *stock* of debt has to be removed, which will take a larger real depreciation in the debtor country than the real exchange rate adjustments needed to eliminate each underlying deficit (flow) imbalance. Such large adjustments in real exchange rates may not be politically feasible if they have to be achieved via an internal devaluation (wage-price deflation) in the debtor countries. But a symmetric adjustment, that is, a joint internal devaluation and revaluation by debtors and creditors, would cut the adjustment needed for each player by half.

Public interventions (loans, bailouts, haircuts, forced restructuring, liquidity injections) can also help by forcing the system away from the point where it breaks down. This is only a temporary expedient however ("kicking the can down the road") because the imbalances will need continuing and increasing financing until an underlying equilibrium is restored.

It is true that current account deficits have now fallen in a number of countries. But this has been due to falling incomes, and hence lower imports, driven by spending cuts and austerity measures, rather than price effects (nominal exchange rates are fixed). Therein lies part of the problem: Operating on one

1. See Visco (2011); also Bergsten and Kirkegaard (2012a and 2012b).

2. South is made up of the following group of countries: Greece, Italy, Spain, Portugal, Ireland, Cyprus.

3. North comprises: Austria, Germany, Belgium, Luxembourg, Netherlands, France, and Finland.

side of the trade balance, current account deficits may have come down but not to zero or a surplus—which means (foreign) debt is still accumulating and the crisis continues. To make the point another way, recent work shows that capital reversals, external imbalances, and losses in competitiveness are at least as important in explaining the debt crisis as fiscal irresponsibility itself (Alessandrini et al. 2012). Hence, to understand which policy measures could be most useful for resolving the debt crisis, we need to model the interactions between current account and portfolio adjustments explicitly—in a framework that can show the effects of a change in incomes or relative prices.

Finally, the reversal of capital flows from North to South suggests that the self-equilibrating mechanisms that normally characterize an economically integrated area do not operate in the euro area. The fact that imbalances have brought about distortions and misallocations, instead of productive investment and growth, suggests that the integration process remains weak and incomplete. In this sense, the "fear of integration" that seems to characterize the underlying political debate in Europe, can be seen as one of the root causes of today's problem. The European crisis should perhaps be seen as collateral damage from political disagreements over the real purpose of EMU and European integration.

CURRENT ACCOUNT IMBALANCES IN THE EURO AREA

Massive financial flows from North to South in the euro area brought about a buildup in internal imbalances. The debt overhang from the accumulation of debt from those imbalances year after year creates the potential for future financial market distress.

Before the crisis there was the presumption that "good imbalances" were desirable, for their association with a rational and productive utilization of capital. This view reflected Blanchard and Giavazzi's hypothesis that the fall in the saving-investment correlation recorded before and particularly after the euro could be interpreted as a positive sign of increasing financial integration, with the capital flowing from the more advanced, capital-abundant, economies to the less advanced, capital-scarce, ones (see Blanchard and Giavazzi (2002)). This perception had to change when the definition of "bad imbalances," resulting from harmful underlying price distortions or capital reversals, turned out to describe the European situation better.[4]

Figure 1 tells us that, following the adoption of the euro, the current account balances of the North and South euro areas started to diverge, with surpluses in the North clearly reflected in deficits in the South. These imbalances are the most striking indicator of the divergent macroeconomic patterns within the euro area, particularly as far as the differences between savings and investment are concerned. In the period between 2004 and 2008 in particular, a trend deterioration is apparent, reflecting the sharp declines in interest rates and the cost of capital, which made borrowing and investment easier and

4. For a definition of "good imbalances" and "bad imbalances" see Eichengreen (2010).

brought about significant inflows of capital from abroad. It is also correlated with the diverging pattern of real exchange rates, which has characterized the euro area since 2000. Indeed, while all member countries experienced a trend of real appreciation since the start, the process has been more pronounced for the Southern countries compared to countries such as Finland, France, and Germany.

This large stock of debt or foreign liabilities is bound to persist for a very long time, even if there is an eventual reduction or disappearance of deficits in the South. It will also need to be refinanced on a continuing basis, exposing the Southern countries to financial crises if the markets should refuse to roll over the existing stock of debt. The cumulative current account position can therefore be viewed as a reasonable proxy for more sophisticated measures of the fragility of net external debt position of each economy.

Following the introduction of the euro, investors in the North initially directed excess savings towards the South. Such a situation remained sustainable so long as the deficits, and corresponding debt positions, could be financed by equivalent flows of capital from North to South. Indeed, in the years preceding the crisis almost all financial accounts flows, which represent the counterpart of current account balances, were intermediated by private markets. The Lehman bankruptcy in September 2008 triggered the market's fears about solvency and liquidity of the banks and, by extension, of the sovereigns that were the bank's guarantors. The countries of the euro area therefore suffered sudden and large withdrawals of private funds after that point, principally in the South, which left them unable to finance themselves at affordable interest rates (European Commission 2012).

EMU/IMF FINANCIAL ASSISTANCE

The sudden reversal of private cross-border flows to the South, by threatening to increase deficits, trigger sovereign defaults and create contagion effects throughout Europe, made it necessary to counter the effects of a potential default by ad-hoc institutional arrangements—among which the Greek loan facility, the EFSF (European Financial Stability Facility), and the EFSM (European Financial Stability Mechanism) were the most important. These programs involved the collaboration of the European Commission, the IMF (International Monetary Fund), and the European Central Bank to provide funds to cover member countries' financial needs and tackle the structural, fiscal, and financial problems affecting the economies in trouble. Last but not least, the euro system provided liquidity to the banking sectors hit by the crisis.[5] This helped offset the outflows of private funding originated by the financial turmoil in the United States in early 2008 and allowed the continued financing of trade flows within the euro area. That therefore

5. See ECB (2012). Put differently the possibility of capital reversals or sudden financing stops means that private risk is easily transformed into sovereign risk (Alessandrini et al. 2012).

prevented a sharp slowdown in intra-European trade. This liquidity assistance was channeled through the TARGET2 payments system.[6]

Prior to the crisis, the net TARGET2 balances of the national central banks were relatively small because the import-related payments were mostly financed by foreign private investors. But, with the withdrawal of private funds after 2008, TARGET2 balances rose dramatically. By the end of 2012, Germany, the Netherlands, and Finland had accumulated credits well above 1 trillion euro. As a counterpart, broad net liability positions were recorded for the group of program countries[7] and to a smaller extent in France and Spain.[8]

Figure 3 shows that a significant share of the net foreign liability positions of the program countries is represented by net liabilities of the respective monetary authorities and official, program-related borrowing by governments. TARGET2 shares are very broad for Ireland, Greece, and Portugal, while private and public debt continued to be largely financed by the market in Italy and Spain until 2012.

The application of loans under the EU and IMF assistance programs, together with the operations conducted by the euro system to provide liquidity, have helped to prevent a disorderly adjustment in the current account imbalances. Consumption and investment in certain member states have been kept at levels that would not otherwise be sustainable.

Nevertheless the situation remains unstable. Sustainable external debt requires the external accounts to be rebalanced. There is wide consensus that this should be achieved with the help of structural reforms, and particularly via real depreciations as specified in the conditions of the existing programs of official financial assistance. In the absence of such measures, macroeconomic imbalances can only be expected to persist and exert a damaging role.

NORTH AND SOUTH IN A MODEL OF CURRENT ACCOUNT AND PORTFOLIO ADJUSTMENT

A model of the interactions between current account imbalances and foreign liabilities (debt) can easily be adapted from the trade-portfolio balance model in Hughes Hallett and Martinez Oliva (2012). This section and the appendix contain a truncated version of that model.

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6. The Trans-European Automated Real-time Gross Settlement Express Transfer System, or TARGET2, is a recording, clearing, and settlement system used by public and private market participants and operated by the ECB. While the net balances of other members are settled daily, euro area national central banks (NCBs) can build up gross and net claims or liabilities in TARGET2 over time, and without limit. In other words, euro area NCBs can borrow from or lend to other euro area NCBs at will through TARGET2. See Buiter, Rahbari, and Michels (2011) and Whelan (2011).

7. Greece, Ireland, and Portugal.

8. The issue of interpreting TARGET2 positions is contentious: see Buiter, Rahbari, and Michels (2011). These authors suggest that the TARGET2 net balances of national central banks must be interpreted with caution in that they do not automatically reflect current account deficits in those countries.

Suppose we have a two-country world: South and North. Southern investors distribute their wealth, W, between home (X) and foreign (X^*) assets, putting a share α in home securities and $1-\alpha$ in foreign assets. Likewise α^* and $1-\alpha^*$ are the shares of Northern wealth, W^*, held in domestic and external assets. We assume that α is increasing in the relative rates of return, on South's assets, R^e [defined formally in the appendix]; and increasing in s, defined as a preference for domestic assets including any home bias or safe haven effects. Symmetrically, α^* decreases in those two factors. If home biases dominate the asset market, as we might expect in bad times, then $\alpha + \alpha^* > 1$.

Equilibrium in the market for South's assets, and hence North's assets, can now be written as:

$$X = \alpha W + (1-\alpha^*)W^*/E = \alpha(X-F) + (1-\alpha^*)(X^*/E + F) \tag{1}$$

This expression is non-linear: its slope is a quadratic function of the real exchange rate E,

$$\frac{dE}{dF} = -\frac{\alpha + \alpha^* - 1}{(1-\alpha^*)X^*/E^2} < 0,$$
$$\frac{dE}{dF} = -\frac{\alpha + \alpha^* - 1}{(1-\alpha^*)X^*/E^2} < 0, \tag{2}$$

Hence (1) is downward sloping iff $\alpha + \alpha^* > 1,$ but decreasingly so as E falls.

Meanwhile, the South's current account balance is given by:

$$F_{+1} = (1+r)F + (1-\alpha)(1+r)(1-1/R^e)(X-F) + D_{+1} \tag{3}$$

This is a current account balance relationship since $CA_{+1}=D_{+1}-rF$. Notice that the term in the middle of (3) reflects the changing evaluation of home-owned foreign assets due to varying relative rates of return R^e (including risk premia). Notice also that (3) contains not only the current account balance, but the cumulative effect of "discretionary" trade balance choices. Policymakers have little control over F except through future trade balances and growth. However they can change the composition of F by providing liquidity or loans in the face of sudden stops in capital flows or financing flows (when F is held constant).

The slope of the current account balance relation in E–F space, in the current period, is then:

$$\frac{dE}{dF} = \frac{-E_{+1}}{(1-\alpha)(1+r^*)(X-F)} < 0 \tag{4}$$

with $F = F_{+1}$ imposed to ensure balance. This implies:

$$0 = rF + \theta E + z \tag{5}$$

where $\theta = [r(1-\alpha)(1+r^*)(X-F)]/E_{+1}$ is a state dependent coefficient defined by the underlying relationship's slope, (11). Notice that $\theta > 0$ if $X > F$; but decreasingly so as F increases. So even if (5) looks like a linear approximation, it is in fact quite different. Instead it provides a state dependent representation of the original equation, and a global representation of (3).

We now rearrange the terms in (1) and (5), we get the complete system:

$$E = \frac{X^*(1-\alpha^*)}{(1-\alpha)X - (1-\alpha-\alpha^*)\mathrm{F}} \quad (6); \text{ and}$$

$$E = -\frac{r}{\theta}F - \frac{z}{\theta} \quad (7)$$

where the slope of (6) is given by (2); and z, if positive, is any shock that increases the trade deficit D. Thus, falling income levels with origin *outside* the foreign trade-portfolio balance bloc (imposed, say, by an austerity program of spending cuts and tax increases) would appear in this model as a negative shock $z<0$.

The slope of (7) is negative and increasingly so as F expands. Equations (6) and (7) can therefore be drawn in (E, F) space, as in figure 4 below.

Equilibrium in the market for South's assets, and hence North's assets, can be represented by a portfolio balance line ("*PB=0*") in *E–F* space; that is, as a relationship between the bilateral *real* exchange rate, E, between North and South, and the *net* foreign liabilities outstanding, F, which leaves the market for assets overall in equilibrium. This relationship is nonlinear: Its slope is a quadratic function of the real exchange rate E; downward sloping if $\alpha + \alpha^* > 1$ but decreasingly so as E falls.

The current account balance relationship ("*CA=0*"), including the evaluations of home-owned foreign assets as rates of return change with risk premia and safe haven/home biases, is also downward sloping—and increasingly so as South's net liabilities to North expand. These two relationships are drawn in (E, F) space in figure 4.

Stability Analysis

Figure 4 shows that our two-country economy has two equilibrium points: A and B. But only A is stable. Point B is unstable and may place the system on an explosive path if there is an adverse shock. For example, to the right of B, a rise in external debt F raises interest payments and thus increases the current account deficit just created. That will force, with the passage of time, a decline in South's real exchange rate to improve the trade balance and current account deficit. But in the short term, to the right of B, new interest payments prevail over any trade balance improvements and lead to an increase in the South's current account deficit and hence an increase in F. This process of falls in the real exchange rate and then increases in net debt will continue without limit.

Left of B, the adjustments go the other way. A decrease in F contributes to an improvement in the current account deficit by reducing interest payments. That allows some deterioration in the trade deficit and a limited rise in the exchange rate without destabilizing the system. In other words, the debt reduction now outweighs the currency effect, and we move off towards a stable equilibrium at A.

At A, the dynamics reverse themselves: Movements to the right improve the current account, movements to the left worsen it. In that sense, A represents the optimal position; and the real exchange rate value E_0 may be viewed as the equilibrium real exchange rate. By contrast, the significance of B is that it shows the debt level at which South's economy collapses—where debt escalates and prices collapse, leading to an eventual default. Thus the distance AB is a measure of safe "trade space," akin to the IMF's concept of fiscal space (Ghosh et al. 2011, Hughes Hallett and Jensen 2012). Policy needs to be directed to keeping net foreign debt within an interval around A where trade and portfolio balances are *self-stabilizing*; but away from point B where shocks, and information or policy errors can easily drive an economy over into default and financial breakdown.

Adjustment Outcomes

What happens now if South's current account balance turns negative? This could be the result of a real exchange rate appreciation following price/wage increases that are faster in the South than the North; or if productivity growth is slower in the South than the North; or if, as part of an austerity drive, direct or indirect tax hikes are (partly) compensated by wage increases; or if the social security contributions by employers increase. Any of these changes increase relative prices or production costs in the South. The real exchange rate would then move from its equilibrium E_0, to a new position E_1 in figure 5.

Point A3 reflects this situation: South's current account is in deficit and its net foreign debt is therefore increasing. The *PB=0* line will therefore shift right and continue to do so for as long as the real exchange rate remains overvalued. Clearly such a situation is not sustainable in the long run as South's foreign debt would increase without limit. That cannot continue forever. When the level of debt can no longer be serviced, default (whether expected or realized) will force South to accept a *real* depreciation, either through deflation or by abandoning the fixed peg/currency union regime. When that happens, the economy will adjust down the *PB=0* dotted line until we reach point C, where, due to the now higher debt level, a lower (more depreciated) real exchange rate is necessary to sustain an equilibrium. Hence the longer the current account imbalances persist, the further the *PB=0* line will have shifted to the right and the greater the increase in debt and currency depreciation needed to restore equilibrium. The result is a larger financial crisis and a greater potential for currency collapse.

When the markets realize that a default or currency collapse is possible or likely, a reversal of capital flows between North and South will occur. This translates into an increase in home bias α^* as private investors in North repatriate their funds from South to the domestic market. Using the same logic as above, the portfolio balance line will shift left again since, from equation (6), $dE/d\alpha^* = -F/X^*$. Figure 6 shows this by restoring the *PB=0* line to its original position.

Official Financing and Liquidity Support

To restore a new equilibrium position such as A depends on a number of conditions, the most important being a sufficient adjustment in real exchange rates. Should that fail, current account deficits will continue to accumulate without being financed by private capital flows. The eventual outcome is a national default, unless some other source of financing can be found. In practice this new source of finance has been, and has had to be, official finance. In the case of the euro system, such financing has been introduced through the official rescue vehicle EFSF (ESM from July 2012), and by the backdoor through TARGET2 payments, both of which have the capacity to replace the private financing assumed in figure 5. In specific episodes, it has also come though liquidity support provided direct to the national banking systems; or through unlimited asset purchases by the ECB to lower the cost of borrowing by distressed governments (the ECB's latest weapon for defending banks or governments under stress in the Euro system: see section 5).

Liquidity support to the banking sector is a result of the TARGET2 payments mechanism, in which the national central banks are empowered to provide credit support to national banks under pressure if they are short of funds—funds that have drained away through capital flows or bad loans. This creates extra liquidity at home and increases the value of the stock of home assets. That in turn reduces the *net* foreign liability position, pushing the *PB=0* line back to the left as shown in figure 6. Cash injections from ESM, or asset purchases by the ECB, do the same thing. Cheap loans from the ECB to the South's banks under the LTRO program also achieve the same effect. But it is important to note that, in each case, the restoration of the old *PB=0* line is just a temporary reprieve. The new position at A2 is only a temporary equilibrium unless the real exchange rate either falls, or is forced to fall, from E_1 to E_0. There is no mechanism in official financing that would force such depreciations; and there is no likelihood that a depreciation will happen of its own accord since relative prices adjust slowly and there is no nominal exchange rate to help out. By the time such adjustments do come about, external deficits will have become larger and the *PB=0* line will have shifted right again. Official financing on this scale is therefore necessarily an emergency measure and one that needs to be applied repeatedly for at least as long as it takes the real exchange to fall by enough to allow us to settle at position A. Since the required real exchange rate adjustment is likely be a protracted process, taking five to ten years, the necessary liquidity support is going to be very large, bordering on infinite. It is not clear if the ESM and ECB would be able to provide the resources necessary; national governments in the South by definition cannot.

OUTRIGHT MONETARY TRANSACTIONS

The most recent, and probably most highly regarded of the measures designed to combat the debt crisis, is the new Outright Monetary Transactions (OMT) program in which the ECB has undertaken (under certain strict conditions) to intervene without limit in the markets for debt to reduce national borrowing costs.

This is important because interest rates also play a role in the adjustment process. As it can be seen from equation (7) a rise in the interest rate *r* will make the (negative) slope of the current account balance curve steeper. Conversely, lower *r* will make the slope of the current account balance line flatter. More important in our case, lower interest rates at a given or preexisting value of *F,* will also shift the current account line up (as shown in figure 7). To see this, take the easy case first. If the effect of an OMT operation is to reduce the South's interest rates, but with a negligible effect on the value of α, then from (7)

$$\frac{\partial E}{\partial r} = \frac{-F}{\theta} + \frac{rF}{\theta^2}\frac{\partial \theta}{\partial r} + \frac{z}{\theta^2}\frac{\partial \theta}{\partial r} \tag{8}$$

Inserting from the definition of , we have

$$\frac{\partial E}{\partial r} = \frac{1}{\theta}\frac{z}{r} \tag{9}$$[9]

which is unambiguously negative since *X–F>0* implies θ>0 if *z<0,* as it has been throughout the European Union's austerity adjustment process (recall the discussion in section 3 above). The rationale for this result is that, in a world of fixed exchange rates, lower interest rates mean smaller net interest payments than before. So current account balance can be achieved with a larger trade deficit or higher real exchange rate.

The more complicated case, where α may vary with domestic interest rates, produces the same result. Indeed given (7), and recognizing that a reduction in *r* will reduce the relative rate of return on domestic assets and hence α [see appendix A2], we can extend (8) to get

$$\begin{aligned}\frac{\partial E}{\partial r} &= \frac{-F}{\theta} + \frac{rF}{\theta^2}\frac{\partial \theta}{\partial r} + \frac{z}{\theta^2}\frac{\partial \theta}{\partial r} + \frac{\partial E}{\partial \theta}\frac{\partial \theta}{\partial \alpha}\frac{\partial a}{\partial r} \\ &= \frac{z}{\theta r} - \frac{(rF+z)r(1+r^*)(X-F)}{\theta^2 E_{+1}}\frac{\partial a}{\partial r}\end{aligned} \tag{10}$$

which is unambiguously negative when *z<0,* since $\partial\alpha / \partial r > 0$ follows from equation (A.6) in appendix A. Hence this more realistic case just produces a larger upward shift than (9) did.

Perhaps the most significant gain from OMT interventions, even if an unintended consequence, is the increase in "trade space" evident in figure 7. This allows the crisis countries more room to run with poor competitiveness, current account deficits, or excess debt before the financing difficulties or default in the "bad equilibrium" set in. That in difficult circumstances may be a significant gain, especially if it takes time to organize a rescue. On the other hand, it also delays the incentive to undertake the reforms necessary to improve competitiveness or reduce debt.

Second, the gains for individual countries will depend on where they are located in figure 7. They will not be all the same. A country currently northwest of the original good equilibrium (point A) will

9. (9) assumes the real exchange rate, *E,* is not expected to change due to sticky relative prices and/or common inflation rates across the currency zone—as we have seen in practice in the EU austerity programs.

find the adjustments to the new equilibrium at A2 are easier than at point A itself, at least in the short term, in the sense that the real exchange rate needs to adjust by less to regain equilibrium (to E_2 rather than E_0). Hence the required competitiveness reforms will be smaller. Likewise, the amount of additional debt that the country would need to accept during the transition would be smaller (F_2 instead of F_0). This is the situation in the stronger economies of Europe's south (such as Italy or Ireland); they have trade deficits, excess real exchange rates, and high or expanding but easily financed net debt (figures B1, B2). For these countries, OMT provides an easier set of reforms or adjustments, and more room for errors or slippage, for as long as interest rates may be held low on the way to the good equilibrium.

But an interesting, again probably unintended contrast emerges with the strong economies in Europe's north. These countries have trade/current account surpluses, low real exchange rates compared to the South, and declining or negative net foreign debt. This places them south or southwest of the good equilibrium (point *A*). For these countries, OMT actually makes it more difficult to reach the new temporary equilibrium (A2): internal revaluations, smaller trade/current account surpluses against their partners, accepting more foreign assets than required at A. To the extent the reforms needed to reach the new equilibrium are now larger, the incentives to make the required adjustments also need to be larger. If the OMT system does indeed increase the pressure on the north to adjust, then it would have created a long awaited "symmetric adjustment" mechanism for the euro area—and with it a natural increase in the degree of integration. Sadly, there seems to have been little appetite in practice for symmetric adjustment, and by implication, no real taste for greater integration.

The third group of countries contains those with a lot of excess or escalating debt, though not all accumulated through fiscal irresponsibility. Instead trade deficits, and lower but still uncompetitive real exchange rates, may have played a larger role (Spain, Portugal, Ireland in 2011–12). These countries have been characterized by higher debt to trade deficits, or smaller current account deficits and lower real exchange rates than elsewhere. They therefore lie north or northwest of the bad equilibrium B, and have potential to improve their trade position through competitiveness and income effects *if* the debt interest rate burden can be reduced. OMT makes this process easier, by lowering interest payments and reducing current account deficits so less foreign debt is accumulated. This shifts those counties upward from B in figure 4. The downside is the upward shift in the *CA=0* line makes it appear that there is a larger competiveness adjustment to make than without OMT, but the debt reductions will be smaller. The enthusiasm for reform may therefore be muted.

Lastly, countries southwest of the bad equilibrium point, B, have high and escalating debt, and large trade/current account deficits despite relatively low real exchange rates (Greece?). OMT can probably do little to arrest their unstable path from B, unless the shift in *CA=0* is large enough to convert their current account deficit into a surplus. If that can be done, these countries will join the third group but with lower

real exchange rates, and have a good (if slow) chance of eventual recovery. So, as in the other cases, it is all a matter of size. Can the OMT interest rate reductions be made large enough to set in train current account reductions, debt reductions, and eventual recovery? If not, OMT offers only temporary relief before direct action to reduce relative prices or default and financial collapse.

All these gains remain temporary however unless action is taken each period to keep r below market clearing levels. Repeated, and ultimately unlimited, interventions in the bond markets may be necessary to maintain lower interest rates in the long term. But that is the point of OMT interventions. They are intended to be unlimited under strict conditions, in contrast to official financing schemes, which are unconditional but limited. This distinction may prove important in the long run. Because real exchange rates are inevitably sticky, they will not adjust fully to their new equilibrium position for some time. So net debt will continue to increase in the interim, and the next intervention will have to be larger than the last to counter that extra debt as well as continue to redress the old disequilibrium. Official balances will continue to expand.

OMT interventions do not have this difficulty; interest rates are freely manipulable (subject to a zero lower bound) if unlimited interventions may be anticipated.[10] Thus, by keeping interest rates lower than free market rates, OMT activities help to reduce the distance and ease the transition between the actual real exchange rate and debt in the South, and the levels necessary to restore a transitional equilibrium. That may stabilize the economy, but it cannot replace a full equilibrium where macroeconomic variables are at their long-term equilibrium levels. OMT can therefore be seen as a helpful device to alleviate the market pressure on member states while they reestablish a sustainable equilibrium. Two qualifiers: Given a zero lower bound, there is no guarantee that interest rate reductions large enough can be found to achieve a stabilizing position on the way to the full equilibrium. Second the analysis has been conducted on the assumption that the $PB=0$ does not shift with r. To a first approximation this is true since the only mechanism would be via changes in α and α^*. However appendix C shows that allowing α and α^* to change would also shift $PB=0$ down by a small amount. But that just reinforces the logic behind the results of this section.

WHY POLICYMAKERS MAY NEVERTHELESS PREFER OFFICIAL FINANCING

For the purposes of numerical simulation, we will make use of calibrated values for r (interest rates in the South), X, X^*, θ (responsiveness of demand for Southern assets to relative prices, real exchange rate changes), and z to establish a metric for assessing the stability of the euro system. In our baseline, the situation at the start of the euro, we use the following. For r, we use the interest rate on the total interest-bearing debt plus the inflation rate prevailing at the time, around 7 percent. Based on a ratio for financial

10. These expectations effects may actually *lower* the cost/size of the interventions needed, as we saw in 2012.

assets to GDP of around 2 we get €6.6 trillion for X and €8.16 trillion for X^*. The range of elasticity estimates in the literature is quite broad; we set θ equal to the mid-range estimate of 0.7.[11] Finally, given these parameter values, we chose z to be –1.6; a figure that is needed to set the baseline at a real exchange rate of unity at the start of the euro. This is just a normalization; we then track the changes from there. This setup implies F is roughly zero; the official accounts of member countries are in balance at the start and no creditor or debtor positions are outstanding. Finally, we set α and α^* to be equal to 0.8 and 0.7—a case in which home/safe haven biases apply. Portfolio balances and current account positions under this scenario are shown in figure 8.

Suppose now that, following a sustained loss of competitiveness in South, the portfolio balance line shifts to the right as a result of current account deficits in the South. Southern foreign liabilities F reach 1 trillion euros (figure 9). That is not a problem in itself since equilibrium can evidently be reestablished with a real depreciation in the Southern economies of 10 percent. In a world with flexible exchange rates, a real exchange rate depreciation of 10 percent could be achieved by a nominal depreciation of the same amount. However this is impossible in the euro area since nominal adjustments cannot be made. Accordingly, if we recognize that adjusting relative prices is normally a slow and politically very damaging process, financing foreign debt via the private sector was the natural solution. When this became impossible in 2010, with foreign creditors fearing potential insolvencies in the South's financial institutions or governments, private financing flows dried up causing a credit stop, a liquidity crisis, and capital reversals. In the short term, public funding (loans, bailouts, TARGET2 payments) of the net foreign asset position were therefore the only solutions left.

A better and more durable solution for the long term would be an internal devaluation: that is, a real exchange rate depreciation via a reduction of prices, wages, or non-wage costs, coupled with productivity increases to enhance competitiveness in the South. An internal revaluation at the same time in the North would achieve a more effective distribution of the burden of the necessary adjustments. If the real exchange rate depreciation is to be achieved by South alone it would have to be larger, and hence less likely (politically and socially) to be achieved since labor cost reductions cannot be imposed by decree and will take time to take effect. It took Germany 12 years to achieve a 16 percent reduction in prices and unit labor costs since 1999, and the efforts by Portugal, Ireland, and Italy in the current crisis are proceeding no faster.[12]

The simulations above confirm this view; the shift in portfolio balances needed to redress the current 1 trillion euro imbalance in foreign assets between North and South would require a 10 percent

11. Blanchard, Giavazzi, Sa (2005). This assumption is consistent with the results found in a survey conducted by Chinn (2002). See also Cline (2005) for a similar figure.

12. See the ECB's harmonized competiveness indicators since 1999 [ECB statistical warehouse data].

reduction in the baseline real exchange rate value. This is shown in figure 9 relative to figure 8. But this is not the end of the story since the real exchange rate was already misaligned before the current imbalances were created; indeed that was part of the process by which the past accumulations of debt came about. To restore equilibrium between North and South *and* remove the net debts that those misalignments had caused, this 10 percent real exchange rate depreciation needs to be added to the past misalignments. That means real depreciations of 10 percent to 30 percent, depending on the indicator used for the past misalignments.[13]

Taking a mid-range value, the South's real appreciation since 1999 was 20 percent of the baseline, which, together with the 10 percent depreciation to remove current imbalances, means a total depreciation of 30 percent between North and South to restore equilibrium between North and South. Put differently, this is the depreciation needed to bring the South's real exchange rate back to the German level (not just to the status quo ante) so as to remove the misalignments between them. This is shown in table 1, where we use four different calculations to come up with the same 30 percent depreciation.

Clearly, a 30 percent real depreciation is too large a figure to be realistic, or politically feasible in a short period of time. Hence the authorities will inevitably resort to official financing to push the *PB=0* line[14] inwards in the interim, and sit out the real exchange rate adjustments needed.

These calculations refer to the countries in the South as a group, of course. Depreciations of the necessary size might still be feasible in some individual cases. The last column of table 1 contains calculations of what each country would have needed to do to restore equilibrium in their own economies by 2011. They range from a real depreciation of 20 percent in Ireland, to 38 percent in Spain. The latter is scarcely more feasible than the 30 percent group figure.[15] On this basis, if a 5 percent real depreciation is the maximum that one can reasonably expect to achieve in one year, Ireland would take at least four years to regain equilibrium, and Spain seven to eight years (to 2020).

More sophisticated calculations are not possible here because they need a full specification of the underlying trade and portfolio relationships, their dynamics and price elasticities inclusive of J-curve effects, portfolio evaluation effects, as well as home biases and expected exchange rates. We do not have the means to estimate those factors. Nonetheless, three points are new:

- The amount of adjustment called for varies by country. Spain is in the worst position, then come Cyprus and Greece.

13. For a broad range of estimates based on alternative indicators, see Bayoumi, Harmsen, and Turuken (2011).

14. Note that *PB=0* means "no further changes in net foreign held debt," not "zero net debt."

15. They have been computed by taking GDP weighted averages of the GDP deflator measure of the real exchange rate appreciations relative to Germany, adjusting that average to 30 percent, and then calculating the resulting individual country deviation by GDP deflator real exchange rate from Germany.

- The debt problem for the euro area will not be solved until the large players (Spain, Italy) restore their competitiveness;
- The difference between columns 1 and 2 of table 1, shows a distinction between those whose unit labor costs have grown faster than output prices (Portugal, Ireland, Italy)—implying TFP (total factor productivity) is growing faster than labor costs—and those in a more difficult position (Greece, Spain, Germany) where labor costs have fallen behind prices, implying productivity is lagging or that there are inefficiencies or monopoly power in the markets. If the problem is to be solved by austerity and wage restraint, then Portugal, Ireland, and Italy have the scope to do so and may start to recover. But Greece and Spain do not. Germany, inadvertently perhaps, may be on the verge of starting to help by becoming less competitive.

CONCLUSIONS: POLICY IMPLICATIONS

The European crisis has highlighted the role of intra-European payments imbalances for the survival of the EMU. Payment imbalances between the North and the South have contributed to the accumulation of large stock of foreign debt, while flows of foreign capital have ceased to finance productive investment, which might have contributed to debt repayment, financing instead consumption and an inflated housing bubble.

The *dynamic* interplay between current account imbalances and the accumulation of foreign debt reveals that, once the system is driven into disequilibrium by a real exchange rate misalignment, the longer a payments imbalance persists the harder and more painful the eventual adjustment—because the accumulated debt is a stock, implying a larger real depreciation is needed to remove the effects of past, in addition to current, misalignments.

Capital reversals, by shifting portfolio balances, lead the system toward instability, sovereign default, and the collapse of the exchange rate regime. Replacing private with public creditors may temporarily help us to stay away from the point where the system breaks down. This is a temporary expedient however because the imbalances will need continuing and increasing financing until equilibrium is restored by other means. A permanent solution will require resetting the real exchange rate to its equilibrium value. How large such an adjustment should be, and how it can be achieved is a matter of specific cases.

If such an adjustment needs to be rapid and achieved by internal devaluations in the debtor countries it may not be politically or economically feasible. Symmetric adjustment, that is, an effort by both debtor and creditors to create internal devaluation and revaluations, would have had a much better chance of success.

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Figure 1 Current account imbalances in the euro area countries

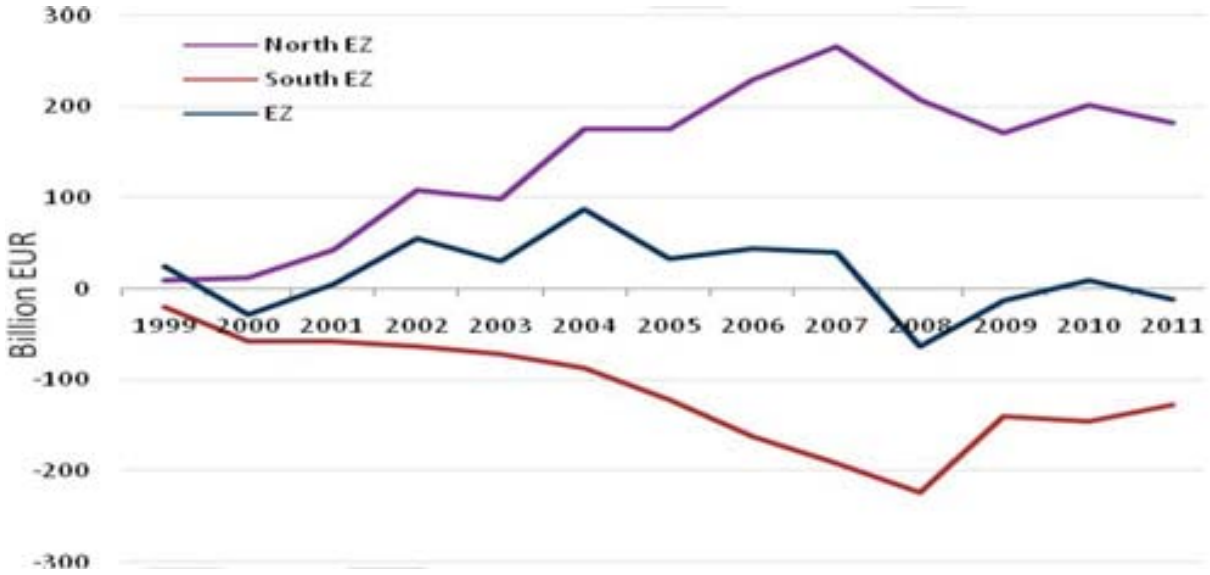
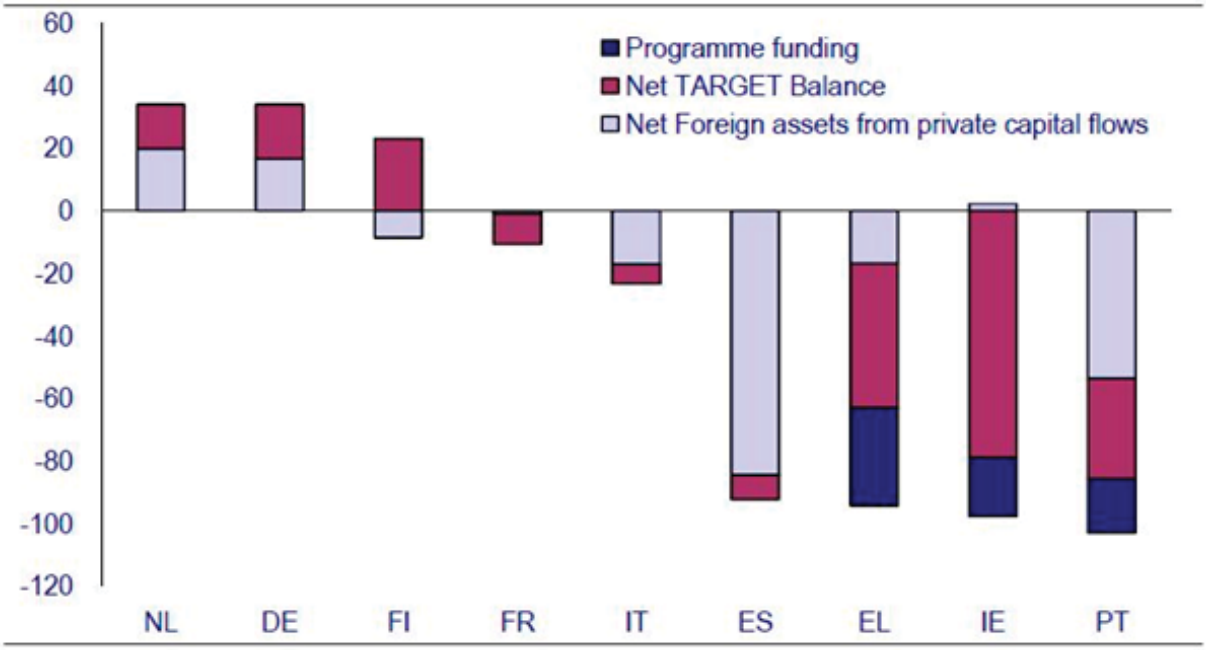


Figure 2 Cumulated current account imbalances for selected euro area countries

Source: Gros (2012).

Figure 3 Net foreign asset position: breakdown by type of funding



Negative values indicate net liabilities. Program lending only; completed disbursements up to September 30, 2011. Program funding only shown for recipient countries (lending are via the EFSF/EFSM represents contingent liabilities for creditor States. Net TARGET balances (TARGET2 positions) as defined in the IIP: "other investment position in loans and deposits of the monetary authority."

Source: European Commission (2012).

Figure 4 Stability of the system and multiple equilibria

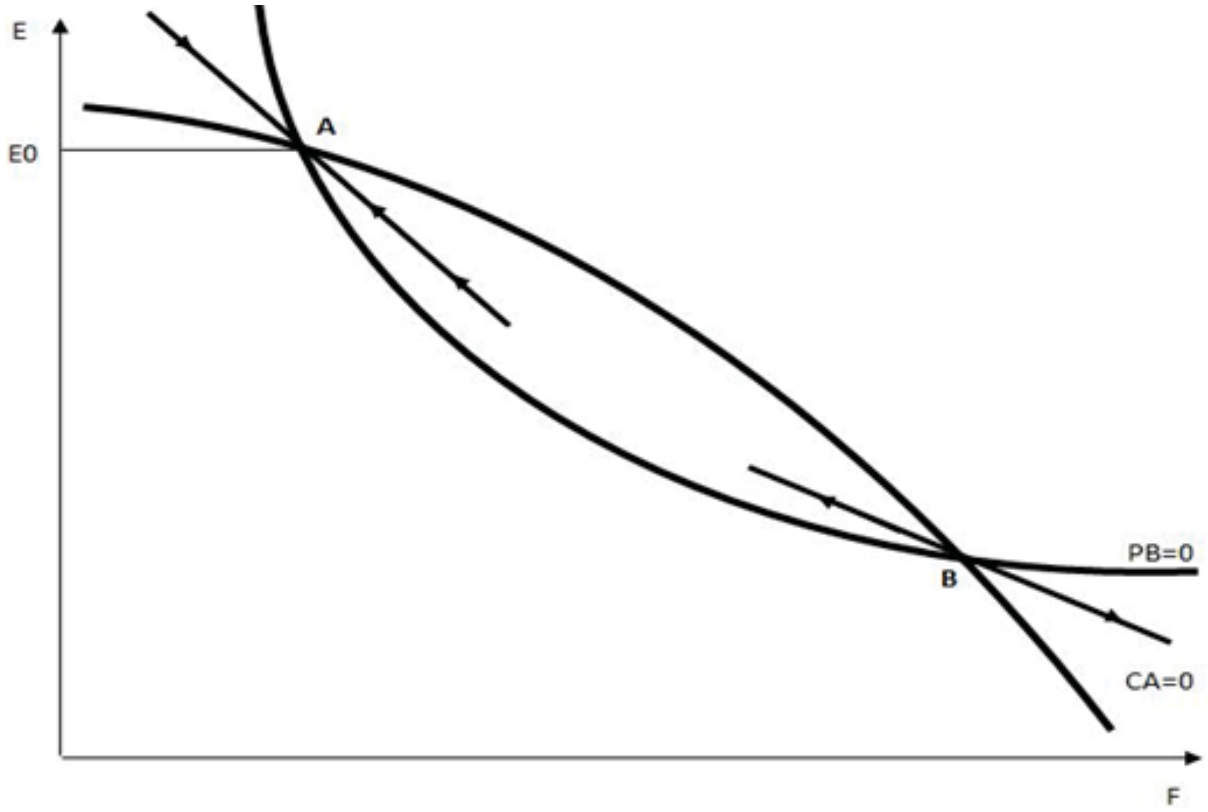


Figure 5 Effect of South's real exchange rate overvaluation

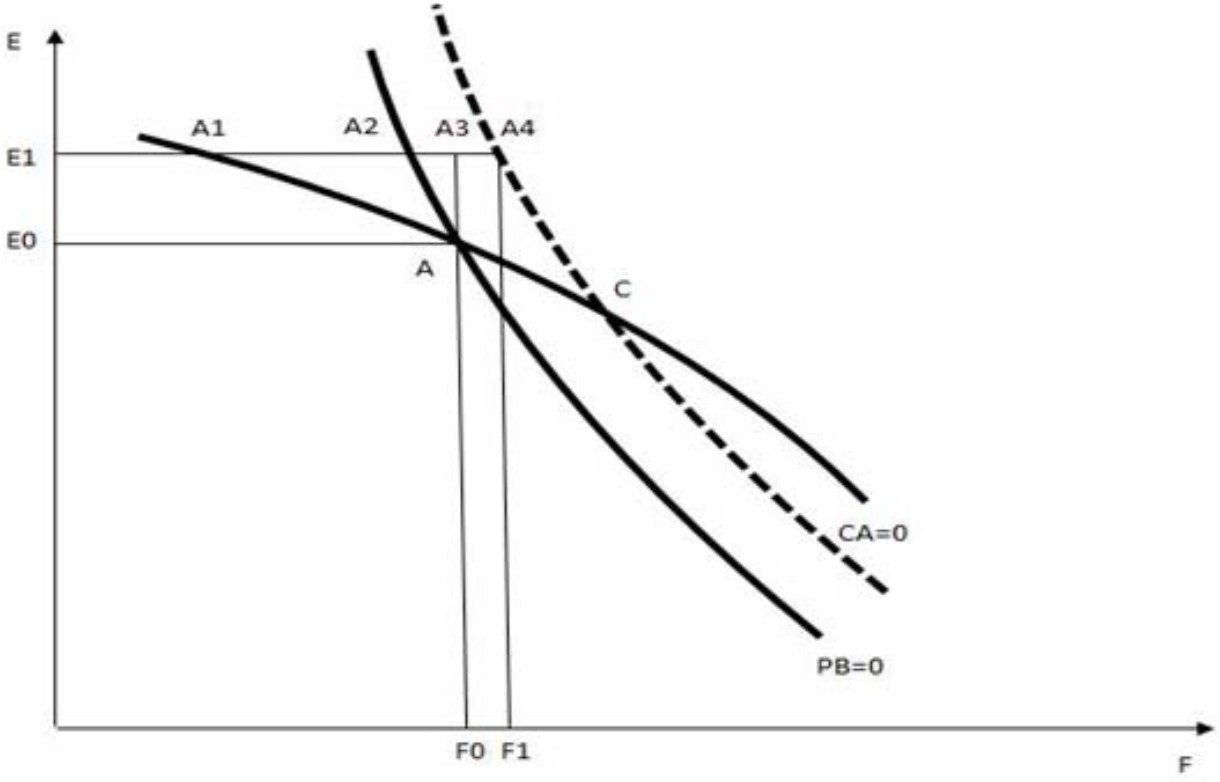


Figure 6 Effect of public funding of net foreign asset position

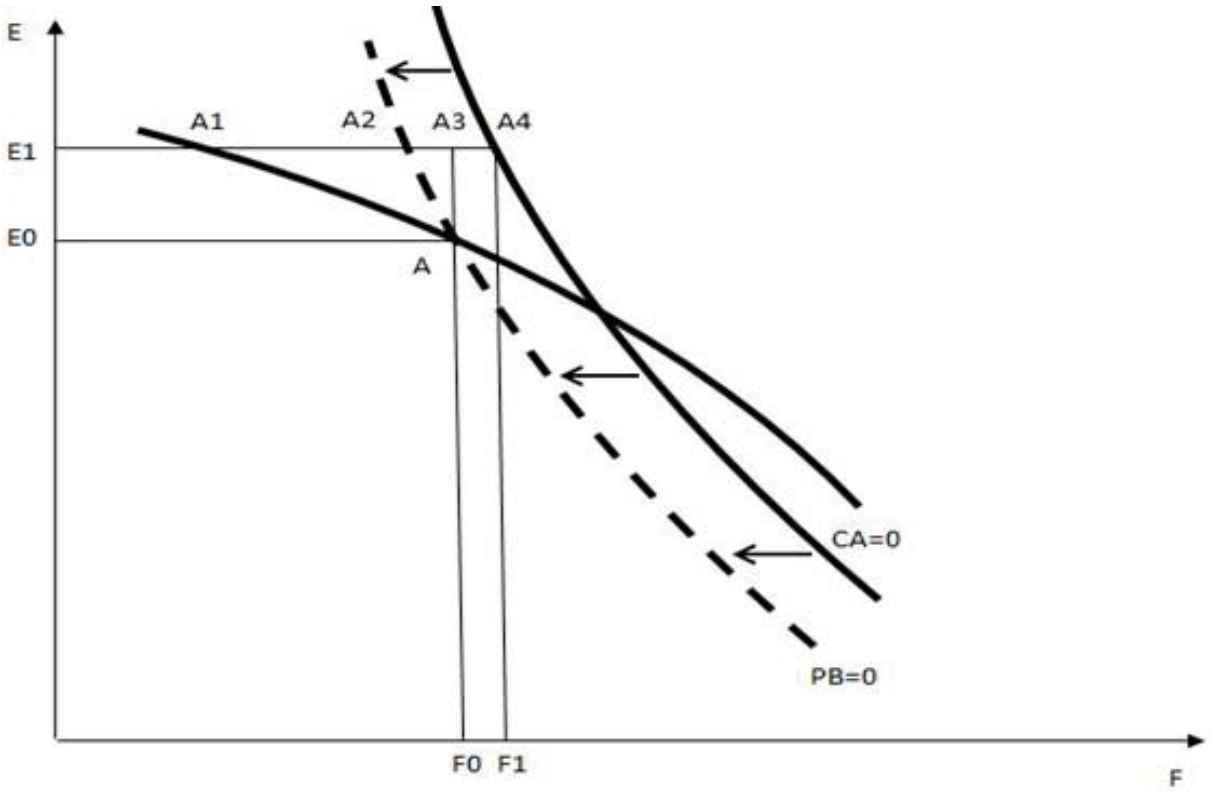
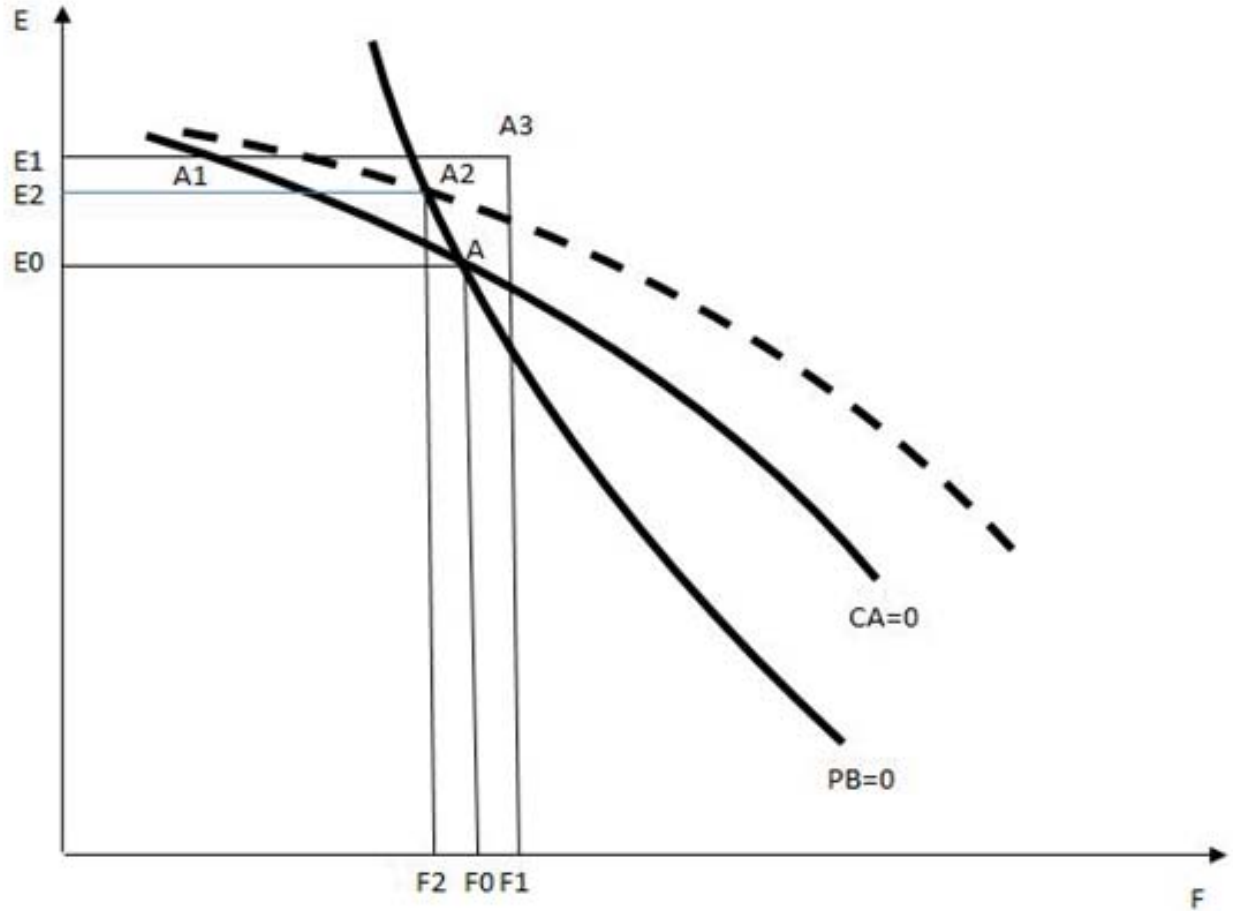
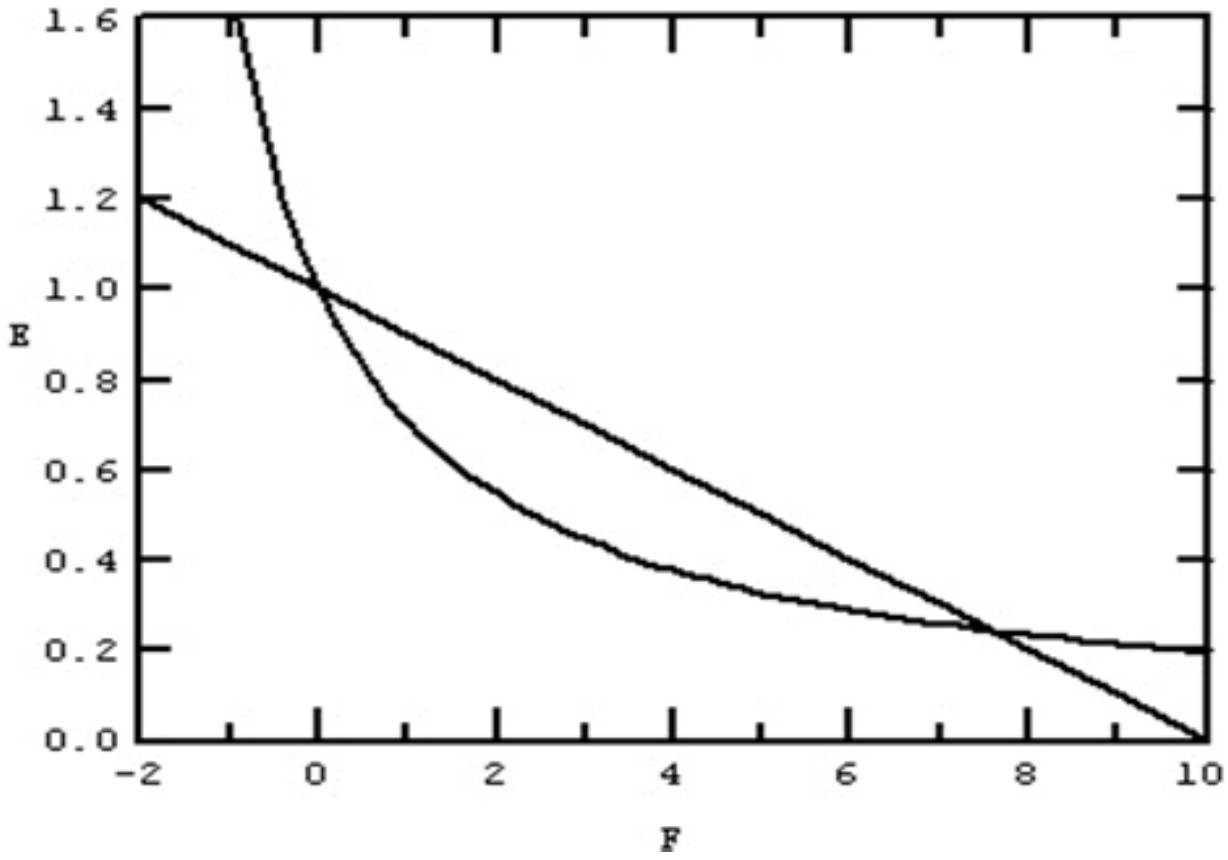


Figure 7 Effect of ECB's OMT on current account equilibrium



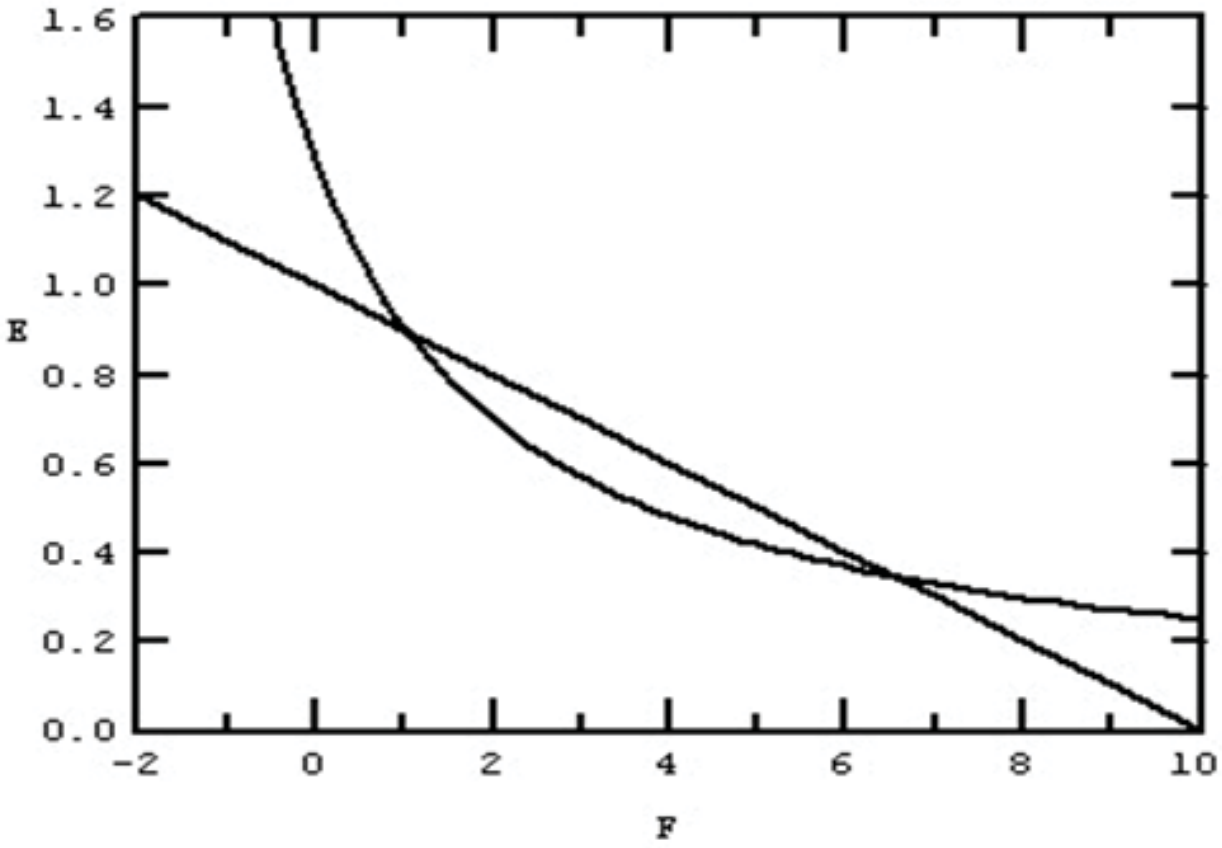
ECB = European Central Bank; OMT = Outright Monetary Transactions

Figure 8 Baseline simulation of North and South at the start of the Monetary Union



Source: Author's calculations.

Figure 9 Simulation of an increase in Southern net liabilities of 1 trillion euro



Source: Author's calculations.

Table 1 Real exchange rate adjustments in 2011, relative to Germany, (1999=100)

Country	RER index; GDP deflator	RER index; ULC figures	Deflator over Germany (percent)	ULCs over Germany (percent)	Percent RER (real) depreciation
Greece	108.97	106.50	28.8	29.3	28.25
Portugal	104.69	106.92	23.7	29.8	23.15
Ireland	102.24	109.93	20.8	33.5	20.25
Italy	105.34	110.02	24.5	33.6	23.95
Spain	117.59	105.74	39.0	28.4	38.45
Cyprus	111.88	111.35	32.2	35.2	31.67
Germany	84.61	82.37	—	—	—

Notes: RER = real exchange rate; ULC = unit labor costs. The GDP-weighted average of depreciations needed by country is 29.45 percent by GDP deflators; 31.38 percent by unit labor costs; 38.99% using German Ministry of Finance figures quoted in Sinn (2010); and 30.78 percent using 2008 figures quoted in Carlin (2012). The latter is scarcely more feasible than the 30 percent group figure. On this basis, if a 5 percent real depreciation is the maximum that one can reasonably expect to achieve in one year, Ireland would take at least four years to regain equilibrium, and Spain seven to eight years (to 2020).

Source: European Central Bank, harmonized competitiveness indices 1999–2011.

APPENDICES

A. A MODEL OF CURRENT ACCOUNT AND PORTFOLIO BALANCES

Since current accounts and portfolio balances both affect exchange rates and rates of return, and are affected by them, they need to be modeled jointly. This is usually done implicitly, assuming perfectly substitutable assets between countries and instantaneous but complete market adjustments. Uncovered interest rate parity can then be applied. However, given that we are dealing with a problem where a country's net debt could become excessive, and may therefore have to be limited, it is not clear that such a model would be suitable in a world of imbalances and market distortions caused by sticky prices, fixed exchange rates, sudden stops, and a revealed preference for holding foreign reserves or foreign assets (a safe haven, or flight to quality).

A general approach is provided by Blanchard, Giavazzi, and Sa (2005), who model current account and portfolio balances directly, and the adjustment processes between them. Such a model allows us to consider imperfect asset substitutability, and hence different asset preferences. It also allows us to examine the stability of the adjustment process in assets/debt under a common currency, sticky relative prices, and sudden stops in capital flows or inter-economy financing. It is based on earlier models developed by Masson (1981), Henderson and Rogoff (1983), and Kouri (1983), extended here to show the gross asset positions of different countries, and the valuation effects caused by exchange rate and interest rate movements.[16]

A.1 Perfectly Substitutable Assets

For simplicity, consider two countries: home and foreign. In each country, the foreign sector is determined by two relationships. First uncovered interest parity,

$$(1+r) = (1+r^*)E / E^e_{+1} \tag{A.1}$$

where r and r^* are home and foreign rates of interest respectively ("*" denotes foreign variables throughout); E is the *real* exchange rate (defined as the price of home goods relative to that of foreign goods), and E^e_{+1} is the real exchange rate expected next period.

Thus $E = P/(eP^*)$ (A.2)

where e is the nominal exchange rate, defined as the units of domestic currency needed to purchase one unit of foreign currency: dollars per euro, say, if the United States is the home country. Hence a fall in e, and a rise in E, indicates a strengthening domestic real exchange rate. However, while we are in the euro

16. Effects stressed in Gourinchas and Rey (2005), Lane and Milesi-Ferretti (2002, 2004), and Obstfeld (2004).

area, $e = 1$ by definition and we are only interested in changes in internal real exchange rates E. In that case, Spain might be "home" and Germany "foreign."

Second, the net foreign liabilities or debt accumulated by the home country are:

$$F_{+1} = (1+r)F + D(E_{+1}, z_{+1}) \quad \text{(A.3)}$$

where F is net debt of the home country denominated in the home currency (the amount of domestic currency needed to pay them off).[17] $D(E,z)$ is the trade deficit, defined to increase with the real exchange rate. Thus $D>0$ implies a deficit; an appreciating real exchange rate will make that deficit larger (the first derivative is positive, $D_E > 0$). Conversely, $D < 0$ denotes a trade surplus and a depreciating real exchange rate will make it larger (more negative). Equation (A.3) says that net liabilities next period are equal to net debt this period, plus net interest payments due, plus the current trade deficit.

Finally, z is a shift variable describing the impact of a trade shock, a change in preference for home goods, or any other changes in spending or the pattern of spending on those goods. It is defined so that an increase in z worsens the trade balance: $D_z > 0.$

A.2 Imperfect Substitutability and Portfolio Balances

To allow for imperfect substitutability between national assets, let W be the total wealth of home investors, X the *total* stock of home's assets, and F the net debt position of the home economy (all in real terms). Thus:

$W = X - F$ where $F \geq 0$ implies a net debt position. (A.4)

The expression for the wealth of foreign investors, in home's currency, is

$$W^*/E = X^*/E + F. \quad \text{(A.5)}$$

So the expected real rate of return from holding home's assets relative to foreign assets, is

$$R^e = [(1+r)/(1+r^*)].E^e_{+1}/E \quad \text{(A.6)}$$

Home investors will distribute their wealth between home and foreign assets, putting a share, α, in home securities and $1-\alpha$ in foreign assets; and α^* and $1-\alpha^*$ are the shares of foreign's wealth held in domestic and external assets. We assume that α is increasing in the relative rates of return on home assets R^e; and also in s, defined as the preference for holding domestic assets including any home bias and/or safe haven effects. Symmetrically, α^* is decreasing in those two factors. If home biases dominate the asset market, then $\alpha + \alpha^* > 1.$

17. We do not distinguish home's foreign and domestic held debt since no euro area country can use monetary policy to inflate its debt away. Given that the ECB cannot do that either, all debt is "foreign."

Equilibrium in the market for home's assets, and hence foreign's assets, is now given by

$$X = \alpha W + (1-\alpha^*)W^*/E = \alpha(X-F) + (1-\alpha^*)(X^*/E + F) \quad \text{(A.7)}$$

This is the portfolio balance equation. Unlike under perfect substitutability, the distribution of wealth between home and foreign is independent of shifts in the trade or current account balances (i.e., *z*). Instead the exchange rate *E*, relative rates of return R^e, and asset preferences *s,* all of which affect α, determine and are determined by the distribution of wealth holdings. Nevertheless, trade and current account balances do lead to changes in F, and hence to changes in the exchange rate:

$$\frac{dE}{dF} = -\frac{\alpha + \alpha^* - 1}{(1-\alpha^*)X^*/E^2} < 0 \text{ iff } \alpha + \alpha^* > 1. \quad \text{(A.8)}^{18}$$

Notice that: (i) the portfolio balance relation is, by definition, nonlinear in *E–F* space and will be downward sloping as long as home biases persist $\alpha + \alpha^* > 1$; (ii) under these conditions, higher debt at home requires a lower exchange rate (because the demand for home assets has fallen, a larger trade surplus is needed to meet interest payments); (iii) real exchange rates respond rather little to current account imbalances; and rather more to changes in portfolio preferences and the distribution of wealth.

A.3 Current Account Balances Under Imperfect Substitutability

If home and foreign goods are imperfect substitutes, and the trade balance *D* behaves as in (A.3), then home's net debt in the next period will be:

$$\Delta F_{+1} = (1-\alpha^*)(1+r)W^*/E - (1-\alpha)(1+r^*)W.E/E^e_{+1} + D(E_{+1}, z_{+1}) \quad \text{(A.9);}$$

That is the foreign ownership of home assets (plus interest), less the value of home owned foreign assets (plus interest), plus the next trade deficit. Rewriting with (A.4), (A.5) and (A.6):

$$F_{+1} = (1+r)F + (1-\alpha)(1+r)(1-1/R^e)(X-F) + D_{+1} \quad \text{(A.10).}$$

This is the current account balance relation since $CA_{+1} = D_{+1} - rF$. Notice the term in the middle reflects the changing evaluation of home owned foreign assets due to differing rates of return (including risk premia). Notice also that (A.10) contains not only the current account balance, but also the cumulative effect of "discretionary" trade balance choices. Policymakers have little control over *F* except by providing liquidity or loans in the face of sudden stops in capital or financing flows (when *F* is held constant). But they can affect *F* through future trade balances and growth.

18. Both (A.8) and (A.11) below are derived assuming that variations in α and α^* are small and may be ignored. This is correct up to a first order approximation. Moreover $\alpha+\alpha^*>1$ is a natural condition given transaction costs and foreign risks, and that $\alpha,\alpha^*=½$ implies indifference between *X* and *X** as assets.

The slope of this current account balance relation in *E*–*F* space, in the current period, is:

$$\frac{dE}{dF} = \frac{-E_{+1}}{(1-\alpha)(1+r^*)(X-F)} < 0 \qquad \text{(A.11)}$$

where the slope depends on the size of the domestic asset base; a large asset base, $X > F$, means a shallow slope, and a small asset base a steep slope. This is the normal state of affairs since, if F rises, it requires E to fall to create a move towards a trade surplus at home in order to generate sufficient extra revenues to pay for the higher net debt—the more so the smaller is the asset base relative to foreign ownership of domestic assets. That implies (A.11) will have to be negative.

B. CURRENT ACCOUNT AND PORTFOLIO ADJUSTMENTS: STABILITY AND DYNAMICS

B.1 Zones of Stability and Instability

Having got the building blocks in place, do these economies offer a stable financial system? Figure 1 implies that they are stable so long as the portfolio balance line has a steeper downward slope than the current account balance line. In that case, a stable steady state will be achieved at the intersection of the two.

To see this, figure B1 (linearized around the equilibrium point for clarity of exposition) divides *E–F* space into eight different zones. It has been drawn with a steady state point where both asset holdings and the current account are in balance at the same time, to reflect a FEER (*fundamental equilibrium* exchange rate) exchange rate value (which leaves the current account at zero) and $F = 0$. But that is convenience: The economies may actually achieve equilibrium at other values for *E* and *F,* for example where *E* generates a trade surplus sufficient to service home's net debt. In fact, trade will be balanced ($D = 0$) where $F = \bar{F}$ lies on the current account line. There is then a trade surplus ($D < 0$) to the right of that point on the *CA=0* line, but a trade deficit to the left, as a consequence of the real depreciation or appreciation involved. Similarly *F* switches along the horizontal, from home having net assets ($F<0$) to home having net liabilities ($F>0$).

Following this logic, going to the right of $F = 0$, the value of $F > 0$ becomes larger which means larger trade surpluses are needed to pay the interest on the larger net debt if the current account is to remain in balance. To generate those surpluses *E* has to fall until the current account deficit reaches the *CA=0* line. Likewise, to the left, $F < 0$ becomes smaller which means larger deficits are possible with the same current account and *E* rises to create those deficits. Thus, above *CA=0,* trade deficits are larger (surpluses smaller) than at points vertically below. Conversely, trade deficits are smaller/surpluses larger below that line than they are at points vertically above. On the *CA=0* line, home's net debt doesn't change since the current account is balanced: $\dot{F} = 0.$ But above that line, *CA<0* and $\dot{F} > 0$; and below it, *CA>0* with $\dot{F} < 0.$

Since the points above the *CA=0* line all have $\dot{F} > 0$, if we arrive at any of these points the portfolio balance line will shift to the right for any given exchange rate. Similarly, the points below *CA=0* all have $\dot{F} < 0$, which means the portfolio line moves to the left. In other words, the current account balance line depicts a set of unstable points in the sense that, once off it, portfolios start to adjust and the portfolio balance positions all shift. The portfolio line, by contrast, does not. Once off it, exchange rates need to adjust to rebalance both trade and the asset distribution. Thus, we arrive at the inequalities, shifts, and dynamic adjustments displayed in figure B2.

B.2 The Stability of Adjustment

Suppose now that we had arrived at a position on the upper side between the two balance lines, but there has been no change in asset preferences or home biases. This could happen after a rise in home's real exchange rate (rising costs); or because of a change of policy (home runs a fiscal deficit, causing a trade deficit); or because of a shift in relative prices or preferences for home goods.

How do the economies now adjust? Home's trade deficit outweighs her net investment earnings. This implies a current account deficit, and a decrease in home's net assets or an increase in her net debt. In a world of flexible relative prices, this would lead to two effects: an increase in foreign's holdings of home's assets; and a depreciating *real* exchange rate to reduce the trade deficit. The two economies therefore move down a saddle path in a southeasterly direction between the two lines until we come to the equilibrium point where *PB=0* and *CA=0* cross (figure 4, point A, of the main text).

But there is more to this adjustment process. Stability not only requires movements to the southeast; the increased interest payments on home's (now higher) debt must also match the decreases in her trade deficit if those movements are to stop. This happens automatically at the intersection point. But whether we actually get to that point depends on whether the elasticity of the trade responses match the speed of portfolio adjustments. If the exchange rate is sticky, or effectively fixed, the adjustment may come about through a path that moves more east than south and therefore hits the portfolio balance line before the intersection point. Early adjustments will then take place through net debt accumulations, and later ones through relative price movements caused by portfolio adjustments in response to valuation changes as the *expected* real rates of return on home assets fall (see (6), and then (10)). Then, once we reach the *PB=0* line we slide down it. Conversely, if relative prices are flexible, the adjustments are mostly south (not east) as foreign dumps her surplus currency reserves or *TARGET2* promissory notes till the *CA=0* line is reached. Then we slide down the *CA=0* line. Either way, the process is stable and depends heavily (but not exclusively) on relative prices and on valuation effects.

We can tell the same story in reverse if we start between the lines on the lower side in figure B1. But starting from any other position, stability is not assured. It depends on the real exchange rate being more flexible than the net debt accumulation process. This is not guaranteed. In fact, it appears to have been a lost cause in most euro area economies.

B.3 Necessary and Sufficient Conditions for Stability

To ensure stability in both the trade and capital markets, we need the slope of the portfolio balance line to exceed that of the current account line. Using (A.8) and (A.11), this amounts to:

$$\frac{(1-\alpha)(1-\alpha^*)}{\alpha+\alpha^*-1} > \frac{E_{+1}E^2}{(1+r^*)X^*(X-F)} \tag{B.1}$$

It is easy to satisfy (B.1), and thus guarantee financial and debt stability, if:

- $X >> F$ or $F < 0$. This represents an economy with a large domestic asset base and self-sufficient in investment and funding; or an economy with net *assets*.
- It is more difficult to satisfy (B.16) if $X - F$ is small: that is, an economy heavily dependent on foreign debt for funding.
- If E is low and expected to remain low; or X^* is large. This is generally a matter of policy stance; as in Germany in the euro area, or China outside.
- If $\alpha + \alpha^* \approx 1$ $\alpha + \alpha^* \approx 1$, i.e., if assets are largely substitutable, but $\alpha\alpha^*$ is large.

It becomes impossible to satisfy this stability condition if α and α^* are such that $\alpha + \alpha^* < 1$; and difficult if $X \approx F$. This may be the case in smaller developed economies, particularly those in the euro area, who need to rely on foreign assets for risk sharing and diversification. If $\alpha + \alpha^* < 1$, the system will be unstable; and it remains unstable, if less so, when $\alpha + \alpha^* > 1$ and $X > F$ is small. That is likely in Greece, Portugal, and Ireland whose assets are widely held by other euro area countries. Italy, by contrast, whose assets are predominantly held at home may be relatively safe because α^* will be large, even if $\alpha \approx ½$ for the rest of the euro area.

That said, E needs to be free to adjust as much as required. Since E is a real exchange rate, this will have strong implications for economies with different degrees of cost inflation, or that have sticky wages and prices.

B.4 What Happens if Real Exchange Rates Fail to Adjust?

Figure B3 shows the implications of having inflexible real exchange rates. This diagram is figure B2, but with a fixed real exchange rate imposed. For ease of exposition, we will treat this as a binding constraint—as indeed it has been in most of the indebted euro area economies.

The implications of this restriction are as follows. At a point A, in a world of fixed real exchange rates, home's current account is in deficit and her net foreign debt rising. So the *PB=0* line will shift right, and will continue to do so as long as the fixed exchange rate value remains in place; and that means for as long as (relative) prices remain sticky. The process of adjustment is exactly that described for figure B2, where the early stage movements involve adjustments in the net debt position before the valuation and exchange rate effects cause us to slide down the *PB=0* line; but with the difference that we will never get all the way to A if no real exchange rate depreciations are possible. This is because the *PB=0* line moves out, and the additions to F chase after it (horizontally to the right) without ever fully catching up. Such a regime is not sustainable because home's debt increases without limit. That cannot be sustained indefinitely; default will break the real exchange rate when the debt ratio can no longer be serviced, the economy goes into recession and prices fall. When that happens, the economy adjusts down the *PB=0*

line till we reach C. But the longer the real exchange rate is maintained, the further the PB=0 line moves out, the greater the debt burden, and the bigger the eventual default.

If we want to avoid those outcomes, home or foreign will have to allow a sudden (capital) stop and provide liquidity support; or they must adjust their real exchange rates; or foreign must accept an ever increasing accumulation of claims on home (that is, unused foreign assets or *TARGET2* promissory notes). In other words, debt is the "great equilibrator" until we are forced to adjust real exchange rates—which is to adjust competitiveness itself.

Hence, equilibrium in this world is certainly possible. But whether we actually reach it is an empirical matter. If the trade balance is sensitive to the exchange rate (i.e., the Marshall-Lerner conditions are satisfied), then the pressure to move down to the current account line will be large relative to the changes in debt and we would catch up with the shifts in C. However the evidence is against such a proposition. The Marshall-Lerner conditions are often not satisfied, especially in the short run when the J-curve effect applies. In that case we would stay around the initial current account position, given sufficient liquidity, as demand for new portfolio balances moves the *PB=0* line to the right. Reaching a new equilibrium then becomes more difficult. In the near term, rising interest payments and the short term insensitivity of the trade deficit to exchange rate variations, mean we move parallel to the current account constraint chasing the *PB=0* line. In the long term, the trade deficit may become sensitive enough, and real depreciations large enough, for the economy to approach the *CA=0* line. If so, *E* will jump to the saddle path, because there is a genuine expectation of reaching the equilibrium at C where $\dot{F} = 0$ and *PB=0* stops moving. In other words, the danger is that the corrections to the trade imbalances may never become large enough, or rapid enough, or strong enough to balance the current account and stop the debt escalation.

C. EFFECT OF OMT INTEREST RATE REDUCTIONS ON THE PORTFOLIO BALANCE LINE

Starting from (6), the portfolio balance, and differentiating under the same conditions as (8) through (10):

$$\frac{\partial E}{\partial r} = \frac{-X^{*}\partial\alpha^{*}/\partial r}{(1-\alpha)-(1-\alpha-\alpha^{*})F} - \frac{X^{*}(1-\alpha^{*})[(F-1)\partial\alpha/\partial r + F\partial\alpha^{*}/\partial r]}{[(1-\alpha)-(1-\alpha-\alpha^{*})F]^{2}} \tag{C.1}$$

$$= \frac{[(1-\alpha)-(1-\alpha-\alpha^{*})F+(1-\alpha^{*})]X^{*}\partial\alpha/\partial r}{[(1-\alpha)-(1-\alpha-\alpha^{*})F]^{2}} \tag{C.2}$$

where we have used the reasonable assumption that the domestic preference for holding domestic bonds and the foreign preference for holding domestic bonds change by equal and opposite amounts when domestic interest rates fall: The expression in (C.2) is clearly positive since follows from (A.6). The PB=0 line shifts down as *r* is reduced.

Figure B1 Debt and trade balance adjustments in the unconstrained model

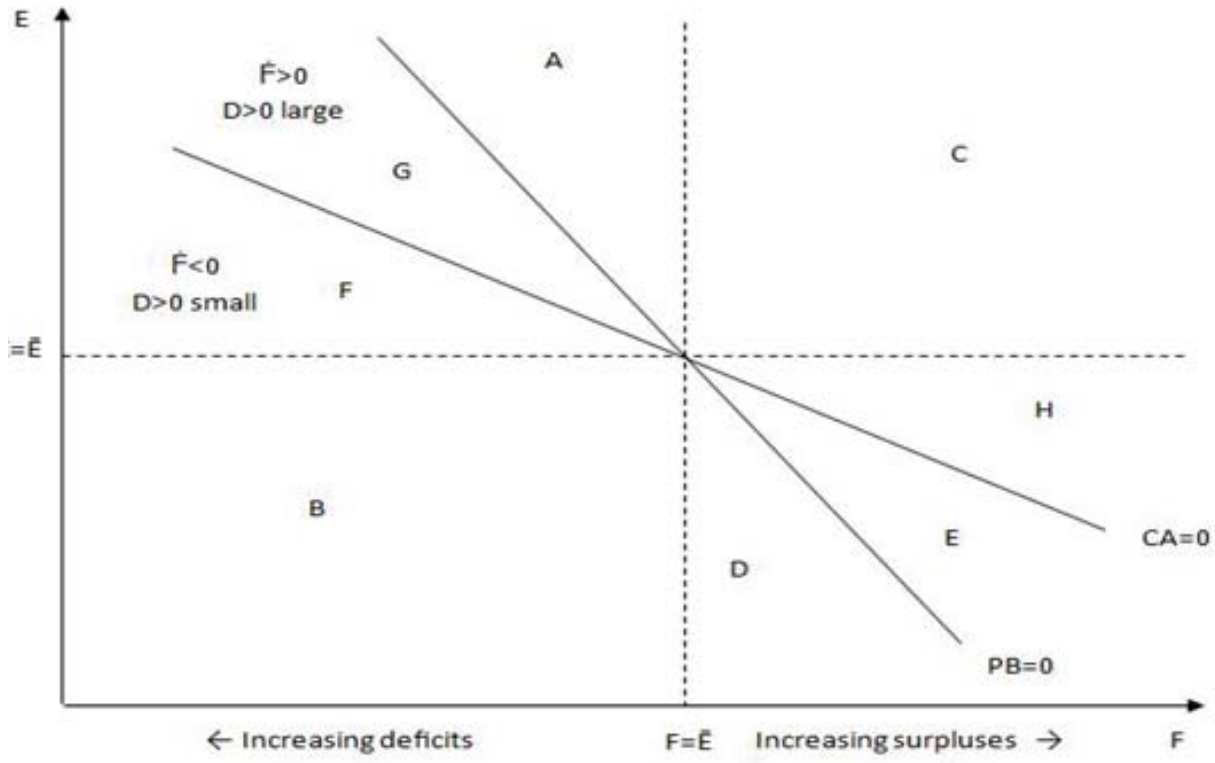


Figure B2 Stable and unstable adjustments to equilibrium

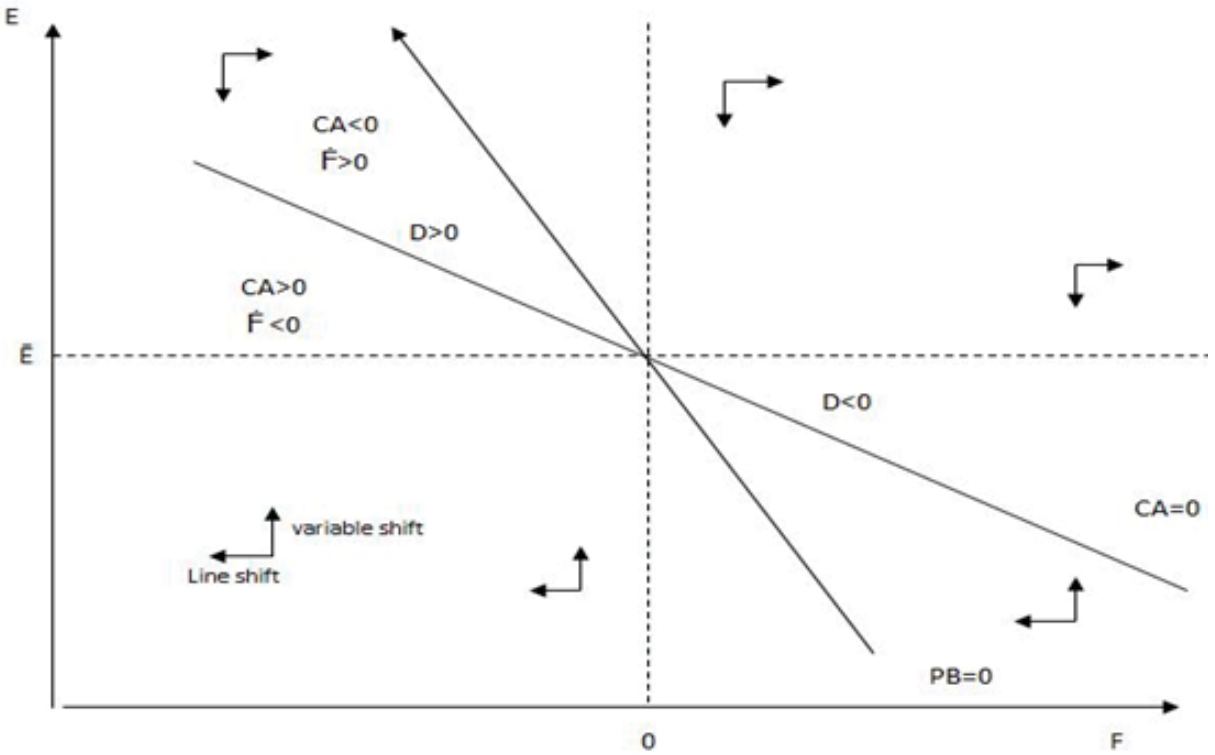


Figure B3 Adjustments to equilibrium with fixed exchange rates