ADBI Working Paper Series

Global Imbalances in a World of Inflexible Real Exchange Rates and Capital Controls

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No. 330
December 2011

Asian Development Bank Institute

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We thank participants at the Asian Development Bank Institute-University of South Australia conference on Economic Governance, held in Adelaide, Australia, on 8–9 July 2011 for helpful comments; in particular Tony Cavoli and Kishen Rajan—also our colleagues at the Peterson Institute for International Economics—Bill Cline, Joe Gagnon, and Michael Mussa.

Suggested citation:

Hughes Hallett, A., and J. C. Martinez Oliva. 2011. Global Imbalances in a World of Inflexible Real Exchange Rates and Capital Controls ADBI Working Paper 330. Tokyo: Asian Development Bank Institute. Available: http://www.adbi.org/working-paper/2011/12/07/4826.global.imbalances.inflexible.exchange.rates.capital/

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Abstract

This paper addresses the issue of international payments in a stock-flow framework, by capturing the interaction between the current account balance and international assets portfolios of domestic and foreign investors. It is argued that the stability of such interaction may be affected by shifts in the preferences of investors, by the relative rate of return of different assets, and—more in general—by institutional settings. The model is then used for policy analysis purposes to derive the conditions for the existence of dynamic equilibria, and if they can be attained, under the assumption of market-distorting policy choices.

JEL Classification: F13, F32, F34

Contents

1. INTRODUCTION

The long debate on the sustainability of current account imbalances has revived in recent years following the world financial crisis of 2007–2009 and the accumulation of large foreign exchange stocks by the main surplus countries. Indeed in recent years, a problem that seemed fully manageable and was even viewed as a new feature of the international monetary system has become a compelling issue[1]. The answer to such a problem cannot but involve a cooperative response by all actors involved. For this reason, at their September 2009 Pittsburgh Summit the Group of Twenty (G-20) Leaders launched their “Framework for Strong, Sustainable, and Balanced Growth”. The thrust of this approach is that, under a mutual assessment process, G-20 economies would adopt the policies aimed at the achievement of their final targets in a mutually coherent framework, to avoid negative spillovers and mutual inconsistencies among national goals. The coordination process has proceeded from there. In their Meeting in Paris last February, the Finance Ministers and Central Bank Governors agreed on a set of indicators focused “on those persistently large imbalances which require policy actions”. The idea of having indicators as a guide to the implementation of economic policy in a world of large open economies has many precedents in economic literature. Most valuably it can be viewed as a way to overcome frictions and disputes that arise from different evaluations of the relationship between targets and instruments[2].

A coordination process based on agreed values of the final targets, however, still requires these values to be such as to reconcile domestic views in a multicounty framework, and also to be economically viable. The latter requirement involves considering a set of end target values to be pursued for the purposes of creating medium- and long-run stability. The key here is the link between stocks and flows. Economic literature has long discussed the interaction between flows and stocks—their development is viewed as particularly relevant in a number of problems ranging from public finance to international payments[3].

It is to the latter problem that the present paper is addressed, with the aim of capturing the interactions between current account balances and the international asset portfolios of domestic and foreign investors in a stock-flow framework. It is argued that the stability of such interaction may be affected by shifts in the preferences of investors, by the relative rate of return of different assets, and—more generally—by institutional settings. The model is then used for policy analysis purposes to derive the conditions for the existence of dynamic equilibria, and if they can be attained, under alternative market-distorting policy choices.

[1] For a survey of the problem and its possible solutions see Martinez Oliva (2011).

[2] See Cooper (1987).

[3] In particular, the connection between current account balances and the net external position of a country lends support to the idea that global imbalances should be closely monitored. For a review of the traditional benchmarks for assessing the level of risk when the stock of external debt is excessive see Cline (2005).

2. A MODEL OF THE CURRENT ACCOUNT AND PORTFOLIO BALANCES

To understand the implications of global imbalances for equilibrium in the world economy, and the potential for different policy regimes to prolong them or to exaggerate them, we need to construct a model of current account balances, internationally held asset balances and the interactions between the two. After all, global imbalances in trade or current accounts cannot be sustained without accumulating matching imbalances in asset holdings (net assets, or net liabilities) to support them.

A model of the interactions between current account balances and (international) portfolio balances will allow us to capture the capacity of the former to generate sufficient funds to supply the net interest payments that need to be paid on the latter; and, where necessary, to repay the net liabilities, if only in the form of refinancing. Modeling these interactions is necessary because equilibrium, with or without imbalances, is going to require what Max Corden (2011) calls "the return journey" to be covered.

To the extent that a country has insufficient capacity to make those payments, or that there is a shift in the trade balance or a change in preferences for domestic or foreign assets, then there has to be some adjustment in exchange rates or rates of return, or in the underlying trade balance and asset positions, until equilibrium is re-established—assuming of course that these adjustments form a stable process and that an equilibrium state exists.

Since current accounts and portfolio balances both affect exchange rates and rates of return, and hence each other indirectly, it is obvious they need to be modeled jointly. Normally this is done implicitly, by assuming perfectly substitutable assets between countries, and instantaneous but complete market adjustments, so that uncovered interest rate parity can be applied. However, given that we are dealing with a problem where current account imbalances or a country's net debt may have to be limited, it is far from obvious that such a model is appropriate for a world of global imbalances and possible market distortions caused by sticky prices, fixed exchange rates, capital controls, and a revealed preference for holding foreign reserves or foreign assets.

A more general approach, with interest parity as a special case, is provided by Blanchard, Giavazzi, and Sa (2005), who model current account and portfolio balances directly, *and* the adjustment processes between them. This 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 asset holdings which follows from a change in (or imposed limit on) trade balances. It is based on earlier models developed by Masson (1981), Henderson and Rogoff (1983), and most obviously Kouri (1983), but extended to show the gross asset positions of different countries, and the valuation effects caused by financial flows between them.[4] We adapt this model to analyze a particular problem, the wider implications of imposing limits to exchange rate movements or capital movements for imbalances in trade and a country's external debt.

To set a model of this kind up, we proceed in four steps:

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

2.1 Perfect Asset Substitutability

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

$$(1+r) = (1+r^*)E / E^e_{+1} \qquad (1)$$

where *r* and *r** are the 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 foreign goods), and E^e_{+1} is the real exchange rate expected next period.

Thus $$E = P/(eP^*) \qquad (2)$$

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 US is the home country. Thus a fall in e, and hence a rise in E, indicates a strengthening domestic currency other things equal: an appreciation of the dollar, say. The interest rate parity condition states that the expected returns on home and foreign assets must always be equal, and assumes that markets clear instantly and that there are no preferences: hence perfectly substitute-able assets.

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

$$F_{+1} = (1+r)F + D(E_{+1}, z_{+1}) \qquad (3)$$

where *F* is net foreign debt or liabilities of the home country denominated in the home currency (the amount of domestic currency needed to pay them off). *D(E,z)* is the trade deficit, defined to be an increasing function of the real exchange rate. Thus *D>0* implies a deficit, and an appreciating currency or 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 currency or real exchange rate will make it larger (more negative). Equation (3) says that net liabilities next period are equal to net foreign debt this period, plus net interest payments due, plus the current trade deficit. Thus, by analogy to the government budget constraint in fiscal policy, *D* plays the role of primary deficit and *rF* the interest payments on past debt – although the government cannot just set *D* in the way it does the primary deficit. It also implies that the current account, *CA = D – rF,* plays the same role as gross fiscal debt.

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

2.2 Imperfect substitutability and portfolio balances

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

$$W = X - F \quad \text{where} \quad X \geq F. \qquad (4)$$

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

$$W^*/E = X^*/E + F. \qquad (5)$$

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

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

Perfect substitutability between assets with instantaneous market clearing is therefore just a special case with $R^e = 1$ since *r* = *r** and $E^e_{+1} = E$. Home investors will distribute their wealth between home and foreign assets, putting a share *α* in home securities and *1-α* in foreign assets (likewise *α** and *1-α** are the shares of foreign's wealth held in domestic and external assets). It is reasonable to assume that *α* is increasing in the relative rate of return on home assets, R^e; and in *s*, defined as the preference for holding home's assets (including home bias, and any safe haven effects) or any other shift factors that increase the demand for home's assets. Symmetrically, *α** is decreasing in those two factors. If home biases dominate the asset market, then $\alpha + \alpha^* > 1$. But whether they do or not is left open: it is not an condition that we impose in this paper.

Equilibium in the market for home's assets, and hence foreign's assets, is then given by

$$X = \alpha W + (1-\alpha^*)W^*/E = \alpha(X - F) + (1-\alpha^*)(X^*/E + F) \quad (7)$$

where *α* and *α** may vary with R^e and *s* as stated. This is the portfolio balance equation. Unlike the perfect substitutability case, the distribution of wealth holdings between home and foreign is independent of shifts in the trade or current account balances (ie *z*). Instead the exchange rate *E* (and relative rates of return R^e and asset preferences *s*, which affect *α*) determines and is determined by the world distribution of wealth holdings. Nevertheless, trade and current account balances do lead to changes in F, and hence to changes in the exchange rate. This we represent by the slope of the portfolio balance relationship:

$$\frac{dE}{dF} = -\frac{\alpha + \alpha^* - 1}{(1-\alpha^*)X^*/E^2} < 0 \quad \text{iff} \quad \alpha + \alpha^* > 1. \quad (8)$$[5]

Notice that: (i) the portfolio balance relation is by definition nonlinear in E-F space, and will be downward sloping as long as some home biases persist $\alpha + \alpha^* > 1$; (ii) under these conditions higher net debt at home requires a lower exchange rate (because the demand for home assets has fallen); (iii) portfolio balances in fact imply a relation between net debt, the exchange rate *and* future expected exchange rates (through *α* and R^e); (iv) the exchange rate will respond rather little to current account or trade imbalances, but rather more to changes in portfolio preferences and the distribution of wealth holdings.

2.3 Current account balances under imperfect substitutability

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

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

[5] Both (8) and (11) below are derived assuming that variations in *α* and *α** are small and may be ignored. This is correct up to a *local* first order approximation, for the reasons that are set out in section 3.1 below. Moreover α+α*>1 is a natural condition given transaction costs and foreign risks, and given α,α*=½ implies indifference between *X* and *X** as assets.

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

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

which is the current account balance equation: since $CA_{+1} = D_{+1} - rF$. Notice that the term in the middle reflects the changing evaluation effects for home owned foreign assets (depending on relative rates of return and expected exchange rate movements). Notice also that (10) contains not only the current account balance, but also the cumulative effect of "discretionary" trade balance choices—analogous to the primary deficit in the budget constraint, although policymakers often have little *direct* influence over *D*. However, in a different policy setting, policymakers may affect *D* via import controls or exchange rate manipulation. As a specific form of the latter, a government may decide to hold (invest) its excess foreign currency in the form of reserves—either held directly, or as sterilized domestic currency bonds. This, as we shall show, plays a particular role in the specific policy regimes highlighted in this paper and amounts to a form of currency intervention aimed at creating comparative advantage and a trade surplus for the recipient.

Similarly, policymakers may affect *F* directly via capital controls: holding F constant if those controls are complete, or (more likely) restricting its movement if they are partial.

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

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

where this time the slope, rather than sign, depends on the size of the domestic asset base: a large asset base, $X > F$, means a shallow slope, a small asset base a steep slope to the current account balance line. This is the normal state of affairs since, if *F* rises, it requires *E* to fall to create a move towards a trade surplus in home to generate sufficient extra revenues to pay for the higher net debt—the more so, the smaller is the asset base relative to the foreign ownership of domestic assets, but less so the larger are home assets relative to foreign owned home assets. That implies (11) will have to be negative.

This completes our revision of the Blanchard-Giavazzi-Sa model.

3. CURRENT ACCOUNT AND PORTFOLIO ADJUSTMENTS: STABILITY AND DYNAMICS

Now we develop a more general version of the model. We examine potential equilibria in the trade and financial sectors for our two economies, together with the dynamics of the adjustment process toward, or away from, those possible equilibria. Do they represent stable steady states?

In this section, we will work with local linearizations about each possible equilibrium point. This is for illustration only. These linearizations will be relaxed in section 5 where we deal with the general case.

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[6]The foreign share of domestic assets is the share of foreign wealth allocated to home assets plus interest paid on home assets, all evaluated in home currency. Similarly, with roles reversed, for the second term.

3.1 Critical values where net foreign liabilities rise: the primary fiscal surplus analogy

For the purposes of illustration, we make a further simplifying assumption: any variations in α and α^* with respect to s or R^e are small and can be ignored. Since α and α^* are themselves small, this is a reasonable starting point. It would be guaranteed if national interest rates were approximately equal and the exchange rate is not expected to adjust much ($r \approx r^*$ and $E^e_{+1} \approx E$, so $R^e \approx 1$), implying there is little reason to expect any changes in asset preferences or the home biases s. These assumptions are for convenience and temporary; they will be relaxed below and in section 5.

Given these simplifications, the portfolio balance equation is, from (9),

$$X = \alpha(X - F) + (1-\alpha^*)(X^*/E + F) \qquad (12)$$

from (7). And the current account balance equation is a simplified version of (3): in this case, since current account balance would imply $F = F_{+1}$,

$$0 = rF + D(E, z) \qquad (13)$$

where the approximation $D(E,z) = \theta E + z$, $\theta > 0$, could be inserted on the right. Both equations imply a negative relation between net debt and the exchange rate because of the need for the home currency to depreciate to generate more of a surplus to service net debt if net debt increases.

How does net debt change in this world? Eliminating F between (12) and (13), we see that net debt does not increase (because the current account remains balanced) if

$$D(1-\alpha-\alpha^*)/r = (1-\alpha^*)X^*/E - (1-\alpha)X \;;$$

i.e., if

$$\bar{D} = r\{(1-\alpha^*)X^*/E - (1-\alpha)X\}/(1-\alpha-\alpha^*) \qquad (14).$$

This defines a critical value for the trade deficit. If $D > \bar{D}$, home's net debt F will rise [by (3)]. But if $D < \bar{D}$, home's net debt will fall; and if $D = \bar{D}$, F remains unchanged. This provides the counterpart to the condition for public sector debt not to rise: that the primary fiscal deficit shall not exceed (growth less interest rates) times the existing debt level.

It is easy to generalize this part of the story to allow interest rates to differ, $r \neq r^*$, and hence exchange rates to move. Inserting those changes in (10), and ignoring all second order changes and higher, (13) becomes $rF + (1-\alpha)(r - r^*)(X - F) + D = 0$. The critical value of D is now

$$\bar{D} = \frac{r\{(1-\alpha^*)X^*/E - (1-\alpha)X\}}{(1-\alpha-\alpha^*)} - \frac{(1-\alpha)(r-r^*)[(1-\alpha)X^*/E + \alpha X]}{(1-\alpha-\alpha^*)} \qquad (15)$$

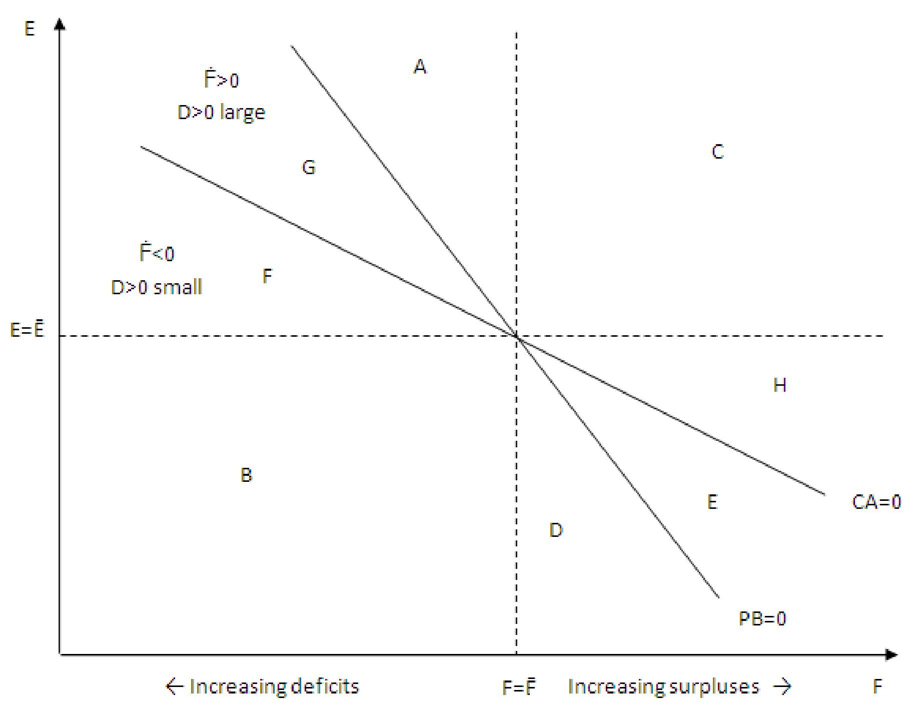
instead of (14). The second term is an additional valuation term. The same results apply with respect to whether F will be rising, falling, or unchanged, but centered now around a new critical value for $\bar{D}$. These results are good up to a first order approximation around the portfolio balance line (notice we have not used any linearization for D at this point).

3.2 Zones of stability and instability

Having got the building blocks in place, do these economies represent a stable trading and 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 1 is divided into 8 different zones. For convenience it has been drawn with the steady state (intersection) point, where both asset holdings and the current account are in balance at the same time, to reflect a Fundamental Equilibrium Exchange Rate **(**FEER) value (which leaves the current account balanced at zero) and $F = 0$. But that is just convenience: the economies may actually achieve equilibrium/steady state at other values for *E* and *F*—for example at an *E* value that generates a trade surplus sufficient to service home's net debt exactly. In fact trade will be balanced ($D = 0$) wherever $F = \overline{F}$ lies on the current account line, whether it corresponds to a steady state on not. In addition, in this conventional case, there is 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 result of the exchange depreciation or appreciation. Similarly *F* switches from home having net foreign assets ($F<0$) to home having net foreign liabilities ($F>0$).

Figure 1: Current Account and Portfolio Imbalances in E-F Space



Source: Authors.

The logic here is that, going to the right of that point, $F > 0$ 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 balanced. To generate those surpluses E must fall, until the current account deficit reaches the current account balance (*CA=0*) line. Likewise, to the left of that point, *F < 0* becomes smaller which means larger deficits are possible with the same current account, and E rises to create those deficits. Thus, above the *CA=0* line, trade deficits are larger (surpluses smaller) than those at points vertically below: whether on the *CA=0* line or below it. Conversely, below that line trade deficits are smaller (surpluses larger) that at points vertically above, whether on or off the *CA=0* line. But on the line, since the current account is balanced, there are no changes in home's net debt position: $\dot{F} = 0$. But above the line, *CA<0* and $\dot{F} > 0$; and below it, *CA>0* with $\dot{F} < 0$.

With these facts in mind, we can trace the movements in *E* and *F* at different points in Figure 1.

- In zone A, *F* is negative but *D* large and positive. So *rF+D > 0*, implying *CA < 0* and hence $\dot{F} > 0$. The explanation is that *E* is too high, meaning the trade deficit is too large to be balanced by the net inflow of investment earnings (*F<0* implies home has net foreign assets, but they are diminishing in this zone);
- Zone B has *F < 0*, but the trade balance is a large surplus (*D < 0*). So *rF+D < 0*; *CA >0* and $\dot{F} < 0$. The explanation is the reverse of that in zone A; E is low so the trade surplus and investment income both add to home's net foreign assets.
- Zone F has *F < 0*; and *D < 0* but small. Hence *rF+D* < 0, *CA > 0* and $\dot{F} < 0$. The explanation is the same as for zone B, but home's foreign assets grow slower.
- Zone G is the same as zone A (i.e *F < 0* but *D > 0*) except that the trade deficit is now smaller, but still large enough to imply *CA < 0* and hence $\dot{F} > 0$.

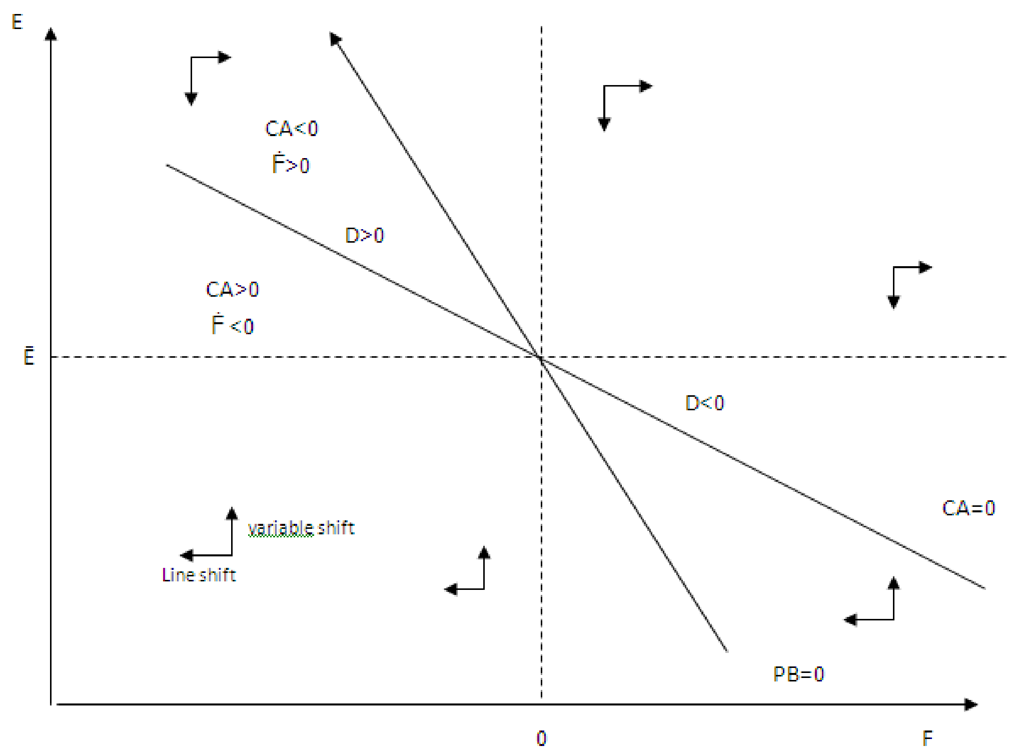
The remaining zones are the mirror image of those four:

- Zone C is the opposite of zone B: *F > 0* and *D > 0* is large. Hence *rF+D > 0* and *CA < 0*, so $\dot{F} > 0$. The trade deficit is reinforced by a investment income outflow.
- Zone H is the same; although the trade deficit is smaller, it still reinforces the net outflow of investment income.
- Zone D has *F > 0* but *D < 0* is large; so *rF+D < 0*, *CA > 0* and $\dot{F} < 0$.
- Zone E has F > 0 and D < 0 smaller, but large enough to imply CA > 0 and $\dot{F} < 0$.

Hence zones A, C, G and H [above *CA=0*] all have $\dot{F} > 0$, which means that if we arrive at any point in those zones the portfolio balance line will shift to the right (at any given exchange rate value). Similarly, zones B, D, E and F [below *CA=0*] all have $\dot{F} < 0$, which means the portfolio line will move to the left. In other words, the current account balance line depicts a set of unstable equilibria 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 show unstable equilibria. Once off it, exchange rates adjust to rebalance both trade and the asset distribution. Thus, we arrive at the inequalities, shifts and dynamic adjustments displayed in Figure 2.

This distinction between the natural instability of the current account equilibria on *CA=0*, and their stability on *PB=0*, is a natural consequence of a stock-flow adjustment process.

Figure 2: Adjustment Paths for the Real Exchange Rate and Foreign Portfolio Balances



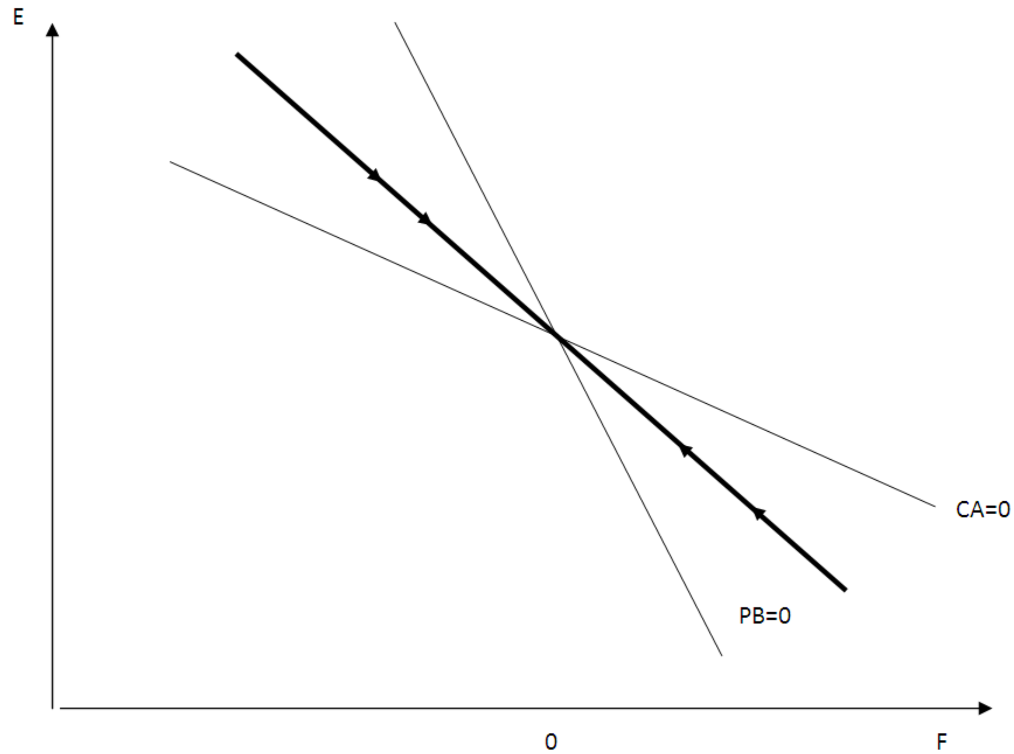
Source: Authors

3.3 Stability of the adjustment process

Suppose now that, for some reason, our two economies had arrived at a position in zone G of Figure 1 (that is on the upper side between the two balance lines), but there has been no change in asset preferences or home biases. This could have happened because of a deterioration 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 preference for home goods (opening to cheap imports, discovery of new technologies).

How do the economies adjust from here? Home's trade deficit outweighs her net investment earnings (if any). This implies a current account deficit, and hence a decrease in home's foreign assets or an increase in her net debt. In a world of floating exchange rates, this leads to two effects: an increase in foreign's holdings of home's assets as foreign recycles her surplus earnings of home's currency or stockpiles them in her reserves; and to a depreciation of the exchange rate which reduces the trade deficit if foreign sells that surplus home currency. The two economies therefore move down the saddle path in a south-easterly direction, as indicated in Figure 3, until the equilibrium (steady state) point where *PB=0* and *CA=0* cross is reached.

Figure 3: The Stable Equilibrium



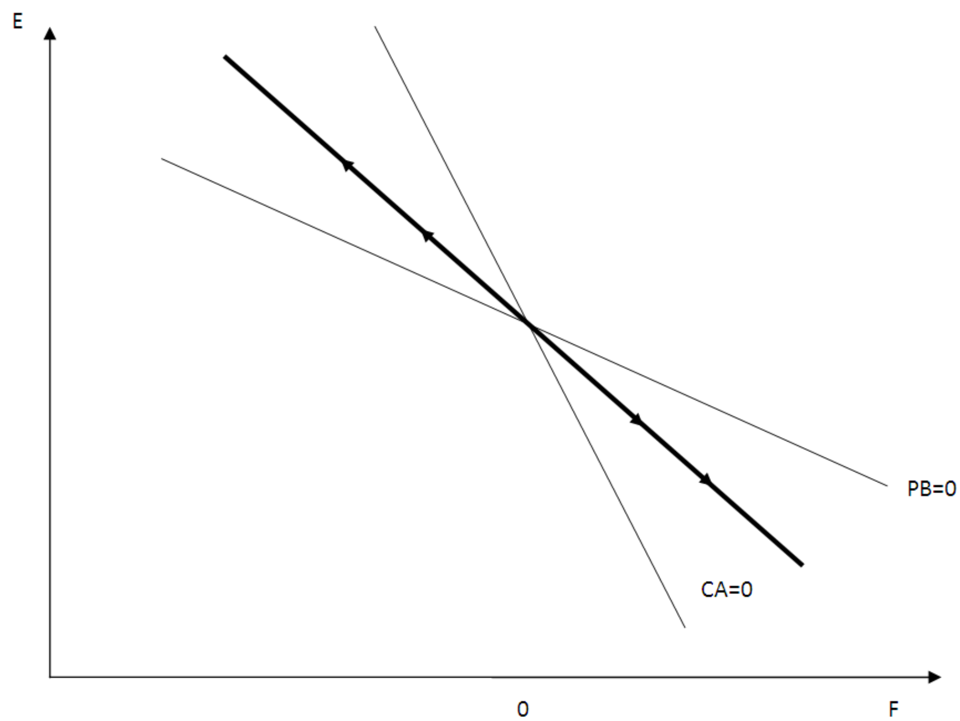
Source: Authors

Now we see something that would not normally appear in phase diagrams such as these. Stability not only requires movements to the south-east. It must also be that the increased interest payments on home's (now higher) net debt exactly match the decreases in her trade deficit to stop the movements. It will happen automatically at the intersection point. But to get to that point depends on how the elasticities of the trade response match up to the speed of portfolio adjustments. If the exchange rate is sticky, or there are attempts to keep it fixed, it may come about through an adjustment path that moves more east than south and therefore hits the portfolio balance line before the intersection point. This means the early adjustments take place through net debt accumulation or redistribution, and the later ones through exchange rate changes caused by portfolio adjustments in response to valuation changes as the expected real rate of return on home assets falls (see (6), and then (10)). Then, once we reach the *PB=0* line we slide down it. Of course, it may happen the other way. If the exchange rate is flexible and sensitive, the adjustments are mostly south, not east, as foreign dumps its surplus foreign currency reserves until the *CA=0* line is reached. The trade deficit has been reduced enough to balance current interest payments on net debt, but needs to fall further to make space for interest payments on the extra debt created since valuation changes will have made home's assets look increasingly attractive. Hence, this time we slide down the *CA=0* line. But, either way, the adjustment process is stable and depends heavily (but not exclusively) on valuation effects.

We can tell exactly the same story in reverse if we start from a point in zone E, between the lines on the lower side in Figure 1. But starting from any other position, stability is not assured. It depends on the exchange rate being more sensitive and flexible than the net debt accumulation process: see Figure 2. This cannot be guaranteed for all parameter values. But if it is true, then the adjustments will either hit the *PB=0* line, if we start from above, or the *CA=0* line if we start from below, and the adjustments will then move along the relevant line as those valuation effects adjust as in the previous paragraph. In all other cases, stability will be lost.

Finally, it is easy to see that if the relative slopes of the *PB=0* and *CA=0* lines become reversed (the *CA=0* line is steeper), then stability is also lost. The potential equilibria are always unstable in this case. Figure 4, which is derived from the same information as Figure 2, shows this directly.

Figure 4: The Unstable Equilibrium



Source: Authors

There is one qualifying remark to make before we go on to specific policy regimes. This analysis has all been conducted with local linearizations about one particular equilibrium point. In a non-linear world it is possible to have multiple steady states, some stable like Figure 3 and some unstable like Figure 4. In section 5 we find that this will in fact be the standard outcome (see figures 6 and 7).

3.4 Necessary and sufficient conditions for stability

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

$$\frac{(1-\alpha)(1-\alpha^*)}{\alpha+\alpha^*-1} > \frac{E_{+1}E^2}{(1+r^*)X^*(X-F)} \quad (16)$$

It is easy to satisfy (16), and thus guarantee stability in the international markets, if:

- *X* >> *F.* This represents an economy with a large domestic asset base; that is self-sufficient in investment and funding (most large developed economies).
- It is much more difficult to satisfy (16) if $X-F$ is small: that is, in an economy heavily dependent on foreign investment for funding (typical of developing or early emerging economies; *F* being net foreign liabilities, not net liabilities).
- If *E* is low, and expected to remain low, or *X** is large (or not widely traded or convertible on the international markets), or *r** is high. This is generally a matter of policy stance, as in the People's Republic of China (PRC) for example or Germany in the eurozone.
- If $\alpha+\alpha^*\approx 1$, i.e., total home biases are not strong (assets are regarded as largely substitutable; investors are indifferent to their source), but $\alpha\alpha^*$ is large.[7]

It becomes impossible to satisfy this stability condition if both α and α^* fall such that $\alpha+\alpha^*<1$; and very difficult if $X\approx F$. This may be the typical case in smaller developed economies—particularly those in the eurozone, or those who peg to the euro or dollar, or those who need to rely on holding foreign assets for risk sharing and diversification. If $\alpha+\alpha^*<1$, as might be the case in Hungary, the Czech Republic or the Baltics ("catch-up" economies with respect to the core eurozone), the system will be unstable especially when domestic assets are mostly held abroad $(X\approx F)$. And it remains unstable, if a little less so, when $\alpha+\alpha^*>1$ and $X>F$ are both small. That is likely in Greece, Portugal and Ireland whose assets are more widely held by other eurozone countries than at home (because of high returns relative to other euro zone assets). Italy or Spain, whose assets are predominantly held at home, may be relatively safe because *α** will be large even in a diversifying (small *α*) eurozone; similarly for Japan relative to the US or the PRC.

The lessons from this section are therefore:

1) The adjustment process described in earlier sections is going to work more effectively in some bilateral comparisons than others.

2) Adjustments in the foreign sector become easier if home has a large asset base and few foreign liabilities but wishes to diversify; and if foreign has a home bias and high rates of return on a smaller asset base.

3) For policies that increase stability: home must reduce its home bias, reduce its foreign debt (run a more balanced trade account) and increase its asset base. Foreign can help

[7] If $\alpha+\alpha^*\approx 1$, then $\alpha\alpha^*\approx\alpha(1-\alpha)$ is maximized at $\alpha=½$. So both conditions imply that stability follows from substitutability.

by raising r^* (allowing the real exchange rate to rise) without raising its home bias, and by increasing its asset base.

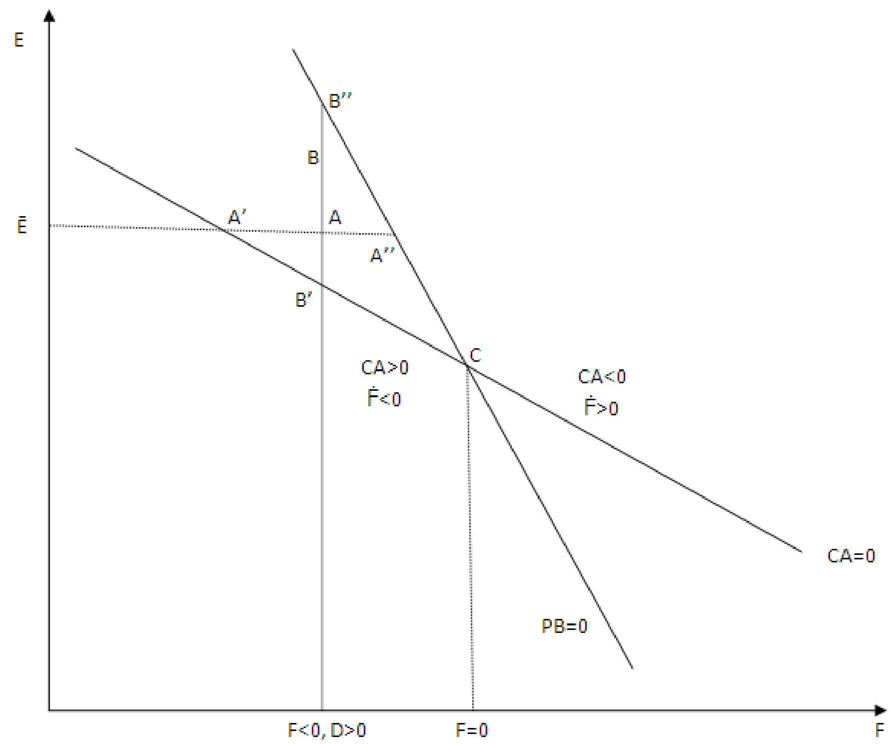
4) That said, *E* has to be free to adjust as much as required. Since *E* is a real exchange rate, this will have strong domestic policy implications for economies with different degrees of inflation control or with managed or sticky (inflexible) nominal exchange rates.

4. FIXED EXCHANGE RATES AND CAPITAL CONTROLS

Now we come to the two specific policy regimes that have been widely used in the name of guaranteeing stability in the foreign exchange and international capital markets: first, fixed exchange rates (as in the eurozone economies; de facto between the US and the PRC, or for any country that dollarizes, euro-izes or otherwise pegs its currency); and, second, the idea that trading economies should restrict, if not completely control, the inflow or outflow of foreign capital. This is an old idea, popular in many developed and developing countries in the 1950s–1980s, for protecting an economy's net foreign debt position. But it has had a remarkable revival in the emerging and developing economies in recent years, as a means to stabilize their net foreign liabilities—without anyone really knowing the impact on economic performance, or whether the economies will be shifted to a new (and possibly less satisfactory) equilibrium position altogether. For example, could these policies have the effect of reducing short term fluctuations at the cost of increasing long term fluctuations, so that the change, when it comes, will be larger and more severe than it need have been? These are different questions to those about effectiveness or enforcement of the controls, or the increased stability in net foreign liabilities achieved.

Figure 5 shows the implications of imposing regimes such as these. This diagram is figure 2 from section 3.2 above with either a fixed exchange rate $\bar{E}$, or a fixed net foreign liabilities limit $\bar{F}$. For ease of exposition, we assume that whichever constraint applies is binding. In other words, we abstract from issues of effectiveness in implementation and enforcement.

Figure 5: Adjustment with fixed exchange rates and capital controls



Source: Authors

In terms of outcomes and performance, the implications are as follows:

1) At a point such as A, in the fixed exchange rate regime, home's current account is in deficit and her net foreign debt is increasing. So the *PB=0* line will shift right, and will continue to do so for as long as the fixed exchange rate value remains in place without depreciations. The process of adjustment is exactly that described in section 3.3, where the early stage movements involve adjustments in the net debt/assets position before the valuation and exchange rate effects that cause us to slide down the *PB=0* line kick in. But the difference is that we never quite get to A'' because no exchange rate depreciations are allowed. So the *PB=0* line moves out, and the adjustments to *F* follow (horizontally to the right) without ever fully catching up with that line. This regime is not sustainable because home's foreign debt increases without limit. That cannot be sustained for ever; default will break the exchange rate peg when the level of debt can no longer be serviced. When that happens, the economy will adjust down the *PB=0* line till we reach C. But the longer the peg is maintained, the further the PB=0 line will have shifted, the greater the increase in debt and eventual currency crash. If we wish to avoid those outcomes, home or foreign must introduce capital controls to overcome the

impossible trinity[8]; or they must let the exchange rate peg go; or foreign must indulge in ever increasing sterilization of foreign currency reserves (unused foreign assets). In other words, the ultimate control has to be placed on the capital account, not the current account—until we are forced to accept a change in the exchange rate.

2) Similarly, at point B, with no fixed exchange rate constraint, home's current account is in deficit and net foreign debt is increasing. Superficially this looks as if it is going to lead to an adjustment process like that in figure 3. But it is different; first because we got to point B by constraint, not as a result of a jump in *E* caused by the market expectations of agents who foresee adjustments down a saddle path to a new equilibrium at C. Second, we are off the portfolio balance line even at the start—which means investors are adjusting their holdings of home's net debt, *F*, even before as well as during the transition to the new equilibrium. Hence *F* adjusts further and faster than in figure 3, implying that *PB=0* moves rapidly to the right.

Whether the combination of these two differences will allow us to reach, and start down, a saddle path to a new, non-stationary equilibrium depends on timing. That is, on the interplay of differences between the faster adjusting debt (hence upward pressure on the current account deficit), vs. the slower short run adjustments of the trade component (downward pressure on the current account deficit). If the former dominates, as we might expect, we will not get back to the $CA = 0$ constraint—moving instead down a parallel line above it, at best[9], until we get close to the portfolio balance line; assuming of course that the slower moving trade adjustments nonetheless allow us to catch up with movements in the portfolio balances. Eventually at *PB=0*, should we ever get there, *F* will be moving slower than the trade balance and it becomes possible to slide down the portfolio balance line to the new equilibrium at C. But there is no guarantee that such a catch up will be possible: it depends on the precise timing and sizes of the changes, on the import/export price elasticities, on Marshall-Lerner conditions vs. evaluation effects, and on expected relative rates of return/capital gains in different assets. And there is no expectations jump to start us off. So there can be no guarantee that a new equilibrium would be reached.

On the other hand, if the trade account changes dominate, then we will leave the initial current account deficit and start down a conventional saddle path in the usual way.

Hence, an equilibrium in this regime is certainly possible. But whether we could actually reach it from any particular capital outflow/inflow restriction is an empirical matter. If the trade balance is sensitive to movements in the exchange rate (i.e., the Marshall-Lerner conditions are well satisfied), then the pressure to move down to the current account line would be large relative to the changes in debt and we would catch up with the shifts in C. However, if that was the case in a flexible (real) exchange rate world, we would almost certainly not have had a current account out of balance in the first place: the trade deficit would already have improved with a depreciating exchange rate, taking us to a legitimate portfolio (net debt) equilibrium—unless the capital control had been placed elsewhere for strategic reasons. Moreover the evidence is against such a proposition. The Marshall-Lerner conditions are often not satisfied, especially in the short run when

[8] Or build up sterilized foreign currency reserves (as in the PRC or South East Asia) to preserve an independent monetary policy while keeping *E* fixed*.* The crucial role of these unused currency reserves is emphasized again at point 5) below.

[9] If there is a J-curve effect, the trade adjustments will be smaller in the short term than in the long term, and the line we move down will have a lesser slope (all periods will contain some new short run adjustments) than the *CA=0* line.

the J-curve effect applies. In that case we will stay around the initial current account position and capital constraint as the demand for new portfolio balances moves the *PB=0* line to the right. Reaching a new equilibrium then becomes a matter of timing. In the near term, rising interest payments, and the short term insensitivity of the trade deficit to exchange rate variations, mean we will move parallel to the current account constraint chasing the *PB=0* line. In the longer term, the trade deficit may become sensitive enough, and cumulative depreciations large enough, for the economy to approach the *CA=0* line. If so, *E* will jump to the saddle path, as in figure 3, because there is now a genuine expectation of reaching an equilibrium at C where $\dot{F} = 0$ and the *PB=0* line stops moving. However, the danger is that the corrections to the trade imbalance may never be large enough, rapid enough, or strong enough, to get us to approach the current account balance line and trigger the larger exchange rate adjustments needed to overcome the escalating debt.

3) These are all changes that may lead to an equilibrium in the long run, when the capital controls break down, or are finally evaded, or become too expensive to enforce properly. And they may lead to an equilibrium in the shorter term too when the capital controls are partial, weakly enforced, or are intended to be incomplete.

Whatever the case, figure 5 shows dual exchange rates will be needed in the short run, either explicitly or implicitly, to sustain the capital controls while they are in operation – higher for asset transactions, and lower for trade, for a capital outflow limit below the current equilibrium value; and vice versa for a capital inflow limit above its current equilibrium. Thus, for a capital controls regime to be implementable, we have to be able to compute the equilibrium position C explicitly; *and* to determine the *PB=0* and *CA=0* lines numerically to calculate the two dual exchange rate values needed. These are of course temporary exchange rate values, and need to be adjusted each period as the underlying trade balances and portfolios change. Dual exchange rates have often been used in developing countries; and now increasingly in emerging markets with excessive capital inflows. The need to adjust the shadow exchange rates correctly and accurately is not easily achieved, even when the wedge between them is created through a tax or a surcharge, or through quantity restrictions. As a result, the adjustment process often gets interrupted, frozen or driven off course, and we never reach the new steady state—which explains why dual exchange rate systems have typically collapsed so easily in practice.

4) Thus, a regime of capital controls can be sustainable. But it is risky because of the danger that debt liabilities build up faster than trade balance improvements; and it can only lead to a new steady state if exchange rates are allowed to be sufficiently flexible. That would probably rule it out as a regime for restraining the trade imbalances between the US and the PRC, or for reducing Germany's trade imbalances with her euro partners; but it could work between the PRC and the eurozone.

Fixed exchange rate regimes are equally risky for the same reason, and because relative prices and costs have to made to move in exactly the right way—see point 7) below.

To better understand how these regimes work, three further observations:

5) The movements described above apply to any points on the fixed exchange rate line between A" and A', including A" but excluding A'; and to any point on the current account constraint between B and B'' (but not B'). This is because at A" and B" the asset portfolios are temporarily balanced, but $\dot{F} > 0$ in either case so the portfolio balance line

will be moving. This is not a temporary equilibrium. But at A' for example, we have an unstable equilibrium because although *D > 0* and *F < 0* the trade deficit is matched by the revenues from home's net foreign assets, implying $\dot{F} = 0$. That is an unstable point because, to sustain it, your trading partner has to sterilize *all* further foreign exchange earnings, or hold them as reserves, but not convert them into assets. If they are converted, the exchange rate will fall, and the portfolio balance line shift, the moment a shock hits the system; or when the trade deficit changes; or when interest rates or relative prices change. In other words that position will not survive shocks or changes without extensive sterilization or careful management of the currency reserves. The same point applies to the unstable equilibrium at B'. In either case, because there will be increasing amounts in unused currency reserves, it is debt management and unrestricted reserves that sustain the regime; not capital controls or fixed exchange rates.

6) Ultimately capital controls can only work with flexible real exchange rates. The two regimes cannot be combined, unless the capital controls are total and dual exchange rates can be enforced.

7) In practice we cannot actually fix *E*, unless strict price stability rules are in place at the same time, since it represents a real exchange rate, not a nominal one. That is to say, inflation control has to produce the same inflation rates in both economies for a fixed (nominal) exchange rate regime to work. Similarly, for capital controls to be sustainable, they have to be combined with a fixed dual exchange rate regime (if control is total); or flexible dual exchange rates coordinated with precisely calibrated changes in relative costs and prices (if not). Thus fixed exchange rates are an option within a full currency union like the eurozone or the United Kingdom; but not between economies with different degrees of inflation control, such as between the PRC and the US or the PRC and the eurozone. Similarly, capital controls could work between flexible exchange rate economies (the PRC and the EU; but not where exchange rates are de facto fixed (at least not without extensive additional agreements on how to adjust relative prices); and not within a currency union lacking a precise mechanism—a competitiveness pact?—to guarantee that both parties are able to adjust their relative costs exactly as required.

5. THE COMPLETE SYSTEM: MEASURES OF "TRADE SPACE"

The last step is to recreate the general problem, but without imposing any linearizations that restrict us to analyzing only certain parts of it. However, rather than assuming a specific functional form for the trade deficit term *D*, which would inevitably introduce additional arbitrariness to a problem where slopes (hence precise functional forms) matter, we work with implicit functions. We start from expressions for the slopes of the portfolio and current account equations already obtained. They enable us to give a global representation for those two relationships, even if the numerical evaluations we use are a series of state dependent approximations to the underlying generic functions.

We start with the portfolio balance equation with imperfectly substitutable assets at (7):

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

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

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

as at (8). Hence (7) is downward sloping iff $\alpha+\alpha^*>1$, but decreasingly so as *E* falls.

The current account balance is given by equation (10), with slope given by the expression at (11) and $F = F_{+1}$ to ensure balance. This implies a current account balance relationship:

$$0 = rF + \theta E + z \quad (17)$$

where $\theta = [r(1-\alpha)(1+r^*)(X-F)]/E_{+1}$ is the state dependent coefficient implied by the underlying relation's slope given at (11). Note that $\theta > 0$ if $X > F$; but decreasingly so as *F* increases. So even if (17) looks like a linear approximation, it is in fact quite different. It provides a state dependent representation of the original equation; or, put differently, a piecewise sequence of linearisations that allows us to give a global representation of (10).

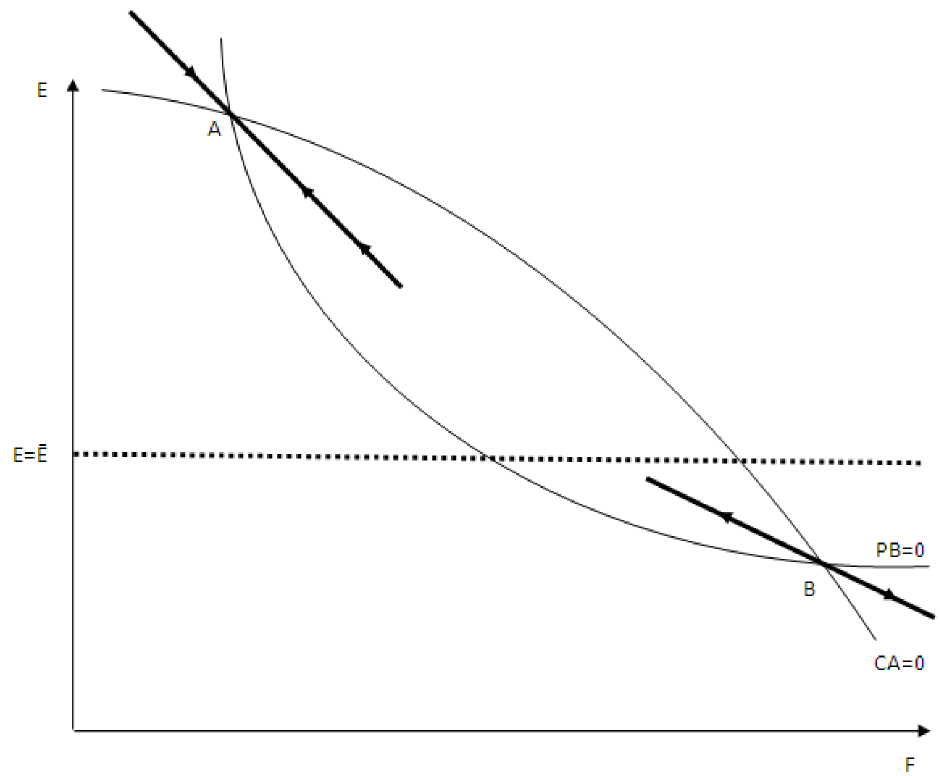
Now, if we rearrange the terms in (7) and (17), we get the system:

$$E = \frac{X^*(1-\alpha^*)}{(1-\alpha)X-(1-\alpha-\alpha^*)F} \quad (18)$$

$$E = -\frac{r}{\theta}F - \frac{z}{\theta} \quad (19)$$

where the slope of (18) is given by (8); and the slope of (19) is negative given *θ*, itself a function of *F* now, and increasingly negative as *F* expands. Equations (18) and (19) can therefore be drawn in (*E, F*) space, as in Figure 6.

Figure 6: Trade Space



Source: Authors

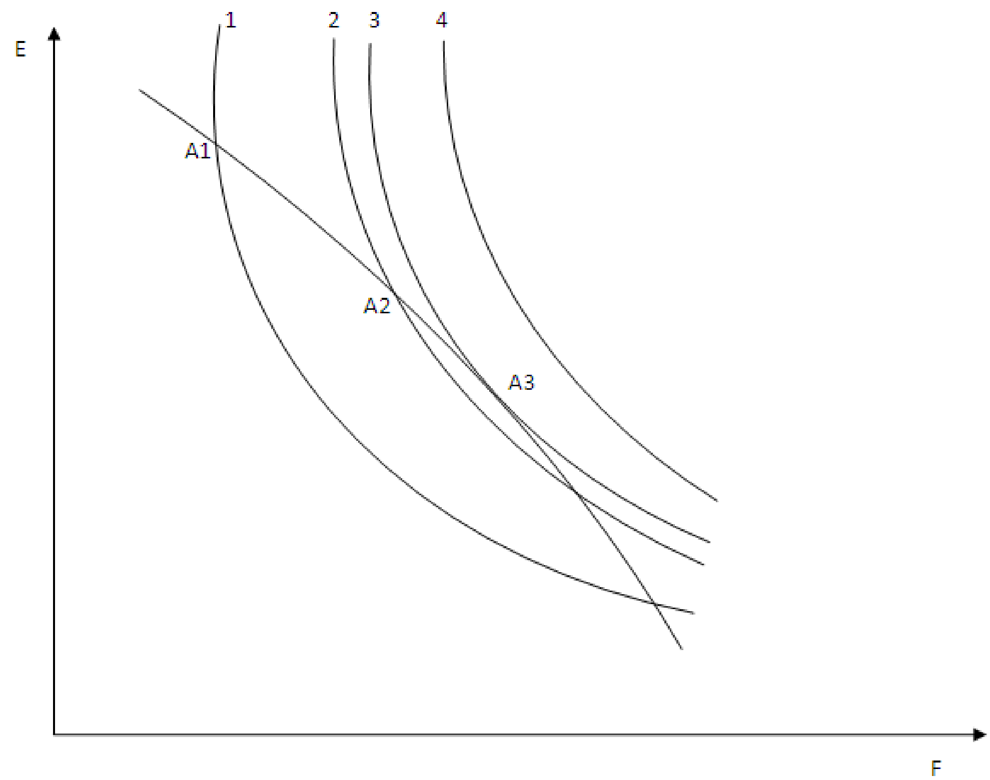
Figure 6 shows there are now two intersection points, corresponding to two equilibria: A and B. Following the results in section 3, it is obvious that only A is a dynamically stable equilibrium. It conforms to the local analysis of Figure 3. Point B, by contrast, is unstable and places the system on an explosive path. That follows from the analysis of Figure 4. In particular, to the right of B, a rise in net external debt *F* raises interest payments and contributes to an increase in the current account deficit. It also forces a decline of the real value of the home currency *E*, which improves the trade balance and thus contributes to a reduction in the current account deficit. To the right of B, the former effect prevails over the latter. The net effect on the current account would be an increase in the deficit, and a corresponding increase in F. This process of exchange rate depreciations and increases in net debt will continue without limit.

To the left of point B, the adjustments go the opposite way. A decrease in F contributes to an improvement in the current account deficit by reducing interest payments (recall Figure 2 showed the current account improves and net debt falls below the *CA=0* line). That permits some deterioration in the trade deficit itself and a rise in the exchange rate. In other words, the net debt reduction now outweighs the currency effect, and we move off to the stable equilibrium at A.

At A, the story is reversed: movements to the right of A improve the current account, movements to the left worsen it. In that sense, A represents the optimal debt position; and B the net debt limit—beyond which the domestic economy will collapse as debt escalates and the domestic currency collapses. Thus if A represents the optimal foreign debt level, AB is a measure of “trade space” (equivalent to the IMF’s concept of “fiscal space” in the management of public sector finances [Ghosh et al., 2011; Hughes Hallett and Jensen 2011]). Policy, therefore, needs to be directed to keeping net foreign debt in the interval around A, where trade and portfolio balances are self-stabilizing, and away from point B where shocks, information errors, or policy mistakes could easily drive an economy into default (the unstable region beyond B) and cause a financial breakdown.

There is one problem remaining: shifts in the relative positions of the current account and portfolio balances will change the position of the (stable and unstable) equilibrium points. As the current account line moves down, and/or the portfolio balance line moves up, the two equilibrium points move together. Ultimately the lines may fail to intersect, in which case no equilibrium exists for either economy and the outcomes will become random and potentially explosive. This is illustrated in Figure 7.

Figure 7: Shifting portfolio balances and the possibility that trade space vanishes



Source: Authors

If we consider the stable equilibrium point A1, an upward shift will move the equilibrium to A2, where the foreign debt F is higher and the real exchange rate is lower (more depreciated); further upward movement might bring the equilibrium to A3, where the portfolio balance curve is tangent to the current account line (stable for movements in one direction, but unstable in the other).

This identifies a potential threat. If the trade space gets small, even a small departure in portfolio balances from A3 to the right, or current accounts to the left, will deny the system any possible equilibrium. Such cases would condemn our economies to a path of endless exchange rate depreciations and debt increases.

To see the circumstances in which this might happen, eliminate *E* between (18) and (19), and solve the result for *F*:

$$r(1-\alpha-\alpha*)\mathrm{F}^2-[r(1-\alpha)X-z(1-\alpha-\alpha*)]\mathrm{F}-[z(1-\alpha)X+\theta(1-\alpha*)X*]=0 \quad (20)$$

It is easy to check if no equilibrium exists. Suppose we have the usual case where $\alpha+\alpha*>1$. Using the conventional test for real roots, our companion paper[10] shows that this will happen if, and only if, there are negative trade shocks (external; or as result of policy interventions, or an unfortunate escalation of costs) to the home economy of a certain size. The size of the danger zone depends on parameters from both partners (asset bases, home biases, rates of return, expected depreciations). So it requires action or policies from both sides to minimize the chances of a breakdown.

6. POLICY CONCLUSIONS

We have used an established but often neglected model of the current account balances, internationally held assets, and the interactions between them, to examine the stability of trade, currency markets and international portfolio balances. Using this model, we have established conditions for equilibrium in the foreign sector as a whole (trade and asset balances together); for whether those equilibria are stable or not; and for whether those equilibria are reachable if the financial markets are distorted by fixed exchange rates or capital controls.

The most important conclusion is that foreign trade and asset markets will, in general, display multiple equilibria: at least two, one stable and one unstable. This gives rise to the idea of a “trade space” defining the areas in which it is safe to allow trade deficits and net foreign assets or debt to go; and areas which are not safe because, lacking an equilibrium position, debt burdens will explode and asset markets collapse. Thus, the first order of business is to ensure that a stable equilibrium exists. This cannot be guaranteed, but can be achieved (in the absence of certain negative trade shocks) if the portfolio balance line is steeper than the current account line at one of the equilibrium positions. This is entirely possible and necessary conditions were given in section 3.4.

We can further strengthen that stability property by making portfolio balances more elastic (*PB=0* steeper); that is, provide currency convertibility, free asset market access, asset substitutability, and greater competitiveness. The new feature, however, is that the ability to reach the relevant saddle path may depend on the relative speeds and timing of adjustments on the current and capital accounts. Modeling those differences in dynamics to determine the relevant critical values is a subject for further research. But they imply that trade imbalances could be inherently unstable, and put us at the bad equilibrium or beyond, even in the absence of shocks.

The second order of business, if we are worried by the size of trade imbalances, net debt, or the possible collapse of certain asset markets, is to consider constraints such as capital controls or fixed exchange rates. But these are no more than temporary expedients; they cannot last without triggering bigger and more expensive adjustments later on, and may set in train adjustments that prevent a final equilibrium ever being reached. So there is a comparative advantage argument here: we should put in place

[10] Hughes Hallett and Martinez Oliva 2011

policies that increase the elasticity of trade adjustments and limit portfolio adjustments first. That of course is the opposite of the capital controls or fixed exchange rates. It says we should target safe net foreign debt or asset levels; and leave trade deficits free to adapt. This can be done within the "trade space" view we have emphasized. Indeed, if there is a case for fixed exchange rates, it is as a circuit breaker, set at $E=\bar{E}$ in figure 6 (a minimum exchange rate value, rather than a fixed value with symmetric deviations), designed to keep us away from the unstable equilibrium.

REFERENCES

Bergsten, F., and J. Williamson. 2004. *Dollar Adjustment: How Far? Against What?*, Washington, DC: Institute for International Economics,

Blanchard, O., F. Giavazzi, and F. Sa. 2005. The US Current Account and the Dollar. *Brookings Papers on Economic Activity* 1 (2005): 1–49.

Cline, W. R. 2005. *The United States as a Debtor Nation*. Washington DC: Institute for International Economics

Cooper, R. N. 1987. International Economic Co-Operation: Overview and a Glimpse of the Future. In *Interdependence and Co-Operation in Tomorrow's World. A symposium Marking the Twenty-Fifth Anniversary of the OECD*. Paris: OECD.

Corden, W. M. 2011. Global Imbalances and Paradox of Thrift. University of Melbourne Institute, WP 20/11. Melbourne, Australia.

Dooley M. P., D. Folkerts-Landau, and P. Garber 2004. The Revived Bretton Woods System. *International Journal of Finance and Economics* 9: 307–313.

Gourinchas, P-O., and H. Rey. 2005. *International Financial Adjustment*. Mimeo. University of California, Berkeley and Princeton University.

Ghosh, A., J. Kim, E. Mendoza, J. Ostry, and M. Qureshi. 2011. *Fiscal Fatigue, Fiscal Space and Debt Sustainability in Advanced Economies*. WP 16782. Cambridge, MA: NBER.

Henderson, D. and K. Rogoff. 1982. Negative Net Foreign Asset Poitions and Stability in a World Portfolio Balance Model. *Journal of International Economics* 13: 85–104.

Hughes Hallett, A., and S. E. H. Jensen. 2011. Stable and Enforceable: a New Fiscal Framework for the Euro Area. *International Economics and Economic Policy.* Forthcoming.

Hughes Hallett, A. and J. C. Martinez Oliva. 2011. Reducing Global Imbalances: Can Fixed Exchange Rates and Current Account Limits Help? *Open Economies Review.* Forthcoming.

Kouri, P. 1983. Balance of Payments and the Foreign Exchange Market: a Dynamic Partial Equilibrium Model. In *Economic Inter-dependence and Flexible Exchange Rates*, edited by J. Bhandari and B. Putnam. Cambridge, MA; MIT Press

Lane, P., and G. Milesi-Ferretti. 2002. Long Term Capital Movements. *NBER Macro-economics Annual*. Cambridge, MA: NBER,.

Lane, P., and G. Milese-Ferretti. 2004. Financial Globalization and Exchange Rates. Discussion Paper 4745. London: Centre for Economic Policy Analysis.

Martinez Oliva, J.C. 2011. The Role of International Money. In *Global Financial Crises—Global Impact and Solutions*, edited by P. Savona, J.K. Kirton, and C. Oldani. Farnham, England: Ashgate..

Masson, P. 1981. Dynamic Stability of Portfolio Balance Models of the Exchange Rate. *Journal of International Economics* 11: 467–477.

Mussa, M. 2004. Exchange Rate Adjustments Needed to Reduce Global Payments Imbalances. In *Dollar Adjustment: How Far? Against What?*, edited by F.

Bergsten and J. Williamson. Washington, DC: Institute for International Economics.

Obstfeld, M. 2004. External Adjustment. *Review of World Economics* 140: 541–568.

Roubini N., and B. Setser 2005. Will the Bretton Woods 2 Regime Unravel Soon?—The Risk of a Hard Landing in 2005–2006. Unpublished manuscript.