

Will there be a dollar crisis?

SUMMARY

Almost everyone believes that the US current account deficit must eventually end, and that this end will involve dollar depreciation. However, many believe that this depreciation will take place gradually. This paper shows that any process of gradual dollar decline fast enough to prevent the accumulation of implausible levels of US external debt would impose capital losses on investors much larger than they currently expect. As a result, there will at some point have to be a 'Wile E. Coyote moment' – a point at which expectations are revised, and the dollar drops sharply. It is much less clear, however, whether this 'crisis' will produce macroeconomic problems.

— Paul Krugman

Will there be a dollar crisis?

Paul Krugman

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1. INTRODUCTION

The United States has a remarkably large current account deficit, both in absolute terms and as a share of GDP. At the moment the country is not having any difficulty attracting capital inflows sufficient to finance this deficit, but many observers nonetheless find the deficit worrisome. The worriers see an ominous resemblance between the current US situation and that of developing countries that also went through periods during which capital flows easily financed large current deficits, then experienced ‘sudden stops’ in which capital inflows abruptly ceased, the currency plunged, and the economy experienced a major setback.

Yet there does not seem to be a clear consensus about how to think about the risks of a dollar crisis. Most of a 2005 issue of *Brookings Papers on Economic Activity* (issue 1) was devoted to the question, and contained excellent, stimulating discussions. Yet the papers seemed, in many ways, to be talking past each other – answering different questions, without being clear about their differences. The purpose of this paper is to sort out the major issues. The idea is to figure out where the various arguments fit, whether they really mean what their proponents claim, and – to the extent possible – how they add up given the available numbers.

I would like to thank participants in the Economic Policy meeting at the Federal Reserve Bank of New York for helpful comments. The Managing Editor in charge of this paper was Philippe Martin.

Although there are some analysts arguing that the US current account deficit is either sustainable or a statistical illusion – arguments discussed briefly below – for the most part the crucial debate is not whether the dollar and the US current account deficit must eventually decline; even if the unorthodox views are given the benefit of the doubt, it is hard to argue that the current levels are indefinitely sustainable. Instead, the debate is or should be about two questions. First, will there be an *abrupt* fall in the dollar – a dollar plunge? Second, if there is a dollar plunge, will it be merely embarrassing or a source of major macroeconomic problems?

This paper does not offer a full model. Instead, it carries out a reduced-form analysis of the possibility of a dollar plunge, followed by a sketch rather than a model of the ways in which such a plunge might cause macroeconomic trouble. As we will see, there are some conceptual problems in linking the question of whether the dollar will plunge to the question of what will happen if it does. But this paper tries to tell a consistent story.

The remainder of the paper is in five sections. The next section argues that investor myopia is key to the question of whether a dollar plunge is likely: it is reasonably clear that the dollar must eventually fall, but that fall only needs to happen abruptly if investors have failed to factor the long-run need for dollar decline into their portfolio decisions. Section 3 offers an analytical treatment of the question of investor myopia and a potential dollar plunge. The fourth section introduces some caveats and qualifications to that analysis. Section 5 suggests a framework for thinking about the macroeconomic effects of a dollar plunge, if that is what is going to happen. A final section suggests some conclusions and directions for research.

2. THE CASE FOR A PLUNGE: A WILE E. COYOTE APPROACH

There is little doubt that the dollar must eventually fall from current levels. Trade deficits on the current scale cannot continue forever – and we are all fond of quoting Stein's Law: 'If something cannot go on forever, it will stop.' Closing the trade deficit will require a redistribution of world spending, with a fall in US spending and a rise in spending abroad. One occasionally hears assertions that this redistribution of world spending can lead to the required change in trade deficits without any need for a change in real exchange rates – a view John Williamson once felicitously described as 'the doctrine of immaculate transfer'. In fact, however, a redistribution of world spending will require a fall in the relative prices of US-produced goods and services, because US spending falls much more heavily than the spending of other countries on those US-produced goods and services. So there must, eventually, be a real depreciation of the dollar. But this depreciation could be gradual, a few percent per year or less. Why should it take the form of a discrete drop?

There has actually been surprisingly little discussion of this question, even in papers that can seem, on a casual reading, to be about the prospects for a dollar plunge. For example, the widely cited work of Obstfeld and Rogoff about dollar adjustment, continued in their 2005 *Brookings* paper, is often cited as reason for alarm.

But their framework is designed to estimate the size of the dollar decline needed to eliminate the current account deficit; it sheds little light on whether that decline will happen quickly, as opposed to a gradual adjustment over the course of a number of years.

The closest any paper in the 2005 *Brookings* symposium came to addressing that question directly was Edwards (2005), whose view is echoed less clearly in a number of discussions. The basic idea can be summarized as follows: there has been an upward shift in the proportion of US assets that foreign investors want to hold in their portfolios. As long as foreign investors are still in the process of moving to this new, higher share of dollars in their wealth, their actions generate a large capital flow into the United States. But the capital flows needed to *maintain* an increased dollar share in portfolios are much smaller than those required to *achieve* that share. So once the desired holdings of US assets have been achieved, the argument goes, capital flows into the United States will drop off sharply, leading to an abrupt decline in both the current account deficit and in the dollar.

There are a number of questions we could raise about this story, but one that seems particularly germane is that of expectations: won't investors see this coming? If they do, the dynamics will be very different. The initial shift into dollars, and hence initial capital inflows, will be damped by expectations of future depreciation. On the other hand, capital inflows will be sustained much longer, because dollar assets will become more attractive over time as the dollar drops toward its long-run sustainable level, reducing the need for further depreciation. So the whole process will be smoothed out. In fact, that is the adjustment process described by another paper in the same conference, by Blanchard *et al.* (2005), which does *not* imply a dollar plunge. So to get the kind of sudden stop envisaged by Edwards and others, investors must be myopic: they must fail to understand the unsustainability of the current exchange rate.

Once we have introduced the possibility of investor myopia, however, we have also introduced the possibility that this myopia will eventually be cured by events: at some point it will become obvious to investors that the dollar must decline – and at that point it will, suddenly. And this brings us to an approach I and others took to the question of prospects for a dollar plunge more than 20 years ago.

Two decades ago the United States was in a position that resembled the present in some important respects. The country had a large current account deficit, although it was only half as large relative to GDP as the deficit today. Then as now some people argued that this deficit could be sustained indefinitely. Others, myself included, argued that the dollar was in for a fall (Krugman, 1985). And some argued that this fall would have dire consequences (Marris, 1985). Fortunately, although the dollar did fall, the predicted evil effects failed to materialize.

At the time I suggested an approach to thinking about the prospects for a dollar plunge that I believe is once again useful, although the modelling framework here is different. The key to this approach is arguing that the real question is not whether the dollar must eventually depreciate. It is whether the dollar must eventually depreciate at a rate *faster than investors now expect*. That is, the only reason to predict a plunge is

if we believe that today's capital flows are based on irrational expectations – that the future path of the exchange rate that investors expect is inconsistent with a feasible adjustment path for the balance of payments. If markets are failing to take the required future fall of the dollar into account, they will eventually have a 'Wile E. Coyote' moment,¹ when they look down and realize that nothing is supporting the currency. At that point the dollar will plunge. That is, we are looking for evidence that investors are not properly forward-looking, and that an abrupt exchange rate adjustment will occur when reality bites.

Some form of Wile E. Coyote analysis is implicit in many dire warnings about a dollar plunge, such as those of Roubini and Setser (2005). The International Monetary Fund's 2006 *World Economic Outlook* (IMF, 2006) offers, in guarded terms, what appears to be a Wile E. Coyote warning: after laying out a benign 'No policies scenario' for the adjustment of external balances, it goes on to point out two problems with this scenario:

'First, foreigners are assumed to be willing to accommodate a further very substantial buildup in U.S. foreign liabilities, from currently less than 30 percent to ultimately around 85 percent of U.S. GDP. This would represent a very high level of external indebtedness, even for a large industrialized country. Second, foreigners would be willing to allocate an increasing share of their asset portfolios to U.S. assets without demanding a large risk premium, even though they may face continued foreign exchange losses ... [T]hese assumptions may not be realistic, and it is relevant to explore alternative scenarios based on more pessimistic assumptions.' (p. 26)

It is, however, useful to make the Wile E. Coyote analysis explicit: doing so both highlights the significance of key economic observations, such as the absence of clear real interest rate differentials between major economies, and helps us sort out the relevance of various seemingly related arguments, such as the alleged emergence of a 'Bretton Woods II' system of exchange rates.

3. WILE E. COYOTE ANALYTICS

What constitutes a feasible adjustment path for the dollar? I would argue that the key criterion for feasibility is that the dollar must fall sufficiently rapidly to avoid an unsustainable level of US external debt. I will not try to define at this point how high a level of debt is unsustainable; as we will see, that may be the crucial question.

How should we model the relationship between the path of the exchange rate and the path of external debt? Those who have been involved with exchange rate models since the early days of floating rates have seen a sudden jump in the value of some old intellectual capital: portfolio-balance models of the exchange rate, drawing on

¹ For those not familiar with the classics: there were often scenes in *Road Runner* cartoons in which the ever-frustrated Wile E. Coyote would run off a cliff, take several steps on thin air, then look down – and only after realizing that there was nothing under him, would he plunge.

early work by Kouri (1976) in particular, are back in fashion. As we will now see, a ‘generic’ portfolio balance model, which glosses over many details, lets us get quite directly at the question of whether investors are properly anticipating the necessary future fall in the dollar.

Our generic model contains only two equations. The first is the portfolio balance equation, which determines the real dollar exchange rate given US net external debt – measured as a share of GDP – and expected dollar depreciation:

$$x = x(D, \dot{x}^e) \quad (1)$$

where x is the real exchange rate, D is US net external debt as a share of GDP and \dot{x}^e is the expected rate of real dollar appreciation. (We measure x so that up is up: a rise in x is a real appreciation of the dollar.)

D has a negative effect on x for at least one and possibly two reasons. First, there is the usual portfolio balance effect: a larger net external debt requires some combination of foreigners holding a larger share of US assets in their portfolios and US residents holding a smaller share of foreign assets in their portfolios. Both changes in portfolio require a lower dollar, other things equal. Second, there may be concerns about US ability and/or willingness to service its debts as the debt-GDP ratio grows large.

Meanwhile, the expected rate of appreciation affects the current exchange rate through its effect on portfolio choice. Consider a simple two-asset model, in which investors allocate their wealth between dollars and euros, which are in fixed supply. Other things equal, expected appreciation of the dollar will make dollars relatively more attractive, inducing investors to hold a larger share of dollars in their portfolio. Since the quantity of dollars is fixed, this share increase occurs through an appreciation that increases the euro value of the dollar stock. Similar logic applies to more complex models; hence the reduced-form inclusion of expected appreciation as a determinant of the exchange rate.

The other equation describes debt dynamics:

$$\dot{D} = B(x, D, \dot{x}) \quad (2)$$

The rate of change of the debt-GDP ratio is not identical with the ratio of the current account deficit to GDP, because it must also take account both of changes in the denominator due to growth in GDP and of capital gains and losses. As Gourinchas and Rey (2005) show, these capital gains and losses loom large in some years. Because the United States tends to hold real assets or equities abroad, while its liabilities consist to a large extent of dollar-denominated debt, dollar depreciation tends to reduce the US net external debt position.

Here is how to interpret the effects of the three variables on the right side of Equation (2). The effect of the real exchange rate is fairly straightforward, although it is important to understand that we are not talking about a naïve ‘elasticities’ approach. Instead, it should be understood as a reduced form of a general equilibrium calculation: given a redistribution of spending from the United States to the rest of

the world that has as its counterpart a rise in B , we ask how the real exchange rate changes as part of the adjustment. (A well-known recent example of this kind of calculation is Obstfeld and Rogoff, 2005.)

The effect of D on its own rate of change works through two channels. On one side, higher net debt reduces net investment income. On the other side, the debt-GDP ratio tends to fall, other things equal, due to GDP growth, and the size of this effect depends on the initial ratio. Which effect predominates depends on whether the marginal rate of return on foreign debt is greater or less than the rate of GDP growth. At the moment, with the US external deficit mainly financed by sales of bonds whose real interest rate seems to be less than the rate of potential growth, the numbers seem to suggest that an increase in debt *reduces* the rate of debt accumulation, a disturbing conclusion. Perhaps this condition will be reversed when foreign investors begin to earn a higher rate of return on their US assets. In any case, as we will see, in the reduced-form approach of this paper we do not need to take a position on the sign of $R-g$.

Finally, the effect of changes in the real exchange rate on the rate of debt accumulation reflects valuation effects. The United States has very little external debt denominated in foreign currency; its liabilities, consisting overwhelmingly of dollar bonds, foreign-owned stocks, and direct foreign investment, can to a first approximation be considered a claim denominated in terms of US goods and services. On the other hand, the bulk of US external assets consist of foreign stocks and direct investment, both of which can to a first approximation be considered claims denominated in terms of foreign goods and services. So a real depreciation of the dollar raises the value, in terms of US GDP, of US external assets without increasing the value of US external liabilities. As a result, dollar depreciation reduces net external debt.

Figure 1 illustrates the familiar dynamics associated with this model. The line DD shows the relationship between D and x that would apply if $\dot{x}^e = 0$, that is, if investors did not expect any future real depreciation of the dollar. The line BB shows the locus of point at which the debt-GDP ratio is stationary, given zero change in the real exchange rate. BB is drawn as downward-sloping, which corresponds to a marginal rate of return greater than the growth rate. If $R < g$, BB is upward-sloping, but the qualitative behaviour is unchanged. With rational expectations, the economy will follow the saddle path SS. (Ignore points 1 and 2 for now.) Notice what happens if investors are forward-looking: when D is below its long-run equilibrium level, the value of the dollar is held down by expectations of future decline, but as D rises, the decline in the dollar is cushioned by rising demand as expected depreciation falls off. That is, forward-looking behaviour by investors works against the possibility of a dollar plunge.

But are investors, in fact, forward-looking? Does the current situation look as if investors are fully taking into account the prospects for future dollar decline? Or does staving off an unsustainable accumulation of debt require a rate of dollar decline that will come as a surprise to investors, setting off a dollar plunge?

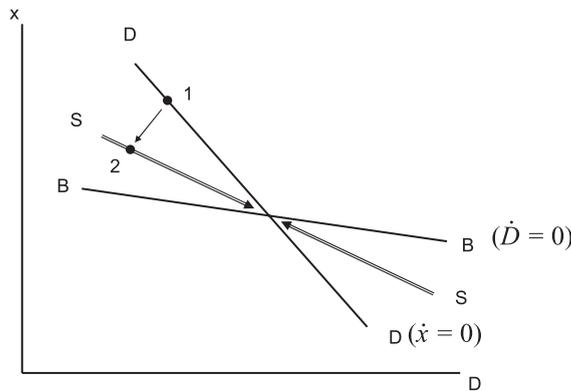


Figure 1. Investor myopia and the Wile E. Coyote moment

One way to approach these issues is to note that if we linearize the model, it implies that both the real exchange rate and the adjusted current account will converge exponentially to their long-run levels:

$$\ln x = \ln \bar{x} + (\ln x_0 - \ln \bar{x})e^{-\kappa t} \tag{3}$$

$$\dot{D} = \dot{D}_0 e^{-\kappa t} \tag{4}$$

where \bar{x} is the long-run equilibrium value of the real exchange rate, and κ is the rate of convergence. Equation (4) also implies that the long run debt to GDP ratio will be:

$$\bar{D} = D_0 + \frac{\dot{D}_0}{\kappa} \tag{5}$$

What Equation (5) tells us is that the eventual debt accumulation depends on the rate of convergence, κ . If we believe that there are limits to how high the debt-GDP ratio can realistically go, that sets a lower bound on the rate of convergence. But from Equation (3), the higher the rate of convergence, the faster the rate of real dollar decline. So we can now rephrase our question: if we assume that the economy converges on long-run equilibrium sufficiently rapidly to lead to a feasible level of debt, is the implied rate of dollar decline consistent with what we know about investor behaviour?

To answer this question, we need to put in some specific numbers. US net external debt at the end of 2005, with direct investment assessed at market value, was 20% of GDP in the fourth quarter of 2005, so we can set the initial value of the debt-GDP ratio, D_0 , at approximately 0.20.

The initial value of \dot{D} may seem straightforward, but it is actually a bit tricky. As I have already pointed out, it is not simply the ratio of the current account to GDP, currently approximately 7% of GDP. Instead, we need to make two adjustments.

First, we need to take account of the erosion of the debt-GDP ratio due to the growth of GDP. Let us assume real growth at 3%, and an inflation rate of 2.5%,

giving us 5.5% nominal growth. With net external debt of 20% of GDP, this subtracts 1.1 percentage points of GDP off the current account deficit.

Second, we need to take account of valuation effects. Since we are measuring D as a share of US GDP, we are in effect using US-produced goods and services as a numeraire. To a reasonable approximation, we can assume away valuation effects in terms of this numeraire on US external liabilities. However, a substantial part of US external assets, consisting both of private holdings of securities and of foreign direct investment, can to a good approximation be considered denominated in foreign goods and services. Then we have:

$$A = A^*/x$$

where A^* is the value of these external US assets in terms of foreign goods and services; when the real exchange rate changes, we have:

$$\Delta A = -A \frac{\Delta x}{x}$$

This tells us that the initial value of \dot{D} depends on the value of selected US assets abroad and on the rate of real depreciation along the assumed equilibrium path. US holdings of foreign securities at the end of 2005, plus foreign direct investment at market value, were equal to 59.7% of fourth-quarter 2005 GDP – call it 60%. With foreign-goods-denominated assets equal to 60% of GDP, real depreciation of 4% per year will cause valuation effects that subtract 2.4 percentage points from the adjusted current account. If real depreciation is only 2% per year, valuation effects will subtract only 1.2 percentage points, and so on.

Finally, how much must the real dollar fall in the long run? In principle, this depends on the steady-state level of external debt relative to GDP, and thus needs to be simultaneously determined along with the adjustment path. For the purposes of this paper, however, it seems possible to take a shortcut, by assuming that the required depreciation needs to be just sufficient to bring the US balance of payments on goods and services to zero. As long as the long-run rate of return on net US liabilities is greater than the growth rate – which is not true in current data, but will probably be true in the long run – this is a lower bound on the real depreciation necessary.

But how large a depreciation would be needed to bring US trade in goods and services into balance? A simple model assumes that the United States and the rest of the world each produce a single composite good, that preferences are Cobb–Douglas, and that the current situation can be viewed as one in which the rest of the world is making a transfer to the United States equal to the US goods and services deficit. If we assume that the rest of the world has a combined GDP equal to three times US GDP, and calibrate the model to US data from the second quarter of 2006, we find that eliminating the transfer would lead to a 42.6% rise in the relative price of rest-of-world products, or a 35% logarithmic real depreciation of the dollar. This is close to the estimate of required dollar depreciation by Obstfeld and Rogoff. Both estimates

Table 1. Implications of different rates of convergence

κ	Initial value of \dot{D}	Long-run value of D	Initial rate of real depreciation
0.05	0.049	1.18	0.0175
0.10	0.038	0.58	0.035

of required depreciation are considerably less than those indicated by fitted trade equations, which suggest that the dollar might have to fall by as much as 20% to reduce the external deficit by 1% of GDP. For current purposes I will assume that:

$$\ln x_0 - \ln \bar{x} = 0.35$$

that is, that the dollar must eventually experience a logarithmic 35% real depreciation; it is unlikely that this is a serious overestimate, and quite possible that it is a serious underestimate.

An aside: as Obstfeld and Rogoff and others have pointed out, a realistic model of future trade adjustment should, at minimum, portray a three-cornered world, since the counterpart of the US external deficit lies in Asia, with Europe roughly balanced. The details of any attempt to model this three-cornered adjustment depends on what we assume about the European balance of payments: would a reduction in the US deficit come partly via a European move toward deficit, or entirely via a counterpart adjustment in Asia? What is clear is that Asian currencies can be expected to appreciate more than average, and the euro less. Lane and Milesi-Ferretti (2007) analyse in this issue how Europe may be affected by an adjustment of the US deficit.

We can now look at the implications of different hypothetical rates of convergence for debt accumulation and rates of real depreciation. Let us be clear: these are not intended as predictions, they are thought experiments. As a result, the assumed rates of convergence here should not be compared with empirical estimates of convergence following exchange rate shocks.

Instead, what we are doing here is a feasibility test: we are trying to determine whether there is any rate of convergence consistent both with market expectations and with plausible end levels of D . Table 1 shows the results of such a calculation. We consider two hypothetical values for κ . A low value, 0.05, implies an initial rate of depreciation of 1.75% per year – 0.05 times the logarithmic long-run depreciation of 35%. After taking account of the growth and valuation adjustments, this implies an initial value for \dot{D} of 0.049, and an eventual net debt-GDP ratio of 118%. As Eichengreen (2006) has pointed out, debt level that high would imply foreign ownership of at least a third of the US capital stock, and more if the US continues to have substantial gross assets abroad. A higher value, 0.10, implies an initial 3.5% real rate of depreciation, an initial value for \dot{D} of 0.038, and an eventual debt-GDP ratio of only 58% – still high by historical standards for a large, relatively closed economy, but perhaps plausible given financial globalization.

Table 2. Interest rates and inflation, August 2006

	Long-term interest rate	Break-even inflation rate on index bonds
United States	4.7	2.5
Euro zone	4.2	2.1
Japan	1.7	1.4

Source: ECB *Monthly Bulletin*, April 2007.

This exercise suggests that a plausible path for long-run adjustment requires real depreciation at more than 2% per year, and possibly as much as 4%. This need not be implausible, if investors were being compensated with higher real returns on dollar investments. But they aren't.

As Table 2 shows, long-term nominal interest rates in the United States are higher than in the euro area, and much higher than in Japan. However, these differentials are partly offset by differences in expected rates of inflation. With well-known caveats (markets for inflation-indexed bonds are relatively thin), we can use the break-even inflation rate on inflation-indexed bonds (BEIR) as an estimate of expected inflation. As of April 2007 the long-term BEIR in the United States was approximately 2.5% per year; that in the euro zone was approximately 2.1%; that in Japan only 0.4%. Thus there was essentially no real interest rate differential between the United States and the euro zone, and only a 0.9% real differential versus the yen.

Nonetheless, private investors are not only holding substantial quantities of US debt, they are continuing to purchase that debt at a substantial rate. (Setser, 2006, argues that a substantial part of apparent private purchases of US debt are actually central bank purchases routed through intermediaries, but even he acknowledges substantial private buying.)

Because we are assuming that bonds in different currencies are imperfect substitutes, expected real returns do not have to be equalized – or to put it differently, the real interest differential is not necessarily an implicit forecast of changes in the real exchange rate. If, however, a realistic path for the exchange rate involves dollar depreciation at 2–4%, this implies large gaps in real rates of return. In fact, investors in Japan and the euro zone are buying US bonds that offer a low or even negative real rate of return in terms of their own consumption baskets. Do they know this?

It seems plausible to argue that they don't: that markets are not taking the prospective long-run decline of the dollar into account. The anecdotal evidence suggests that investors are purchasing US debt not merely for the purpose of diversification, but because they perceive the expected yield on dollar-denominated debt as higher than that on euro- or yen-denominated debt. Thus in the 21 November 2005 issue of *Business Week* an article on the rising dollar declared, 'Behind the dollar's allure: Investors love the higher inflation-adjusted yields on U.S. securities. "Real" rates on 10-year government bonds are around 2% in the U.S., vs. 1.5% in Europe

and 1% in Japan.’ Notice that the *Business Week* quotation describes the higher real rate on dollar bonds as a reason for the dollar’s ‘allure’. That suggests that investors’ decisions are based on the expectation that the real exchange rate will remain essentially unchanged over time.

If markets are not taking future dollar decline into account, the world economy is not on the rational-expectations saddle path. In terms of Figure 1, the world economy is at a position like point 1, on the curve that corresponds to zero expected real depreciation, rather than on the saddle path.

And now we can see what a Wile E. Coyote moment would look like: after a period of real dollar decline, or some kind of economic or political shock, investors would take a closer look at the prospects for dollar-denominated assets – and the world economy would jump from DD to the saddle path SS, from a point such as 1 to a point such as 2. (Notice that the jump is to the southwest, not the south; this reflects the valuation effects of a dollar depreciation, which will reduce net external debt.)

On the face of it, then, there is a pretty good though not ironclad case for believing that markets are failing to take account of the needed future real depreciation of the dollar; that at some point investors will realize that they are being insufficiently rewarded for holding dollar-denominated assets; and that the dollar will drop steeply as a result. But the intensive discussion of the US current account deficit over the past few years has turned up several influential arguments often interpreted as implying that the current value of the dollar is more sustainable than I have suggested.

4. NOVEL ARGUMENTS REGARDING CAPITAL FLOWS AND THE DOLLAR

Any sustained deviation of an economic variable from historical norms raises the question of whether we are seeing a temporary aberration – perhaps a bubble – or a structural change. At least four influential arguments suggest structural reasons why the US current account deficit and hence the dollar may be more sustainable than previous experience would seem to indicate. On the other hand, there is one important argument, which has received surprisingly little attention, suggesting that the dollar is even less sustainable than the previous analysis indicated. Let’s look at these arguments in turn.

4.1. Global savings glut

In a widely quoted speech, Ben Bernanke (2005) argued that there is a global excess of savings over investment outside the United States, in effect attributing the US current account deficit to high savings abroad rather than low savings at home. Follow-up analyses have tried to assess world savings and investment rates: are savings really exceptionally high, or is investment demand unusually depressed? Either way,

a savings glut could explain why the United States is running such a large current account deficit, and could provide support for the view that a large deficit for an extended period makes sense in economic terms.

But even if there is a global savings glut, the net indebtedness of the United States as a percentage of GDP must eventually stabilize, which means that the dollar must eventually fall in real terms. If investors take this into account, a capital inflow produced by a global savings glut should have the same signature as a capital inflow produced by a US savings shortfall: a real interest differential between the United States and other countries. That is, the sign that the United States offers higher investment opportunities than other economies ought to be high US investment relative to savings *in spite of* a real interest differential that compensates investors for necessary eventual US real depreciation.

So Bernanke's hypothesis does not, at least in any obvious way, offer comfort against concerns about a dollar crisis. There may well be a global savings glut, and that glut may explain why real interest rates are low everywhere. But real rates are nearly as low in the United States, with its huge current account deficit, as in surplus economies. This suggests that markets are not taking into account the long-run need for dollar decline, which implies that at some point the dollar will plunge.

4.2. Return differentials

In recent years economists, starting with Gourinchas and Rey (2005), have drawn attention to an important point, which we have already mentioned, about the US position as a debtor nation: US investors abroad earn substantially higher rates of return than those earned by foreign investors in the United States. This explains why the US balance on investment income is still slightly positive, even though the US net international investment position is strongly negative.

The explanation of this gap lies largely in the low rates of return foreign investors earn on direct investment in the United States. These low returns seem odd; they may reflect either an initial period of 'breaking in' to the US market, or they may be a statistical illusion created by tax shifting. If either of these explanations is correct, the US current account deficit may, in a fundamental sense, understate the accumulation of future debts. But suppose that for some reason the return differential is permanent, that it reflects some form of what Gourinchas and Rey call 'exorbitant privilege', using DeGaulle's term for the alleged ability of the United States to force the world to accept dollars and low-return dollar-denominated securities because of the dollar's key currency status.

Exorbitant privilege is already reflected, in two ways, in the calculations reported in Section 3 of this paper. First, the yield differential, coupled with low real interest rates everywhere, leads to a low, perhaps negative value of $R-g$. This low value means that the impact of debt build-up on the adjusted current account is basically negligible, a point that does undermine more apocalyptic views of the consequences of today's deficits.

The second effect of exorbitant privilege is its effect on the initial value of \dot{D} , the rate at which the debt/GDP ratio is changing. Even though the United States is a net debtor, its balance on investment income is still approximately zero, and it is probably significantly positive if you adjust for inflation. So the rate of debt accumulation is actually lower than the deficit on goods and services.

Does exorbitant privilege have any further impacts on prospects for a dollar plunge beyond those already taken account of in these calculations? We will get to that later.

4.3. Bretton Woods II

In a now famous phrase, Dooley, Folkerts-Landau and Garber (2003) declared that the international monetary system has entered ‘Bretton Woods II’, a new era in which major central banks, mainly in Asia, can be counted on to buy dollars in order to maintain more or less fixed exchange rates. A lot of the debate over this work has focused on their analysis of central bank motives and their implications: can we really count on the Reserve Bank of China, in particular, to seek ever-larger dollar hoards over the long term? But before we get to that, let’s ask what it takes before reserve holdings can matter in the first place.

The answer, of course, is that assets denominated in different currencies must be significantly imperfect substitutes. China is engaged in very large-scale sterilized intervention that supports the dollar; sterilized intervention only affects exchange rates to the extent that bonds in different currencies are imperfect substitutes. Imperfect substitution means both that Chinese reserve acquisition can have an impact on the value of the dollar, and that interest rate differentials cannot be interpreted as implicit forecasts of future exchange rates. So the data in Table 2 could, in principle, be consistent with the view that everyone expects the dollar to decline by 2% or 3% per year in real terms. And Dooley, Folkerts-Landau and Garber in effect argue that capital is still flowing in the United States, in spite of the low rate of return, because central banks believe that they need dollar assets to provide liquidity, act as escrow for direct investment, and so on.

But if central bank intervention was really supporting the dollar in spite of a fairly high rate of expected real depreciation, one would expect to see private capital outflows at least partly offsetting official capital inflows. That is, official inflows should not merely be financing the current deficit, they should be overfinancing it (as they do, in reverse, for China’s current account surplus).

In fact, however, official data seem to indicate that while central bank reserve accumulation plays a substantial role in financing the US current account deficit, private bond purchases also play a large role. Even estimates like those of Setser, which suggest that true official inflows to the United States are larger than reported, show significant private inflow, not the outflow we would expect if official inflows were maintaining the dollar’s value in spite of realistic private expectations about the dollar’s future evolution. As a result, Bretton Woods II seems a doubtful way to resolve the puzzling fact that investors seem to regard a modest real return differential,

well short of reasonable estimates of the rate at which the dollar must fall, as sufficient to attract private funds into the United States.

4.4. Dark matter

In an analysis that made a substantial media splash, Hausmann and Sturzenegger (2005) argued that the positive US balance on investment income, despite a large net debtor position, reflects measurement error. In particular, they argued that US assets overseas are drastically understated by official statistics (see their contribution in this issue, Hausmann and Sturzenegger, 2007), probably because US-based multinationals are exporting hidden assets, such as reputation, stability know-how and marketing expertise. They argued that this ‘dark matter’ not only implies that the United States is not a net debtor, but that the true current account balance is much less in deficit than the measured number.

There have been many discussions of this claim. Let me summarize what I believe to be the three key points.

First, much of the ‘dark matter’ puzzle reflects the failure of flows to be fully reflected in stocks – that is, large cumulative current account deficits have not made the United States as much of a debtor nation as one might expect. There is, however, a prosaic explanation for this divergence: unanticipated capital gains and losses. The difference between the cumulative current account balance and the actual net investment position is largely explained by US capital gains on its assets abroad, primarily because of the long-term decline in the dollar, but also to some extent because the past quarter-century, which has been a time of persistent US deficit, has also been a secular bull market that has worked to the advantage of the United States, a country that in effect borrows and invests proceeds in foreign equities and real assets.

Second, the puzzle of the roughly zero investment income balance given the negative net US investment position seems to reflect low returns on foreign investment in the United States rather than high returns abroad. As Brad Setser puts it (using bad physics but good economics), to explain the numbers using the Hausmann–Sturzenegger approach we need ‘dark antimatter’, not dark matter; rather than having US firms export good reputations to overseas markets, we need foreign firms bringing bad reputations to US markets, which does not seem to make sense.

Third, the *level* of dark matter, if it exists, is not very important to sustainability calculations. What we need to refute the argument made in Section 3 of this paper is a rapid increase in dark matter and/or dark antimatter, so as to reduce the value of the adjusted current account deficit. And that is a much harder case to make.

4.5. Secular dollar decline

One last point actually strengthens the case for a dollar plunge: the argument that any long-term dollar decline must chase a moving target.

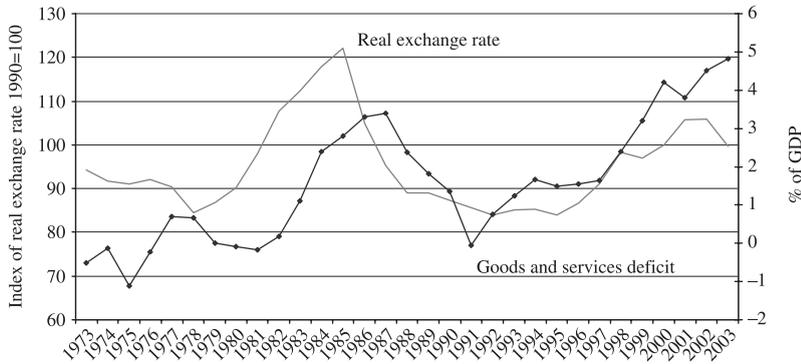


Figure 2. Real exchange rates, external balance, and the secular dollar trend

Source: OECD Economic Outlook database.

Figure 2 shows the US real effective exchange rate and the deficit on goods and services as a percentage of GDP since 1975. The data strongly confirm the impact of the real exchange rate on the trade balance, especially during the dollar cycle of the 1980s, while indicating a significant lag in that relationship, which as we will see may play an important role in the adjustment to a dollar plunge. But they also suggest a significant secular downward trend in the real dollar: over time, the real dollar associated with any given level of trade deficit seems to have declined.

Old hands often refer to such secular trends with the term ‘Houthakker–Magee’, after the early work showing large differences in the income elasticities of demand for US exports and imports. At a deeper structural level, the secular decline in the dollar may reflect technological catch-up by emerging economies; the data hint at an accelerated trend as China’s exports have soared. Whatever the source, a downward trend in the equilibrium real exchange rate reinforces the case that markets are not properly taking future declines in the dollar into account.

5. MACROECONOMICS OF A PLUNGE

Suppose that there is a dollar plunge. What will this do to spending, income, and output?

There is broad consensus about what a fall in capital inflows would mean in the medium run. The dollar would depreciate in real terms, leading to a rise in net exports. At the same time, domestic demand would be compressed, possibly via a rise in interest rates. Overall aggregate demand should be roughly unchanged, with higher net exports and reduced domestic spending cancelling each other out.

The question is whether the transition to this new equilibrium would be smooth or rocky – whether it would involve a recession or at least a slowdown along the way. Mainly this comes down to the question of whether the squeeze on domestic demand

will get ahead of the rise in net exports. Let me deal briefly with two possible reasons for a temporary slump in aggregate demand, before turning to what I believe is the central issue for the United States.

In many sudden stop crises in the developing world, balance sheet effects of depreciation seem to have played a crucial role. Indonesia 1997 and Argentina 2002 are the classic examples. In each case external debts were denominated in foreign currency, so that when the domestic currency fell the net worth of many economic agents was compressed, in a sort of open-economy version of Fisherian debt deflation. Advanced countries are less susceptible to this effect because they tend to be able to borrow in their own currency. The United States, of course, is especially secure. In fact, the nature of its international investment position means that depreciation tends to reduce net indebtedness and raise net worth.

The United States is less secure against a surge in consumer prices as a result of a sharp dollar decline, although even there pricing to market by foreign firms may limit the effect. If the Federal Reserve feels that it must respond to an increase in headline inflation by raising short-term interest rates – perhaps because it believes that wages and other factor costs are indexed, at least implicitly, to inflation – this could indirectly be contractionary. The Fed's recent response to a spike in energy prices suggests that there may be something to this. In fact, precisely this sort of response underlies IMF concerns about a disorderly unwinding of global imbalances. But it is not the main channel most of those fearing a dollar plunge have in mind.

The main concern, instead, is that the compression of domestic demand caused by a reduced foreign willingness to buy dollar assets will happen quickly, while the increase in net exports will happen slowly. But this can seem a bit puzzling. If we expect net exports to rise in the future, that is the equivalent of saying that foreign savings available to finance domestic investment will dry up at some future date. But what is the channel through which the expectation of a future fall in savings reduces demand today?

Discussions such as DeLong (2005) emphasize the effect of future savings on long-term interest rates. I find it clearer, however, and perhaps more accurate, to focus on Tobin's q : the price of capital in place relative to replacement cost.

Consider the following stripped-down representation of the savings-investment balance:

$$S(q) - I(q) = B(x) \tag{6}$$

I include an effect of q on saving because of wealth effects. In fact, in the United States today surely the most important component of q is housing. Rising house prices have led both to high residential investment spending and, via refinancing, high consumption and low spending. Equation (6) defines an upward-sloping locus, as shown by GG in Figure 3.

Meanwhile, investors are comparing returns at home and abroad. Let's write the arbitrage equation as follows:

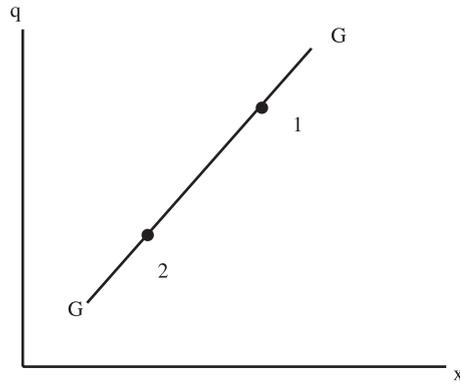


Figure 3. Internal balance and the adjustment problem

$$\frac{n}{q} = r^* + \rho \quad (7)$$

where n is the rental per unit of capital and r^* is the rate of return on foreign bonds. Here, ρ is a catch-all term that includes risk premia and expectations both about future exchange rates and future values of q . The case for a dollar plunge can be represented in this framework as a claim that ρ is low right now compared with its medium-run value, and can be expected to jump. This would have the effect of moving the economy along the curve GG from a point like 1 to a point like 2, causing a real depreciation together with a fall in q .

Why might we argue that ρ is low and must rise? First, as argued above, we can argue that investors have unrealistic expectations about future exchange rates, because they have failed to take proper account of the prospective decline in the real value of the dollar. Second, we can argue that investors have unrealistic expectations about future values of q . In practice, this amounts to saying that there is a bubble in housing prices, which in real terms are vastly above historical experience. This does not prove the existence of a housing bubble, a question that is much debated, but it explains why those so inclined may see high housing prices as a very big issue – quite possibly bigger than the current account deficit.

The possible excesses in housing are the reason it may be a mistake to focus on long-term interest rates in analysing the possible effects of a dollar plunge. Suppose that we have double bubble trouble, and the crisis takes the form of a more or less simultaneous downward revision of expectations about the future value of the dollar and expectations about the future price of houses. In that case, long-term interest rates could move either way.

Now, finally, we can ask whether the medium-term adjustment shown in Figure 3 would involve a recession or at least a slowdown in the short run. The answer depends on the relative speed of adjustment to changes in x and in q . To put it

crudely, if the contractionary effect of a burst housing bubble arrives more quickly than the expansionary effect of a dollar depreciation, a dollar plunge will be associated with an overall slump.

In fact, at the time of writing a serious slump has already developed in the US housing market, while the dollar, despite some weakening, remains in the same range as recent experience. Because the bursting of the housing bubble is already underway, issues of dollar sustainability cannot play the leading role in driving an economic slowdown. However, a dollar plunge, by heading off what might otherwise be a substantial fall in long-term interest rates, may extend and deepen the housing-induced slump.

A weaker dollar would eventually be expansionary through its effect on net exports. But standard estimates indicate a lag of more than two years before depreciation has its full effect on trade flows. Moreover, the size of the trade deficit is unprecedented; this suggests that a major increase in net exports may take longer than usual, because resources need to be shifted on a large scale back into tradable sectors.

Can the Fed offset the contractionary effects of a dollar plunge-cum housing slump by cutting interest rates? There are two possible limitations to the Fed's ability to act. One is that the Fed, concerned about inflation, might be reluctant to cut rates in the face of a plunging dollar. The second is the zero bound on the Fed funds rate. Bear in mind that the principal channel through which Fed policy affects domestic demand is via housing. If a burst housing bubble is part of the economic problem, the Fed's leverage over the economy will be greatly reduced, and even a zero Fed funds rate might have only a modest stimulative effect. So there is a plausible, but far from conclusive, case that the initial impact of a dollar plunge will be contractionary, and that the Fed will find itself unable to offset this contraction.

Are we missing something here? Quite possibly. The history of crisis modelling in international macroeconomics reveals that each successive wave of crises exposes possibilities for crisis that were overlooked in earlier analysis. There may be risks of a hard landing – perhaps in the form of financial disruption – that are overlooked by our models. On the other hand, there are cautionary tales on the other side: currency plunges, from the dollar in 1985 to Brazil's *real* in 1999, that were widely expected to bring recession in their wake but didn't.

6. SUMMARY AND CONCLUSIONS

Concerns about a dollar crisis can be divided into two questions: Will there be a plunge in the dollar? Will this plunge have nasty macroeconomic consequences?

The answer to the first question depends on whether there is investor myopia, a failure to take into account the requirement that the dollar eventually fall enough to stabilize US external debt at a feasible level. Although it is always dangerous to second-guess markets, the data do seem to suggest such myopia: it is hard to reconcile the willingness of investors to hold dollar assets with a very small premium in real interest rates with the apparent necessity for fairly rapid dollar decline to contain growing

foreign debt. The various rationales and rationalizations for the US current account deficit that have been advanced in recent years do not seem to help us avoid the conclusion that investors are not taking the need for future dollar decline into account.

So it seems likely that there will be a Wile E. Coyote moment when investors realize that the dollar's value doesn't make sense, and that value plunges.

The case for believing that a dollar plunge will do great harm is much less secure. In the medium run, the economy can trade off lower domestic demand, mainly the result of a fall in real housing prices, for higher net exports, the result of dollar depreciation. Any economic contraction in the short run will be the result of differences in adjustment speeds, with the fall in domestic demand outpacing the rise in net exports.

The United States in 2007 isn't Argentina in 2001: although there is a very good case that the dollar will decline sharply, nothing in the data points to an Argentine-style economic implosion when that happens. Still, this probably won't be fun.

Discussion

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The basic argument of this paper is simple and intuitive. It is easy to derive crisis-like behaviour in cases where exchange rates are fixed, as Krugman himself and others have shown us over the past quarter of a century. One of the points of floating exchange rates, therefore, is that they help you avoid such crises. So how on earth could there be an exchange rate crisis in the context of a floating exchange rate regime? Where is the elastic band that can be stretched up to a certain point, but eventually snaps? Krugman's answer is that for such a story to hold, there has to be investor myopia, and this seems to me to be entirely sensible.

However, I wonder whether Krugman has made his life unnecessarily difficult, if what he wants to do is convince us that there may be a dollar crisis, by his choice of where to draw the line (in the balance of payments, that is). He has drawn it under the current account, and thus his argument depends on the current account being unsustainable (which is what implies that the dollar will have to fall, which is why the absence of significant real interest rate differentials in favour of the United States suggests investor irrationality). History, however, tells us that very large current account deficits are in fact sustainable for very long periods of time, as one glance at Figure 4 will indicate. The late 19th century, in particular, saw very large and sustained current account imbalances, with countries such as the United Kingdom exporting vast amounts of capital, and countries such as Argentina, Australia and Canada importing equally vast quantities. As is the case today, these flows were interpreted in a number of different ways at the time. Some observers worried that UK investors were irrationally lending money overseas, despite inadequate foreign

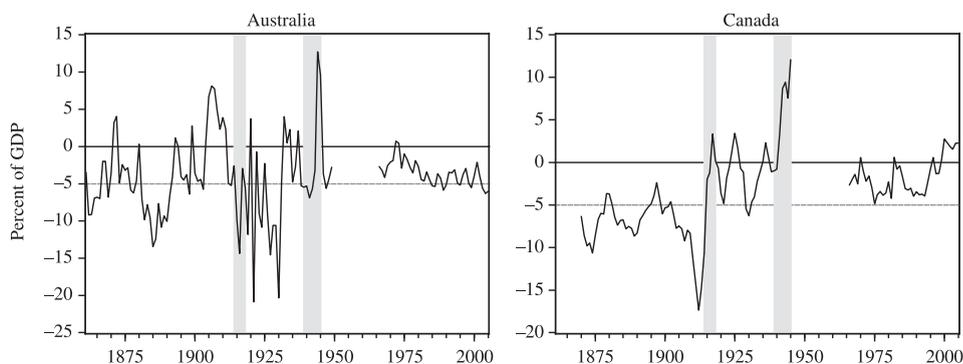


Figure 4. Current account as a percentage of GDP, Australia and Canada, 1861–2005

Note: The shaded areas refer to the two world wars.

Source: Jones and Obstfeld (2001), *World Development Indicators*.

returns, an argument that was eventually debunked by Michael Edelstein (1982). Others explained the flows in terms of savings and investment, at home and abroad. Like Ben Bernanke, J.A. Hobson believed that a UK savings glut was responsible for the outflows, while a lack of good domestic investment opportunities was pointed to then by Vladimir Lenin as the root cause, as it is today by commentators such as Backus *et al.* (2006). Today's new economy boosters are the 21st century counterparts to frontier enthusiasts such as Horace Greeley, arguing that it is outstanding investment opportunities in the United States that are driving the deficit, just as 19th century frontiers drove lending to the New World. Meanwhile, cliometricians such as Taylor and Williamson (1994) have found evidence that New World savings were insufficient 100 years ago, just as Larry Summers (2004) argues they are today.

Once you start posing things in savings–investment terms, large-scale flows start to seem rational and stable (though Hobson and Lenin would disagree!), and in fact the late 19th century experience *was* relatively stable. While the events of August 1914 mean that we will never know how sustainable these flows really were, many observers will surely regard Figure 1 as being reassuring from a US point of view. Moreover, when there *were* current account reversals in the late 19th century, these tended to be sustained, with adjustment being relatively smooth (Meissner and Taylor, 2006), facilitated by real exchange rate changes (Catão and Solomou, 2005), with real depreciations of the order of just 2–8%, as well as by migration flows. Only 3 out of 33 reversals were associated with currency crises (or 7 out of 33 if a 5-year currency crisis window is used) (Meissner and Taylor, 2006).

So, does history suggest that there is no problem? It may depend on where you draw the line. Draw it further down, and we fast-forward from the 1870s to the 1960s, with its many arguments about what constituted a sustainable balance of payments, a context-specific issue if ever there was one (Despres *et al.*, 1966; Cooper,

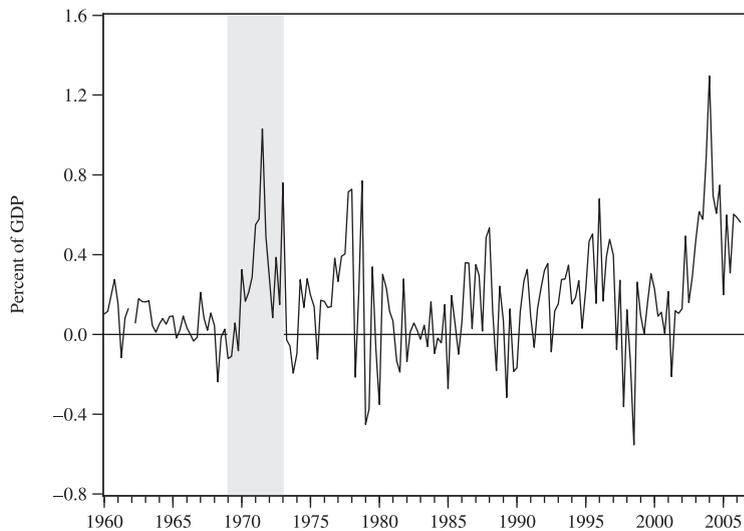


Figure 5. Increase in foreign official assets in the United States as a percentage of US GDP

Note: The shaded area refers to the quarters 1969:1 through 1973:1 inclusive.

Source: BEA.

1966; Kindleberger, 1969; and so on). If you draw the line just above official reserve transactions, for example, the case for pessimism may be easier to sustain, even in the absence of a gold-backed dollar and the Triffin paradox (Roubini and Setser, 2005; Eichengreen, 2004). Central banks may not always be consenting adults, and collective action problems may make it difficult for the rest of the world's central banks to prop up an overvalued dollar (with non-Chinese central banks playing the 'spoiling' role of the 1960s *Banque de France*). If one lesson of history is that large current account imbalances are sustainable over the long run, a second is that there may be a limit to the willingness of the rest of the world to accumulate dollar reserve assets. And as Figure 5 shows, foreign accumulation of official dollar assets is now at a historically high level when expressed as a percentage of US GDP, higher even than during 1969–73, when the Bretton Woods regime was in its death throes.

The dollar may well plunge for the reasons Krugman outlines. But even if investors are more rational than he thinks they are, the dollar may *still* plunge. This 'probably won't be fun' for the United States, as he says, and it risks being a great deal worse than that for Europe.

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This intriguing piece by Paul Krugman (what else can you expect from Paul Krugman but an intriguing piece?) addresses a crucial question. Taking for granted that the

correction of US imbalances requires (further) dollar depreciation in real terms, the adjustment is likely to take the form of a dollar plunge: under what conditions will the dollar plunge create a macroeconomic crisis?

The argument is developed in three steps. First, the text clarifies the meaning and the analytics of a dollar plunge, defined as a fall of the dollar at a much faster rate than the markets have so far anticipated. The plunge is essentially attributed to investors' myopia: waking up from a state of denial, at some point people realize that the dollar must fall, and this makes it happen. To study the dynamics of a dollar plunge, Krugman uses a reduced-form model which directly draws on the portfolio model developed by Kouri (1976). Admittedly, this is a vintage model (a good vintage though). But portfolio theory is an area in which the ongoing micro-founded reconsideration of international economics has only recently started to deliver. So at the time of the writing there is no well-established alternative.

Second, the text inspects the main interpretations of the causes underlying the current imbalance. Here the main issue is where the recent literature provides any convincing argument that the US current account deficit is 'more sustainable than previous experience seems to indicate', and that adjustment will occur without substantial dollar depreciation. The answer is a qualified 'no'.

Finally, the text sketches a model of possible macroeconomic consequences associated with a dollar plunge, distinguishing between mild and more worrisome scenarios.

In what follows, I will develop my discussion starting from an essential premise to the main argument: the need for a large dollar depreciation in real terms. I will then discuss the logic underlying popular estimates of the magnitude of the adjustment. I will make some comments on the interpretation of the results from the portfolio model in the text. I will conclude with some observations pointing to issues left open in the piece.

On the need for dollar depreciation

The task of writing this comment gave me a golden opportunity to read once again Paul Krugman's previous piece on a similar topic, 'Has the adjustment process worked?', written for the Institute for International Economics in 1991, after a conference with the same title held in November 1990. The question on the table was: 'Has [the adjustment problem] worked more or less as we thought it would? . . . And in ways that we find acceptable?' (Krugman, 1991, p. 3). The answer is positive and articulated in three main conclusions: (a) exchange rate changes work; (b) exchange rate changes are necessary; and (c) the relation between trade and exchange rate is stable. To a large extent, these three points summarize well Paul Krugman's (and the mainstream) view today.

In the 1991 piece, the mainstream view was shaped by the 'Mass. Ave. Model,' i.e. a macro model derived from the Mundell–Fleming framework, as opposed to a

portfolio model in the current text. Notably, the 1991 text did not have any chapter on financial issues: these were only discussed in the appendix.

The discussion of challenges to the mainstream view focused on three competing schools of thought. The first is the ‘schmooist view’, according to which relative prices do not matter in the adjustment (this is true if all national goods are highly substitutable, i.e. there is a single ‘schmoo’ traded across borders). This view questions the necessity of exchange rate adjustment.

Some traces of this view can be found in current analyses placing a large weight on expectations of large income and productivity gains in the United States in the future, as the main determinants of the US current account deficits. For this channel to be strong, the relative-price movements associated with higher future output cannot be expected to be too large. If future prices are expected to fall a lot with an increase in quantities, the effects on current consumption and investment of anticipation of future growth in output are necessarily contained. In other words, the higher the substitutability of domestic and foreign goods, the stronger the short-run macroeconomic implications of expectations of high productivity in the future. The mechanism underlying this point, stressing the interaction of shock persistence and trade elasticities, is analysed in detail in related work of mine joint with Luca Dedola and Sylvain Leduc, where we also discuss its implications on the dynamics of the real exchange rate and the terms of trade (see Corsetti *et al.*, 2007a).

The second view at odds with the mainstream is the structuralist view – casting doubts on the effectiveness of adjustment through exchange rate movements, per effect of changes in the economic environment. Interestingly, Paul Krugman concedes that ‘we are all a little bit structuralists’, observing that ‘at least in the short run, and possibly for a little longer, the real exchange rate changes needed to achieve substantial trade adjustment are simply too large to be tolerable’ (p. 16). As I argue below, in my opinion this observation applies to the possibility of macroeconomic costs of turmoil in the financial and currency markets – a possibility the above text abstracts from.

The last view listed in the 1991 piece is the secularist view, questioning the stability of the transmission mechanism, because of trend depreciation of the dollar. Interestingly, in 1991 secular dollar depreciation was attributed to the ‘declining relative US technology and quality, . . . as a result of poor US education, deteriorating infrastructure or whatever’. Today, Paul Krugman espouses the same secular view of the dollar, but by using quite different arguments!

As in the 1991 piece, the current text also discusses theories (in part different from the one listed above) which could potentially challenge the mainstream view. Section 4 of the text is devoted to an analysis of recent popular interpretations of global imbalances, including: ‘Global savings glut’, ‘Return differentials’ ‘Bretton Woods II,’ and ‘Dark matter’, in addition to the new version of the ‘Secular dollar decline’ (my own analysis of these interpretations is included in Chapter 3 of the EEAG’s Annual Report on the European Economy 2006). The analysis of these interpretations is

important, because one's view of the causes underlying the US current account deficit is likely to shape one's view of the modalities of adjustment of global imbalances. However, on the specific question of exchange rates and relative prices, Krugman argues that none of the competing views of the origin of global imbalances casts doubt on real dollar depreciation as an essential element in the coming adjustment. So, in 2007, as in 1991, there is no disagreement on this point. Or is there?

The required magnitude of dollar depreciation

The essential premise to Krugman's analysis is that dollar depreciation is necessary to close the US current account deficit. The reason is rooted in the economics of the 'transfer problem' – as defined in the well-known debate between Keynes and Ohlin. Krugman refers to a recent reconsideration of this problem provided in a popular set of pieces written by Obstfeld and Rogoff (2004, 2005, henceforth OR) on the US current account imbalance.

It is instructive to reconsider in some detail the logical structure of the OR reasoning step by step. Reducing the US trade deficit requires a redistribution of world spending – spending must fall in the United States, must increase abroad. This redistribution of demand is essentially a 'transfer'. Now, consider a world economy with four goods: US traded (T) goods and non-traded (NT) goods; foreign traded and non-traded goods. The value of total domestic demand (commonly referred to as 'absorption') plus the transfer must be equal to the total value of output. Using a simple accounting scheme, and normalizing the price of foreign goods to 1 (i.e. $P_F = 1$), we can write:

$$\begin{aligned} & P_N C_N + P_H C_H + C_F + Transfer \\ & \quad \quad \quad \overset{absorption}{P_N C_N + P_T C_T} + Transfer \\ = & P_N Y_N + P_H Y_H \end{aligned}$$

where P_T denotes the price of tradables, including both domestic and imported.

Now, assume that *output is fixed* (an upper bar will denote variables which are constant by assumption). Then current account adjustment (i.e. an increase in transfer from the United States to the rest of the world) requires a fall in the relative price of US tradable goods ($P_H/P_F = P_H$), to raise foreign demand for US exports, and discourage US demand for imports. However, note that, other things equal, cheaper US tradables would also increase the US demand for them. Hence adjustment also requires a fall in the relative price of US non-tradables (P_N/P_T), to redirect US demand away from tradables, towards US non-tradables (whose quantity is fixed by assumption).

These relative price movements – corresponding to real effective depreciation of the dollar – reduce absorption. Seen from the 'income' side, they lower the value of US output (both traded and non-traded) relative to foreign output:

$$\begin{aligned}
& P_N \downarrow \bar{C}_N + P_H \downarrow C_H \downarrow + C_F \downarrow + Transfer \uparrow \\
& = P_N \downarrow \bar{C}_N + P_T \downarrow C_T \downarrow + Transfer \uparrow \\
& = P_N \downarrow \bar{Y}_N + P_H \downarrow \bar{Y}_H
\end{aligned}$$

A striking result by OR concerns the relative magnitude of these price adjustment. Namely, the equilibrium adjustment in the relative price of tradables ($P_H/P_F = P_H$) – i.e. adjustment in the terms of trade – accounts only for a relatively small portion of the overall required depreciation: it can explain a real exchange rate depreciation between 5 and 15%. It is the relative price of non-tradable which plays the leading role: adjustment in P_H/P_T can explain a real exchange rate depreciation between 20 and 30%. This is 3 to 5 times larger than explained by terms-of-trade movements!

To summarize, adjustment requires a large fall of US non-traded goods prices, but a relatively contained adjustment of US export prices. It is worth stressing that the limited movements in international relative prices of US exports is an equilibrium outcome, totally independent of pricing to market.

As mentioned above, the OR estimates are derived from fixing output quantities, checking robustness for different values of elasticities of substitutions across goods. Most adjustment margins – including employment, sectoral labour allocation, investment etc. – are shut down. Many see this as a very strong assumption.

Notably, some debate has focused on whether rebalancing of the current account would require a prolonged recession (see e.g. Edwards 2005, and the discussion in Faruquee *et al.*, 2007). Using the scheme above, we can easily see that if Y_N falls *persistently*, the quantity of non-tradables which need to be consumed by US residents in equilibrium is lower, and US demand falls with US relative income:

$$\begin{aligned}
& P_N \downarrow C_N \downarrow + P_H \downarrow C_H \downarrow + C_F \downarrow + Transfer \\
& P_N \downarrow C_N \downarrow + P_T \downarrow C_T \downarrow + Transfer \\
& = P_N \downarrow Y_N \downarrow + P_H \downarrow \bar{Y}_H
\end{aligned}$$

Then, it is clear that the dollar depreciation required to close the current account imbalance is lower than in the case of fixed output.

The same logic underlies the idea, stressed by OR, that ‘growth in nontradables’ in the United States is ‘bad for the dollar’. Given prices, an increase in NT output translates into an increase in US income: the dollar needs to fall more to correct the trade imbalance. By the same token, an increase in European exports raises competition in the world markets: in order for US producers to export, they need to reduce their prices more (see Corsetti *et al.*, 2007b for an empirical assessment).

However, the logic of the transfer problem goes through also in models with tradable goods only – a point which is well understood since the controversy between Keynes and Ohlin. The important difference with the above scheme is that, with only one relative price, adjustment is entirely carried over through movements in the terms-of-trade adjustment (the relative price of non-tradables plays no role).

Indeed, looking at the evidence on the episode of dollar depreciation and current account adjustment in the mid-1980s, movements in domestic relative prices are strikingly contained: the relative price of non-tradables did not fall significantly, and definitely much less than the terms of trade.

Specifically, I calculate the average quarterly rate of real depreciation based on the multilateral real exchange rate for the United States from the beginning of 1985 to the end of 1987; then I calculate the average quarterly rate of change of the US PPI relative to the US CPI for services. This is arguably a good proxy for the relative price of non-tradables.

Now, over these years, average real depreciation (2.4% on a yearly basis) is three times as large as the change in the domestic relative price of non-tradables (0.8%). The relative magnitude of these relative price adjustment is the opposite of what is suggested by the OR estimates mentioned above.

It is quite likely that, in practice, the adjustment faced by the US involves much less domestic price movements than implied by the OR baseline scenario. This is not to say that dollar depreciation in real terms is not necessary. But the weight placed on adjustment of non-traded prices may not be as large as suggested by the OR calculations.

Moving from this observation, Philippe Martin, Paolo Pesenti and I have developed a model of transfers which differs from the above in two respects: first, there is almost no movement in the price of non-tradables; second, labour supply is elastic and mobile across sectors (Corsetti *et al.*, 2007c). Running the same exercise as OR, we find that the rate of real dollar depreciation required to close a current account deficit as high as 5% of GDP is of the order of 20%. From a macroeconomic vantage point, this is achieved through a combination of lower consumption (−6%), and higher employment (+3%).

We also have a version of the model with entry and exit of firms and product varieties – drawing on another contribution by Paul Krugman (Krugman, 1989). The exchange rate predictions change quite a bit in this case, and the dollar depreciation can actually become much smaller than 20% – even close to zero.

The exercise we perform is quite informative in at least two respects. First, our results show that the magnitude of price adjustment is not necessarily an indicator of macroeconomic pain. In our calculations, we find that the welfare consequences of adjustment are equally harsh, whether there is a large adjustment in prices, or the adjustment is mainly through the flow of new firms and products in the market.

Second, it is important to recognize that there is quite a bit of uncertainty as regards the ‘required real exchange rate adjustment’. This is not to deny that ‘adjustment will be!’ As Krugman stresses: ‘Keynes may have been wrong in theory, he was right in practice’ (1991, p. 19). But ultimately, the issue is an empirical one. As in the 1980s, we are now living through another important field experiment in the area of exchange rate economics. We may well run into some interesting surprises regarding the relative role of different margins of adjustment.

Portfolio models and the analytics of dollar plunges

The core of Paul's model of dollar plunge is the analytics of the portfolio and macroeconomic consequences of what one can dub a 'RE-ality check' on investors' beliefs about the dollar – where RE stands for Rational Expectations. The model in the background is similar to the one developed by Blanchard *et al.* (2005), except that US debt is measured in ratio to GDP.

The main elements are well explained in the main text of the article. In what follows, I just summarize the essential passages, and provide a slightly different reading of the main results.

In the model economy, US and foreign bonds are imperfect substitutes; return differential R and R^* depends on both a risk premium (in turn depending on the outstanding supply plus other things) and expected devaluation δ .

The dollar exchange rate X depends on US foreign debt D (because of portfolio balance effects and other considerations), and the expected rate of depreciation:

$$X = x(D, \delta^e)$$

The dynamics of US foreign net debt (to GDP) D depends on X , D , and the rate of actual and expected depreciation, dx/dt and δ^e :

$$dD/dt = B(X, D, \delta^e, dx/dt)$$

The accumulation of net foreign liabilities (in percentage of GDP): (a) *slows down* with a weaker dollar (in real terms), as well as with *ex post* valuation effects from current depreciation (note that uncovered interest parity is assumed to hold in this part of the model); (b) *rises* with D as a function of $R-g$.

Now, putting some flesh on the bare bones of this model, Krugman posits that the initial current account deficit (growth-, valuation-adjusted) is 5% of GDP; the logarithmic real depreciation of the dollar required to achieve trade balance is 35%.

Based on these pieces of information, the model provides a simple framework to assess the rate of debt accumulation and dollar depreciation along the saddle path in the presence of fully rational agents. Specifically, the speed of adjustment depends on the elasticity of foreign (US) demand for US (foreign) assets, i.e. the degree of substitutability between US and foreign bonds (see Blanchard *et al.*, 2005). The logic is straightforward:

High elasticity \rightarrow high substitutability \rightarrow low speed of adjustment along the saddle path
 Low elasticity \rightarrow Low substitutability \rightarrow high speed of adjustment.

In equilibrium, the rate of exchange rate convergence along the saddle path k and the long-run foreign debt level are linked to each other by the formula:

$$D_{LR} = D_0 + CA/k$$

Set $k = 0.05$ and 0.1 , corresponding to relatively *high and low US-foreign bond substitutability*. It is easy to see that, with a 35% dollar depreciation required in the long run to ensure trade balance: (a) the initial US annual real depreciation is between 1.7 and 3.5%; (b) the half life of 35% depreciation is between 15 and 8 years; and (c) the long-run (sustainable) level of US foreign debt D_{LR} is roughly between 120 and 60% of GDP.

Observe that, to the extent that market integration affects bond substitutability, it also affects exchange rate dynamics in response to shock.

Now, suppose investors do not expect any depreciation: the economy is initially on point 1 of figure 1, a point which is not stable. In principle, the forces of the model should generate high debt dynamics, with a stable or even an appreciating dollar in real terms. But assuming that investors are myopic, there is no particular harm in thinking that the economy lingers around it.

Starting from point 1, the 'RE-ality check' experiment consists of a sudden injection of rational expectations into markets. From point 1, the economy cannot but jump onto point 2 in the graph.

Here is a second important point. Not only the speed of adjustment, but also the initial exchange rate jump depends on elasticity of substitution between bonds. In the high elasticity case ($k = 0.5$), the exchange rate adjustment is large on impact, but the rate of depreciation along the saddle path is small. In the low elasticity case ($k = 0.1$), the adjustment is smaller on impact, but the adjustment along the saddle path is faster.

Observe that the RE-ality check is not at all a liquidity run. Sure enough, when it happens investors will not be willing to hold US liabilities at the current exchange rate. But this will just accompany the change of market rates consistent with equilibrium relative prices.

I emphasize this point: the reader should avoid interpreting the 'dollar plunge' as a financial crisis. In the model, there is no macroeconomic cost associated with it. Actually, there is a cost in maintaining the dollar at a disequilibrium high rate. This is not to deny the possibility of liquidity runs involving liquidation costs and macro stress, if the exchange rate swings widely and suddenly: as Paul Krugman puts it in 1991, we are all a little bit 'structuralists'. But the paper analyses a benign scenario in which the dollar jumps towards equilibrium. Namely, despite (or thanks to) a large dollar fall, the world keeps financing the United States.

So, where can stress come from? The crucial point is that RE-ality check may involve a strong correction of other prices in disequilibrium, namely, housing prices. Stress in the housing markets is worrisome not only because of its direct contractionary effect on demand; but also because it may weaken an important channel through which monetary policy can effectively stabilize the economy: housing market stress may jeopardize the effect of interest rate cuts on aggregate demand. The paper rightly stresses that corrections in housing prices need not coincide with an increase in real rates.

The analysis in the text is quite clear, and I have little to add. I just observe that a correction in the price of housing plays the same role of the contraction in \mathcal{I}_N in the analysis of OR, as regards its effect on US income and absorption. I also observe that the reduced impact of monetary policy on long-term rate in both directions (contraction and expansion) is a concern for central banks already, independently of housing market stress.

Concluding comments

So, what is the main message of this paper? I try to summarize it as follows: the economics and policy of soft-landing does not rule out large dollar correction. It may actually need 'more correction': by how much is, however, an open issue.

An *equilibrium* correction of the dollar cannot be painful almost by definition. Macroeconomic stress may nonetheless come from elsewhere. The analysis emphasizes the consequences of a strong correction in the housing market.

Yet, the analysis somewhat shies away from possibly important international dimensions of the dollar crisis. If and when the dollar plunge will come, it is possible that the world at large will experience financial and macro stress. Sizeable changes in the currency composition of international portfolios are likely to have relevant international financial and macro ramifications.

Where can we look for inspiration? The analysis of emerging markets crises (say, Thailand in 1997) can hardly provide guidance and insights into the global risks faced by the United States. The breakdown of Bretton Woods fits the bill in one dimension, namely, the crisis resulted from the unravelling of tension generated by US policies inconsistent with the current international monetary arrangement (the gold exchange standard), as well as with inflation preferences in the other major player in the world economy (Germany). However, the size and importance of international financial markets at the time was pathetically smaller than today.

It would be quite interesting to hear more from Paul Krugman on this question.

Panel discussion

Many of the panel questions focused on the event(s) that could trigger a dollar crisis. Roubini argued that the exact nature of the event that triggers the moment matters for the kind of landing. It could be a trade war with China and a stock market crisis, as in 1987, or a foreign policy announcement like the one of Japan in 1998. The exchange rate crisis could lead to a hard landing, or in the opposite direction, a housing crisis could trigger a sharp fall of the dollar. The mechanics that follow are different in terms of flight to safety, credit crunch, and so on. Krugman replied that even *ex post* it is not as easy to determine which event(s) triggers an exchange rate crisis. In fact,

hundreds of explanations were polled by Shiller in 1987! It is not fully obvious today whether the baht devaluation, the Russian default really triggered the 1997 crisis.

Milesi-Ferretti pointed out that risk management strategies matter in this type of situation. There is a complex web of financial instruments and it is not clear who would bear the brunt of the crisis.

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