# The Unsustainable US Current Account Position Revisited*

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**Abstract**

We show that the when one takes into account the global equilibrium ramifications of an unwinding of the US current account deficit, currently running at more than 6% of GDP, the potential collapse of the dollar becomes considerably larger than our previous estimates (Obstfeld and Rogoff 2000a)—as much as 30% or even higher. It is true that global capital market deepening appears to have accelerated over the past decade (a fact documented by Lane and Milesi-Ferreti (2003, 2004) and recently emphasized by outgoing US Federal Reserve Chairman Alan Greenspan), and that this deepening may have helped allowed the United States to a record-breaking string of deficits. Unfortunately, however, global capital market deepening turns out to be of only modest help in mitigating the dollar decline that will almost inevitably occur in the wake of global current account adjustment. As the analysis of our earlier papers (2000a,b) showed, and the model of this paper reinforces, adjustments to large current account shifts depend mainly on the flexibility and global integration of goods and factor markets. Whereas the dollar's decline may be benign as in the 1980s, we argue that the current conjuncture more closely parallels the early 1970s, when the Bretton Woods system collapsed. Finally, we use our model to dispel some common misconceptions about what kinds of shifts are needed to help close the US current account imbalance. For example, faster growth abroad helps only if it is relatively concentrated in nontradable goods; faster productivity growth in foreign tradable goods will actually exacerbate the US adjustment problem.

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Five years ago, we published a paper (Obstfeld and Rogoff 2000a) arguing that the United States current account deficit—then running at 4.4% of GDP—was on an unsustainable trajectory over the medium term, and that its inevitable reversal would precipitate a change in the real exchange rate of 12 to 14% if the rebalancing were gradual, but with significant potential overshooting if the change were precipitous. Though the idea that global imbalances might spark a sharp decline in the dollar was greeted with considerable skepticism at the time, the view has since become quite conventional. Indeed, when Federal Reserve Chairman Alan Greenspan gave a speech in November 2003 arguing that the US current account would most likely resolve itself in quite a benign manner, his once conventional view was greeted as contrarian.[1]

In addition to updating the earlier calculations, this paper extends our previous analytical framework in some important dimensions, including taking into account general equilibrium considerations resulting from the United States' large size in the global economy. We also generalize our model to incorporate terms of trade changes (changes in the relative price of exports and imports), in addition to changes in the relative price of traded and nontraded goods. These analytical changes point to a substantially steeper dollar decline. (In another paper, Obstfeld and Rogoff 2005, we extend the present analysis in a number of dimensions, including, especially, analyzing alternative scenarios for how the requisite real decline in the dollar might be distributed across Asian and non-Asian currencies.)

Under most reasonable scenarios, the rise in relative United States saving required to close up the current account deficit implies a negative demand shock for US-produced

[1]See Greenspan (2004).

nontraded goods.  The same forces, however, imply a positive demand shock for foreign nontraded goods, and this general equilibrium effect turns out to imply an even larger depreciation in the real dollar exchange rate —as much as double that in our earlier partial equilibrium calculation. Overall, taking into consideration current data, as well as our improved analytical framework, we conclude that US current account adjustment entails a larger potential decline in the dollar than we had earlier speculated. Moreover, we now believe that some of the potential rebalancing shocks are considerably more adverse than one might have imagined in 2000 (in view of the increased long-term security costs that the United States now faces as well as its open-ended government budget deficits and its precariously low, housing-bubble distorted, personal saving rate). Thus, our overall take is that the United States current account problem poses even more significant risks today than it did when we first raised the issue five years ago.[2]

The general equilibrium perspective of this paper also offers helpful insights into what sorts of traumas the US and foreign economies might experience, depending on the nature of the shocks that lead to global current account rebalancing.  For example, a common perception is that a global rebalancing in demand risks setting off a dollar depreciation that might be catastrophic for Europe and Japan.  Fundamentally, this view is correct, in that Europe's product and labor markets, and Japan's credit markets, are much less flexible than those in the United States, and hence these regions have more difficulty adjusting to any kind of shock, exchange rate or otherwise. However, as the model makes clear, a global rebalancing of demand would also yield some benefits.  It is true that a dollar depreciation will likely shift demand towards United States exports and

[2]For another early examination of US external deficit sustainability, see Mann (1999).

away from exports in the rest of the world, although this effect is mitigated by the well-documented home bias in consumers' preferences over tradables. However, ceteris paribus, global rebalancing of demand will give a large boost to foreign nontraded goods industries relative to United States nontraded goods industries, and this has to be taken into account in assessing the overall impact of the dollar depreciation. Another widespread belief in the policy literature is that a pickup in foreign productivity growth rates, relative to United States rates, should lead to a closing of global imbalances. Our analytical framework shows that would only be the case if the relative productivity jump were in nontradable goods production, rather than tradable goods production where generalized productivity gains often first show up. Therefore, contrary to conventional wisdom, as global productivity rebalances towards Europe and Japan, the US current account deficit could actually become larger rather than smaller, at least initially.

In the first section of the paper we review some basic statistics on the size and current trajectory of the United States current account deficit, the country's net international investment position, and the dollar's real exchange rate. Compared to similar charts and tables in our 2000 paper, we find that the US current account position has worsened somewhat, whereas the broadly trade-weighted dollar has moved by a comparatively small amount (appreciating until February 2002, depreciating to somewhat below its 2000 level since). The path of US net international indebtedness has been somewhat different from that of cumulated measured current accounts, due largely to the rate-of-return effect highlighted by Gourinchas and Rey (2005): that US current account deficits historically predict high future dollar returns on US foreign assets compared to

US foreign liabilities.[3] As Tille (2003, 2005) has observed, the composition of US foreign assets and liabilities—with US assets only partly linked to the dollar and liabilities almost entirely dollar-denominated—implies that a depreciation of the dollar helps strengthen the US net foreign asset position.[4] In the United States, the bond-market rally associated with the onset of recession in 2001 worked to increase net foreign debt, an effect that will play out in reverse as long-term dollar interest rates rise relative to foreign rates. While these considerations are important for determining the timing of the United States current account's ultimate reversal, our results here (and the more detailed analysis in Obstfeld and Rogoff, 2005) suggest that they are of secondary importance in determining the ultimate requisite fall in the dollar whenever global current accounts finally close up. This turns out to be the case regardless of whether the driving force is shifts in savings (say, due to a flattening or collapse in US housing prices) or in productivity trends (due to a catch-up by the rest of the world in retailing productivity.) The reason is that the main impact on the dollar comes from a global rebalancing of trade, rather than any change in the transfer necessitated by interest payments on global debt positions.

A few further points merit mention, both by way of introduction to the present analysis and clarification of our earlier (2000a) paper. First, our framework should not be

[3]In general, the rate of return on US foreign assets has exceeded that on US foreign liabilities; see Lane and Milesi-Ferretti (2004), Obstfeld and Rogoff (2005), and the chapters by Gourinchas and Rey and by Lane and Milesi-Ferretti in this volume. On the valuation of net foreign assets, see also IMF (April 2005).

[4]Lane and Milesi-Ferretti (2001) have attempted to adjust for such asset-price changes in constructing their series of countries' foreign assets and liabilities.

thought of as asking the question: "How much depreciation of the dollar is needed to rebalance the current account?" Though pervasive in the press and the mostly model-free policy literature, this view is largely misguided. In fact, most empirical and theoretical models (including ours) suggest that even very large (say 20%) autonomous change in the real trade-weighted dollar exchange rate will only go a fraction of the way (say, 1/3) towards closing the better than 6% US current account deficit. The lion's share of the adjustment has to come from saving and productivity shocks that help equilibrate global net saving levels, and that imply dollar change largely as a by-product (though our model of course implies simultaneous determination of exchange rates and current accounts). In particular, although we allow the terms of international trade to respond to current account adjustment, the relative price of imports and exports is only one element underlying the overall real exchange rate response, and not the dominant element from a quantitative viewpoint.

Second, it is important to note that our model assumes that labor and capital cannot move freely across sectors in the short run. To the extent factors are mobile, domestically as well as internationally, and to the extent that the closing of the current account gap plays out slowly over time (allowing factors of production more time to relocate), the real exchange rate effects of global rebalancing will be smaller than we calculate here. A related issue that we leave aside is the possibility of change in the range of goods produced and exported by the United States. Although that effect realistically is absent in the short run, over the longer run it might soften the terms of trade effects of various economic disturbances.

Third, the sanguine view that capital markets are deep and the US current account can easily close up without great pain ignores the adjustment mechanism highlighted here, which depends more on goods-market than capital-market integration. The US current account may amount to "only" 6% of *total* US production, but it is likely 20% or more of US *traded* goods production (at least according to the calibration suggested by Obstfeld and Rogoff 2000b). Our view is consistent with the empirical findings of Edwards (2004). His survey of current account reversals in emerging markets finds an economy's level of trade to be the major factor in determining the size of the requisite exchange rate adjustment, with larger traded-goods sectors implying a smaller currency adjustment on average. Calvo, Izquierdo, and Talvi (2003), who adopt a framework nearly identical to that of Obstfeld and Rogoff (2000a), arrive at a similar conclusion. Parenthetically, we note that most studies of current account reversals (including IMF 2002, or Croke et al. 2005) focus mainly on experiences in relatively small open economies. But as our model shows, the fact the United States is a large economy considerably levers up the potential exchange rate effects. Indeed, as Edwards (2005) shows, the recent trajectory of US deficits is quite extraordinary and, both in terms of duration and as a percent of GDP, far more extreme that many of the cases considered in the above-cited IMF and Federal Reserve Studies—even ignoring the United States mammoth size.

Finally, we caution the reader that while our analysis points to a large potential move in the dollar—over 30% in our baseline long-term calculation, but potentially larger if the adjustment takes place quickly so that exchange rate pass-through is incomplete—it does not necessarily follow that the adjustment will be painful. As we previously noted, the end of the 1980s witnessed a 40% decline in the trade weighted dollar as the Reagan-era current account deficit closed up. Yet, the change was arguably relatively benign (though some would say that Japan's macroeconomic responses to the sharp appreciation of the yen in the late 1980s helped plant the seeds of the prolonged slump that began in the next decade ). However, it may ultimately turn out that the early-1970s dollar collapse following the breakdown of the Bretton Woods system is a closer parallel. Then, as now, the United States was facing open-ended security costs, rising energy prices, a rise in retirement program costs, and the need to rebalance monetary policy.[5]

## 1. The Trajectory of the US Current Account: Stylized Facts

Figure 1 shows the trajectory of the United States current account as a percentage of GDP since 1970. As is evident from the chart, the recent spate of large deficits exceeds even those of the Reagan era. Indeed, in recorded history, the US current account never appears to have been as large as the 4.7% experienced in 2003, much less the 5.7% recorded in 2004 or the 6.1% projected by the IMF (September 2005) for 2005 and 2006. Even in the late nineteenth century, when the US was still an emerging market, its deficit never exceeded 4% of GDP according to Obstfeld and Taylor (2004).

[5]Though there is no official Bretton Woods system today, some have argued (Dooley et al. 2003, 2004, as well as those authors' chapter in this volume) that the current Asian exchange rate pegs constitute a Bretton Woods II system. Perhaps, but their analysis – which emphasizes Asia's vast surplus labor pools applies more readily to China and India than to demographically-challenged, labor-starved, Japan and Germany, which each account for a much larger share of global current account surpluses.

Figure 2 shows the net foreign asset position of the United States, also as a percentage of GDP. The reader should recognize that this series is intended to encompass all type of assets, including stocks, bonds, bank loans, and direct foreign investment. Uncertainty about the US net foreign asset position is high, however, because it is difficult firmly to ascertain capital gains and losses on US positions abroad, not to mention foreign positions in the United States. But the latest end-2004 figure of 22% is close to the all-time high level that the United States is estimated to have reached in 1894, when assets located in the US accounted for a much smaller share of the global wealth portfolio. Figure 3, which updates a similar figure from our 2000 paper, shows the likely trajectory of the US net foreign asset position, assuming external deficits of 6% of GDP indefinitely and continuing 6% nominal GDP growth. The graph also shows a few benchmarks reached by other, much smaller, countries, in some cases prior to major debt problems. We do not anticipate the United States having a Latin-style debt crisis, of course, and the United States' unique ability to borrow almost exclusively in domestic currency means that it can choose a back-door route to default through inflation, as it has on more than one occasion in the past (including the high inflation 1970s, the revaluation of gold during the Great Depression, and the high inflation of the Civil War era). Nevertheless, these benchmarks are informative. We note that our figure does not allow for any exchange rate depreciation which—assuming foreign citizens did not receive compensation in the form of higher nominal interest payments on dollar assets—would slow down the rate of debt accumulation along the lines emphasized by Tille (2003) and by Gourinchas and Rey (2005).

Figure 4 shows the US Federal Reserve's "broad" real dollar exchange-rate index, which measures the real value of the trade weighted dollar against a comprehensive group of US trading partners. As we asserted in the introduction, the index has fallen only modestly since we published our 2000 paper – by roughly 8% from November 2000 to November 2005 – though it should be noted that the decline has been more substantial against the major currencies such as the euro, sterling, and the Canadian dollar. Although the nexus of current accounts and exchange rates has changed only modestly over the past four years, however, other key factors have changed dramatically.

Figure 5 highlights the dramatic changes witnessed in the fiscal positions of the major economies. The swing in the United States fiscal position has been particularly dramatic, from near balance in 2000 to a situation today where the consolidated government deficit roughly matches the size of the current account deficit. That fact is highlighted in figure 6, which breaks down the US current account deficit trajectory into the component attributable (in an accounting sense) to the excess of private investment over private saving, and the component attributable to government dissaving. One change not indicated in this diagram is the changing composition of the private net saving ratio. From the mid-1990s until the end of 1999, the US current account deficit was largely a reflection of exceptionally high levels of investment. Starting in 2000, but especially by 2001, investment collapsed. Private saving also collapsed, however, so there was no net improvement in the current account prior to the recent swelling of the fiscal deficit. (The personal saving rate in the United States was only 1% in 2004, having fallen steadily over the past twenty years from a level that had been relatively stable at 10% until the mid-1980s. A major factor, of course has been the sharp rise in personal wealth, resulting first from the equity boom of the 1990s and later from the sustained housing boom. Without continuing asset appreciation, however, the current low savings rate is unlikely to be sustained.)

Finally, figure 7 illustrates another important change, the rising level of Asian central bank reserves (most of which are held in dollars). At the end of 2004, foreigners owned 40% of all US Treasuries held outside the Federal Reserve System and the Social Security Administration Trust Fund. In addition, foreigners hold more than 30% of the combined debts of the giant mortgage financing agencies, Fannie Mae and Freddie Mac. These quasi-government agencies, whose debt is widely viewed as carrying the implicit guarantee of the United States federal government, have together issued almost as much debt as the United States government itself (netting out inter-governmental holdings.) Indeed, netting out the Treasuries held by the US Social Security Trust administration and by the Federal Reserve System, the remaining Treasuries held privately are of roughly the same order of magnitude as foreign central bank reserves. These reserves are held mostly by Asia (though Russia, Mexico, and Brazil are also significant), and held disproportionately in dollars. Indeed, over the past several years, foreign central bank acquisition of Treasuries nearly equaled the entire US current account deficit during a number of sustained episodes.

We acknowledge that these data in no way prove that US profligacy needs to come to an end anytime soon. It is conceivable that the deficits will go on for an extended further period as the world adjusts to more globalized security markets, with foreign agents having a rising preference for holding United States assets. We do not believe, however, that this is the most likely scenario, particularly given that the composition of foreign flows into the United States remains weighted toward bonds rather than equity, (at the end of 2004, only 38% of all foreign holdings of US assets were in the form of direct investment or equity.) The current trajectory has become particularly precarious now that the twin deficits problem of the 1980s has resurfaced. One likely shock that might reverse the US current account is a rise in US private saving—perhaps due to a slowdown or collapse in real estate appreciation. Another possible trigger is a fall in saving rates in Asia, which is particularly likely in Japan given its aging population and the lower saving rates of younger cohorts. Another, more imminent, potential shock, would be a rise in investment in Asia, which is still low even compared to investment in the late 1980s and early 1990s, even excluding the bubble level of investment in the mid-1990s just before the Asia crisis.

In the next section of the paper, we turn to an update of our earlier model that aims to ask what a change in the US current account might do to global demand and exchange rates. We note that the model is calibrated on a version of our "six puzzles" paper (Obstfeld and Rogoff 2000b) that attempts to be consistent with observed levels of OECD capital market integration and saving-investment imbalances. Less technically oriented readers may choose to skip directly to section 3.

## 2. The Model

The model here is a two-country extension of the small-country endowment model presented in Obstfeld and Rogoff (2000a), in which one can flexibly calibrate the relative size of the two countries. We go beyond our earlier model by differentiating between home and foreign produced tradables, in addition to our earlier distinction between tradable and nontradable goods. (As we show in more detail in Obstfeld and

Rogoff, 2005, the traded-nontraded goods margin is considerably more important empirically when taken in isolation than is differentiation between imports and exports. However, the interaction between the two magnifies their joint effect.) We further extend our previous analysis by exploring more deeply the alternative shocks that might drive the ultimate closing of the US current account gap.

Otherwise, the model is similar in spirit to our earlier paper on this topic. We draw the reader's attention to two features. First, by assuming that endowments are given exogenously for the various types of outputs, we are implicitly assuming that capital and labor are not mobile between sectors in the short run. To the extent global imbalances only close slowly over long periods (admittedly not the most likely case based on experience), then factor mobility across sectors will mute any real exchange rate effects (Obstfeld and Rogoff 1996). Second, our main analysis assumes that nominal prices are completely flexible. That assumption—in contrast to our assumption on factor mobility—leads one to sharply understate the likely real exchange rate effects of a current account reversal. As we discuss later, with nominal rigidities and imperfect pass-through from exchange rates to prices, the exchange rate will need to move much *more* than in our baseline case in order to maintain employment stability.

The Home consumption index depends on Home and Foreign tradables, as well as domestic nontradables. (Think of the United States and the rest of the world as the two countries.) It is written in the nested form

$$C = \left[ \gamma^{\frac{1}{\theta}} C_T^{\frac{\theta-1}{\theta}} + (1-\gamma)^{\frac{1}{\theta}} C_N^{\frac{\theta-1}{\theta}} \right]^{\frac{\theta}{\theta-1}},$$

where $C_N$ represents nontradables consumption and $C_T$ is an index given by

$$C_T = \left[ \alpha^{\frac{1}{\eta}} C_H^{\frac{\eta-1}{\eta}} + (1-\alpha)^{\frac{1}{\eta}} C_F^{\frac{\eta-1}{\eta}} \right]^{\frac{\eta}{\eta-1}}.$$

where $C_H$ is the home consumption of Home-produced tradables, and $C_F$ is home consumption of Foreign-produced tradables. Foreign has a parallel index, but with a weight $\alpha^*$ ($\alpha^* > ½$) on consumption of its own export good. This assumption of a relatively high domestic preference weight on domestically-produced tradables, as opposed to the more common assumption of identical tradables baskets, generates a home consumption bias within the category of tradable goods.[6] The assumption can also be viewed as a "stand-in" for the explicit introduction of trade costs for tradable goods, which are omitted from the present model.

The values of the two parameters $\theta$ and $\eta$ are critical in our analysis. Parameter $\theta$ is the (constant) elasticity of substitution between tradable and nontradable goods. Parameter $\eta$ is the (constant) elasticity of substitution between domestically-produced

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[6]Warnock (2003) takes a related approach. In an earlier version of the paper, we assumed "mirror symmetric" preferences, such that $\alpha$ was also the weight of Foreign tradables in the Foreign tradable consumption basket. In our simulation below, however, the US is only about ¼ of the world economy, so it is more reasonable to think that $1 - \alpha^*$, the weight that Foreigners attach to imports from the US, will be smaller than $1 - \alpha$, the weight that US residents attach to their own imports from the rest of the world. This modification tends to increase the terms-of-trade effect of current account adjustment, as well as the overall resulting real depreciation. We thank Chris Erceg for suggesting this modification. The framework of Obstfeld and Rogoff (2005) models a world economy consisting of three equally-sized regions.

and imported tradables. The two parameters are important because they underlie the magnitudes of price responses to quantity adjustments. Lower substitution elasticities imply that sharper price changes are needed to accommodate a given change in quantities consumed.

The Home consumer price index (CPI) corresponding to the preceding consumption index $C$, measured in units of Home currency, depends on the prices of tradables and nontradables. It is given by

$$P = \left[\gamma P_T^{1-\theta} + (1-\gamma) P_N^{1-\theta}\right]^{\frac{1}{1-\theta}},$$

where $P_N$ is the Home-currency price of nontradables and $P_T$, the price index for tradables, depends on the local prices of Home- and Foreign-produced tradables, $P_H$ and $P_F$, according to the formula

$$P_T = \left[\alpha P_H^{1-\eta} + (1-\alpha) P_F^{1-\eta}\right]^{\frac{1}{1-\eta}}.$$

In Foreign there are an isomorphic nominal CPI and index of tradables prices, but with the latter attaching the weight $\alpha > \frac{1}{2}$ to Foreign exportable goods. These exact price indexes are central in defining the real exchange rate.

Though we consider relaxing the assumption in our later discussion, our formal analysis assumes the law of one price for tradables throughout. Thus $P_F = \mathcal{E} P_F^*$ and $P_H^* = P_H / \mathcal{E}$, where $\mathcal{E}$ is the Home-currency price of Foreign currency—the nominal exchange rate. (In general we will mark Foreign nominal prices with asterisks.) The terms of trade are

$$\tau = \frac{P_F}{P_H} = \frac{P_F^*}{P_H^*}$$

and the real exchange rate is

$$q = \frac{\mathcal{E}P^*}{P}.$$

Note that because of the home bias in consumption of tradables, purchasing power parity does not hold for the differing preferred baskets of tradables in each country, even if the law of one price holds for individual tradable goods. That is, $P_T \neq \mathcal{E}P_T^*$. Indeed, the ratio $\mathcal{E}P_T^*/P_T$ is given by

$$\frac{\mathcal{E}P_T^*}{P_T} = \frac{\left[\alpha^*\tau^{1-\eta} + (1-\alpha^*)\right]^{\frac{1}{1-\eta}}}{\left[\alpha + (1-\alpha)\tau^{1-\eta}\right]^{\frac{1}{1-\eta}}},$$

while the real exchange rate is

$$q = \frac{\mathcal{E}P_T^*}{P_T} \times \frac{\left[\gamma + (1-\gamma)(P_N^*/P_T^*)^{1-\theta}\right]^{\frac{1}{1-\theta}}}{\left[\gamma + (1-\gamma)(P_N/P_T)^{1-\theta}\right]^{\frac{1}{1-\theta}}}.$$

Given our assumption of home-export consumption preference, the measured real exchange rate depends positively on the terms of trade (that is, $dq/d\tau > 0$).

Because the assumed utility functions imply constant elasticity of demand for each of the endowment goods, we can conclude that the global market for the home produced good clears when

$$Y_H = \alpha\gamma\left(\frac{P_H}{P_T}\right)^{-\eta}\left(\frac{P_T}{P}\right)^{-\theta} C + (1-\alpha^*)\gamma\left(\frac{P_H/\mathcal{E}}{P_T^*}\right)^{-\eta}\left(\frac{P_T^*}{P^*}\right)^{-\theta} C^*,$$

where $Y_H$ is home's endowment of its tradable good. There is a corresponding market-clearing condition for the foreign tradable supply, $Y_F$. For Home nontradables we have

$$Y_N = (1-\gamma)\left(\frac{P_N}{P}\right)^{-\theta} C,$$

and, of course, there is again a corresponding Foreign condition.

Let us abstract from the underlying determinants of domestic and foreign saving and consumption. Thus, we take as given $C$ and $C^*$, along with the endowments $Y_H, Y_F, Y_N,$ and $Y_N^*$. Then the preceding market-equilibrium conditions allow us to solve for relative prices. For example, we can rewrite the equilibrium condition for the home export's market as

$$Y_H = \alpha\left(\frac{P_H}{P_T}\right)^{-\eta} C_T + (1-\alpha^*)\left(\frac{P_H/\mathcal{E}}{P_T^*}\right)^{-\eta} C_T^*$$

implying that the price indices must be governed by

$$P_H Y_H = \alpha\left(\frac{P_H}{P_T}\right)^{1-\eta} P_T C_T + (1-\alpha^*)\left(\frac{P_H}{\mathcal{E}P_T^*}\right)^{1-\eta} \mathcal{E}P_T^* C_T^*. \qquad (1)$$

Residually, we can calculate Home's current account surplus $CA$, measured in Home currency, as

$$CA = P_H Y_H + iF - P_T C_T,$$

where $F$ denotes Home net foreign assets and $i$ (which we take as given) denotes the interest rate (both in Home currency units). For Foreign, the corresponding relationship is

$$\mathcal{E}CA^* = \mathcal{E}P_F^* Y_F - iF - \mathcal{E}P_T^* C_T^* = -CA.$$

As a first pass to understanding the exchange rate impact of global current account rebalancing, we begin by solving analytically for the effects of shocks that make $CA = 0$. (If there is no production effect, such shocks are best thought of as shocks to relative Home and Foreign demand. When we move later to consider supply shocks, we will allow relative outputs to move simultaneously.) Substituting for $P_T C_T$ and $\mathcal{E} P_T^* C_T^*$ in eq. (1) and its Foreign-tradable analog, one gets

$$P_H Y_H = \alpha \left( \frac{P_H}{P_T} \right)^{1-\eta} \left( P_H Y_H + iF - CA \right) + (1-\alpha^*) \left( \frac{P_H}{\mathcal{E} P_T^*} \right)^{1-\eta} \left( P_F Y_F - iF + CA \right), \quad (2)$$

$$P_F Y_F = (1-\alpha) \left( \frac{P_F}{P_T} \right)^{1-\eta} \left( P_H Y_H + iF - CA \right) + \alpha^* \left( \frac{P_F}{\mathcal{E} P_T^*} \right)^{1-\eta} \left( P_F Y_F - iF + CA \right),$$

for tradables, while, for the nontradables markets, one can show that

$$P_N Y_N = \frac{1-\gamma}{\gamma} \left( \frac{P_N}{P_T} \right)^{1-\theta} P_T C_T = \frac{1-\gamma}{\gamma} \left( \frac{P_N}{P_T} \right)^{1-\theta} \left( P_H Y_H + iF - CA \right), \quad (3)$$

$$\mathcal{E} P_N^* Y_N^* = \frac{1-\gamma}{\gamma} \left( \frac{P_N^*}{P_T^*} \right)^{1-\theta} \left( \mathcal{E} P_F^* Y_F - iF + CA \right). \quad (4)$$

Of the preceding conditions, three are independent, allowing solution for the terms of trade $\tau$, $\frac{P_N}{P_T}$, $\frac{P_N^*}{P_T^*}$, and hence the real exchange rate, $q$. Notice the presence of a transfer effect in the equations above. Because we assume $\alpha + \alpha^* > \frac{1}{2}$, the stock of net foreign assets influences equilibrium relative prices. It will be most helpful to rewrite the equations in terms of ratios to nominal tradable GDPs ($P_H Y_H$ and $P_F Y_F$), the ratios of nontradable to tradable supplies, and the relative sizes of the two countries' tradables sectors. Let $ca = CA/\left(P_H Y_H\right)$ and $f = F/\left(P_H Y_H\right)$. Let $\sigma_T = Y_H/Y_F$, $\sigma_N = Y_N/Y_H$, and $\sigma_N^* = Y_N^*/Y_F$. Finally, let $x = P_N/P_T$ and $x^* = P_N^*/P_T^*$. Then we can write the three independent eqs. (2)-(4) as

$$1=\alpha\frac{1}{\left[\alpha+(1-\alpha)\tau^{1-\eta}\right]}\left(1+if-ca\right)+(1-\alpha^{*})\frac{1}{\left[\alpha^{*}\tau^{1-\eta}+(1-\alpha^{*})\right]}\left(\frac{\tau}{\sigma_{T}}-if+ca\right), \quad (5)$$

$$\sigma_{N}=\left(\frac{1-\gamma}{\gamma}\right)x^{-\theta}\left[\alpha+(1-\alpha)\tau^{1-\eta}\right]^{-\frac{1}{1-\eta}}\left(1+if-ca\right),$$

and

$$\sigma_{N}^{*}=\left(\frac{1-\gamma}{\gamma}\right)\left(x^{*}\right)^{-\theta}\left[\alpha^{*}+(1-\alpha^{*})\tau^{-(1-\eta)}\right]^{-\frac{1}{1-\eta}}\left(1-i\frac{\sigma_{T}}{\tau}f+\frac{\sigma_{T}}{\tau}ca\right).$$

The real exchange rate $q$ is given by

$$q=\frac{\left[\alpha^{*}\tau^{1-\eta}+(1-\alpha^{*})\right]^{\frac{1}{1-\eta}}}{\left[\alpha+(1-\alpha)\tau^{1-\eta}\right]^{\frac{1}{1-\eta}}}\times\frac{\left[\gamma+(1-\gamma)(x^{*})^{1-\theta}\right]^{\frac{1}{1-\theta}}}{\left[\gamma+(1-\gamma)x^{1-\theta}\right]^{\frac{1}{1-\theta}}}. \quad (6)$$

A helpful approximation to equation (6) is given by

$$\Delta\log q \approx \gamma(\alpha+\alpha^{*}-1)\Delta\log\tau + (1-\gamma)[\Delta\log(P_{N}^{*}/\mathcal{E}P_{N})]. \quad (7)$$

The preceding expression relies, in turn, on an estimate of the change in relative tradables price indexes, $\Delta\log(\mathcal{E}P_{T}^{*}/P_{T}) \approx (\alpha+\alpha^{*}-1)\Delta\log\tau$. As expression (7) illustrates, the larger the share of nontraded goods ($1-\gamma$) in consumption, the bigger the effect of changes in the relative international price of nontraded goods. Similarly, the effect of the terms of trade on the real exchange rate $q$ depends on the degree of home bias, captrued by $\alpha+\alpha^{*}-1$. Absent home bias ($\alpha=\alpha^{*}$ = ½), the terms of trade cannot affect the real exchange rate in (7), because $\tau$ affects both countries' consumption deflators in the same way. Note that the above decomposition is essentially an accounting relationship, not a behavioral one. Of course, $\Delta\tau$ will be smaller the more substitutable are tradable goods (the higher is η), and the greater is the degree of home bias in tradables consumption, whereas the change in the relative price of nontraded goods across countries is smaller the greater the elasticity of substitution between traded and nontraded goods, θ.

With these analytical results in hand, we now proceed to study the model's quantitative implications.

## 3. The Exchange Rate Impacts of Rebalancing Global Current Accounts

One can potentially do a number of alternative experiments within the preceding framework. For example, as already discussed, just letting $CA$ go to zero effectively captures a pure relative demand-driven current account reduction ( that is, rebalancing of current accounts because US aggregate demand falls while foreign aggregate demand rises). And, as we have also already alluded, one can simulate any accompanying effects of a relative productivity shocks by varying Home and Foreign relative output at the same time as we let the current account go to zero.[7]

Other exercises include trying to simulate the effects of a rise in US government war expenditures. To parameterize that exercise, we need to ask how military spending is allocated between tradables. and nontradables, as well as between Home and Foreign. We are assuming that international debt is denominated in dollars, but that assumption is easily relaxed.

[7]The chapter by Faruqee et al. in this volume studies current account adjustment scenarios within a dynamic multi-region model.

In our calibration we assume that $P_H Y_H/(P_H Y_H + P_N Y_N) \approx 0.25$, so that a deficit-to-tradables ratio of $CA/P_H Y_H = -0.2$ approximates the current external deficit of the United States. We take net US foreign assets (in dollars), $F$, divided by the dollar value of traded goods output, $P_H Y_H$, to be $-0.8$, and assume a nominal interest rate of $0.05$ per year. Also, under the assumption that, $Y_H/Y_F = 0.22$, the dollar value of tradables produced by the US fluctuates between about 20 and 25% of global dollar sales of tradables (depending on the terms of trade).[8] We take $\eta = 2$ or 3, $\gamma = 0.25$, $\alpha = 0.7$, and $\alpha^* = 0.925$. For the most part, this calibration is broadly consistent with the one that we deduced in Obstfeld and Rogoff (2000b), where we argued that realistic trade costs (here, a large share of nontraded goods in consumption) can explain the degree of international capital-market integration that we actually observe among the OECD countries. We have taken the international trade elasticity $\eta$ to be quite a bit lower than the value of $\eta = 6$ assumed in Obstfeld and Rogoff (2000b), however, both because short-run trade

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[8]We assume that $Y_N/Y_H = Y_N^*/Y_F = 1$. The precise choices of these numbers have no bearing on the logarithmic changes in ratios of nontradable to tradable prices. Within rather large limits of variation, they have little effect on the change in the overall real exchange rate. The rationale for the calibration in this paper is that, at a position of current account balance, with no net external debt and with the terms of trade $\tau = 1$, the equality between the intratemporal marginal rate of substitution and relative prices (in Home, for example) can be written as $\frac{\gamma}{1-\gamma}\left(Y_H/Y_N\right)^{1-\theta} = \frac{P_H Y_H}{P_N Y_N} \approx \frac{1}{3}$. The results are very close, however, if we instead take $Y_N/Y_H = Y_N^*/Y_F = 3$, as in Obstfeld and Rogoff (2005).

elasticities are smaller and because estimates based on micro data are quite a bit larger than those estimated to apply to aggregated US trade flows.[9] Our calibration also requires an assumption about the elasticity of substitution in consumption between tradables and nontradables, $\theta$. In our 2000a paper, we argued that a unit elasticity was a reasonable base case, and that the empirical literature would support even a lower estimate. Since it will turn out that the exchange rate change is larger the smaller $\theta$, and since we want to include a conservative benchmark, we allow for $\theta$ as large as 2, in order to see how a higher elasticity of intra-national substitution (that is, between tradables and nontradables) might moderate the exchange rate effects, but we also briefly look at the case $\theta$=0.5, which certainly is consistent with several of the empirical estimates reported in the literature (see the references in Obstfeld and Rogoff 2005).[10]

In table 1, we ask what happens if the US accounts for roughly a quarter of world GDP and a relative demand shock abruptly closes its current account deficit from 5% of

[9]See, for example, Gagnon (2003). The chapter by Mann and Plück in this volume presents a critical assessment of trade elasticity estimation.

[10]Solution of the model is straightforward. To handle its nonlinearity, we write equation (2) in the form

$$1=\alpha\frac{1}{z}\left(1+if-ca\right)+(1-\alpha^{*})\left[\frac{1-\alpha}{\alpha^{*}(z-\alpha)+(1-\alpha)(1-\alpha^{*})}\right]\left(\frac{\tau}{\sigma_{T}}-if+ca\right),$$

where $z\equiv\left[\alpha+(1-\alpha)\tau^{1-\eta}\right]$. Given $\tau$, this is a quadratic equation in $z$. One can solve for $z$ using the quadratic formula, then extract the implicit solution for a $\tau$ using the definition of $z$, then substitute the $\tau$ solution back into the quadratic, solve again for $z$, and iterate until convergence is achieved.

GDP to full balance. (We use 5% as a conservative figure; nearly identical results would ensue if the deficit ratio fell from, say, 6% to 1%.) Suppose, for example, that an end to the housing boom in the United States reduces consumption there, while improving growth expectations lead to higher consumption levels in Europe, Japan, and China.

In our first (low-elasticity) case of $\theta = 1$, $\eta = 2$, the real exchange rate needs to move by about 32.3% (computed as a log difference), more than double the effect we found in our earlier small-country model with flexible prices. (Our favored estimate, which allows for nominal rigidities and incomplete pass-through in the short run, is going to be higher still, see below.) Why is the effect so large? One part of it comes from the fact that we are now allowing for terms of trade changes, which reinforce and magnify the effects of the relative price of nontraded goods on the real exchange rate. (The shift in the locus of global demand away from the United States leads to a relative drop in demand for US traded goods because US citizens are assumed to have a relative preference for US-produced tradables. Thus, as Table 1 also illustrates, the US terms of trade fall substantially, by about 15.8%. ) Some of the difference comes from the fact that whereas the US current account was 4.4% of GDP in 2000, it is over 6% today, so closing up the gap leads to a bigger exchange rate movement.

A final but key difference compared with the small-country case arises, however, because we are now allowing for general equilibrium effects due to price movements outside of the United States. To see the effect of this change most clearly, abstract temporarily from terms of trade changes. Within the United States, the elimination of the current account deficit implies something like a $20\%$ fall in the demand for traded goods (since the current account deficit is $5\%$ of GDP, while traded goods production accounts for about $25\%$ of GDP). Thus, the relative price of nontraded goods needs to fall by $20\%$ when the elasticity of intranational substitution is $1$. But now, we must also take into account the fact that abroad, the price of nontraded goods must *rise* in parallel to the effect in the United States. If the world economy's two regions were roughly equal in size, and there were no terms of trade effects, then in our general equilibrium model, the real exchange rate change would have to be twice that in the partial equilibrium model. But if the US accounts for only $1/4$ of global traded output—so that a US current account deficit of $5\%$ of GDP corresponded to a foreign current account surplus of $1.67\%$ of foreign GDP—the effect would be about $33\%$ instead of 100% larger—a change of about 26.6% (= 20% × 1.33) in the component of the dollar real exchange rate attributable exclusively (that is, ignoring terms-of-trade effects) to relative nontradable and tradable prices at home and abroad.

A convenient if rough way to get a handle on the sizes of the total real exchange rate change (including terms-of-trade effects) is to rewrite (7) in the equivalent form

$$\Delta\log q \approx (\alpha + \alpha^* - 1)\Delta\log\tau + (1-\gamma)[\Delta\log[(P_N^*/P_T^*)/(P_N/P_T)],$$

which once again is based on the approximation $\Delta\log(\mathcal{E}P_T^*/P_T) \approx (\alpha + \alpha^* - 1)\Delta\log\tau$.[11] In

[11] It is instructive to compare the preceding approximation to the equivalent equation (7). The preceding version makes it obvious that, *given* relative prices of tradables and nontradables, the change in relative tradables price indexes feeds through one-for-one into the real exchange rate, and not merely by the fraction γ one might guess from a hasty

our simulation $\alpha + \alpha^* - 1 = 0.625$, $1 - \gamma = 0.75$, and $\Delta\log \tau = 15.8\%$. We substitute above the back-of-the envelope guess of 26.6% for $\Delta\log[(P_N^*/P_T^*)/(P_N/P_T)]$ to get

$$\Delta\log q \approx (0.625)(0.158) + (0.75)(0.266) = 9.9\% + 20.0\% = 29.9\%.$$

This answer is only about 8% off of the model's exact prediction of 32.3%. The minor discrepancy is the net result of algebraic approximations, the initial divergence between tradables consumptions and tradable endowments, and additional terms-of-trade effects that enter the equilibrium conditions (3) and (4).[12]

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glance at equation (7). Holding all else constant in equation (7), we can see, for example, that a percent rise $x$ in $\mathcal{E}P_T^*/P_T$ will have not only a *direct* effect on $q$ equal to $\gamma x$ percent, but in addition an *indirect* effect equal to $(1-\gamma)\,x$ percent due to the induced changes in the relative international prices of nontradables. Engel (1999) uses a similar decomposition in his empirical study of the US dollar's real exchange rate.

[12]Using equation (4) for Home, the proportional fall in tradables consumption, given the initial current account deficit and external debt, is approximated by

$$\widehat{C}_T \approx \frac{\Delta ca}{1 + if - ca} - (1-\alpha)\widehat{\tau} \approx -\left(0.86\right)(20\%) - (0.3)(15.8\%) \approx 22\%.$$

Thus, taking account of the corresponding effects in Foreign, a lower-bound estimate of the real exchange rate component $\Delta\log[(P_N^*/P_T^*)/(P_N/P_T)]$ would be (1.33)(22%) = 29.3% rather than the 26.6% applied above in the text. Using this number instead, the total real exchange rate change is approximated by (0.625)(0.158) + (0.75)(0.293) = 9.9% + 22.0% = 31.9%.

With higher elasticities all around, for example, as in the fourth row of table 1, changes in terms of trade and real exchange rates are naturally smaller. When $\theta = 2$ and $\eta = 3,$ the terms of trade fall by only 9.4% whereas real dollar depreciation is 14.4%. Lowering the tradable-nontradable substitution elasticity $\theta$ has a particularly dramatic effect on real dollar depreciation. The fifth row of table 1 alters the case in the first row by taking $\theta$ =0.5; in this case the real exchange rate change is 64.4%, double what it is when $\theta$ =1.

We emphasize that in a quantitative decomposition of the overall real exchange rate response, substitution between US-produced and foreign traded goods can be less important empirically than substitution between traded and nontraded goods. This imputation is due in part to the large share of nontradables in the CPI. Our mode of analysis therefore stands in marked contrast to the bulk of applied policy work on international trade flows, which asks only how relative *traded* goods prices must change in order to eliminate a given external trade imbalance. To ascertain the quantitative importance of the intranational substitution margin, the last row of table 1 looks at the case of a very high international substitution elasticity, $\eta = 1000,$ in which case the terms of trade change is virtually nil. In that case real dollar depreciation is still 17.6%, which equals a fraction 17.6/32.3 = 54.5% of its value when $\eta = 2$. Thus, in the case shown in the first row of table 1, only a minority of the overall real exchange rate change is attributable to the terms of trade. The terms of trade effect could dominate if the elasticity of substitution between traded and nontraded goods were higher or that between imports and exports lower, but this may not be the most likely scenario. Nevertheless, adding the terms of trade channel does substantially magnify the requisite exchange rate change, both through its direct effect and through its interaction with the relative price of nontraded goods.

Table 2 asks what happens if the shock that closes up current accounts is associated with a large relative *rise* (20%) in US productivity in tradables This will, of course, mute the real exchange rate effect: higher production of tradables allows the US to cut its current account deficit without a correspondingly large cut in consumption. In our base case, $\theta=1$, $\eta=2$, the dollar depreciates in real terms by only 24% as compared with the 32.3% in table 1; but remember, this is in the face of a huge increase in traded goods production that depresses the US terms of trade by 22.4%. The effect is approximately linear, so for more realistic values of the productivity shock (e.g., $\Delta Y_H/Y_H = 0.02$), the effect would be to reduce the exchange rate movement implied by full current account adjustment by a fairly insignificant amount. For higher elasticities, both the terms of trade decline and the real dollar depreciation are smaller. A corollary of our approach is that the precise factors that changes the currrent account have a central bearing on the accompanying real exchange rate response.

It may seem anomalous to the reader that it takes a *rise* in relative US productivity in tradables to dampen the exchange rate effect of a reduction in the US deficit; however, this is perfectly logical. Policy analysts frequently argue that a rise in relative productivity in the rest of the world will mute the exchange-rate impact of global current account rebalancing. But this is correct only if the foreign productivity rise is concentrated in the nontradables sector—for example, if foreign retailing productivity levels start to catch up to those of the United States, which has experienced a retailing productivity boom over the past 20 years. Indeed, our model suggests that the US nontraded-goods productivity boom could help explain the widening of the US current account deficit.[13] We hope to explore the issue in a follow-up paper.[14]

Table 3 allows the real dollar depreciation to reduce the real value of the US net foreign debt, in line with Tille's (2005) estimates of US foreign assets and liabilities denominated in foreign currencies.[15] As suggested above, the effect on the extent of depreciation is not large, even when the reduction in net foreign debt is substantial. (This is only to be expected: even for gross foreign assets and liabilities as large as those of the US, debt reduction cannot be significant when the exchange rate change is small.) For example, in the first row of table 3, the net foreign debt of the US is reduced from 0.8 to only 0.18 of nominal tradables output, yet the degree of real dollar depreciation is still 27.3% (as compared with 32.3% in table 1) and the fall in the terms of trade is 13.4% (as compared with 15.8% in table 1). For higher elasticities, the debt reduction is smaller, as is the effect on the ultimate equilibrium relative-price changes.[16]

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[13]According to Gordon (2004), over 50% of the US Europe productivity differential over the past decade is due to retailing, with another 25% due to wholesale.

[14]For foreign productivity growth in tradables to promote real dollar appreciation, we would need an implausible combination of higher home consumption bias in tradables, a larger overall consumption share of tradables, and lower trade elasticities.

[15]The revaluation calculation assumes that nominal and real depreciation coincide, as is justified below.

[16]The exercise of allowing for valuation effects is executed in much more detail in Obstfeld and Rogoff (2005), who similarly find that valuation effects can only temper the exchange rate adjustments by roughly 1/5. Notice that now, the extent of real

A final exercise, reported in table 4, assumes that the closing of the deficit is accompanied by a shift to permanently higher military and security expenditures, for example, due to an open-ended commitment of American force in Iraq. (In table 4 we do not endogenize net foreign assets.) Nordhaus's (2002) estimates suggest that roughly 3% of US tradables would be required annually for this purpose. We assume that all the resources used are tradables, drawn roughly half out of US tradables and half out of foreign tradables. In the low-elasticity case of $\theta = 1$ and $\eta = 2$, both the real depreciation and the terms of trade decline are greater than in table 1, but not hugely so: a 35.3% versus 32.3% depreciation and a 16.5% versus 15.8% terms of trade decline. The differential effects are smaller at higher elasticities, as expected.

Some readers will be more interested in understanding what happens to the nominal exchange rate as opposed to the real exchange rate. To make this translation, we must, of course, make an assumption about monetary policy. The simplest assumption is that central banks target CPI inflation rates in which case, under flexible prices, $\Delta \log \mathcal{E} = \Delta \log q$ . (Allowing for the case of GDP deflator targeting is a bit more complicated but turns out to make only a marginal difference, so we do not report the results here.)

All of the above analysis assumes flexible prices and complete pass-through from exchange rates to final goods prices. While we do not explore price rigidities and imperfect pass-through explicitly in this paper, we can draw some preliminary conclusions from the results of our earlier small-country model. If pass-through from

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depreciation affects the equilibrium terms of trade change because net foreign assets influence spending on tradables.

exchange rates to prices is 50% (as we assumed in our 2000 paper), the requisite change in the exchange rate will have to be roughly double the ones calculated in the tables, assuming that central banks target overall inflation and allow the exchange rate to move to maintain full employment in the nontraded goods sector. In fact, newer estimates suggest that for the United States, pass-through is less than 50% after one year, and only 25% in the short run, (see Campa and Goldberg 2002), in which case the immediate overshooting would be twice as large. Because the pass-through following a very large exchange-rate change probably is higher, we might take 50% as a conservative estimate to use for the medium-term pass-through to import prices.

## 4. Parallels with the Early 1970s

Given our analysis, why then do some, such as Greenspan (2004), argue that a decline in the United States current account deficit is likely to be benign? Greenspan points to the fact that capital markets are becoming increasingly integrated, and cites reductions in home bias in equities, the secular waning of the Feldstein-Horioka puzzle, and other factors considered in our 2000b paper on the six major puzzles in international macroeconomics, as well as in our 2000a paper. But our calibration here is totally consistent with the current degree of integration of capital markets, and indeed is consistent with the calibration of our earlier paper. What matters for the exchange rate effect here is not the depth of international capital markets, but the costs of adjusting to lower tradables consumption in the *goods* markets. Given our assumptions here the nontraded goods account for 75% of GDP (as we found in our earlier calibrations), and that there is home bias in tradable goods consumption (as is consistent with a broad variety of evidence from the trade literature), then US current account adjustment necessarily requires a significant exchange rate adjustment. True, the adjustment is smaller the smaller the adjustment in the current account (our model, for realistic parameters, exchange rate adjustments are approximately linear in trade balance adjustments.) But even a closing up of the US current account from 6% to 3% would require very substantial exchange rate adjustments, especially if one takes the likely effects of exchange rate overshooting into account.

The real question is not whether there needs to be a big exchange rate adjustment when the US current account goes from its current unsustainable level to a lower, more sustainable one. For most plausible shocks leading to global rebalancing, this is a given. The real question is how drastic the economy-wide effects are likely to be. This is an open question. We agree with Greenspan's (2004) argument that some markets are becoming more flexible, and that this should allow the world economy to absorb the blow better than it might have otherwise. But whereas US markets may have achieved an impressive degree of flexibility, Europe (and to a lesser extent Japan) certainly has not. The rest of the world is not going to have an easy time adjusting to a massive dollar depreciation. It is also the case that world derivatives markets have exponentially expanded in comparison with even ten years ago. The increasing diversity of banks' counterparty risk (see, for example, the International Monetary Fund's *Global Financial Stability Report*, 2005) raises the chances that a massive dollar movement will lead to significant financial problems (events along the lines of the collapse of Long-Term Capital Management in 1998). Such problems are inherently difficult to foresee until they suddenly unfold.

Of course, the optimists can point to the dollar's relatively benign fall in the late 1980s (though arguably it was a critical trigger in the events leading up to Japan's collapse in the 1990s). But perhaps the greatest concern is that today's environment has more parallels to the dollar collapse of the early 1970s than to the late 1980s. We hope to address this analogy in future research.[17] For now, however, we note some broad similarities. During the years 1971-72 (in the run-up to the November 1972 election), the United States had relatively loose fiscal policy (fueled particularly by a generous election-year increase in social security benefits), soft monetary policy, and faced open-ended security costs. Back then it was Vietnam; today it is Iraq and homeland security, the combined costs of which could easily match the cumulative 12% of GNP that the Vietnam War cost or the 15% of GNP that financed the Korean War (see Nordhaus 2002). There were twin deficits (albeit signicantly smaller in the 1970s than they are today), and energy prices were a major factor (although the 1974 oil price hike was much greater, when measured in real terms, than anything seen yet in 2004.) The year 1973 saw a breakdown of the Bretton Woods fixed exchange rate system (mainly involving European countries), but today there is a quasi-fixed exchange rate system between the US and much of Asia.

Broadly speaking, one has to be concerned that if the United States current account closes up under a backdrop more like the 1970s than the 1980s, the outcome may be much more severe than it seemed to be during the 1980s dollar descent. Aside from a

[17] The chapters in this volume by Adalet and Eichengreen and by Freund and Warnock survey the empirical characteristics of past current account adjustment episodes.

boomerang effect of slow foreign growth on United States exports, there are further risks of rising inflation and interest rates, and perhaps even a significant financial crisis (see Obstfeld and Rogoff, 2005, for further discussion).

## 5. Conclusions

In the paper, we have generalized our discussion in Obstfeld and Rogoff (2000a) to take account of general equilibrium effects and terms of trade changes. Both are important. First, the large size of the US in the world economy (about 22% of global GDP) implies that when the US current account shrinks, the same price dynamic needed to induce US citizens to tilt consumption toward nontraded goods must play out in reverse in the rest of the world. As a consequence, the requisite dollar depreciation is larger than if the US were a small country. A number of factors may mitigate the required degree of depreciation (a higher elasticity of substitution between tradables and nontradables than in our baseline, and a greater degree of factor mobility across sectors). Notwithstanding these qualifications, and given the depreciation that has already occurred in the last couple of years, it still seems quite conservative to suppose that the trade weighted dollar needs to depreciate at least another 20-25% as the current account rebalances. If the rebalancing takes place over a very long period, the change could be significantly less as factor mobility allows real adjustment to mitigate the need for price adjustment. On the other hand, if the adjustment were to take place quickly (a definite risk), then there could be a large potential overshoot in the event of a rapid reversal causing the trade-weighted dollar to fall by 40-50% or more.

Second, taking into account terms of trade effects (the relative price of a country's imports and exports) also levers up the required depreciation of the dollar when the US current account closes up, though this effect is quantitatively somewhat smaller than the one implied by the requisite movements in relative prices of traded and nontraded goods. (There is also an interaction between the two effects, though it is smaller than the direct impacts.)

One way to assess the general plausibility of the central mechanism driving our model's exchange-rate prediction is to compare the model's retrospective predictions with history.[18] We do this in an extremely simple way. We solve for changes in the equilibrium dollar real exchange rate abstracting from all other than the current account balance and the stock of net foreign assets. For the parameter values assumed above (with $\theta=1$, $\eta = 2$), Figure 8 shows the resulting simulated and actual log real exchange rate paths, both normalized to zero in 1980, a year of approximate external balance for the United States. Perhaps surprisingly in view of the many potential caveats listed above, the model indeed tracks the broad movements in the dollar, with the exception of the most recent depreciation cycle. Perhaps the most glaring discrepancy is the much-studied episode starting in 1985, when the dollar's descent from its peak, driven by market anticipations as well as concerted policy initiatives, began several years in advance of the current account's turn toward balance. The last few years' experience looks similar, with the US current account worsening (albeit more sharply) as the dollar dives. Of course, figure 8 raises quite starkly the question of when the current account will adjust, and what

[18] We thank Mick Devereux for suggesting this exercise, and implementing a preliminary version of it.

the consequences for the dollar might be if it does not do so soon.

While predicting a dollar cycle in the 1980s, figure 8 does not capture its magnitude. Figure 9, however, shows that with the still empirically plausible assumption of $\eta = 0.6$, the model does capture the Reagan-era cycle quantitatively. Under this parameterization, however, the discrepancy of the last few years is accentuated, with a large and growing divergence between actual dollar depreciation and the appreciation predicted by the model in the face of a growing external deficit. Possibly the dollar's fall in the last few years reflects anticipations of the eventual current account adjustment, a short-run factor not present in our model. Over the last two decades of the twentieth century, such anticipations were correct over the longer term. The anomalous post-2002 divergence in figure 9 suggests that if US spending does not fall more into line with income soon, inflationary pressures will gather momentum.

Our discussion has not touched explicitly on issues of capital-market integration, and instead has focused on the relative price movements needed to preserve goods-market equilibrium in the face of a current-account adjustment. The extent of capital-market integration would enter the market primarily through the rate of interest that the US must pay foreigners on its external obligations. Even if the US can greatly expand its foreign debts without triggering a sharp rise in its cost of foreign finance, our analysis implies that when US current account adjustment comes, the exchange rate effects may be massive. Unless gross debts rise further or the US external borrowing rate rises sharply, however, the reduction in the current account itself will still be the dominant factor altering international relative prices.

Of course, as we noted above, it is difficult to say with certainty when the US current account adjustment will commence or whether it will be gradual or abrupt. With lower integration in the world capital markets, abrupt current account adjustment, sooner rather than later, is more likely. If greater financial integration allows bigger and more protracted US deficits, however, the ultimate relative price adjustments will have to be more extreme. In other words, further deepening of global capital markets may postpone the day of reckoning. But as long as nontraded goods account for the lion's share of US output, a sharp contraction in net imports—a significant closing of the US current account—will lead to a large exchange rate adjustment under most plausible scenarios. That adjustment will be sharper the longer is the initial rope that global capital markets offer to the United States, though the main variable will be the type of shock that sets off adjustment (for example, a housing price crash or an abrupt change in foreign central bank portfolio demand), and the speed with which the trade balance is forced to adjust.

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**Table 1: Return to external balance with outputs, *NFA* constant**

| θ | η | Fall in terms of trade (percent) | Real dollar depreciation (percent) |
|---|---|---|---|
| 1 | 2 | 15.8 | 32.3 |
| 1 | 3 | 9.4 | 26.4 |
| 2 | 2 | 15.8 | 19.1 |
| 2 | 3 | 9.4 | 14.4 |
| 0.5 | 2 | 15.8 | 64.4 |
| 1 | 1000 | 0.0 | 17.6 |

**Table 2: Return to external balance, U.S. tradable output expands by 20 percent**

| θ | η | Fall in terms of trade (percent) | Real dollar depreciation (percent) |
|---|---|---|---|
| 1 | 2 | 22.4 | 24.0 |
| 1 | 3 | 13.5 | 15.9 |
| 2 | 2 | 22.4 | 18.1 |
| 2 | 3 | 13.5 | 11.5 |

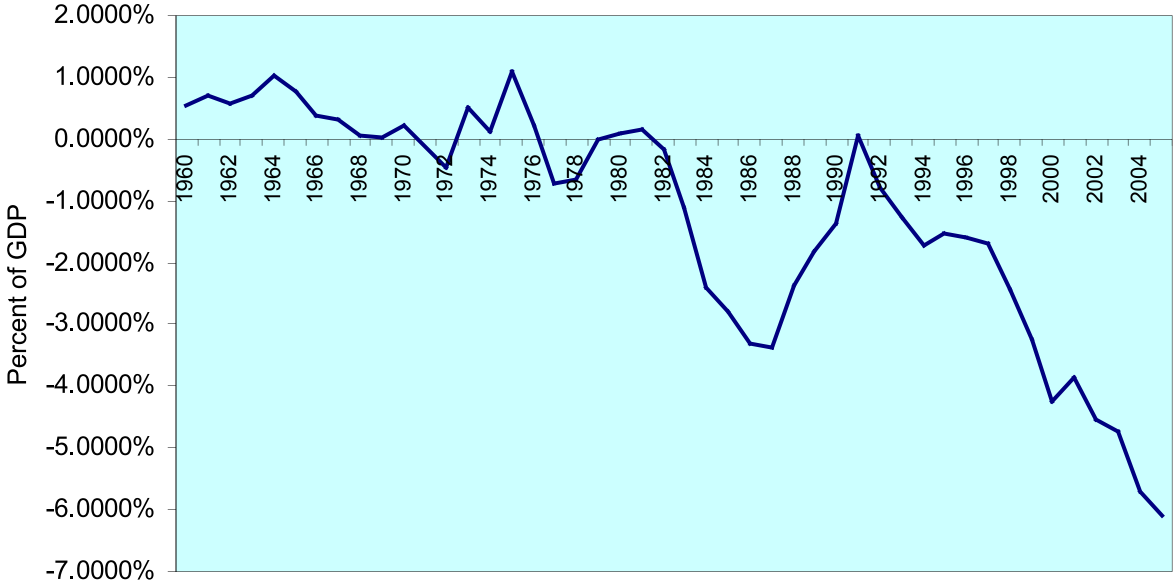
**Table 3: Return to external balance, outputs constant, *NFA* endogenous**

| θ | η | Fall in terms of trade (percent) | Real dollar depreciation (percent) |
|---|---|---|---|
| 1 | 2 | 13.4 | 27.3 |
| 1 | 3 | 8.2 | 22.8 |
| 2 | 2 | 14.4 | 17.3 |
| 2 | 3 | 8.8 | 13.3 |

**Table 4: Return to external balance, military spending expands permanently**

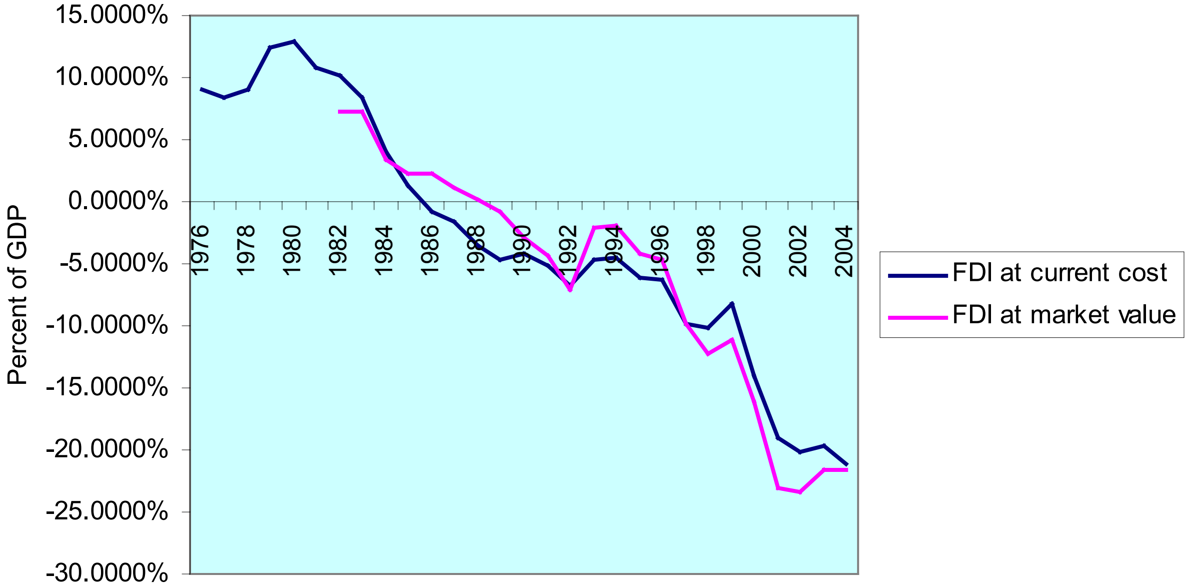
| θ | η | Fall in terms of trade (percent) | Real dollar depreciation (percent) |
|---|---|---|---|
| 1 | 2 | 16.5 | 35.3 |
| 1 | 3 | 9.9 | 29.1 |
| 2 | 2 | 16.5 | 20.6 |
| 2 | 3 | 9.9 | 15.7 |

**Figure 1: U.S. Current Account Balance, 1960-2005**



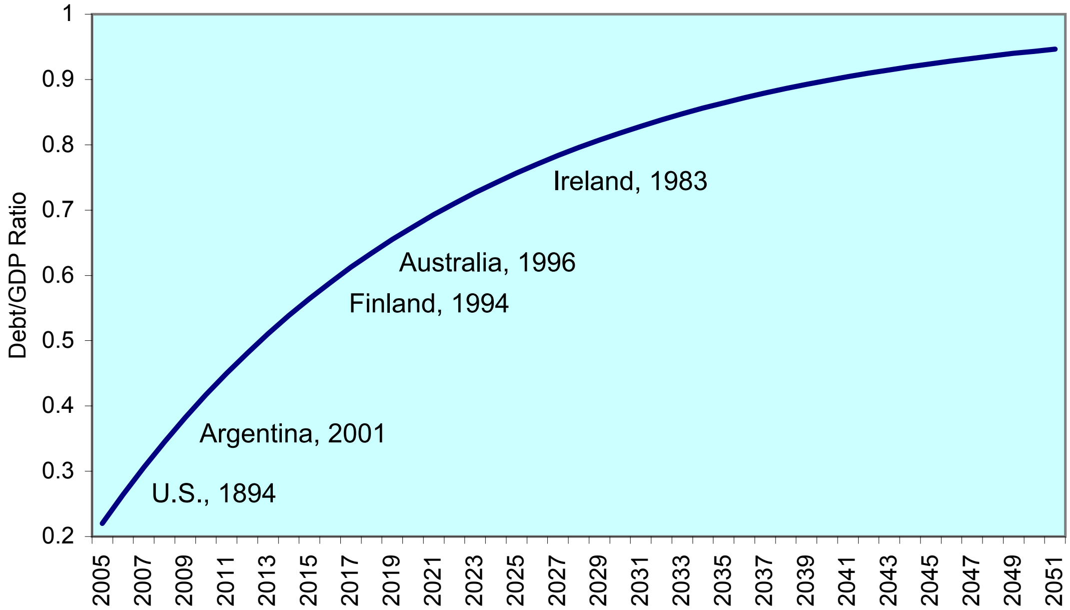

Source: BEA; IMF WEO projection for 2005

**Figure 2: U.S. Net International Investment Position, 1976-2004**



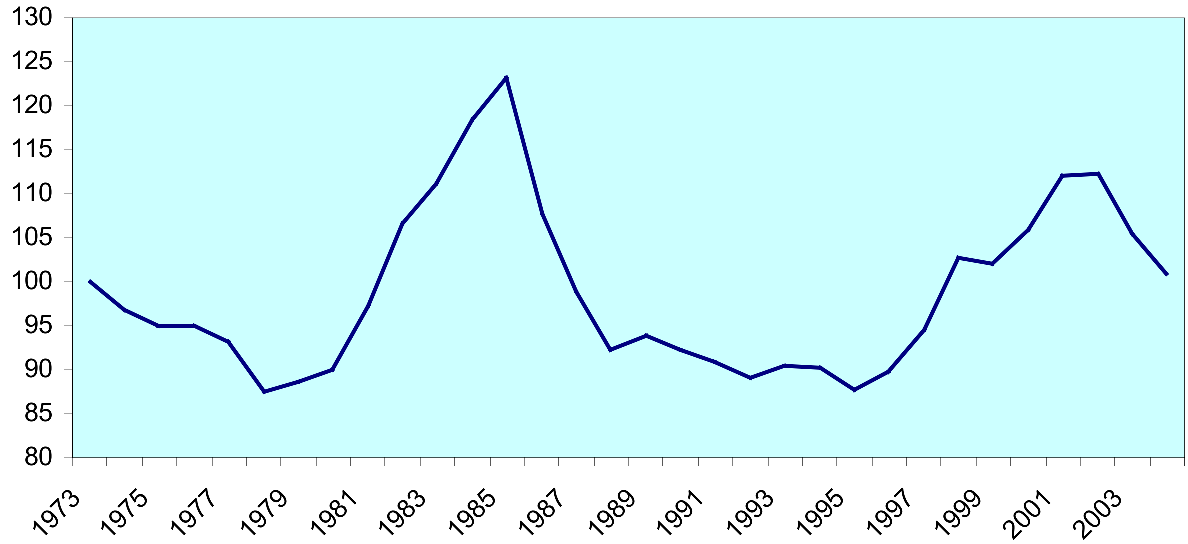

Source: BEA

**Figure 3: Up the Debt Ladder?**
**A Hypothetical U.S. Debt Trajectory**



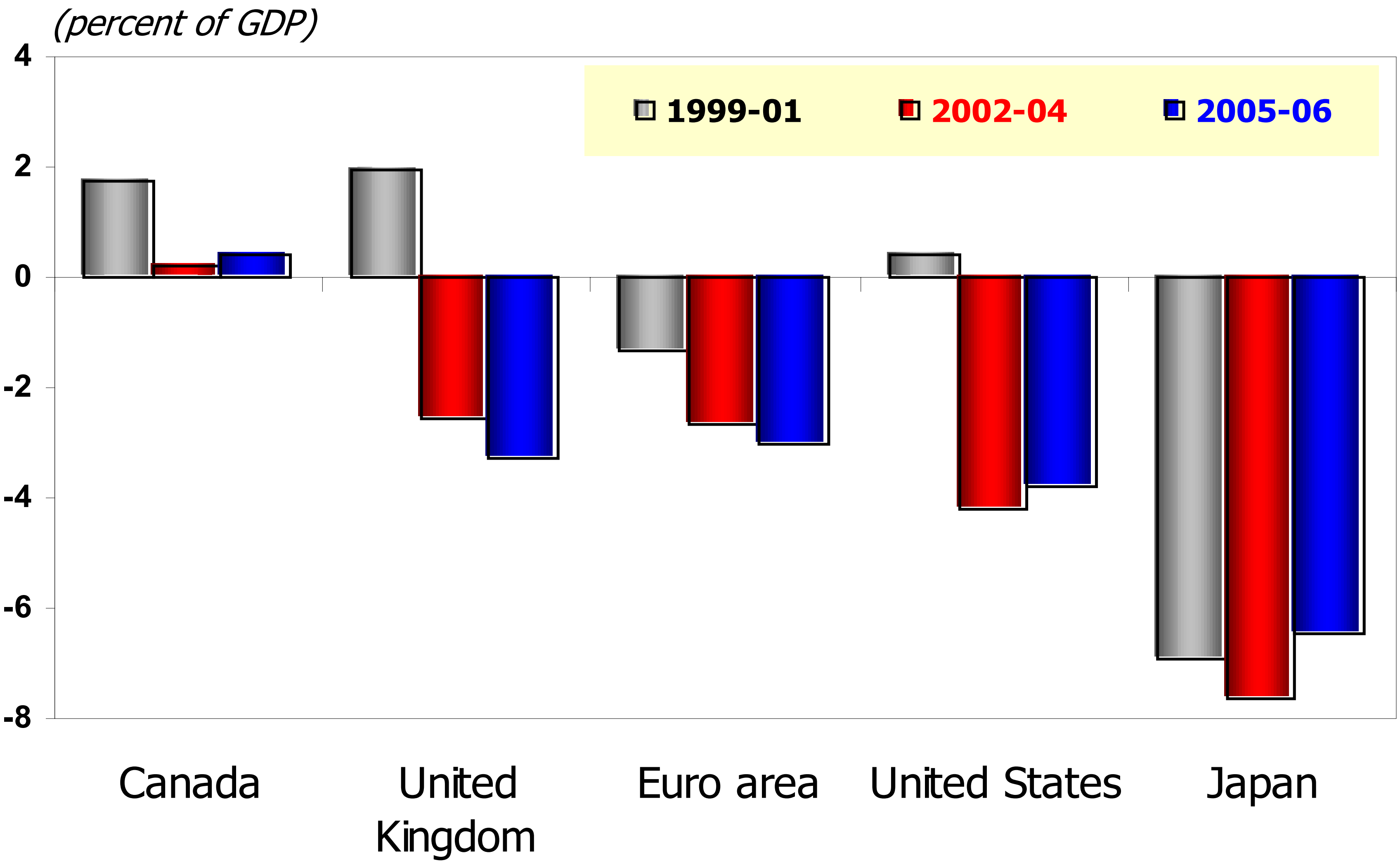
## Figure 4: U.S. Dollar Real Exchange Rate

**Broad Index, March 1973 = 100**



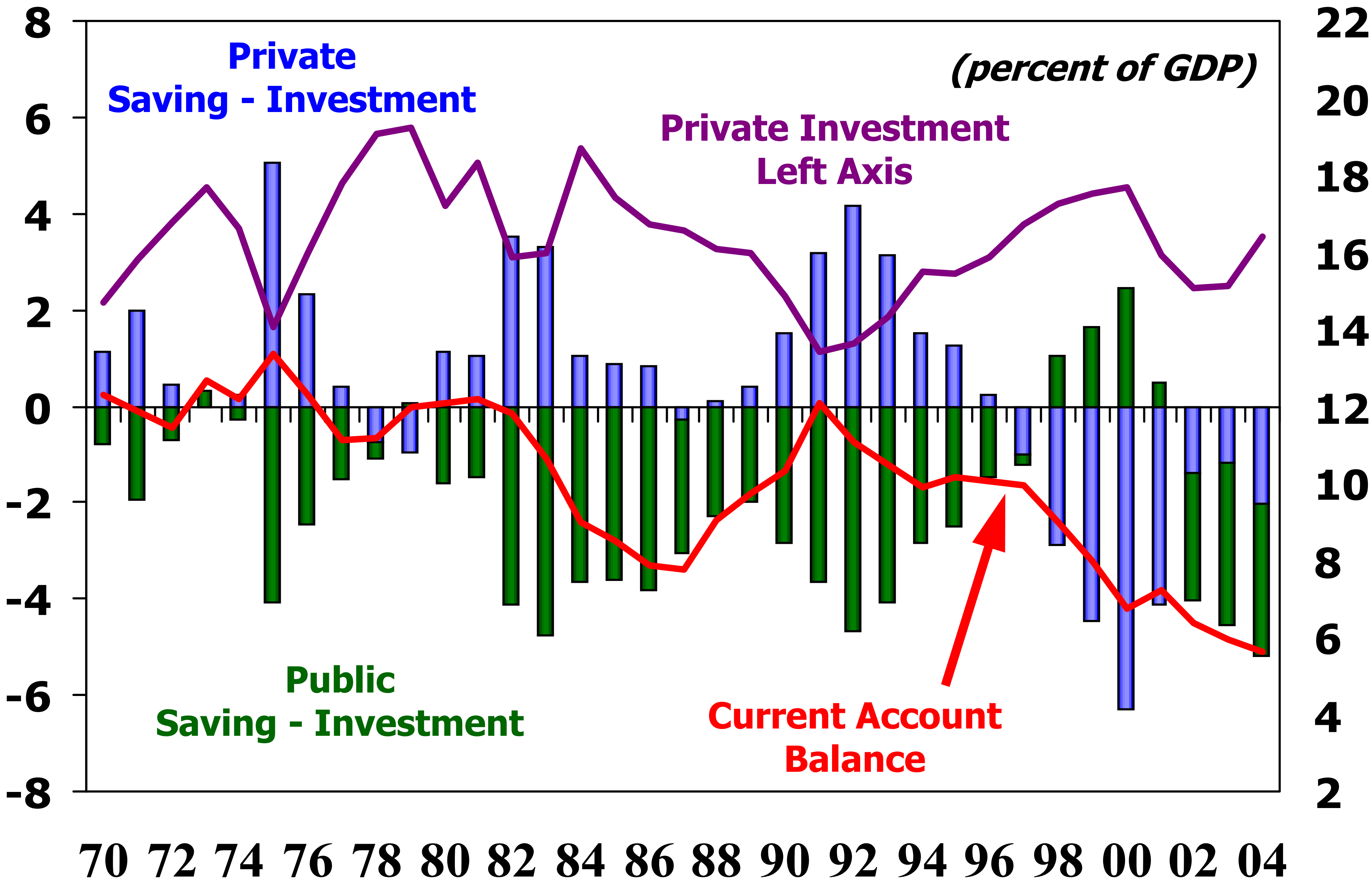

Source: Board of Governors of the Federal Reserve System

# Figure 5: Fiscal Balances in Major Economies

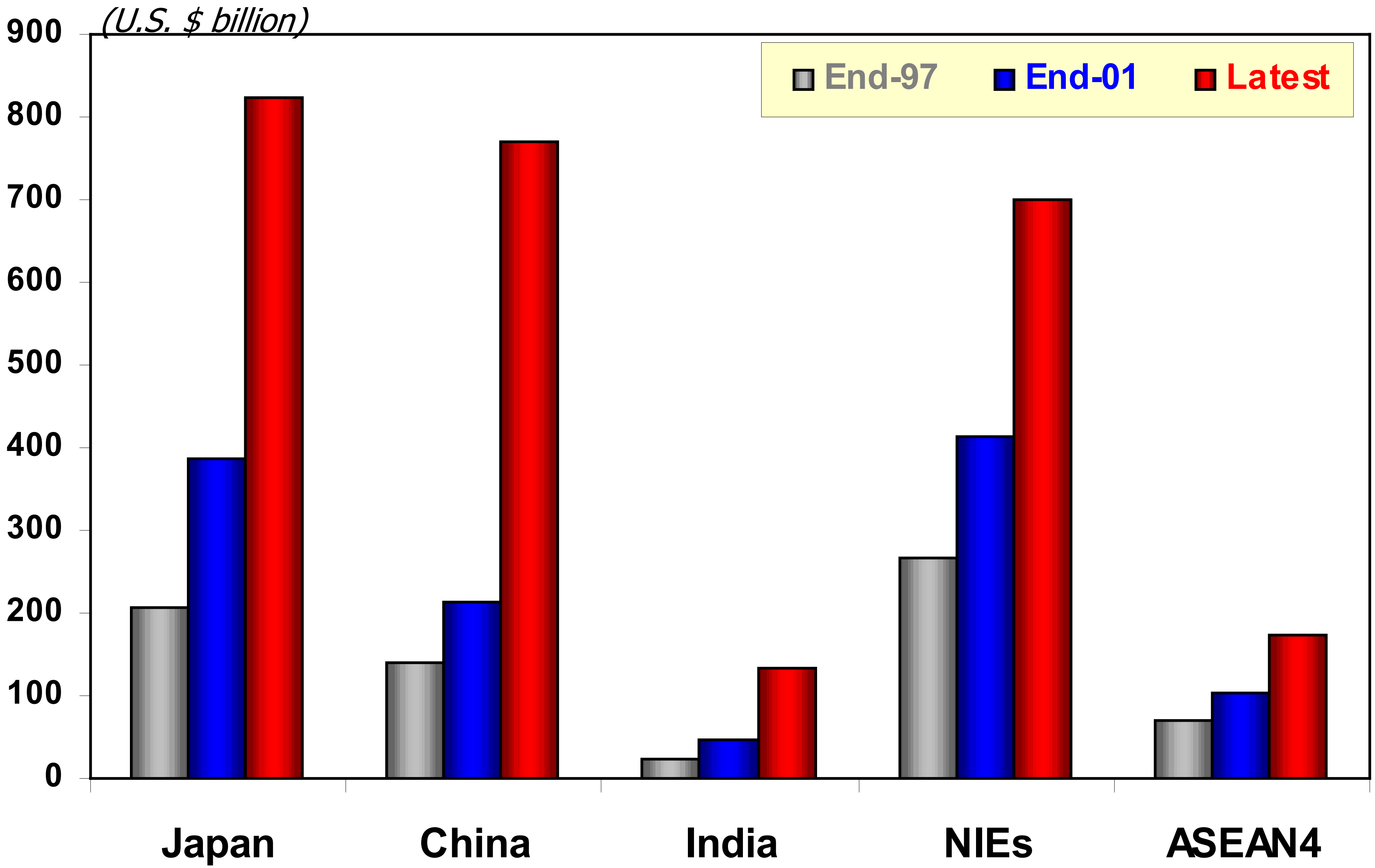



Source: International Monetary Fund WEO data base

# Figure 6: US Current Account and Saving-Investment



# Figure 7: Foreign Exchange Reserves




Source: *International Financial Statistics* and *Economist Magazine*

**Figure 8: Simulated vs. actual log USD real effective CPI exchange rate: effects of CA and NFA only (theta = 1)**

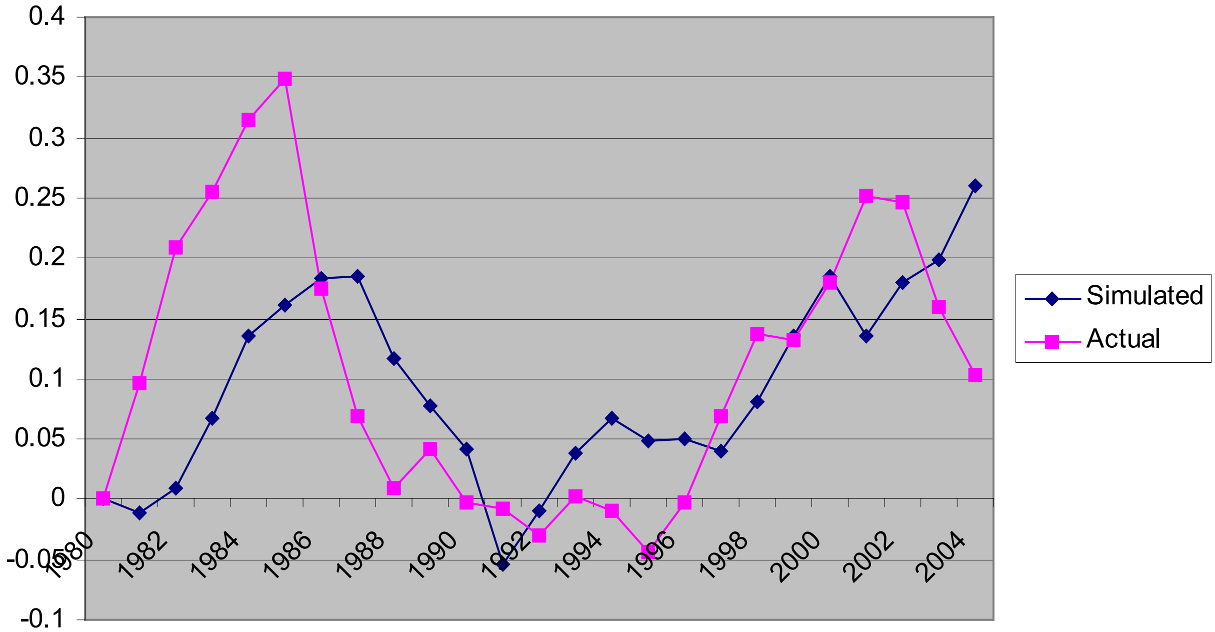


**Figure 9: Simulated vs. actual log USD real effective CPI exchange rate: effects of CA and NFA only (theta = 0.6)**