Implications for the Yen of Japanese Current Account Adjustment

Keynote Speech by Maurice Obstfeld

This paper presents a quantitative evaluation of the effect on the yen of some alternative scenarios under which Japan reaches current account balance. The analytical framework is a global general equilibrium model, based closely on Obstfeld and Rogoff (2005a, b), within which relative prices clear the world markets for traded goods as well as the domestic markets for nontraded goods. Depending on assumptions about the critical substitution elasticities underlying the model, the yen could appreciate by as much as 10 percent for each 1 percent of GDP reduction in its current account surplus. The effect would be smaller if substitution elasticities were larger, or if adjustment were accompanied by an expansion of Japanese nontradable output, the latter presumably implied by a return to a more efficient level of labor utilization.

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I. Introduction

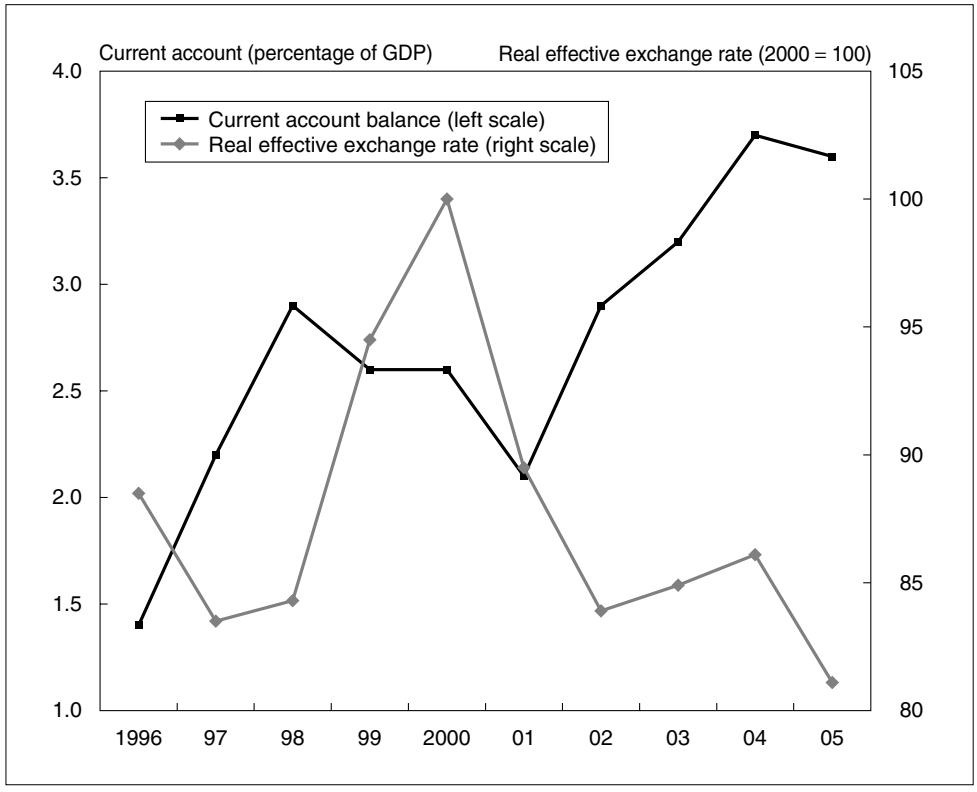
In three papers written over the past five years, Kenneth Rogoff and I have analyzed the possible impact on exchange rates of a rapid return by the United States to a position of current account balance (Obstfeld and Rogoff [2000, 2005a, b]). Back in 2000, the U.S. deficit (though at a historically high level) was smaller than it is now. Also, as has become clearer as a result of the very important work of Lane and Milesi-Ferretti (2001, 2005) in assembling consistent data on international asset and liability conditions, the widening of global net external imbalances has been accompanied by an explosion in gross international positions, as countries—especially industrial countries, but increasingly emerging markets—have leveraged their international positions by effectively financing increasing gross foreign assets through increasing gross foreign liabilities. This development has greatly expanded economic interdependence, in part by creating conditions under which unexpected exchange rate movements will cause large wealth redistributions among countries.

Some, notably Greenspan (2004), have argued that the enhanced depth of international financial markets should reduce the weight that large external imbalances deserve in the list of policymaker concerns. Larger imbalances can be financed more easily, the argument goes, given the apparently greater willingness of financial market participants to accumulate foreign claims. On the other hand, Rogoff and I have argued that the exchange rate effect of current account adjustment, when it does occur, depends only in a secondary way on the degree of integration of global asset markets. Rather, it depends on the fluidity of goods markets, which remains limited in the short run in both the domestic and (particularly) international arenas. The vast extent to which the adjustment speed of global asset markets now outstrips that of goods markets creates a hazard: when asset markets allow the development of large income-expenditure imbalances, they create the overhang of large potential exchange rate adjustments, which may in turn provide the motivation for sharp fluctuations in international financial flows, or even panics. The avoidance of such volatility will depend on the firmness of asset-market actors in taking a long view and providing the finance needed for the long-term gradual adjustment of global imbalances. One goal of my work on adjustment with Rogoff has been to assess the potential strain on markets in the event that global investors prove fickle rather than firm.

Japan is one of several countries that have extended their surplus positions, in Japan's case from around 2 percent of GDP in 2001 to more than 3.5 percent of GDP in 2005. Figure 1 shows this development, as well as the accompanying movement in the yen's real effective exchange rate index (as reported by the OECD, with an upward movement being an appreciation).[1] Between 2000 and 2004, the yen depreciated by around 15 percent in real terms against trading partners' currencies. Indeed, the degree of negative correlation between the real exchange rate index and the current account surplus is remarkable in Japan's case, with real depreciations

1. Current account data are taken from the International Monetary Fund's (IMF's) *World Economic Outlook*, various issues. The data on Japan's saving and investment rates cited later in this paragraph also come from that source. The real effective exchange rate series is taken from OECD, *Main Economic Indicators*.

Figure 1 Japan's Current Account and the Yen's Exchange Rate



closely tracking increases in the surplus.[2] Notwithstanding the claim that there has been a global savings increase since the late 1990s that may be keeping world interest rates low (Bernanke [2005]), Japan has not been a contributor. Since 1997, Japan's gross saving rate has fallen from 30.9 percent to an estimated 26.8 percent of GDP in 2005 (that is, by 4.1 percentage points of GDP), whereas its investment rate has fallen from 28.7 percent to an estimated 23.2 percent of GDP (that is, by 5.5 percentage points of GDP)—implying a 1.4 percentage point rise in the external surplus over those same years.

What would be the effect of a rapid narrowing of this surplus on the yen's exchange value? Such a narrowing could reflect some sudden event abroad, such as a collapse in housing prices, that sharply reduces foreign current account deficits. The conventional approach to the question would rely on econometric estimates based on a trade model or some other framework focused on international transactions. The approach below will take a different tack, however, one that recognizes that the relative price of traded and nontraded goods is a key component of the real exchange rate, and that the GDPs of modern economies consist *mostly* of services and other

2. Over the period shown in Figure 1, the correlation between the real exchange rate lagged one year and the current account ratio is –0.62.

nontraded goods. The model does take account of international trade, of course, but as will be evident, that is not where all or even most of the action occurs.

As argued in Obstfeld and Rogoff (2005b), there is no single answer to the question of how much exchange rate change is associated with a given change in the current account: even for a fixed set of fundamental parameters, the magnitude of exchange rate change will depend on the precise scenario under which adjustment occurs. Even less sensible is the question of how much current account adjustment is *caused* by a given exchange rate change, because the exchange rate is one of the many endogenous variables that will respond to the exogenous impulses causing the current account to change. The model explored below suggests that for sufficiently low substitution elasticities (between traded and nontraded, and between various traded goods), and under a scenario in which sectoral output levels remain constant so that the main impulse is a change in saving behavior, a 1 percent fall in Japan's surplus could be associated with as much as a 10 percent yen appreciation.[3] The exchange rate impact would be smaller if the current account change is accompanied by a rise in nontradable output in Japan, as part of a movement toward full employment.

Because Japan, like other industrial countries, has vastly expanded its gross foreign assets and liabilities, and therefore holds substantial foreign currency assets abroad, a yen exchange rate change has a potentially large effect on Japan's net external wealth. In the case of a complete and unexpected adjustment to full current account balance, the cost to Japan would amount to a substantial fraction of a year's GDP.

The plan of the paper is as follows. Section II sets out the model. Section III carries out the core simulations. Finally, Section IV lists some caveats and concludes.

II. The Model

The model deployed here is the two-region model of Obstfeld and Rogoff (2005a), calibrated to represent Japan in relation to the aggregate of its trading partners. I sketch the model's main features, leaving it to interested readers to consult the earlier paper for a more detailed and technical discussion.

There are two regions, Home and Foreign. Each region produces a nontraded good and an export good, while importing the other region's export good, which is an imperfect substitute for its own. (Think of Japan and the rest of the world as the two regions.)

The model assumes that endowments are given exogenously for the various types of outputs, thereby implicitly assuming that capital and labor are not mobile between sectors in the short run. Over the longer run, one would expect factor mobility across sectors to dampen real exchange rate effects. The core analysis also assumes that nominal prices are completely flexible. That assumption builds in an understatement of the likely real exchange rate effects of a current account reversal.

3. To the naked eye, incidentally, this number does not look grossly out of line with the association displayed in Figure 1.

The Home consumption index depends on Home and Foreign tradables, as well as domestic nontradables. 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 Home consumption of Home-produced tradables, C_F is Home consumption of Foreign-produced tradables, and $\alpha > 1/2$. Foreign has a parallel index, but with a weight α^* ($\alpha^* > 1/2$) on consumption of its own export good. By assuming substantial Home-export consumption preference, rather than identical tradables baskets, I generate a Home consumption bias even within the category of tradable goods. This feature will, in turn, generate a transfer effect—a *ceteris paribus* rise in a country's spending improves its international terms of trade. Furthermore, a *ceteris paribus* improvement in a country's terms of trade will entail a real appreciation of its currency, because the domestic export has a preponderant weight in the domestic tradable consumer price index (CPI).[4]

The parameters θ and η are central to our analysis. Parameter θ is the (constant) elasticity of substitution between tradable and nontradable goods. Parameter η is the (constant) elasticity of substitution between domestically produced and imported tradables. The two parameters govern 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 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

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

4. Strictly speaking (as will be evident from the formulas below), the transfer effect will operate whenever $\alpha + \alpha^* > 1$. For example, a very basic symmetrical monopolistic competition model without any home bias, in which the preference weight attached to any good by any consumer in the world reflects that good's share in world output, would imply $\alpha + \alpha^* = 1$. See, for example, Krugman (1989). In that case, there is no transfer effect.

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

If we assume the law of one price for tradables, then $P_F = \epsilon P_F^*$ and $P_H^* = P_H/\epsilon$, where ϵ is the Home-currency price of Foreign currency—the nominal exchange rate (I signify 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

$$q = \frac{\epsilon P^*}{P}.$$

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. In terms of the model's notation, $P_T \neq \epsilon P_T^*$.

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

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

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

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

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

The model abstracts from the underlying determinants of domestic and foreign saving and consumption. Thus, it takes as given the tradable consumption levels C_T and C_T^*, 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. There are three key relative prices: those of exports to nontradables in each country, plus the terms of trade. And by Walras' Law, the four market-clearing conditions (two traded, two nontraded) yield three independent conditions determining the three relative prices.

How does the level of external imbalance impinge on these goods markets? Home's current account surplus CA, measured in Home currency, is

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

where F is net Home foreign assets (in Home currency units) and i the corresponding interest rate. Therefore, tradables consumption can be expressed as a function of the current account via

$$C_T = \frac{P_H Y_H + iF - CA}{P_T}.$$

For Foreign, of course, the corresponding relationship is

$$\epsilon CA^* = \epsilon P_F^* Y_F - iF - \epsilon P_T^* C_T^* = -CA.$$

By letting CA change, the impact of a *ceteris paribus* change in consumption behavior can be ascertained. More complex scenarios, for example, those involving productivity shifts, are analyzed by allowing CA to move along with some of the output endowments. Letting $CA \rightarrow 0$ yields the effect of a complete external adjustment (to a configuration with zero current accounts). Because the numerical effects are approximately linear, the exchange rate effect of partial current account adjustment can be gauged by prorating the calculated effect of complete adjustment.

A central relationship in the model is that linking real exchange rate changes to changes in terms of trade and in relative nontradables prices. It can be approximated by the expression:

$$\Delta \log q = \gamma(\alpha + \alpha^* - 1)\Delta \log \tau + (1 - \gamma)\Delta \log (\epsilon P_N^*/P_N).$$

Home's percent relative real depreciation depends on the difference between the Foreign and Home rate of tradables price inflation (with weight γ) and the difference between the Foreign and Home rate of nontradables price inflation (with weight $1 - \gamma$), both measured in the same currency. In turn, because of the asymmetry in international preferences over tradables, which is equal numerically to $\alpha + \alpha^* - 1$ (and therefore is zero in the uniform-preferences case of $\alpha = \alpha^* = 1/2$), Foreign's tradables price inflation relative to Home's is an increasing function of the percentage improvement $\Delta \log \tau$ in the Foreign terms of trade against Home.

III. Numerical Assessment of Rebalancing Global Current Accounts

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

In our calibration, we assume that, for Japan, $P_H Y_H/(P_H Y_H + P_N Y_N) \approx 0.2$; so that a surplus-to-tradables ratio of $CA/P_H Y_H = 0.035/0.2 = 0.175$ approximates the country's current external surplus. According to the Ministry of Finance, Japan's net external assets at the end of 2004 were ¥185.8 trillion, the difference between gross foreign assets of ¥433.9 trillion and gross liabilities to foreigners of ¥248.1 trillion. I therefore take initial net Japanese foreign assets (in yen), F, divided by the yen value of traded goods output, $P_H Y_H$, to be 1.85, and assume a nominal rate of return of 5 percent per year on net foreign assets.[5] I set relative output levels in Japan and the rest of the world so that the U.S. dollar value of tradables produced by Japan is around 12 percent of global dollar sales of tradables.

Regarding preference weights, I take $\gamma = 0.2$ and $\alpha = 0.8$. To reflect both the rest of the world's bias toward its own tradables and Japan's weight in world production of tradables, I set $\alpha^* = 0.975$.[6] I investigate several possible values of substitution elasticities. Between different regions' tradables, I consider values of η equal to 2 or 3. These are high relative to the numbers suggested by econometric studies of macro data, but for reasons discussed in Obstfeld and Rogoff (2005b), these values seem more reasonable than the estimated values of 1 or below prevalent in the literature on national-level trade equations. In any case, lower elasticities would imply sharper terms of trade and real exchange rate movements. For the traded-nontraded elasticity θ, I entertain values of $\theta = 1$ or 2.

A final issue concerns the relationship between the real exchange rates that appear in the model and nominal rates. To make this translation, we must add an assumption about monetary policy. The simplest one is that central banks target CPI inflation rates in which case, under flexible prices, $\Delta \log \epsilon = \Delta \log q$.

Table 1 answers the question: what happens if a relative demand shock suddenly eliminates the current account surplus of Japan (which therefore drops from 3.5 percent of GDP to zero)? In this initial set of experiments, I do not allow outputs to vary, nor do I account for the potential effect of the exchange rate in revaluing Japanese external assets and liabilities.

Under the lowest-elasticity scenario in the table (the first row), the yen appreciates in real terms by 37.5 percent—more than 10 percentage points for every percentage point of GDP in current account adjustment. Higher values of θ do not affect the terms of trade change in this simulation, but they do reduce the needed extent of

Table 1 Japan's Return to External Balance, Simplest Case

θ	η	Increase in terms of trade (percent)	Real yen appreciation (percent)
1	2	24.2	37.5
2	2	24.2	26.7
1	3	14.6	28.5
2	3	14.6	18.6

5. As will become clear below, within reasonable limits, this last choice implies very little by way of numerical consequences.
6. Obstfeld and Rogoff (2005a) set the corresponding parameter to 0.925 in a two-region model in which Home is the United States.

real appreciation by reducing the equilibrating increase in the price of Japanese nontradables relative to tradables. At the same time, an increase in the international trade elasticity reduces the terms of trade improvement sharply, but has a smaller proportional effect on the extent of necessary real appreciation, which remains at nearly 30 percent in the $\theta = 1$ case. In the highest elasticity case (last row of Table 1), the terms of trade increase is 14.6 percent and the real appreciation 18.6 percent—numbers that seem somewhat too small, in light of past experiences, to be plausible.

Recent contributions by Tille (2003), Gourinchas and Rey (2006), and Lane and Milesi-Ferretti (2004) have stressed that effects of asset price changes, and especially exchange rate changes, on net international positions. The simulations reported in Table 2 take account of the composition of Japan's internationally leveraged portfolio, and allow for the revaluation effects of exchange rates as global current accounts unexpectedly return to balance. The assumption underlying the simulations is that all of Japan's external liabilities are denominated in yen, whereas (as suggested by the IMF's Coordinated Portfolio Investment Survey for 2001) 75 percent of Japan's external assets are denominated in non-yen currencies. The implication for the net position is quantitatively significant. If the yen suddenly appreciates uniformly against external currencies by, say, 10 percent, the implied wealth transfer to foreigners will be 7.5 percent of the gross foreign asset stock of ¥433.9 trillion, which is equal to approximately 6.5 percent of a year's Japanese GDP! This number should be kept in mind in evaluating the exchange rate changes reported below.

Table 2 shows that accounting for the revaluation of the net international position reduces the degrees of terms of trade and real currency appreciation for Japan, but leaves both quite large. This is true even in the first row, where the implied wealth transfer to foreigners—assuming no prior adjustment of interest rates in anticipation of the exchange rate change—is nearly 40 percent of initial net external assets. The reason for this somewhat limited impact on relative price change is basic: unless ratios of gross assets and liabilities to GDP are truly huge, only a large exchange rate change can result in a sizable reduction in national wealth.

The equilibrium result does, however, accord with intuition. Because yen appreciation reduces national wealth, Japanese consumption is dampened relative to foreign consumption, resulting in a smaller terms of trade gain and a smaller increase in the relative price of nontradables. As a result, the implied real appreciation is smaller, too. Qualitatively, the changes line up as in Table 1, but are somewhat muted.

One interesting aspect in the comparison of Tables 1 and 2 is that, in Table 2, the terms of trade change differs across different values of θ. Why the difference? In Table 2, a change in θ changes the degree of nominal and real appreciation, which

Table 2 Japan's Return to External Balance, with Asset Revaluation

θ	η	Increase in terms of trade (percent)	Real yen appreciation (percent)
1	2	18.8	29.6
2	2	19.7	21.8
1	3	12.2	24.0
2	3	12.7	16.2

alters net foreign wealth. Because the net foreign wealth level feeds directly into the markets for tradables—a smaller level of net foreign wealth implies that a smaller trade deficit is consistent with the current account balance—the international terms of trade are now affected. Table 2 shows that a bigger yen appreciation, and hence a bigger reduction in net foreign wealth, is accompanied by a smaller terms of trade improvement (although once again, the quantitative differences are small).

So far, I have analyzed a situation in which Japan moves from a situation of internal balance and external surplus to one of external as well as internal balance. It could be argued, however, that Japan remains in the grip of deflationary pressures, so that its position is one of external surplus and deflation. In such cases, as is well known from the textbook "four zones of economic discomfort" diagram, internal and external balance could, conceivably, be attained without any exchange rate adjustments.

Because the present model is strictly speaking one with full employment, it is difficult to address this possibility directly. Consider, though, the following indirect approach. A situation with deflationary pressure could be construed as one in which the relative price of nontradables is too high to balance supply with demand, so that a deflation in nontradables prices would occur absent other changes in the economy. In that case, an increase in Japanese spending could simply remove the downward pressure on nontradables prices, rather than actually raising them. One way of mimicking such downward pressure is to suppose that, just as the Japanese current account moves to balance, the *supply* of nontradables rises. Realistically in light of the Japanese economy's current position, this supply increase could reflect an end to the disguised unemployment in the nontradable sector, whereby currently employed but nonproductive workers actually begin to produce valuable outputs.

Table 3 (which accounts for the revaluation of the net foreign asset position) takes up this possibility. The simulations it reports assume that as the current account surplus disappears, output in the nontradable sector rises by a substantial 10 percent. Even with this large increase in nontradables output, however, a real appreciation of the yen is still implied, although its magnitude is considerably dampened. In the low elasticity case of the first row, for example, a 23.3 percent yen appreciation is still implied, as compared to 29.6 percent in the corresponding row of Table 2.

Table 3 Japan's Return to External Balance, with Expansion in Nontradable Output

θ	η	Increase in terms of trade (percent)	Real yen appreciation (percent)
1	2	19.4	23.3
2	2	19.9	19.1
1	3	12.6	17.6
2	3	12.9	13.4

IV. Caveats and Conclusions

This paper has analyzed the exchange rate and terms of trade implications of a rapid adjustment to balance of Japan's current account, presently running at a surplus of about 3.5 percent of GDP. With moderately low elasticities (albeit easily within the range of standard empirical estimates), the effect on the yen could be a real appreciation of 30 percent, even accounting for the possible effect of an unexpected appreciation in reducing Japan's substantial net foreign wealth. The analytical framework is a two-region global equilibrium model with nontraded and differentiated traded goods.

Insofar as the model used abstracts from factor mobility between and especially within countries, the model overstates the real appreciation that would occur were adjustment to be gradual and anticipated. However, the model also disallows nominal rigidities and deviations from the law of one price in international markets, for example, those associated with international firms' ability to price to market. Those features certainly lead the model to understate the impact of a sudden current account surplus reduction. To fully analyze the short-run dynamics, a more detailed model fully specifying international asset market linkages would have to be spelled out. It is in that context that financial market factors, which have been much discussed in assessing the sustainability of external imbalances, would have their greatest influence. The present form of the model shows, however, that imperfections in goods markets are sufficient to generate large swings in international relative prices even when explicit sticky price and pricing-to-market frictions are absent.

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