ESCAPING JAPAN'S LIQUIDITY TRAP: AN EMPIRICAL ASSESSMENT OF THE SVENSSON PROPOSAL

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Abstract

The Japanese economy shows few signs of escaping the liquidity trap. With no room to use conventional monetary policy instruments to stimulate activity, opinion is divided on the efficacy of unconventional approaches. This paper assesses empirically the "foolproof" strategy centered on yen depreciation proposed by Svensson (2000). It appears that yen depreciation, if credible and sustained, could have a powerful impact on activity in Japan. The effect on trading partners is ambiguous, but could well be positive given their scope to ease monetary policy in response to exchange rate appreciation against the yen. The plausibility of pursuing a sustained, credible depreciation of the yen is questionable, however, given problems of time inconsistency of policies and possible international reactions.

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I. INTRODUCTION

Japan's prolonged economic slump shows few signs of ending, with GDP contracting by some 2 percent in the first half of 2002 from the previous year. Against a background of continuing deflation and little scope for maneuver in fiscal or interest-rate policy, the issue of "unconventional" approaches to stimulating activity in Japan and escaping the liquidity trap remains relevant.[1] Yet there is little consensus on the policy actions that would be required to get out of the trap, or the precise channels through which they would operate.

One area in which there is general agreement is that a rise in inflation expectations, if credibly engineered, would represent an important element of a strategy for escaping the trap. Indeed, model-based analysis suggests that an exogenous boost to expectations would be sufficient to achieve this goal.[2] Less clear, however, is the issue of how to generate higher inflation expectations. Proposals that the Bank of Japan (BoJ) set an inflation target, for instance, have met objections from policymakers that, without the tools to achieve such a target, it would have no credibility.

Others have proposed quantitative monetary easing (e.g. Bernanke (2000)). There are differences in views, however, on the channels through which quantitative easing would have an impact when interest rates are already at or close to zero: as Svensson (2000) observes, the liquidity effect is not operative when liquidity is already costless, as it involves "pushing on a string."[3, 4] There may be other, less direct, channels — including portfolio and wealth effects

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[1] See Posen (2002) for a pessimistic assessment of Japan's prospects.

[2] See, e.g., Krugman (1998) and Meredith (1999).

[3] Regardless of the theoretical issues, however, it could be argued that if people believe that quantitative easing works, it *will* work through its effect on inflation expectations.

[4] It is important to distinguish here between situations in which the economy is expected to escape the liquidity trap at some point down the road, and those in which the trap is expected to be permanent. In the former case, increasing the current money supply and credibly committing to

(continued)

— through which quantitative easing would work, but these are difficult to evaluate in the absence of tested models of their operation.[5]

Sustained currency depreciation, in contrast, involves more direct channels of influence. In the first instance, it would stimulate net exports. Furthermore, to the extent that the initial change in the *real* exchange rate brought about by nominal depreciation is expected to be unwound over time, it would raise inflation expectations. Higher inflation would lower real interest rates, raising domestic demand in Japan. These mechanisms form the basis of Svensson's (2000) "foolproof" proposal for escaping the liquidity trap.[6] He does not, however, assess empirically the operation of the proposal, so its feasibility remains uncertain.

This paper looks in more detail at an active policy of yen depreciation as a means of escaping the liquidity trap. It considers rules of thumb for the impact on external and internal demand, and then compares these effects with the results of model simulations. Both approaches suggest that a sustained, credible yen depreciation on the order of 20 percent against the dollar would have large effects on output and inflation in Japan. Most of the impact would come through the "internal" channel in the form of higher domestic demand due to lower real interest rates. Indeed, after taking into account the effect on imports of

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keeping it at this higher level after the economy escapes the trap *will* have future liquidity effects that will raise inflation expectations and thus current activity. In the latter case, monetary expansion will have no current or future liquidity effects, thus any influence on activity would have to come through other channels.

[5] Meltzer (2000) is a proponent of the view that portfolio effects and other indirect channels are important. In terms of the empirical evidence, Nelson (2002) finds a direct effect of base money growth on activity in the U.S. and the U.K., but interprets this as reflecting a proxy for longer-term rates of interest as opposed to a direct causal channel.

[6] Svensson also envisages shifting to an inflation target at some future date when the economy has escaped the liquidity trap. This aspect of his proposal is more relevant to the medium-term orientation of monetary policy than the dynamics of escaping the trap, and is not directly addressed in this paper.

higher domestic demand, net exports would provide a smaller stimulus to growth. While small, this contribution is nevertheless crucial, as it sets off the chain of events that lifts the economy out of the liquidity trap.

One implication of this mix of effects is that any negative impact on activity in the rest of the world of yen depreciation would be relatively minor. Given that yen depreciation would also lower import prices and thus inflation in trading partners, providing scope for monetary easing, activity could even be boosted in other economies. In this sense, a weaker yen would redistribute the need for policy easing from Japan, which has no policy levers to use, toward countries that have the capacity to take offsetting monetary actions. The net impact would be to raise global aggregate demand by removing the impediment to expansion in Japan.

Of course, the realism of these channels can be questioned, especially the rise in inflation expectations in Japan. It hinges critically on the assumption that sustained yen depreciation, and its subsequent effects, are both credible and "rationally" perceived by private agents. The paper discusses some caveats in this regard. Partly these involve the likely difficulties in reaching international agreement on yen depreciation, and partly the need for a clear change in the orientation of monetary policy in Japan — including a commitment to accepting a higher inflation rate for a longer period of time than would otherwise be desired. Any lack of credibility of the yen depreciation strategy will tend to be self-fulfilling, because inflation expectations will not respond, undermining a key transmission channel.

The paper is organized as follows. The next section discusses how yen depreciation could be brought about. The third section analyzes the effects on Japan, based on both rules of thumbs and model simulations. The fourth section assesses the impact on trading partners, particularly those in the Asian region. In the fifth section, some caveats to the analysis are presented regarding the realism of the policy strategy and its effects. The last section provides concluding remarks.

II. MEANS OF BRINGING ABOUT YEN DEPRECIATION

An obvious issue in considering the exchange rate as a policy instrument is how to influence its value. Under a floating regime, the exchange rate is endogenously determined by factors such as expected returns on domestic versus foreign assets. Under a fixed regime, policy actions — typically either interest rate or reserve movements — offset market forces that would otherwise cause the exchange rate to deviate from the fixed level. With interest rates already constrained by the lower bound of zero in Japan, and uncertainties about the effectiveness of sterilized intervention, how could a sustained depreciation in the yen be engineered from its current level?

The simplest conceptual framework in which to address this issue is based on uncovered interest parity (UIP).[7] Under UIP, the expected holding-period yield on domestic assets equals that on foreign assets, adjusted for expected exchange rate movements and a possible risk premium:[8]

$$s^e_{t+1} - s_t \equiv \Delta s^e_{t+1} = i_t - i^f_t - \rho_t \ , \qquad (1)$$

where s_t is the log of the domestic currency price of foreign currency (thus an increase indicates depreciation); i_t is the nominal yield on domestic assets and i^f_t the foreign yield; ρ_t is a risk premium on domestic assets; and the ^{e} superscript indicates an expected value.

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[7] The use of UIP can be questioned on the grounds that it does not hold empirically. This failure, however, can be attributed to the endogeneity of the interest rates employed as regressors, as opposed to shortcomings as a structural relationship in a model that incorporates the relationships determining nominal interest rates (Meredith and Ma (2002)).

[8] The term "risk premium" is used for convenience — more generally, ρ reflects any portfolio effects that drive a wedge between expected yields on domestic and foreign assets.

UIP, however, does not tie down the *level* of the exchange rate, absent a model of how expectations are formed.[9, 10]

Anchoring the level of the exchange rate via equation (1) then requires making some assumption about its expected future value. Holding this value constant, depreciation could be brought about by a reduction in the short-term domestic interest rate (ignoring the potential endogeneity of the risk premium for the moment). But policy-related interest rates in Japan are already virtually zero, so this lever is not operative. Changing the spot value of the yen must then rely on influencing expectations. Any change in s^e_{t+1}, holding the yield differential and risk premium constant, would lower the spot rate by the same amount. So a credible commitment to accepting a lower future value of the yen would reduce its current value by the same amount. Policymakers would also need to commit to not changing current or future interest rates in response to a weaker yen. Specifically, a weaker exchange rate would, ceteris paribus, boost output and inflation, prompting policymakers to raise interest rates. Instead, they would need to passively accept higher output and inflation, foregoing any interest rate response. If this commitment is credible, "immaculate" exchange rate movements can be engineered by fiat — credibly *doing nothing* in response to exchange rate movements allows any resulting level of the exchange rate to be consistent with an expectational equilibrium.

How credible would such a commitment be for Japan? Higher output and inflation are generally desired – even the BoJ acknowledges that continued deflation is not desirable. This common perception makes acceptance of the consequences of yen depreciation inherently

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[9] Under rational expectations, the expected future exchange rate is tied down by other model relationships, in particular those linking it to output and prices, which in turn influence monetary policy (and vice versa).The classic reference is Dornbush (1976).

[10] Repeated substitution into equation (1) for the expected future exchange rate yields an expression where the spot rate equals the sum of all expected future yield differentials and risk premia. For this sum to be bounded, the yield differential must converge to the risk premium, requiring an unknown terminal value for the exchange rate to yield a solution for s_t .

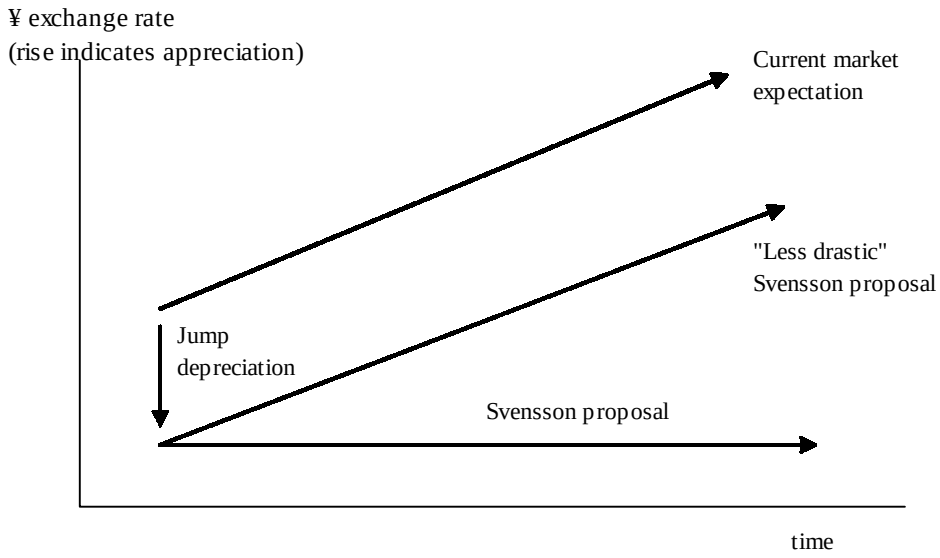
more credible. It is less clear, however, that a steady-state rate of inflation equal to that in trading partners is compatible with the BoJ's perception of its mandate of price stability. Moreover, inflation could well "overshoot" this level for a period of time if the yen were to depreciate sharply, as described below. To achieve the desired short-run response, policymakers would have to accept a medium-term outcome that is suboptimal from their perspective in order to induce the initial depreciation in the yen. This is an example of time inconsistency in policy formulation: policymakers have an incentive to renege down the road on current commitments, making the commitments themselves "incredible" absent a binding mechanism to prevent future abandonment. These issues are discussed in Eggertsson (2002), who concludes that allowing fiscal policymakers to also set monetary policy could alleviate the time-inconsistency problem. Again, this would require major institutional changes in the Japanese system. The practical problems this would raise for a yen depreciation strategy are discussed below.

In any case, the Svensson (2000) plan assumes full credibility, and represents a special case of operating on expectations in the UIP equation. In the existing market environment, with nominal short-term interest rates in Japan at roughly zero and those in major trading partners averaging about 3 percent, UIP implies expected appreciation in the yen's nominal effective value of about 3 percent per year — assuming for the moment no risk premium. In contrast, Svensson proposes committing to holding the nominal value of the yen constant at some depreciated level. The expected exchange rate change term in the UIP equation would go to zero, meaning that the nominal interest rate in Japan would rise to the world rate. This increase in Japan's nominal interest rate may appear perverse as part of a strategy for escaping the liquidity trap, which involves getting around a *lower* bound on the nominal rate. Yet it comes about as part of a package that would raise inflation expectations by an even greater amount, given the initial depreciation of the level of the exchange rate and the absence of future appreciation.

From a theoretical perspective, the commitment in the Svensson plan to keeping the exchange rate constant at a depreciated level implies an element of overkill. A less drastic alternative would be to simply prevent the exchange rate from rising by more than the

original 3 percent expectation, after the initial depreciation, as illustrated in the following figure. The nominal interest rate in Japan could then stay at zero, while activity would still be boosted by the initial depreciation in the yen and its effect on inflation expectations. Indeed, this plan could be preferable to the Svensson plan if inflation is very sticky — with the nominal interest rate jumping by some 3 percentage points on impact, the success of the Svensson plan relies on inflation expectations reacting quickly. The empirical analysis below suggests that a rapid response might be realistic if the plan is fully credible, but this cannot be taken for granted.

Alternative Paths for the Yen



There are practical advantages to the Svensson plan, however. It ensures that, along the new growth path, nominal interest rates in Japan would be bounded well above zero, minimizing the risk that further shocks could return the economy to a liquidity trap. Second, the concept of a fixed nominal exchange rate is relatively easy to explain, increasing the plan's transparency and credibility. Third, the increase in the nominal interest rate under full credibility and the absence of a risk premium allows scope for setting nominal interest rates below the level in partner countries if these conditions do not obtain.

Consider, for instance, the possibility that agents believe, contrary to the authorities' commitment, that the nominal exchange rate will rise over time at rate γ after the initial depreciation. Then the nominal interest rate under the Svensson plan could be set at $i^f - \gamma$, offsetting the expected appreciation with a lower interest rate in the first instance. As long as γ did not exceed i^f, this strategy would neutralize any expected appreciation, eliminating the yield incentive to shift assets into yen. Over time, agents would presumably become convinced of the firmness of the authorities' commitment, and γ would decline to zero.

Another scenario would be one where the risk premium on yen assets declined from its initial level. The evidence suggests there is currently a negative risk premium, with yields adjusted for expected exchange rate movements being lower on yen assets than assets in other currencies.[11] If this premium were to become even more negative, interest rates would have to be held below world levels to prevent the yen from appreciating. Anecdotal information, though, suggests that the negative risk premium on yen assets probably stems from uncertainty about economic prospects that induces Japanese residents to avoid exposure to exchange-rate risk by keeping their assets in domestic currency. In this case, to the extent that a plan to escape the liquidity trap reduced economic uncertainty, the risk premium would be more likely to rise toward zero than become more negative.

Beyond the scope to hold the nominal interest rate below the world level to prevent yen appreciation, intervention could be used to stop the exchange rate from rising if there were upward pressures at the depreciated level. In principle, there would be unlimited scope for buying foreign assets with domestic assets to keep the exchange rate depreciated

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[11] A survey by Consensus Economics (2002) in April 2002 indicated that analysts expected the nominal yen/dollar rate to remain roughly constant over the next 24 months, in spite of a significant interest differential in favor of the dollar. If these expectations were representative of market participants, a substantial negative risk premium on yen assets is implied. Assuming this premium remained constant, a level depreciation of the yen would leave interest rates in Japan at zero. The dynamics described below would be similar, except that the nominal interest rate would not be permanently raised in the new equilibrium.

(McCallum (2000) and Svensson (2000)). With both the interest rate and intervention tools in hand, it would not seem difficult to push the yen down, even if expectations did not initially respond fully to the announced policy.

The opposite scenario is one where the initial yen depreciation led to pressures for further depreciation, either because of expectations of further depreciation or a moderation in the negative risk premium on yen assets. Then, reliance on the interest rate tool would imply raising interest rates *above* the world level to offset expected future depreciation. Alternatively, intervention could be used to support the exchange rate, but there are inherent limits on the scope for intervention in this direction that could reduce its credibility.[12] A scenario where the yen undershot its desired level, however, is perhaps less problematic than that of not being able to engineer a sufficient depreciation in the first place. Presumably the effects on activity and inflation would be even larger than discussed below, reinforcing the credibility of the underlying strategy. When the economy escaped the liquidity trap, there would be room to raise interest rates to control inflation and achieve a more desirable exchange rate level.

The above analysis deals with a "pure" strategy of yen depreciation — i.e. one that relies on an exogenous change in the yen, with other policies being used only to support the new exchange rate level. Even if feasible in theory, such an approach could be problematic from an international perspective. A more acceptable policy might be to allow the yen to depreciate in the context of a broader-based strategy to reflate the Japanese economy. Quantitative monetary expansion would be an obvious candidate in this regard. Analytically, though, it is difficult to assess the effect of monetary expansion on the exchange rate under the liquidity trap. The interest rate channel is inoperative, so the impact would have to rely on

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[12] Specifically, after exhausting existing foreign currency reserves, the government would need to fund intervention by borrowing foreign currency to sell in spot markets, or equivalently taking a short position in forward markets. Eventual limits on its borrowing ability would circumscribe the scope for further intervention.

wealth and/or portfolio effects. Yet the importance of these channels is not well understood, so the amount of yen depreciation that would be associated with monetary expansion is uncertain.[13]

Finally, the authorities could wait opportunistically for market forces to depreciate the yen, and then attempt to keep it from reappreciating by intervention or other means, without explicitly announcing a policy of sustained depreciation. The problem here is that the impact of yen depreciation on expectations would likely be lost. As discussed below, the effects of an explicit and credible policy of sustained depreciation would be much larger than those observed in the past from temporary, market-driven exchange rate movements. This reflects the key role that inflationary expectations play, which in turn are heavily conditioned on the expected future behavior of the exchange rate. So the following analysis would not apply to any depreciation in the exchange rate — only those credibly perceived to be permanent.

III. EFFECTS ON JAPAN

a. Channels of influence

Exchange rate depreciation would affect activity in Japan through both external and internal channels. The external effects are straightforward – with factor prices sticky in the short run, nominal exchange rate depreciation leads to real depreciation. Export and import prices would rise relative to domestic non-traded goods prices, inducing import substitution and a resource transfer to the traded-goods sector. Real net exports would rise. Changes in export and import prices would depend on the degree of pricing to market, both of exporters and importers. Based on typical estimates, it is likely that import prices would rise by more than export prices, and thus the terms of trade would deteriorate. The terms-of-trade loss would moderate the rise in the nominal external balance. It would also lower domestic real

[13] Indeed, recent evidence points to a perverse relationship, with the yen appreciating against the dollar in the face of a significant expansion in the Japanese monetary base.

income and spending, leading to lower imports. On the other hand, income and spending would be raised by higher net exports, leaving the net effect on domestic demand ambiguous.

Internally, nominal exchange rate depreciation would raise both current inflation and inflation expectations. For the initial decline in the real exchange rate to unwind over time, with the nominal exchange rate constant at a depreciated level, domestic inflation would have to rise relative to foreign inflation. The difference would depend on the size of the depreciation and the time frame over which the real exchange rate gap was reversed. Taking as an example a 15 percent real depreciation reversed over five years, domestic inflation would need to rise by 3 percentage points relative to foreign inflation to close the gap.[14] In the case of a country that is small compared with the rest of the world, this adjustment would come about through higher domestic inflation. Domestic real interest rates would fall in line with the expected real exchange rate appreciation — in the example given above, by 3 percentage points. Lower real interest rates would boost domestic spending through intertemporal substitution and wealth effects. Higher spending would raise imports, moderating the increase in net exports caused by relative price effects. Whether the overall impact on the external balance would be positive or negative is ambiguous, depending on whether relative price effects dominate activity effects.

As for inflation, it is useful to consider the exchange rate impact in terms of a typical relationship for domestically generated inflation (π):

$$\pi_t = \alpha\pi_{t-1} + (1-\alpha)\pi^e_{t+1} + \beta(y_t - y^*_t) + \gamma(\pi^{im}_t - \pi_t) \qquad (2)$$

[14] Estimates of the speed of adjustment of real exchange rates vary. Rogoff (1996) finds a typical half-life of deviations from PPP of from 3 to 5 years. More recent estimates of nonlinear models find somewhat faster responses (Taylor and others (2001)). In any case, historical estimates reflect the combined influence of many shocks, and may well underestimate the adjustment speed in the case of an exogenous change in the nominal exchange rate. The convergence period assumed here of five years is typical of the model responses discussed below.

where π^e is expected inflation, $y - y^*$ is the output gap, and π^{im} is import price inflation.[15] Higher inflation would result, in the first instance, from higher domestic activity and imported prices. Expectations of future inflation would also increase due to the lagged impact of higher current inflation, and from expectations of a higher future output gap due to the depreciated real exchange rate.

Finally, there would be balance-sheet effects from yen depreciation. The most direct would be the revaluation of Japanese-held assets denominated in foreign currency. This would tend to raise wealth for Japan, as residents in the aggregate have a net positive position in foreign-currency assets. For the banking sector, however, there would be a secondary effect on capital adequacy ratios. Consider a bank that has an equal value of foreign-currency assets and liabilities. The bank's capital base is entirely denominated in yen, and thus is unaffected in the first instance by changes in the exchange rate. The value of foreign-currency assets (and liabilities), however, would be boosted in yen terms by exchange rate depreciation. Thus the asset side of the bank's balance sheet would be raised holding the capital base constant, reducing its capital ratio and potentially constraining credit supply.

Other balance-sheet effects would be felt through changes in bond and stock prices. Higher interest rates would lower prices of longer-term bonds, reducing their marked-to-market value. This would tend to redistribute wealth from the banking sector to the government, who is the issuer of most longer-term debt in Japan. At the same time, lower real interest rates and faster real growth would raise stock prices, leading to capital gains on the banks' equity holdings. So the effects on banks would work in opposite directions.

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[15] Imported inflation affects the domestically generated component of inflation to the extent that factor prices, particularly wages, are determined by consumption prices.

b. Back-of-the-envelope calculations

The channels described above involve interdependent effects with complex dynamics. One could analyze these interactions in a model context — an approach taken in the next section. It is useful, however, to first consider the channels individually in terms of responses based on typical parameter estimates. This can provide insight into the nature of the individual effects and the forces underlying the model results.

We consider a depreciation in the real effective value of the yen of 15 percent. As shown below, a depreciation of this magnitude is large enough to generate a significant impact on growth and inflation. To evaluate how a depreciation of this size would translate into more familiar bilateral exchange rate values, we first look at the historical relationship between the real effective value of the yen and the nominal yen/dollar rate (t-statistics in parentheses):

$$\Delta\ell n(\textit{real effective yen}) = \alpha + \beta\,\Delta\ell n(\textit{nominal yen/dollar})$$

	1-month change	12-month change
1980M1 - 2002M2	0.789 (41.2)	0.781 (36.2)
1980M1 - 1996M12	0.768 (37.7)	0.794 (31.3)
1999M1 - 2002M2	0.946 (18.0)	0.939 (19.9)

The strength of the relationship depends on the importance of movements in third currencies against the dollar, and in the response of price movements to nominal exchange rate changes. It is apparent that these factors have not dominated, as the historical link is quite close. [16] Surprisingly, there is no evidence that the relationship weakened following the

[16] These two effects can be decomposed by regressing the nominal effective rate on the bilateral rate, and the real effective rate on the nominal rate. The first regression yields coefficients of about 0.8, while the second gives coefficients of close to unity. This indicates that the "slippage" between the real effective yen rate and the nominal bilateral yen/dollar rate is almost entirely due to nominal movements in third currencies against the dollar, as opposed to price level movements.

Asian crisis, when some regional currencies abandoned soft pegs to the dollar — if anything, it appears to have strengthened. As discussed below, however, this reflects the anomalous behavior of the euro over the past few years rather than that of other Asian currencies. Taking the estimates for the sample as a whole as being more representative, a 15 percent real effective depreciation would be associated with a change in the nominal yen/dollar rate of close to 20 percent.[17]

Standard elasticity estimates can be used to calculate the trade effects of such a depreciation. "Ready reckoners" used by IMF staff in assessing exchange rates, for instance, imply that a 15 percent decline in the real value of the yen would lead to a cumulative rise in the real trade balance of about 2½ percent of GDP over 3 years.[18] The current account surplus would rise by slightly over 1 percent of GDP, while the terms of trade would deteriorate by around 1½ percent of GDP. The results are similar using the average values from a survey of Japanese trade price elasticities (Meredith (1992)), which indicate a price elasticity of real exports of close to unity, and of imports of about 0.6.[19] They are also typical of the elasticities used in other models of Japan's trade sector.[20]

To calculate the net impact on activity from the external channel, we also need to take into account induced changes in domestic spending, both from higher activity due to increased net exports and the drop in real income from the terms-of-trade loss. Assuming a marginal propensity to spend out of income of one half, domestic demand would rise by

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[17] The terminology "percent change" here and elsewhere in the paper are use to denote logarithmic changes, as most of the relationships under consideration are log-linear.

[18] See Isard and Mussa (1998) for an overview of the approach used by IMF staff.

[19] The trade price equations indicate a full pass-through of nominal exchange rate changes to import prices in the long run, while Japanese export prices are tied down by domestic prices.

[20] The Oxford Economic Model for Japan, for instance, predicts an improvement in the real trade balance of 1¾ percent of GDP over two years.

about ½ percent. The net increase in aggregate demand, then, would be about 3 percent (2½ percent from net exports, and ½ percent from domestic demand).

Regarding the domestic channel, the main effect would come from lower real interest rates. As a starting point, assume that the real depreciation is expected to be reversed over five years, so that real interest rates drop by an average of 3 percentage points over this horizon. This would imply a negative real interest rate in the range of 2 percent, compared with current real rates of about 1 percent.[21] A standard rule-of-thumb for the effect of real interest rates on domestic spending for industrial countries involves a semi-elasticity of 1:1 — i.e., a 1 percentage point drop in real interest rates raises spending by about 1 percent.[22] On this basis, Japanese domestic demand would increase by about 3 percent. With a share of imports in domestic demand for Japan of about 12 percent, and assuming a marginal propensity to import of 1½, imports would rise by about ½ percent of GDP. The net impact would be an increase in demand of about 2½ percent.

Combining the domestic and external channels, a real depreciation of 15 percent would boost the level of real GDP by about 5½ percent, with 3½ percent of the increase coming from higher domestic demand, and 2 percent from increased net exports. This change in GDP is large — indeed, it might seem implausibly large by the standards of historical experience. Two considerations must be kept in mind, however. The first is that historical exchange rate movements have not typically been driven by exogenous policy shocks, but rather by endogenous factors. This undermines their usefulness as a guide to the relationship when exchange rate changes are driven by sustained policy initiatives. The second, related, point is that the shock embodies a (credible) commitment to keeping the nominal exchange

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[21] For the short-term real rate, this level is based on a nominal rate of zero and an inflation projection for 2002 of –1 percent. The longer-term real rate is similar, based on a 10-year government bond yield of 1.3 percent and a 10-year expected inflation rate averaging 0.2 percent (Consensus Economics (2002)).

[22] See, for instance, Smets (1995). The estimates reviewed in Kumar and Sgherri (2002) are centered on a similar value, although the range is wide.

rate depreciated and accepting the inflationary consequences. It is this commitment that lowers the expected real interest rate, which in turn accounts for much of the rise in output. There is no historical precedent for a shock of this type on which to base the responses.

Effects on Japan of a 15 Percent Real Yen Depreciation
(percent of GDP)

External channel (from lower exchange rate)	
Increase in real net exports	2½
Induced rise in domestic demand	½
Domestic channel (from lower real interest rates)	
Rise in domestic demand	3
Induced fall in real net exports	-½
Net impact on real GDP	5½

The decline in real interest rates depends on an assumed return of the real exchange rate to equilibrium over five years, giving an average adjustment of 3 percent per year. To achieve this adjustment, holding the nominal exchange rate constant, would require an inflation rate 3 percentage points above that in the rest of the world. With Japanese inflation currently about 3 percentage points below that in trading partners, the implied rise in some 6 percentage points. Is this consistent with the dynamics associated with the stylized inflation equation shown above?

This question is difficult to answer on the back of an envelope because of the important role expectations play in the inflation process, which in turn depends on the expected future path of the output gap, the real exchange rate, etc. But some illustrative calculations can shed light on the issue. A typical parameter on the output gap in the inflation equation is about 0.2, so a 5 percent increase in GDP would directly raise inflation by 1 percentage point. The parameter on import prices could be in the range of 0.05, meaning that a 15 percent rise in import prices would increase inflation by ¾ percentage point on impact. If expected future inflation rose by 6 percentage points, and the parameter on future inflation was roughly ½, this would add another 3 percentage points to initial inflation. Combined, these effects imply a rise in inflation of close to 5 percentage points. This is

somewhat below the 6 percentage point increase that would be consistent with the assumed path for the real exchange rate, but the dynamics are not fully worked out in this static example. Over time, there would be additional positive effects from the lagged inflation term; on the other hand, the initial effect of higher import prices would unwind. Without looking at the full model dynamics, it is difficult to say much more than that standard parameters suggest a rise in inflation that would plausibly be consistent with the assumed real exchange rate path, and that expectations would play an important role in "leveraging" the increase in inflation.

The balance sheet effects of yen depreciation would generally be positive for Japan, given that it is a net creditor in foreign assets, which would rise in value in yen terms. Japan's overall net foreign assets are about 25 percent of GDP. Assuming they are mostly denominated in U.S. dollars, a 20 percent depreciation of the yen/dollar rate would imply a positive wealth effect of close to 5 percent of GDP. Based on typical spending responses to wealth, this would raise aggregate demand by a small amount — less than ¼ percent of GDP.

Looking more specifically at the government and banking sectors, the government has net foreign reserves of about $250 billion, or 4 percent of GDP. A depreciation of the yen of 20 percent would raise this net asset position by about 0.8 percent of GDP. This, of course, would be a drop in the bucket relative to gross public debt of about 130 percent of GDP and the fiscal deficit of 8 percent of GDP in Japan. Nevertheless, the sign of the effect would be favorable, unlike the situation faced by depreciating countries with large foreign-currency liabilities like Argentina.[23]

Data on the net foreign asset positions of the commercial banks are not readily available. The authorities have indicated that the banks maintain nearly closed foreign

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[23] An additional fiscal consideration is that higher nominal interest rates would raise debt-servicing costs and thus the deficit. Nevertheless, real interest rates would be lower, and the debt-to-GDP ratio would follow a lower trajectory given higher inflation.

currency positions, although it is not clear whether this refers to trading operations or their overall balance sheets. In any event, it seems reasonable to suppose that the impact on the value of assets relative to liabilities of yen depreciation would not be significant. At the same time, it would raise the yen value of both sides of the balance sheet relative to the capital base, which is denominated exclusively in yen. This would tend to lower capital-adequacy ratios somewhat. Again, it is not possible to quantify this effect using available information. But with the withdrawal of Japanese banks from overseas operations in recent years probably means that the foreign currency component of balance sheets has declined markedly, reducing the impact.[24]

Assessing the impact of changes in interest rates and stock prices on bank balance sheets is also difficult given data limitations. The banks are in the process of reducing their equity holdings, but these still represent a significant component of assets. Government bond holdings are also large, although there are no precise data on their market value or maturity structure. So it is difficult to arrive at any meaningful estimate of balance sheet effects in these areas.

c. Model simulations

The back-of-the-envelope calculations point to the following effects of a 15 percent real depreciation of the yen: an increase in real output of somewhat over 5 percent; an increase in the real trade balance of about 2 percent of GDP; a rise in the current account of about ½ percent of GDP; and a rise in inflation of close to 6 percentage points. Of course, these effects have been calculated without reference to the precise timing of the impact, or

[24] This stands in contrast to the situation in the early and mid-1990s, when yen movements had a significant impact on banks' balance sheets.

the interaction between the variables. A more comprehensive approach involves simulating a dynamic model.[25]

For this purpose we use three different models: the two-region model described by Meredith (2001) adapted to reflect some specific characteristics of the Japanese economy; the IMF's multi-country simulation model, MULTIMOD (Masson and others (1990) and Laxton and others (1998)); and a beta version of the IMF Research Department's new Global Economic Model, GEM (Pesenti (2002)). Under the first model, the size of the domestic economy is set at 17 percent of world output, roughly Japan's share. The intertemporal elasticity of substitution in consumption is set to a relatively low value (¼), reflecting the weak response of consumption to real interest rates in Japan.[26] The share of trade in GDP equals 12 percent. The parameters in the inflation equation are consistent with those given above. In the baseline, Japanese inflation is set 3 percentage points below the level in the rest of the world. The yen is assumed to depreciate by about 15 percent in real terms on impact, and then is held constant in nominal terms thereafter.

As shown in Figure 1, output rises by over 4 percent in the first year of the shock, increasing to over 5 percent in the second — an effect roughly the same size as implied by the rule-of-thumb calculations. The increase in output comes predominantly from higher domestic demand, with real net exports playing a minor role. Domestic demand is driven by a decline in the real interest rate of about 3½ percentage points, as inflation jumps by almost 6 percentage points versus an increase in the nominal interest rate of 3 percentage points. The nominal trade balance (not shown) deteriorates slightly in the first two years of the shock

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[25] Earlier model simulations of policies to escape the liquidity trap are presented in Hunt and Laxton (2001). Their exchange-rate based approach differs from that considered here, however, in that it reflects an exogenous shift in the risk premium on yen assets, as opposed to a fixed nominal exchange rate.

[26] The elasticity of substitution for the rest of the world was set to ½. The excess discount rate on labor income was set to 0.03 in Japan versus 0.05 for the rest of the world, implying a lower marginal propensity to consume out of wealth in Japan.

before turning slightly positive thereafter. It takes the real exchange rate about 6 years to return back to its original level, at which time inflation stabilizes at about the same level as in trading partners (i.e., 3 percentage points above baseline).

The simulation results of this model, then, are consistent with the rule-of-thumb calculations. In a sense, this is not surprising, given that the model parameters are similar to those used above. What the simulations indicate, however, is that the individual effects play out consistently in a simultaneous environment with forward-looking expectations. The speeds of adjustment and orders of magnitude of the effects generally seem plausible. The inflation response is of particular interest — here, the initial rise in inflation of over 5 percentage points results from the important role played by inflation expectations, as discussed earlier, and also the degree of inflation stickiness in the model.

Turning to MULTIMOD, it has an advantage in terms of realism in that its inflation parameters reflect the estimated properties of country-specific data.[27] The nature of the shock is somewhat different than that considered above, as the initial depreciation of the exchange rate is followed by the shift to an inflation target in the third year of the shock. This shift is consistent with the strategy outlined by Svensson (2000), and prevents an overshoot in the inflation rate that would otherwise occur in MULTIMOD with a pure exchange rate target. Under these assumptions, the initial increase in real GDP of about 4 percent is similar to that found with the first model. The relative contributions of domestic demand and net exports are also comparable, with the former providing most of the boost to activity. The main differences from the first model is that the variables converge more quickly back to equilibrium. This is due to two factors: (i) the return to an inflation target moderates the rise in inflation that would otherwise occur under a pure nominal exchange rate target; and (ii) the baseline path for Japanese inflation in MULTIMOD rises over the medium term, so that the increase in inflation implied by the shock scenario is smaller — over the long run, inflation

[27] Although there is the issue of whether the parameters might have been affected by the recent deflationary experience.

stabilizes at 1 percentage point above its baseline value versus 3 percentage points in the earlier scenario.

The third set of results are provided by a preliminary version of the Research Department's GEM. This model is based on a two-sector structure for the domestic economy with wage and price stickiness, as well as spending, determined from optimizing behavior. Real output rises on impact by about the same amount as in the other two models, while inflation builds up to over 7 percentage points above baseline by the third year. This results in a relatively rapid adjustment of the real exchange rate, which then slightly overshoots its equilibrium level. The composition of the increase in output between domestic spending and net exports is similar to those in the other models, with most of the stimulus coming from higher domestic demand.

The models, then, provide similar pictures of the response to an exogenous yen depreciation. This might be regarded as reassuring evidence of the robustness of the effects, or a reflection of the common heritage of the builders. There seems to be enough diversity in the structure and approach to parameterization of these models, though, to lend weight to the former view. Assuming some confidence in the model-based results, the main issue in terms of the overall plausibility of the results is then one of whether or not the depreciation strategy is credible — which the models themselves cannot directly address.

IV. Effects on other countries

In terms of direct effects, the rest of the world (ROW) would experience the reverse side of the improvement in Japan's real net exports. Because the ROW is much larger than Japan, however, the effect (with sign reversed) would be proportionately smaller in relation to GDP — about one sixth the size. This would amount to a fall in real net exports of less than ¼ percent of GDP based on the model simulations. At the same time, the terms of trade of the ROW improve, raising real income and wealth. Inflation would drop because of lower import prices and the induced effect on factor costs, allowing room for monetary easing. Using both the two-country model and MULTIMOD, the positive impact of higher real

incomes and lower interest rates outweighs the contractionary trade effect, leading to a mild increase in ROW output of about ¼ percent in the initial years. This effect unwinds quickly and output returns close to baseline thereafter. Under GEM, in contrast, foreign GDP declines by about ½ percent in the initial years of the shock.[28] The overall message from these simulations, then, is that yen depreciation would not have a major negative impact on trading partners. On the contrary, by providing scope for monetary easing, ROW output can rise even if the external position deteriorates.

The effects on specific countries would depend on the strength and composition of their trade linkages with Japan, as well as policy responses. Japan's trade linkages with other Asian countries are shown in Table 1 in terms of export and import shares.[29] Malaysia and Singapore have the highest overall trade shares in relation to their GDP, while Indonesia has a relatively large export exposure. China, in contrast, has one of the lowest trade exposures in relation to GDP. These gross figures conceal important details, however. Almost half of Indonesia's exports to Japan are oil-related, for instance. In the case of Malaysia and Singapore, high import and export shares probably reflect two-way trade in electronics components, exaggerating the value-added associated with this trade.

Senhadji and Ma (2002) also note that much of Asia's exports to Japan consist of raw materials or food, which are likely to be relatively price inelastic. Imports from Japan consist of capital goods and industrial materials, so yen depreciation would indirectly boost the competitiveness of these countries by lowering production costs. For these reasons, the response of the trade balances of other Asian countries to yen movements may be smaller than conventional elasticity calculations would suggest. On the other hand, the above

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[28] The GEM result, however, is obtained from a preliminary calibration of the model for a generic industrial country, and thus is illustrative only.

[29] From Senhadji and Ma (2002).

bilateral trade shares do not reflect competition in third markets, which could be particularly important for some of the NIEs.

Table 1. Trade Shares with Japan of Other Asian Countries

	Exports		Imports	
	% of total	% of GDP	% of total	% of GDP
China	16.9	3.9	16.1	3.7
Hong Kong SAR	5.9	7.0	11.3	14.1
India	4.3	0.4	4.1	0.4
Indonesia	30.2	9.4	19.6	3.5
Korea	11.9	4.5	19.8	7.0
Malaysia	13.4	13.3	19.2	16.0
Philippines	15.7	7.2	21.0	8.6
Singapore	7.7	10.7	13.9	18.3
Taiwan	10.4	4.6	24.1	9.3
Thailand	15.8	8.6	22.0	12.0
Vietnam	18.1	8.6	14.8	7.4

In terms of exchange rate movements, Asian trading partners could allow their exchange rates against the dollar to depreciate to buffer appreciation against the yen. Indeed, countries could in principle completely offset the direct trade effects of yen depreciation by holding their effective exchange rates constant. The historical response of the nominal effective exchange rate of trading partners to movements in the yen/dollar rate can be characterized by the following regression:

$$\Delta \ell n(neer) = \alpha + \beta \Delta \ell n(yen/\$) \ , \qquad (3)$$

where *neer* is the nominal effective exchange rate of the home country. If β is positive, the nominal effective rate tends to appreciate when the yen depreciates against the dollar; if negative, it depreciates. For countries with pegs to the dollar, for instance, one would expect

β to be significantly positive.[30] This regression has advantages over one using the exchange rate against the dollar as the dependent variable, as it incorporates the effects of movements in third currencies in response to yen/dollar movements. In either case, however, $\hat{\beta}$ is a summary statistic resulting from a multitude of shocks. Caution is needed in interpreting it as a policy response to exogenous yen/dollar movements.

Regression (3) was run using data for several of Japan's Asian trading partners over two time periods: January 1980 to December 1996, and January 1999 to February 2002, corresponding to pre- and post-Asian crisis experiences.[31] The regressions were estimated using both month-to-month changes and 12-month changes to assess both the immediate and longer-term responses to yen/dollar movements. The results are shown in Table 2 (absolute t-statistics in parentheses).[32]

[30] In the limiting case of no other bilateral exchange rate movements against the dollar, β would equal the share of the yen in the effective exchange rate index.

[31] The second period for the regressions using 12-month changes started in 1999M8, meaning that the base period for the first observation was 1998M9, after the Russian crisis hit and the ringgit peg was introduced.

[32] The t statistics are not adjusted for the presence of autocorrelated error terms in the case of the 12-month change regressions.

Table 2. Response of Effective Exchange Rates to Yen/Dollar Movements

	1-month changes:		12-month changes:	
	1980M1-1996M1	1999M1-2002M2	1980M1-1996M1	1999M8-2002M2
Australian dollar	0.257 (4.9)	0.190 (1.3)	0.302 (6.2)	-0.179 (2.0)
Chinese renminbi	0.423 (6.0)	0.233 (5.5)	0.714 (15.0)	0.176 (6.7)
Hong Kong dollar	0.288 (8.9)	0.218 (6.6)	0.284 (9.2)	0.216 (11.6)
Korean won	0.380 (12.4)	-0.090 (0.7)	0.311 (7.4)	-0.501 (5.9)
Malaysian ringgit	0.231 (9.4)	0.237 (4.9)	0.318 (13.7)	0.227 (9.3)
Taiwan dollar	0.332 (12.5)	0.347 (2.9)	0.226 (7.2)	-0.121 (2.8)
Memo items:				
Euro/ deutschemark	-0.113 (5.5)	0.069 (1.3)	-0.099 (4.8)	0.238 (7.4)
U.S. dollar	0.464 (20.4)	0.247 (4.3)	0.464 (15.6)	0.238 (7.7)

In the pre-crisis period, all of these Asian currencies tended to appreciate in effective terms when the yen depreciated against the dollar, as measured by both 1-month and 12-month changes. Post-crisis, the Korean, Australian, and Taiwanese currencies have tended to *depreciate*, especially at the 12-month horizon. Not surprisingly, given their pegs to the dollar, the renminbi, Hong Kong dollar, and ringgit have appreciated when the yen depreciates. While the response of the renminbi appears to have declined post-crisis, this is probably an artifact of the pre-1998 experience of a secularly strong yen/dollar rate and a weak renminbi/dollar rate, as opposed to a change in the endogenous response of the renminbi to yen/dollar movements.

On the whole, these estimates suggest a shift in the behavior of some Asian currencies, notably the won, to yen/dollar movements in the post-crisis period. These currencies have tended to follow the yen more closely than before, moderating the impact of yen/dollar movements on the yen's effective exchange rate. This would appear to contradict the earlier finding that post-crisis movements in the yen's effective exchange rate have corresponded *more* closely to yen/dollar movements. The explanation involves the behavior of the euro, proxied here by the deutschemark before 1999. The effective value of the euro tended to appreciate along with the yen before the crisis, but depreciate after the crisis. This switch could reflect a fundamentally different process driving the euro post-1999 compared with the pre-1999 deutschemark, but it more likely reflects other factors leading to secular euro weakness since its introduction that are unrelated to yen/dollar movements.

Notwithstanding the caveat that these coefficients reflect average responses to a variety of shocks, it seems reasonable to interpret them as rough guides to policy reactions in countries that pay close attention to their exchange rates. Consider the Korean case, for example: if anything, the won appears to have followed a "yen shadowing" rather than a "dollar shadowing" policy in the post-crisis period. Based on the above estimates, its effective value would *fall* by about 10 percent over 12 months in response to a 20 percent yen depreciation. The overall impact on Korean trade would be positive, reinforcing the stimulus from higher Japanese activity. In the case of Taiwan, recent behavior also points to some depreciation, albeit smaller. On past performance, the Australian dollar would also depreciate, although this is probably more attributable to market forces than an active policy stance. China and Malaysia, in contrast, would experience effective appreciations given their pegs to the dollar, as would Hong Kong SAR.

The effective appreciations of the renminbi, HK dollar, and the ringgit would be similar to that of the U.S. dollar based on the historical relationships in Table 2. A 20 percent depreciation of the yen would be associated with effective appreciations of 4-5 percent for all four currencies. As China and the U.S. have similar trade shares in GDP, the overall external shock would be similar. For Hong Kong SAR and Malaysia, it would be larger given higher

trade shares (although gross trade flows may significantly overstate value added in the traded-goods sector).

With the renminbi, ringgit, and Hong Kong dollar tied to the U.S. dollar, interest rates in those currencies would move in line with those on U.S. dollar assets, assuming no change in exchange risk premia. In the above simulations, the U.S. nominal short-term interest rate drops by slightly over ¼ percentage point on impact. Assume for simplicity that the response of domestic demand to interest rate movements is the same in the Asian economies as in the U.S. Then, the effect on overall activity in Mainland China would be similar to that in the U.S. — i.e. positive — given that their trade shares are roughly the same magnitude. Hong Kong SAR and Malaysia would be hit harder, given larger trade shares in relation to GDP. Beyond the direct effect of lower U.S. interest rates, capital controls in China and Malaysia could provide some scope for independent monetary easing to respond to the external shock.

The above analysis assumes a relatively controlled response of other currencies to yen depreciation. This, of course, stands in contrast to the 1998 experience, when the plunge in the yen to over 150 yen/dollar fuelled widespread currency speculation. The risks appear much smaller now, as discussed in Senhadji and Ma (2002). Most other Asian economies have built up large foreign exchange reserves at the same time as short-term external debt has shrunk. Current account surpluses, while somewhat narrower than immediately after the crisis, remain substantial. For countries that have abandoned soft pegs to the dollar, the threat of destabilizing speculation in the event of yen depreciation appears minimal.

This leaves the question of currency pressure on economies that retain strong links to the dollar — China, Malaysia, and Hong Kong SAR. For China, the presence of vast reserve holdings, capital controls, and large external surpluses suggests scope to pursue independent monetary easing without being concerned about the exchange rate impact. Malaysia would be harder hit on the trade side, but against the background of a real effective exchange rate that is some 20% weaker than its pre-crisis level. From an initial situation of substantially improved competitiveness, less volatile foreign debt, and without the prospect of uncontrolled depreciations in trading partners, any external pressures would likely be limited.

In Hong Kong SAR, exchange market pressures have been very slight since the 1997-98 crisis, against the background of a significant improvement in competitiveness and the external balance. With the sound fundamentals of the renminbi reducing any likelihood of spillovers on the Hong Kong dollar, there would seem to be no obvious trigger for substantial market volatility.

V. CAVEATS

The positive effects on both Japan and trading partners of yen depreciation hinge critically on the assumption that the depreciation is credible and sustained. They also depend on its effects being "rationally" expected, i.e. consistent with the future values predicted by the model. Both of these features are central to the rise in inflation expectations that lowers the real interest rate and boosts domestic demand, which is the main channel of growth unleashed by yen depreciation. Both, however, are questionable on practical grounds.

One issue is the perception of institutions outside of Japan of the yen depreciation policy. If trading partners are not convinced that this is a positive-sum strategy that will ultimately benefit them, there is likely to be considerable resistance.[33] And if international acceptance of the approach is questioned, private agents may reasonably doubt its sustainability — a doubt that will be largely self-fulfilling, as inflation expectations will not rise. The effect on Japanese domestic demand then will not materialize, leaving only the direct trade impact. This would still be positive for Japan, but negative for trading partners, tending to validate any initial skepticism about positive spillovers from yen depreciation.

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[33] Treasury Secretary O'Neill was recently quoted as saying, for instance: " . . . nowhere have I seen any indication from the (Japanese) Prime Minister's remarks that he believes that tampering with foreign exchange rates is a realistic element of a reform agenda. I agree with him." (Senhadji and Ma (2002)).

Endorsement by the IMF of yen depreciation would probably be an important aspect of the process of international acceptance. Yet the strategy would, at first glance, conflict with the principles of exchange rate surveillance, which state that Fund members **"**shall avoid manipulating exchange rates …to prevent effective payments adjustment or to gain an unfair competitive advantage…." Of course, the precise interpretation of this language could be flexible, and the principles also state that the appraisal "shall be made within the framework of a comprehensive analysis of the general economic situation and economic policy strategy of the member…." Based on purely external considerations, Japan's existing large trade surplus and large and rising foreign exchange reserves would weaken the formal case for yen depreciation. Looking at the overall economic situation and lack of policy options, however, if a robust consensus existed among IMF members it seems possible that a yen depreciation strategy could be judged consistent with the surveillance principles. At the same time, it would appear quite feasible for individual members to challenge the Fund's endorsement on technical grounds.

A second objection could be that the plan involves time inconsistency in monetary policy. Policymakers would want to renege on the commitment to keeping the nominal exchange rate depreciated as soon as the economy escapes the liquidity trap, as at that point there would be no need to live with the inflation "overshoot" needed to escape the trap in the first place. To make the plan credible, policymakers would have to be perceived to be fully committed to sustaining a weak yen and (relatively) high inflation over a number of years. This, in turn, could potentially conflict with the independent status of the BoJ and its associated mandate of price stability. Markets would also have to be convinced of the willingness of the authorities to intervene in potentially very large amounts to keep the yen at an appropriate level, which runs in the face of their traditional aversion to incurring balance sheet risk.

A third issue is the effect that yen depreciation would have on expectations. The model-based results assume that agents correctly perceive the nature of the shock and anticipate the results based on an economic view similar to that reflected in the models. This imposes high information requirements that are unlikely to be met in practice. Bounded

rationality suggests, instead, that agents use simple rules in the first instance to form their expectations, adapting them over time to conform with observed developments.[34] Furthermore, these expectations could actually be more accurate than their fully rational counterparts if other participants share the same beliefs.[35]

A simple heuristic rule for relating exchange rate changes to future inflation, for instance, might rely on the past bivariate relationship. A regression of Japanese inflation (12-month log CPI change) on current and lagged changes in the nominal effective exchange rate from 1980 to 2001 gives:

$$\pi_t = \underset{(14.4)}{0.013} + \underset{(1.60)}{0.048}(e_t - e_{t-12}) + \underset{(1.78)}{0.051}(e_{t-12} - e_{t-24}) \qquad (4)$$

The sum of the coefficients on the exchange rate changes is about 0.1, with the exchange rate defined such that a rise indicates appreciation. This result indicates that exchange rate appreciation has been associated with *higher* inflation, and depreciation with lower inflation. The past experience is not necessarily inconsistent with the structural models used above, depending on the nature of the shocks. As the yen has not been used in the past as an exogenous policy instrument, its endogeneity complicates the interpretation of a reduced-form relationship like equation (4). Nevertheless, this regression represents the optimal linear prediction rule for someone with no additional information on the nature of the shocks driving the exchange rate or the rest of the model structure. In practice, more information would likely be available at low cost. The model responses, however, reflect an extreme case where no weight is placed on heuristic rules like (4) compared with the "full-information" alternative. Assuming the real world lies somewhere in between, the effect on inflation expectations may not be as pronounced or rapid as the model results suggest.

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[34] Gigerenzer and Selten (2001).

[35] Townsend (1983).

This is particularly true if the exchange rate movement were driven by market forces, in which case it would be even more natural for agents to expect dynamics typical of those observed in the past. This is a problem with a strategy of "opportunistically" waiting for market forces to engineer a depreciation in the yen and then passively accommodating it. While presumably more acceptable from the standpoint of international opinion, it would reinforce the impression that the forces driving the yen were typical of past shocks, undermining the effect on expectations.

VI. Concluding Remarks

The above analysis suggests that a fully credible, permanent depreciation of the nominal value of the yen could have a significant positive impact on activity and inflation in Japan. Furthermore, any negative impact on activity in the rest of the world would likely be minor, as stronger domestic demand in Japan would largely offset the impact of a weaker yen on other countries. Furthermore, trading partners would have scope to lower interest rates to buffer the impact on activity of effective appreciations of their currencies. Over time, the effect on the rest of the world would likely be positive of renewed growth in one of the world's major economies.

Whether yen depreciation is a "foolproof" means of escaping the liquidity trap, however, is questionable. The positive effects rely heavily on the impact on inflation expectations, which in turn depend on the credibility of the strategy and on how expectations are formed. Weak credibility and/or the sluggish adjustment of expectations would tend to be self-reinforcing, as the absence of an initial impact on expectations would undermine the impact on activity and thus observed inflation. A strategy of yen depreciation, then, must be critically evaluated in terms of the perceived commitment of policymakers in Japan and abroad. First, an international consensus would need to be reached on the desirability of the approach, and on mitigating any negative impact on other regional economies. Second, policymakers in Japan would need to be fully committed in terms of current and future policies, and in particular to policies that they might otherwise want to renege on at a future date. Coordination among fiscal and monetary policymakers in Japan has so far been limited

in the face of the liquidity trap, and changes would be needed to establish the appropriate environment for decisive policy actions. Third, the Japanese public would need to be educated about the policy and its implications.

An obvious alternative to yen depreciation as a stand-alone strategy is quantitative monetary expansion. Under the liquidity trap, such an approach will not have a direct effect through interest rates, but it may still operate through wealth and expectations channels. Preliminary analysis indicates that such effects can be significant, but sensitive to the expectations formation process and the credibility of the commitment to keeping money balances at a high level. In practice, the monetary base in Japan has expanded by some 35 percent since early 2001, with little apparent impact on inflation, activity, or the exchange rate. The absence of a visible effect may reflect the fact that the increase has as yet been too small, or the absence of a credible commitment to keeping the monetary base high enough for long enough.

In any case, to the extent that a credible policy of monetary expansion *does* raise inflation expectations, the effect on the real and nominal exchange rate would be similar to that of direct yen depreciation. So the difference between the two approaches may be more cosmetic than substantive, as they represent different aspects of the same broad strategy. Finally, the adoption of a positive medium-term inflation target would round out a stimulus program. Any of these policies could individually be effective in escaping the liquidity trap if they were fully credible. Given that they are mutually consistent, adopting them collectively would seem desirable to maximize the likelihood of success. In addition, the adoption of quantitative monetary expansion and an inflation target would help to rationalize associated yen depreciation from an international perspective, making it potentially more palatable as part of a broader package. With this kind of approach in mind, the above analysis indicates that yen depreciation could be an important element of a strategy to rescue Japan from the liquidity trap, if pursued as part of a credible plan to reflate the economy.

REFERENCES

Blanchard, Olivier (2000), "Bubbles, Liquidity Traps, and Monetary Policy: Comments on Jinushi et al, and on Bernanke," http://econ-www.mit.edu/faculty/blanchar/papers.htm, January.

Bernanke, Ben S. (2000), "Japanese Monetary Policy: A Case of Self-Induced Paralysis?," in *Japan's Financial Crisis and its Parallels to the U.S. Experience*, R. Mikitani and A.S. Posen eds., Institute for Internal Economics.

Callen, T. and W. McKibbin (2001), "Policies and Prospects in Japan and the Implications for the Asia-Pacific Region," IMF Working Paper WP/01/131, September.

Consensus Economics (2002), "Consensus Forecasts," May.

Dornbush, R. (1976), "Expectations and Exchange Rate Dynamics," *Journal of Political Economy*, Vol. 84, pp. 1161-76.

Eggertsson, G.B. (2002), "Committing to being Irresponsible: Deficit Spending to Escape a Liquidity Trap," unpublished manuscript, January.

Gigerenzer, G. and R. Selten eds. (2001), *Bounded Rationality: The Adaptive Toolbox*, (MIT Press).

Hunt, B. and D. Laxton (2001), "The Zero Interest Rate Floor (ZIF) and its Implications for Monetary Policy in Japan," IMF Working Paper WP/01/186, November.

Isard, Peter and Michael Mussa (1998), "A Methodology for Exchange Rate Assessment," in *Exchange Rate Assessment: Extensions of the Macroeconomic Balance Approach*, IMF Occasional Paper 167.

Krugman, P. (1998), "Japan's Trap," at http://web.mit.edu/krugman/www/japtrap.html.

Kumar, M. and S. Sgherri (2002), "Monetary Policy Transmission in the G-7," IMF Research Department manuscript, May.

Laxton, Douglas, Peter Isard, Hamid Faruquee, Eswar Prasad, and Bart Turtelboom (1998), *MULTIMOD Mark III: The Core Dynamic and Steady-State Models*, IMF Occasional Paper No. 164, (Washington: International Monetary Fund, May).

McCallum, B. (2001), "Japanese Monetary Policy Again," unpublished mimeo of the Shadow Open Market Committee, October.

Masson, Paul R., Steven Symansky, and Guy Meredith (1990), *MULTIMOD Mark II: A Revised and Extended Model*, IMF Occasional Paper No. 71, (Washington: International Monetary Fund, July).

Meltzer, Allan H. (2000), "Monetary Transmission at Low Inflation: Some Clues from Japan in the 1990s," Bank of Japan Institute for Monetary and Economic Studies Discussion Paper No. 2000-E-25, September.

Meredith, Guy (1993), "Revisiting Japan's External Adjustment Since 1985," IMF Working Paper WP/93/52, June.

Meredith, Guy (1999), "REPMOD: A Smaller Sibling for MULTIMOD," IMF Working Paper WP/99/8, January.

Nelson, Edward (2002), "Direct effects of base money on aggregate demand: theory and evidence," *Journal of Monetary Economics*, Vol. 49, pp. 687-708.

Pesenti, Paolo (2002), "The IMF Global Economy Model: Theoretical Framework," IMF Research Department memorandum, August.

Posen, Adam S. (2002), "The Looming Japanese Crisis," IIE Policy Brief No. 02-04, May.

Rogoff, K. (1996), "The Purchasing Power Parity Puzzle," *Journal of Economic Literature*, Vol. 34, pp. 647-68.

Senhadji, A. and H. Ma (2002), "The Impact of a Weak Yen on the Asian Region," APD mimeo, April.

Smets, F. (1995), "Central Bank Macroeconometric Models and the Monetary Policy Transmission Mechanism," Bank for International Settlements.

Svensson, L. (2001), "The Zero Bound in an Open Economy: A Foolproof Way of Escaping from a Liquidity Trap," Bank of Japan *Monetary and Economic Studies*, February, pp. 277-321.

Taylor, M.P., D. Peel, and L. Sarno (2001), "Nonlinear Mean-Reversion in Real Exchange Rates: Towards a Solution to the Purchasing Power Parity Puzzles," *International Economic Review*, Vol. 42, pp. 1015-42.

Townsend, R.M. (1983), "Forecasting the Forecasts of Others," *Journal of Political Economy*, Vol. 91, No. 4, pp. 546-588.

Figure 1. Model Simulations of Yen Depreciation

(Shock Minus Control)