

# Dynamics of Foreign Exchange Market Intervention: Effective Strategies in Managing the Yen/Dollar Exchange Rate

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## Abstract

Japanese foreign exchange market intervention reached a new high in 2003, with the Bank of Japan selling 20.2 trillion yen (\$177 billion USD) in exchange for dollars—an amount surpassing that of any other country at any time attempting to stem domestic currency appreciation. Despite these efforts the yen exchange rate appreciated from 118 to 107 yen per dollar. And unsterilized intervention operations provided very little stimulus to the economy—the key money supply aggregate (M2+CDs) rose only 1.7 percent despite the 16 percent jump in the monetary base.

Was this massive intervention effective in slowing the rate of yen appreciation against strong fundamentals? Or was it simply a misguided and futile attempt by policymakers—a force of habit-- and waste of taxpayers money? These are difficult questions since we are not able to directly observe the counterfactual—what would yen appreciation have been in the absence of the authorities’ massive market intervention? This identification problem is a key issue in literature on foreign exchange intervention—the technical difficulty in distinguishing between the reaction of authorities (the reaction function) to exchange market developments (in deciding to intervene), and ultimately determining what the exchange rate would have been in the absence of intervention. This is an especially key issue in Japan at present since an additional policy instrument such as foreign exchange market intervention is needed in the absence of effective monetary or fiscal instruments (Fatum and Hutchison, forthcoming).

This paper uses a new approach to construct a counterfactual to the “without intervention” scenario which provides new insights into the effectiveness of intervention on exchange rate dynamics. In particular, we use a matching methods/propensity score methodology-- usually employed in medical studies and labor economics—to measure the effectiveness of alternative operational strategies to manage the yen/dollar exchange rate (Heckman et al. 1997, 1998; Rubin et al. 1992). This methodology allows us to shed light on the questions posed above.

The basic idea is straightforward yet powerful. Each participation observation (i.e. cases in which the government intervenes in the foreign exchange market) is matched to a non-participation observation (i.e. no intervention) that has the same observed values of a vector of other characteristics that determine participation (intervention). That is, propensity scores (probability that the Bank of Japan will intervene) are calculated from an intervention reaction function that are then divided into cases where intervention was and was not observed. Each intervention observation is then “matched” to an observation where there was no intervention occurring, but *a priori* the likelihood of intervention was

identical (or very similar). Under certain standard assumptions, the difference in the observed outcome between the two matched observations is the effect of intervention. As Heckman et al. (1997) state: "...simple balancing of observables in the participant and comparison group samples goes a long way toward producing a more effective evaluation strategy" (p. 607).

This article evaluates the exchange rate effects of intervention using several matching methods designed to deal with sample selection bias. In particular, we use "nearest neighbor", "stratification" and "radius" methods to account for the "selection on observables" approach that has heretofore been largely neglected in the macroeconomics literature (Persson, 2001). This methodological approach is ideally suited to the problem at hand since it is specially designed to identify the closest possible counterfactual case to observed intervention—identifying the particular observation where the authorities decided not to intervene in the foreign exchange market despite all indications that they would have done so based on historical experience.

The second part of the paper disaggregates the overall effect of intervention on exchange rates into its specific effects on the first and subsequent days. We define an intervention event as one or more days of continuous intervention in the foreign exchange market, and then calculate (using propensity score/matching methodology) whether the effectiveness of intervention increases or dissipates over time. We are able to examine, for example, whether the first day of official intervention is the most effective in moving the exchange rate (perhaps surprising the market) while successive days in the market may have more limited effects. In this context, we are also able to investigate the effects of intervention on the last day the authorities intervene after being in the market for several days. Our methodological approach allows us to determine whether the authorities, on the last day of several successive days of intervention, leave the market because intervention operations are successful or because market conditions improve and they take the opportunity to exit on a high note.

The third part of the paper links the results on the effectiveness of intervention in the foreign exchange market to macroeconomic policy, and asks whether this policy may be an alternative instrument for the monetary authorities to pursue in the absence of other effective policy instruments such as interest rates (in a period of a zero interest rate floor) or monetary aggregates (in the presence of liquidity trap/banking crisis environment). The key question is whether large-scale intervention taken by the Japanese authorities has substantively increased the level of aggregate demand compared to what it would have been in the absence of intervention. This part of the analysis starts with our estimates of the difference between the observed exchange rate and the no-intervention counterfactual. We derive the effect on aggregate demand using our estimates of the exchange rate impact of intervention linked with conventional estimates of effect of exchange rate depreciation on real GDP. Of course, the exchange rate appreciated in 2003 and one might argue that intervention—even on a massive scale—was not successful in stimulating aggregate demand. The relevant counterfactual, we would argue and that which this study investigates, is how much weaker would have been aggregate demand and GNP in the absence of massive intervention by the authorities.

Progress of the paper to date (April 22, 2004):

- Data gathering completed
- Main matching/propensity score analysis completed
- Basic Tables (for parts 1 and 2) and methodology write-up of paper completed
- Parts 1 and 2 of analysis completed; part 3 remains to be completed

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