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# FRBSF WEEKLY LETTER

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## Interdependence: U.S. and Japanese Real Interest Rates

Over the last decade, Japan's integration into the world economy has increased substantially. Japan became the world's largest capital exporter in the 1980s with net foreign assets rising from \$11.5 billion at the end of 1980 to more than \$380 billion at the end of 1991. This period was also marked by far-reaching financial liberalization in Japan, the rapid expansion of Japanese financial institutions abroad, and the growing importance of Tokyo as a world financial center. In international trade, Japan is among the world's largest exporters and importers, topping the list in exports of many sophisticated industrial products and several categories of imported raw materials. Japan's growing economic size, importance in international trade, and the magnitude of its capital outflows also suggest that it may be having an important influence over *world* economic developments.

This *Weekly Letter* reports on research (Hutchison and Singh 1993) investigating the extent to which Japan's integration with the world economy has led to greater real interest rate interdependence. It presents evidence that U.S. and Japanese real interest rates are closely linked. It also shows that causal influence runs both ways. Not only does the U.S. have a significant impact on real interest rates in Japan, but real interest rates in the U.S. are greatly influenced by economic developments in Japan.

### The real interest rate gap

Highly integrated markets permit more efficient allocation of capital across national boundaries. But these international capital flows also link real interest rates in different countries. Since real interest rates (that is, nominal rates adjusted for expected inflation) are important determinants of national saving and investment patterns, these links make national economies more vulnerable to foreign economic developments and limit their ability to pursue independent macroeconomic policies. With highly integrated markets, for example, a rise in real interest rates in Japan would be transmitted to the U.S. via higher domestic

real interest rates, in turn dampening U.S. economic activity.

Given the large gross and net capital flows between the U.S. and Japan in recent years, one might expect little differential between each country's real interest rates. But a number of studies have found large, albeit decreasing, short-term real rate differentials between the U.S. and Japan, for both debt and equity instruments.

To understand why rates would differ between the two countries, consider that the real interest rate differential is the sum of (1) the nominal interest rate differential and (2) the price inflation differential (both adjusted for expected exchange rate change). The nominal interest rate differential reflects the degree of integration of financial markets: Perfectly integrated markets with unlimited arbitrage possibilities lead to a small or zero exchange-rate-adjusted interest differential, controlling for political and default risks. A zero differential is called uncovered interest rate parity (UIP). Increasing liberalization of financial markets in Japan has meant fewer impediments to arbitrage and consequently smaller deviations in UIP. Specific liberalization measures included lifting restrictions on nonresidents' investments in Japanese securities in February 1979 and Gensaki transactions (bond trading with repurchase agreements) in May 1979. Another important step was the enactment of the new Japanese Foreign Exchange and Foreign Trade Control Law (December 1980), which for the first time lifted all restrictions on capital flows unless explicitly prohibited. These measures allowed greater arbitrage opportunities between the domestic and foreign financial markets.

Therefore, it is more likely that the source of the real interest rate differential is in the price inflation differential, which reflects the degree of integration of goods markets. If goods markets in two countries are completely integrated, price levels and price inflation of internationally traded products measured in a common currency should

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be roughly comparable (after taking into account transactions costs, tax differences, and so on). This is called purchasing power parity (PPP). Big differences in inflation rates that are not offset by corresponding exchange rate changes (so that inflation rates expressed in a common currency also differ) generally mean big impediments to goods arbitrage, which effectively separates national product markets. Clearly, goods markets in the U.S. and Japan are not fully integrated, particularly in the short term when institutional, legal, technical, and informational barriers limit arbitrage possibilities. These impediments include import tariffs, voluntary export restraints (VER or informal quotas), transport costs, restrictive distribution systems, and so on. Thus swings in purchasing power between the U.S. and Japan in the 1980s may be responsible for the short-term real interest rate differentials despite highly integrated financial markets.

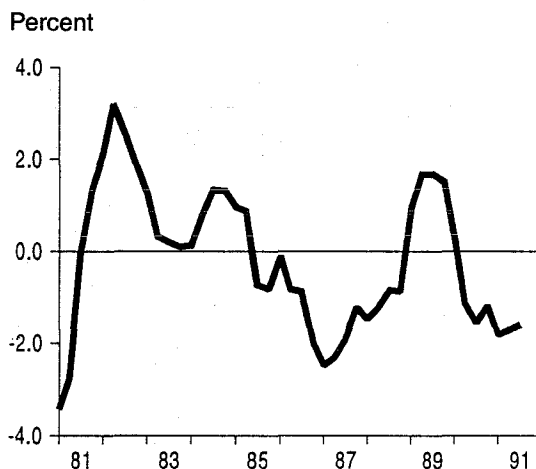
A deviation from PPP means that international goods prices are not equal across countries, which in turn may create profitable arbitrage opportunities. Taking advantage of these opportunities in goods markets takes time, but the larger the price differences, the greater is the incentive to find ways around the obstacles limiting international market integration. This is why many studies find evidence that arbitrage works to reduce PPP deviations over longer periods as the economy settles down to "equilibrium." Hence, investigating "equilibrium" real interest rate relationships between countries, where the wedge between rates associated with PPP deviations is less due to arbitrage, should lead to a better measure of the true degree of linkage between Japan and the U.S.

## Measuring real interest rate linkages

Prima facie evidence provides some support for the argument that real interest rate deviations tend to disappear over longer periods of time. Figure 1 shows the ex post real interest rate differential (four-quarter moving average) between the U.S. and Japan for the 1981:Q1–1991:Q3 period when international financial transactions were substantially liberalized. The data are quarterly and constructed from short-term (3-month) market determined interest rates (Gensaki rate in Japan; Treasury Bill rate in the U.S.) less realized inflation.

The figure suggests that the real interest rate differential between the two countries varies widely

**Figure 1**  
U.S.-Japan Real Interest Rate Differential

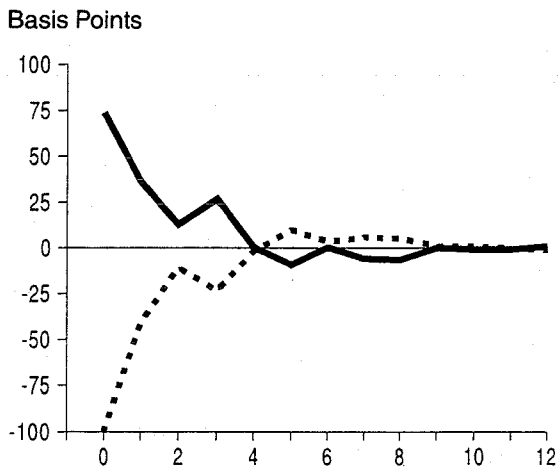


over time, but there may be arbitrage pressures bringing it back to zero. Formal statistical tests also suggest that the real interest rate differential is transitory. This means that over longer periods of time there is a tendency for real interest rates in Japan and the U.S. to move closely together. Marston (1992) also finds that real interest rate differentials in the Eurodollar and Euroyen markets (using WPI deflators) vary widely over short sample periods, but that average differentials are close to zero over long sample periods.

How long does it take for real interest rates to reach their equilibrium values? And to what extent do rates in Japan adjust compared to rates in the U.S. following an initial disturbance? To address these issues we estimate a simple dynamic model (an "error correction model") of U.S. and Japanese real interest rates which takes into account short-run adjustment dynamics as well as the tendency for real interest rate parity to hold in equilibrium over the long run. The model is estimated over 1981:Q1–1991:Q3. Simulations of the model allow us to trace out the path of the real interest rate differential response to unexpected jumps in the U.S. or Japanese rates. Figure 2 illustrates the behavior of the interest rate differential when U.S. real rates rise 100 basis points (solid line) and when Japanese real rates rise 100 basis points (dashed line). These estimates show that the real interest rate differential adjusts to the long-run equilibrium in about four to eight quarters, regardless of the source of the shock.

Since the U.S. economy is much larger than the Japanese economy, one might expect that Japan

**Figure 2**  
**Real Interest Differential Response to Rise in U.S. Rates (solid) and Japanese Rates (dashed)**



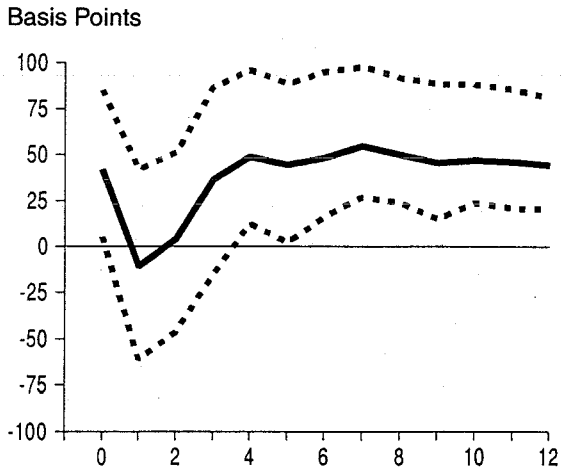
would bear the lion's share of the adjustment when a temporary gap in the interest rate differential opens up. However, additional simulations suggest that the adjustments are more symmetrical. Figure 3 shows the response of U.S. real interest rates given an unexpected 100-basis point jump in Japanese rates. The dashed lines show 90 percent statistical confidence bounds around the simulated path. The simulation indicates that U.S. real interest rates settle down after about five quarters and rise about 40 basis points following a 100-basis point shock emanating from Japan. This is about the same response of Japanese rates to shocks emanating from the U.S. (see Hutchison and Singh 1993).

### Conclusion

Our results indicate a very high degree of real interest rate linkage between the U.S. and Japan since the early 1980s, perhaps in response to the financial liberalization measures taken in Japan. Gaps in real interest rates between the two countries also appear to close quickly, and Japan seems to play an important role in the determination of rates in the U.S.

These results are surprising in that they indicate a higher degree of linkage and attribute greater economic importance to Japan than do other studies. Could they be overstated? Perhaps. The period over which markets have been liberalized in Japan is fairly short, which limits the power of statistical tests attempting to measure equilibrium real interest rate differentials. It is also difficult to

**Figure 3**  
**Response of U.S. Real Interest Rates to 100 Basis Point Rise in Japanese Rates**



separate "causal" relationships in real rate movements, which are related to economic importance and interdependence, from simply "linkage" relationships, which are related to arbitrage and economic integration.

In most respects, however, it is not surprising that economic developments in Japan play an important role in the determination of U.S. and world real interest rates. Japan's importance in other areas, such as international business practices, technology development, and international trade, is beyond dispute. The findings here are fully consistent with these other signs of Japan's growing economic importance, as well as interdependence, in the world economy.

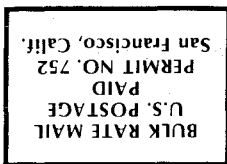
**Michael M. Hutchison**  
 Associate Professor  
 University of California, Santa Cruz  
 and Visiting Scholar, FRBSF

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P.O. Box 7702  
San Francisco, CA 94120

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