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THE SYNDROME OF THE EVER-HIGHER YEN, 1971-95: AMERICAN MERCANTILE PRESSURE ON JAPANESE MONETARY POLICY

by

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ABSTRACT

From August 1971 through to April 1995, the yen ratcheted up against the dollar because of mercantile pressure from the United States, which was anxious to dampen its eroding market shares in manufacturing and burgeoning trade deficits. While temporarily ameliorating political tensions arising out of innumerable Japan-U.S. trade disputes, these great yen appreciations imposed relative deflation on Japan without correcting the trade imbalance between the two countries.

Although resisting sharp yen appreciations in the short run, the Bank of Japan validated this syndrome of the ever-higher yen by following a dependent monetary policy that was deflationary relative to that independently established by the U.S. Federal Reserve System. The appreciating yen was a forcing variable in determining the Japanese price level. After 1985, this resulted in great macroeconomic instability in Japan including endaka fukyo (high-yen-induced recessions) in 1986-87 and more severely in 1992-95. These recessions further curtailed Japan's imports, thus widening her trade surplus, and so further aggravated American mercantilists.

This unfortunate cycle was (temporarily?) suspended in the summer of 1995 only after authorities in the U.S. Treasury finally recognized that the Japanese macro-financial system was on the verge of collapse. In addition to suspending trade hostilities, the American and Japanese governments collaborated to drive the yen back down by almost 50 percent from its April peak. This permitted the modest recovery of the Japanese economy in 1996-97. But whether the syndrome of the ever-higher yen is over, or is simply in remission, remains to be seen.

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As defined by Webster's Tenth New Collegiate Dictionary, a syndrome is
1: a group of signs and symptoms that occur together and characterize a particular abnormality; and, 2: a set of concurrent things (as emotions or actions) that usually form an identifiable pattern.

From 1971 when the yen/dollar rate was 360 through April 1995 when the rate briefly touched 80 (figure 1), the interactions of the American and Japanese governments in their conduct of commercial, exchange-rate, and monetary policies resulted in what we call "the syndrome of the ever-higher yen". Our model of this syndrome is unusual because it links "real" considerations, i.e., commercial policies including threats of a trade war, with the monetary determination of the yen/dollar exchange rate and price levels in the two countries.

We hypothesize that the yen continually appreciated against the U.S. dollar because the Japanese and American governments were caught in a mutual policy trap. Since the late 1960s, the United States faced continual erosion of its worldwide market share in manufactures--often to Japanese competitors--in one market after another. This erosion was exacerbated by a fall in the American savings rate that led to large current-account deficits in the early 1980s and subsequently. Although high-saving Japan began to run correspondingly large current-account surpluses, it still used "invisible" regulatory restraints to protect some of its more backward sectors in industry, agriculture, and services. This appearance of unfair trading by Japan infuriated American businessmen.
and government officials and led to numerous trade disputes. Repeated American threats of a trade war caused the yen to ratchet up in 1971-73, 1977-78, 1985-87, and 1993 to mid-1995 (figure 1). While ameliorating commercial tensions by temporarily making Japanese industry less competitive, these great appreciations imposed relative deflation on Japan without correcting the trade imbalance between the two countries.

Why, asymmetrically, should continual yen appreciation against the dollar be a forcing variable in determining the Japanese price level but not the American one? Because of the United States' large size and history as the center country in the world payments system, the U.S. Federal Reserve System (Fed) independently determines American monetary policy--sometimes with high price inflation as in the 1970s, but also with greater price stability after the early 1980s (figure 2).

In contrast, Japanese monetary policy has not been independently determined. When American mercantile pressure--arising out of continual trade disputes--drove the yen up episodically, the Bank of Japan (BoJ) was reluctant to enter the foreign exchange market, or adjust domestic monetary policy, strongly enough to drive the yen back down and thus antagonize the Americans further. Although often resisting yen appreciation in the short run, the Bank of Japan (BoJ) allowed the Japanese economy to deflate relative to the American in the longer run--and thus validated the yen's increase. In effect, the BoJ was forced to follow a dependent monetary policy that, after 1985, led to absolute deflation and to serious macroeconomic disturbances in Japan: the now famous endaka fukyos (high-yen recessions) in 1986-87 and more severely in 1992-95. Figure 2 shows the Japanese wholesale price index (WPI) rising more slowly than the American after 1975,
and then falling absolutely from 1985 through 1995—when the yen remained seriously overvalued by the purchasing power parity criterion.

These contractions in the Japanese economy then led to a fall in imports such that the Japanese trade surplus with the United States (and rest of the world) widened. Concerned with the increase in its trade deficit, the American government applied more mercantile pressure on Japan to do something about it—including pressure for further yen appreciation! And so the cycle continued—thus reinforcing the syndrome.

In effect, the U.S. government initiated mercantile actions—whose consequences it did (does) not fully understand—that promote the syndrome. Nevertheless, the Japanese government was very slow to learn how its own reactions supported or validated the yen’s continual appreciation. It tolerated relative deflation in the Japanese price level and only reluctantly liberalized its protected sectors. Thus the two countries were trapped in a mutual interaction, the "syndrome", which generated political discord and undermined economic efficiency in both.

Fortunately, in April 1995 officials in the U.S. Treasury finally realized that further deflation and exchange-rate overvaluation might cause a serious macroeconomic breakdown in Japan with a slump in investment and a major banking crisis. They relaxed commercial pressure on Japan, and the BoJ worked with the Fed to depreciate the yen and re-expand the Japanese economy from mid-1995 to mid-1997 (McKinnon and Ohno, 1997, chapter 11). The consequential dramatic fall in the yen, from 80 to the dollar in April 1995 to close to purchasing power parity at 125 to the dollar by May 1997 (Figure 3), effected an easing of Japanese monetary policy and a modest economic recovery.
Although this remarkable fall in the yen confirms our mercantile pressure theory of the yen/dollar exchange rate, we don't yet know whether this remission from the syndrome from mid 1995 to mid 1997 is temporary or permanent. Mercantile pressure from the United States to appreciate the yen, with deflationary repercussions in Japan, could well up again.

Thus this paper focuses on how the syndrome worked up to early 1995. In Part 1, we describe the origins of American mercantile concerns and episodic pressures resulting in yen appreciations after 1970. In Part II, we use more recent data from 1985 to early 1995 to design an econometric test to show how yen appreciation was a "forcing" variable for determining commodity price deflation in Japan, and how this was sometimes resisted, but not fully offset, by the Japanese monetary authorities.

The problem posed by the ever-higher yen for financial adjustment between the two countries has many facets. These include labor market and wage adjustment, trade imbalances and capital transfers, the speed of induced prices changes, asset bubbles, and the generation of business cycles in both countries. In particular, by 1978 the expectation that the yen would go ever-higher became firmly imbedded in nominal interest rates: yields on yen bonds were driven down so that they have averaged about 4 percentage points less than those on dollar bonds ever since. All of these, as well as other related issues are covered in McKinnon's and Ohno's book Dollar and Yen: Resolving Economic Conflict between Japan and the United States, MIT Press, 1997. In this paper, we focus more narrowly on the mercantile origins of the upward pressure on the yen, and its implications for relative and absolute price deflation in Japan.
I. MERCANTILE PRESSURE ON THE YEN/DOLLAR EXCHANGE RATE

When President Nixon closed the gold window in August 1971, he also imposed a tariff surcharge on imports of manufactured goods and demanded that trading partners in Europe and Japan appreciate the dollar value of their currencies. They all formally appreciated by 10 to 20 percent (the yen by 17 percent) in the famous, but temporary, Smithsonian Accord of December 1971—at which time Nixon removed the surcharge.

We hypothesize that, after 1971, the U.S. pursued a similar policy—but one increasingly narrowly focussed on Japan—of coupling protectionist threats with demands, implicit or explicit, for yen appreciation. (The major exceptions were the strong-dollar policy of the first Reagan administration from 1981 to 1984, and the Fall of the Yen after April 1995.) Figure 4 shows that the yen’s 250 percent appreciation against the dollar from 1970 to 1994 was the greatest among U.S. trading partners.

No matter how much the dollar fell (Figure 1), at least some U.S. government officials typically saw further room for yen appreciation. Since the Nixon shock in 1971, various Secretaries of the Treasury—notably Blumenthal in 1977, Baker in 1985-87, and Bentsen in 1993—have suggested that the dollar was too high against the yen and in each of these cases the dollar subsequently fell. These attempts to "talk" the dollar down were accompanied by intense trade negotiations aimed at forcing the Japanese to open or share this or that market.

But talk is cheap. Why should it force the yen up over the long term? Although the exchange rate is a forward-looking asset price, the (forward) "fundamentals" are difficult to define, let alone model by foreign-exchange traders or econometricians. Thus,
under certain circumstances, talk on exchange rates by Treasury secretaries, and the commercial disputes themselves, can affect peoples’ perceptions of future relative monetary policies in the two countries. The anxiety that Japanese investors feel for continually adding to their portfolios of dollar assets is then heightened, and actual or incipient portfolio readjustment then causes the yen/dollar rate to fall.

More precisely, we identify two concerns which have induced American governments to pressure, sometimes only implicitly, Japan to appreciate its currency:

(1) the perception, since the late 1960s, by individual business interests in the United States that Japan was an "unfair" international competitor. Let us call these microeconomic concerns commercial pressure.

(2) deteriorating U.S current-account balances, beginning in the late 1970s but burgeoning in the 1980s and 90s: the counterpart of Japan current surpluses. Conventional academic wisdom held that this called for dollar devaluation or yen appreciation. Let us call this macroeconomic concern academic pressure.

The exchange markets perceive that sudden yen appreciation reduces the competitiveness of Japanese exporters worldwide against their American counterparts in the short run, and thus will temporarily relieve commercial pressure on the exchange rate. The markets also perceive that many (academic) economists and policy makers believe that yen appreciation will reduce the American trade deficit in the future. So when it does appreciate, academic pressure will also temporarily slacken. Thus, in times of intense American concern over its trade position, market-makers find a consensus for driving the yen/dollar rate down (the yen up) to alleviate that concern.
Although commercial pressure and academic pressure on the yen/dollar rate are hardly independent of one another, let us discuss each in turn.

**Commercial Pressure**

Why should commercial tension be (have been) more intense between Japan and the United States than between other pairs of industrial countries?

Since the early 1950s, productivity and output growth in Japanese manufacturing industries was much higher than in their more-mature American counterparts. And this growth was highly uneven: more explosive in Japanese industries such as electrical machinery, automobiles, and consumer electronics than in others. The overall Japanese economy, now the world’s second largest, grew rapidly: total Japanese exports were only about one quarter of the American in 1964, but had risen to well over three quarters by 1995. Thus, whether the exchange rate was fixed or floating, or trade imbalances were present or absent, or how assiduously each country’s diplomats had sought political harmony, a serious problem of mutual economic adjustment would still exist.

But adjustment was also complicated by unfortunate trends in the political economy of each country. On the Japanese side, the government operated too long under the principle of "developmental authoritarianism", or more simply what Murukami [1992] calls "developmentalism", for promoting the industrial sector--well past the point when such action might have been needed to support recovery from wartime devastation. For the next several decades, the government targeted--although not always successfully or accurately--particular industries to be internationally competitive. To prevent the
domestic distribution of income from being unduly skewed by such favoritism, the
government then used a complex regulatory apparatus to cosset or shield many other
"disadvantaged" industries--often outside the manufacturing sector--from the rigors of
international and domestic competition (McKinnon and Ohno, forthcoming, ch. 2).

To foreigners trying to sell in Japan, this concerted regulatory power of the
various ministries, often operating through industry-wide trade associations of domestic
Japanese business firms, appeared to be a formidable barrier, and a possible shield for
collusive behavior in other international markets. Whence the proliferation of books on
Japan being an "unfair" international competitor. Upscale in this genre, Laura Tyson--
President Clinton's principal economic advisor from 1993 to 1996--published the book
After several chapters documenting extreme regulatory hurdles facing American
producers of semiconductors, cellular telephones, super computers, and other high-
technology goods trying to sell in the Japanese market--and the intense political
confrontations arising out of these disputes, Tyson concludes (page 266):

The(se) cases of U.S.-Japan trade competition .... provide compelling historical
evidence of the persistence of structural and policy impediments to the Japanese
market. Although formal protection has been phased out, primarily in response to
American gaiatsu (pressure), the peculiar features of Japanese capitalism impede
access to foreign suppliers to shape competition to the advantage of their
Japanese rivals.

Similarly, in their more extensive review of industry studies covering Japanese
manufacturing, primary products and services in their book, Reconcilable Differences?
United States-Japan Economic Conflict [1993], C. Fred Bergsten and Marcus Noland
conclude (p. 72):

In Japan there is scant evidence of significant tariffs and quotas outside of agriculture. Nevertheless, it is widely believed that the Japanese market is effectively closed to manufactured imports. The methods of import control include discriminatory networks of affiliated firms (keiretsu); administrative guidance on the part of government officials to intimidate importers; misuse of customs procedures and product standards, testing, and certification procedures to discourage imports; incomplete enforcement of patent and trademark rights; government procurement procedures that advantage domestic suppliers; and restrictions on the distribution channels for imported products, to name a few.

But airport newsstands sport plenty of downscale versions of how Japan Inc. was conspiring to undermine the American economy through collusive trading practices.

Although in the 1990s Japan has liberalized many of its more restrictive regulatory barriers to foreigners selling in the Japanese market—such as the opening of large-scale discount retailers [OECD 1995]—the idea of an overly intrusive Japanese bureaucracy persists in minds of foreign protagonists in trade disputes.

American concern with commercial pressure from its faster growing political allies goes back a long way. As early as 1956, the U.S. put pressure on Japan to impose a "voluntary" export restraint (VER) on Japanese cotton textiles entering the American economy. In 1966, a number of European countries and Japan were persuaded to impose a VER on steel exports to the United States, which spread to specialty steels in the 1970s. In 1968, US television producers filed antidumping suits against Japanese producers—and the US government imposed substantial antidumping duties on imports of Japanese televisions in 1971. In the late 1960s, severe measures to protect all manufacturing industries were introduced in the US Congress. These ultimately failed but nevertheless put pressure on the American government to "do something" to help
American manufacturing industry [Baldwin 1988].

As long as the Bretton Woods System of par values for exchange rates was firmly in place and the U.S. current account showed a surplus—as was generally the case in the 1950s and 1960s—the dollar's exchange rate was insulated from protectionist pressure. This was a great strength of the par value system [McKinnon, 1996]. However, this pressure intensified when inflation in the United States increased after 1968: U.S. wholesale prices began drifting upward relative to those in Germany and Japan. President Nixon responded by devaluing the dollar in August 1971.

But this one-time dollar depreciation did not end the protectionist pressure. In the late 1970s, the United States government introduced trigger prices on steel imports, which, when VERs expired, were (and are) associated with a variety of antidumping suits filed by American steel companies against foreign steel producers in general, and against Japanese in particular, throughout the 1980s into the 1990s. The American government increasingly focussed on Japan as it made its way up the ladder from simple to more complex industrial goods. Voluntary restraints on Japanese exports to the American market proliferated: televisions beginning in the 1970s, machine tools in the 1970s and 1980s, and automobiles in the 1980s.

The U.S. government made it increasingly easy for American firms to prove allegations of "dumping" against foreigners, particularly those with appreciating currencies. The procedures used by the U.S. Department of Commerce in evaluating "fair" foreign prices for selling in the U.S. market became increasingly arbitrary with incredible bookkeeping (discovery) costs imposed on foreign firms victimized by
antidumping suits—whether successful or not. The standards for determining material injury to American producers became ever weaker [Krueger 1995].

Before the mid 1980s, government-to-government negotiations to relax commercial pressure on the United States took the form of ad hoc "voluntary" export restraints. These were certainly outside the spirit of the GATT but were not inconsistent with any of its specific articles. Similarly, private anti-dumping suits were potentially consistent with the antidumping articles of the GATT.

By the late 1980s, however, the retreat of international communism as an organized economic and military threat to the United States made it even more difficult for the American President to suppress domestic protectionist interests, which had always been heavily represented in Congress. By 1988, aggressive unilateralism outside the rules of the GATT had become firmly institutionalized in American trade law under what is now popularly called "Super 301". In her book, American Trade Policy: A Tragedy in the Making [1995], Anne Krueger suggests (p. 64) that

The Omnibus Trade and Competitiveness Act of 1988 extended Section 301 of the Trade Act of 1974 to broaden considerably the scope of the unfair trade procedures and took it well beyond procedures that are consistent with the GATT in principle. In particular, Congress instructed the USTR (United States Trade Representative) to take an inventory of other countries' unfair trading practices ... in a report to Congress by the end of May each year... The 1988 trade act also instructed the USTR to take retaliatory action against imports from the named country (or countries) in the event that the USTR could not negotiate for the removal of the named practices.

Without requiring reciprocity by the United States, Section 301 clears the way for the USTR to demand unilaterally that other countries take action to open their national markets to American goods if the USTR believed that "structural impediments" existed
(Ito 1992. p. 376). One result was to demand specific shares in foreign markets through so-called voluntary import expansions (VIEs). The first was negotiated in 1986 in semiconductors to assure foreign producers (imagined to be mainly American) 20 percent of the Japanese market, with riders for keeping Japanese prices sufficiently high that American producers could compete more easily at home and in third markets. There have been recriminations and subsequent renegotiations into the 1990s over whether or not the Japanese were violating these riders [Itoh 1994].

Krueger notes that Super 301 was not renewed by the Bush Administration when it expired at the end of 1990. But she also notes that

By the winter of 1994, however, bilateral trading relations with Japan had deteriorated under the Clinton Administration’s pressure for "quantitative targets". In March 1994, President Clinton reinstituted Super 301 by executive decree. He insisted that the bilateral trade balance with Japan, and even the magnitude of Japanese imports of individual items, were legitimate subjects for bilateral bargaining. He threatened retaliation (presumably punitive tariffs) if Japan did not address to the satisfaction of the United States, the "unfair trading practice" of a large bilateral trade imbalance. [p. 67].

This reinstituted Super 301 was the basis for acrimonious discussions in the first four months of 1995 on opening Japanese markets to American automobiles and components when the yen ratcheted up so sharply from 100 to 80 to the dollar (figure 3).

The Great Relaxation of Commercial Pressure, 1995-96

Only in April 1995 did the American government finally realize that something had gone terribly wrong with its commercial and exchange rate policies toward Japan. At 80 to the dollar, the greatly overvalued yen (purchasing power parity was closer to 125 to
the dollar [McKinnon and Ohno, forthcoming]) threatened a collapse in the Japanese financial system, and a much deeper depression than the endaka fukyo the Japanese economy was already suffering from in 1993-95.

So what was the American response? On the commercial side, U.S. officials abandoned further significant pressure on Japan. The dispute over automobile components was settled quietly in July 1995 with no fixed numerical targets, and with Japan promising only to simplify bureaucratic restraints on importing while encouraging dealers to stock a wider range of foreign vehicles and parts. Afterwards, new potential flashpoints for invoking Super 301 against Japan were ignored for at least a year. Most importantly because of its great symbolism, the long-simmering dispute between Eastman Kodak and Fujifilm over Kodak’s alleged inability to market its film in Japan (because of Fuji’s alleged monopolization of the Japanese market) was defused by finally sending it to the WTO after the American government pointedly deciding not to invoke Super 301:

In May of last year (1995), Kodak officials were brimming with confidence when their new Chairman, Mr. George Fisher, announced that the company had filed a complaint against Japan’s Fuji with the US Trade Representative. ...

A year after the filing, the world’s two photographic giants--having spent untold millions on lawyers, lobbyists, and public relations--have fought each other to a standstill. Yesterday the US Trade Representative’s office announced not threats or sanctions in the usual US government fashion, but a decision to take Kodak’s complaints to a multilateral forum--the World Trade Organization.

Financial Times, June 14, 1996.

For Japan’s recovery in 1996-97 from the mid-1995 crisis, this relaxation of American commercial pressure was absolutely necessary. But not itself sufficient to permit the BoJ to re-expand the economy. In mid-1995, no formal commercial compact
ensured that the U.S. would tolerate a fall in the yen toward PPP over the coming year. We show (Mckinnon and Ohno 1997) that concerted joint interventions by the BoJ and the Fed in the summer of 1995 were also needed to drive the yen/dollar rate to 100 by the end of the year. This signalled the markets that the American government would not complain if the yen depreciated further. Thus the BoJ could successfully reflate, with the yen further depreciating to about 108 per dollar in the summer of 1996 and to 125 per dollar in early 1997 (figure 3), to promote Japan's modest economic recovery.

**Academic Pressure: The Trade Balance Approach to the Exchange Rate**

In addition to the political influence wielded by individual American companies, pressure to appreciate the yen from 1971 to mid 1995 was also partly conceptual or "academic". It arose out of a particular interpretation of economic theory. Most economists espouse an exchange rate doctrine based on the elasticities model of the balance of trade. They convinced American policy makers that devaluing the dollar would, in itself, reduce the U.S. trade or current account deficit--and that exchange-rate changes can be treated as a rather clean and acceptable instrument of economic policy. And because Japan has had the biggest current-account surpluses--until 1994, about the same size as the U.S. deficit (Figure 5)--the yen/dollar rate becomes the focal point of attempts by the American government to reduce the trade deficit by talking the yen up.

But when applied to mature industrial economies that are financially open and would otherwise be stable, this elasticities approach for correcting a trade imbalance is misplaced [Komiya 1994]. The persistent overall current account surplus of Japan, and
overall deficit of the United States, reflects Japan's saving surplus on the one hand, and abnormally low saving by the U.S. on the other. Exchange rates changes, arising out of perceived changes in (future) national monetary policies, cannot systematically affect these national saving-investment balances (McKinnon and Ohno 1997). Instead, as interdependence grows, changes in nominal exchange rates begin to impact the domestic economy through multiple channels, and the presumption that devaluation improves the trade balance becomes tenuous.

True, devaluation immediately makes domestic products cheaper than foreign products. This relative price effect certainly works to improve the trade balance--as the elasticities approach would have it--as long as the Marshall-Lerner elasticities condition holds. (We assume throughout that this condition is satisfied.) But in a highly open industrial economy, there are several other effects that may partially or completely offset the favorable relative price effect.

The first is the reverse absorption effect: devaluation tends to stimulate part of domestic spending--particularly investment by tradable industries--and worsens the trade balance. Conversely, appreciation dampens domestic investment, causes recession, and perpetuates a trade surplus. This latter phenomenon is popularly known as "endaka fukyo" (high yen-induced recession) in Japan. As Kawai [1994] shows, when the adverse effect of exchange movement on macro activity is present, the impact of real devaluation on the trade balance cannot be theoretically ascertained. In their empirical work, Miyagawa and Tokui [1994] estimate that a 1-percent real effective appreciation of the yen reduces domestic investment by about 0.7-0.9 percent of the total capital stock--
although there is a partial offset through a reduction of imported material prices.

Second, there is the pass-through effect. If the home currency is kept substantially undervalued (overvalued) in view of the law of one price, imported inflation (deflation) will arise through commodity arbitrage, which dilutes and eventually eliminates the initial international price gap in tradable goods. In the long run, the price advantage of domestic industries will disappear and the real exchange rate is unaffected by manipulation of the nominal exchange rate. That is, there is mean reversion toward purchasing power parity (PPP).

Third, and closely related to the pass-through effect, an engineered depreciation of the dollar against the yen is typically validated ex post, involuntarily or even imperceptibly, by the Bank of Japan tightening its long-term monetary policy relative to that of the United States. Historically, the BOJ accepts a higher yen (which is assumed, in American minds, to reduce Japan’s surplus) so as to placate U.S. Congress and trade officials. This subtle deflationary bias imposed on Japan’s monetary policy will, sooner or later, reduce absorption (i.e., domestic spending) in Japan relative to what it would have been without such monetary adjustment. This tends to keep Japan’s production above its spending, thus perpetuating its current-account surplus which the cheaper dollar was originally supposed to eliminate, and also speeds mean reversion to PPP.

Fourth, the J-curve effect is known to increase the trade gap at least temporarily, before the quantities of exports and imports have had time to respond to the change in the relative price. The adverse effect lasts all the longer if the country starts with the position of a substantial trade gap. In the very long run, Kawai [1994] suggests that the
trade balance would return to the original level so that the curve is an elongated "S" rather than "J."

Fifth, a continued overvaluation of the yen prompts an exodus of Japanese manufacturing bases to China and Southeast Asia, i.e., *the hollowing-out phenomenon*. This increases Japanese exports of capital and intermediate goods in order to build and operate new factories in these countries. Over time, the country origins of "Japanese" brand products will shift from Japan to the rest of Asia, with probably only a minor impact on the global trade balance of the United States.

But there is much opposition to this idea that the elasticities approach to the trade balance doesn't work for financially open, mature industrial economies like Japan and the United States. For example, using data since the end-1970s, Cline [1995] shows a remarkable correlation of the Japan-U.S. bilateral trade gap with the real yen/dollar rate lagged two years. Ito [1992] also finds a similar lagged correlation of 12 to 24 months. Bergsten and Noland [1993] invoke Cline's diagram to make the same point. In Figure 6, we have replicated this diagram with our own data extended to include earlier years. Following Cline, the bilateral trade balance (*T*) is defined in percent of total bilateral trade, that is,

\[
T = \frac{X - M}{X + M}
\]

(1)

where *X* is Japan's exports to the United States and *M* is Japan's imports from the United States. Here the real exchange rate is defined as the relative price of tradables between the two countries (deflated by bilateral wholesale prices).
We immediately notice that the cyclical movements of the bilateral trade balance and the real yen/dollar rate are, if the best-fitting lag structure is chosen, are highly synchronized during the floating rate years. But this two-year lag need not reflect delayed relative price effects as the elasticities approach would have it. Instead, fluctuations in national income and absorption, also associated with exchange-rate changes, could be responsible.

To illustrate this last point, consider the Japanese experience from 1993 to 1996 with income fluctuations. In 1993 to mid-1995 when the yen was high and rising and domestic prices falling, this inadvertent "tight money" situation caused the Japanese economy to slump and its current-account surplus to balloon as the demand for (net) imports fell. But with the relaxation of American commercial pressure allowing the BoJ to reflate the economy with incidental yen depreciation beginning in mid 1995 (Figure 3), Japan's current-account surplus fell dramatically in 1996 as its recovering economy sucked in imports. However, a naïve econometrician, wedded to the elasticities approach with a two-year lag, would attribute the 1996 decline in Japan's current surplus to the delayed relative price effects from yen overvaluation in 1994! For example, in explaining the sharp fall in the Japanese trade surplus in 1996,

Fred Bergsten, director of the Institute for International Economics, a private Group, says that "the main reason the Japanese trade surplus is down is because of the sharp rise of the dollar against the yen in 1993 and 1994". He adds that it takes about two years for these currency changes, which made Japanese goods more expensive in the U.S., to influence the trade figures.


From the perspective of the elasticities model based on relative-price effects that
so influences Bergsten, this correlation between Japan's overall trade surplus and the lagged yen/dollar rate is spurious. Rather than price effects, it is fluctuations in Japanese income and absorption from changes in monetary policy forced by fluctuations in the yen/dollar rate (see Part II below) that dominate fluctuations in the trade surplus. Even so, over the whole half cycle (about two years) from depression to recovery, the impact of the exchange rate on Japan's cumulative current surplus is ambiguous.

More fundamentally, Figure 6 also uncovers two further facts that are not favorable to Bergsten's and Cline's interpretation: (i) apart from cyclical movements, the long-term declining trend in the real exchange rate has no explanatory power over the rising structural surplus of Japan vis-à-vis the United States; and perhaps more importantly, (ii) in earlier years of the Bretton Woods fixed-dollar standard, movements in the trade balance occurred without any perceptible changes in the real exchange rate. Clearly, there exists a persistent upward trend in the bilateral trade balance over the last 40 years (at least to mid 1995) spanning two different international monetary regimes. All this points to the strong possibility that changes in the trade balance need not be triggered by movements in the real exchange rate. Independently of the real exchange rate, the structural trade balance can shift smoothly with changes in national-saving investment balances when capital markets are integrated (McKinnon 1996, ch. 4).

In general, exchange appreciation by a financially open economy (does) not alter its cumulative trade balance in any predictable way. Thus it is not surprising that, from 1971 to mid 1995, academic pressure to appreciate the yen against the dollar failed to "correct" the bilateral trade imbalance between the two countries. However, we suggest
that American mercantile pressure (academic and commercial pressure together) did succeed in (1) appreciating the yen after 1971, and (2) forcing relative deflation on Japan after the early 1970s. This led to serious macroeconomic instability in Japan after 1985.

II. A CAUSALITY ANALYSIS OF YEN APPRECIATION AND JAPANESE MONETARY POLICY

Suppose that price inflation in American tradable goods was given exogenously. Can we then demonstrate empirically our proposition that the yen/dollar exchange rate was indeed the forcing variable "causing" the relative price deflation in Japan?

(The alternative interpretation is that, under floating exchange rates after 1971, the Bank of Japan (BoJ) freely determined Japanese monetary policy and the Japanese price level according to domestic economic conditions. In this more traditional view, the yen/dollar rate would then adjust passively to be consistent with the independently chosen Japanese monetary policy.)

Consider first the question of causality in long-term purchasing power parity. The concept of purchasing power parity (PPP) was originally proposed by Gustav Cassel in the early 20th century. According to his formulation, the exchange rate is determined by the ratio of the "purchasing powers" of two national currencies. The purchasing power of a currency in turn is determined by the inverse of the price of a typical goods basket. Thus, the PPP exchange rate \( E^{PPP} \) is shown by the following equation:

\[
(2) \quad E^{PPP} = P/P^* 
\]

where \( P \) is the price level in the home country and \( P^* \) is the price level in the foreign
country. Suppose Japan is the home country and the United States is the foreign country, and (for example) let the price of a certain goods basket be 100,000 yen in Japan and 1,000 dollars in the United States. Then the PPP yen/dollar exchange rate for this basket is 100 (=100,000/1,000). According to the original interpretation of PPP by Cassel, an increase in the Japanese price level would proportionally depreciate the yen against the dollar, and an increase in the American price level would proportionately depreciate the dollar against the yen.

It is important to distinguish tradable goods from nontradable goods when we discuss PPP. For tradable goods, PPP holds in the long run--aside from temporary deviations and when transportation costs, tariffs, and other frictional factors are taken into account. Because industrially diversified economies, like Japan and the United States, each produce thousands of similar goods and are not specialized in a few products, persistent shifts in their overall terms of trade are unimportant. Thus, in the long run, commodity arbitrage will align their average price levels--as represented by $P$ and $P^*$--internationally. In contrast and by definition, such commodity arbitrage does not occur over nontradable goods and services. Therefore, internationally divergent movements of nontradable prices do not necessarily indicate goods-market disequilibrium. In what follows, we focus on the PPP relationship among tradable goods.

Under floating exchange rates since the early 1970s, short-term PPP seldom holds. Frequent exchange-rate bubbles and overshooting keep the actual exchange rate mostly away from the PPP level. For the yen/dollar exchange rate, the short-term violation and the long-term validity of PPP is depicted in figure 7. (See McKinnon and Ohno [1997]
for alternative methods of computing PPP rates.) During the past two decades, both the actual and PPP yen/dollar exchange rates had declining trends (figure 7) reflecting the long-term yen appreciation against the dollar and the relative fall in the Japanese price level. In the short run, however, deviations occur because the actual exchange rate changes much more rapidly than the PPP rate, whose movement depends on the more slowly-evolving national price levels.

Three hypotheses

Although many studies on the validity of long-term PPP exist, how to investigate the mechanism by which such a relationship holds between major currencies has not been fully established. Generally speaking, the causality between two endogenous variables, such as the exchange rate and the relative price, i.e., the ratio of relative price levels $P/P^*$, is mutual. The empirical observation of long-term PPP only demonstrates correlation, but does not prove causality. Understanding the dominant causality, which is unlikely to be uniliteral, requires another set of empirical inquiries.

Following Cassel, the traditional interpretation of PPP presupposes that the main causality runs from prices to the exchange rate: autonomous changes in domestic price levels induce proportional changes in the exchange rate. The assumption of such one-way causality is still widely accepted. Dornbusch [1988] defines the concept of PPP thus:

Purchasing power parity (PPP) is a theory of exchange rate determination. It asserts (in the most common form) that the exchange rate change between two currencies over any period of time is determined by the change between two countries’ relative price levels."
Also, in the empirical study of PPP in the 1970s, Frenkel [1981] estimates a traditional
PPP equation with the exchange rate as the dependent variable and the relative price as
the independent variable.

However, the exchange rate may also cause the movement of relative national
price levels. In this case, the PPP relationship becomes an equation determining
domestic prices. If the home currency accidentally appreciates, independently from the
fundamentals, the residents will find that imported goods are now cheaper--and this will
exert a downward pressure on the domestic price level. Causality is reversed from the
previous case: the exchange-rate movement is causal to the changes in the fundamentals.
For instance, empirical studies by Helkie and Hooper [1988] and Ohno [1990] treat the
exchange rate as an explanatory variable which determines domestic prices. In addition,
practically all contributions to the literature of exchange-rate pass-through treat the
exchange rate as an exogenous shock.

Because the exchange rate is an asset price dominated by expectations, it could
also anticipate future changes in the fundamental variables and move first. Then true
causality runs from Japanese monetary policy to the yen/dollar rate--although the time
sequence is reversed from the traditional Cassell case.

In sum, there are three alternative and mutually exclusive interpretations of the
fact that the nominal exchange rate and relative national price levels move in the same
direction in the long run:

Hypothesis 1: The exchange rate is an "adjusting variable" that passively
accommodates changes in the fundamentals (prices, monetary policy, etc.). In this case,
the flexibility of the exchange rate--despite short-term volatility--contributes to economic adjustment in the medium to long run. Causality runs from the fundamentals to the exchange rate.

**Hypothesis 2:** The exchange rate is a "forward-looking variable" that anticipates future autonomous changes in the fundamentals. In this case, the true causality is from the fundamentals to the exchange rate, but the movement of the exchange rate precedes the fundamentals in the observed time-series sequence.

**Hypothesis 3:** The exchange rate is a "forcing variable" that produces changes in relative national price levels, monetary policies, etc. In this case, the exchange rate is causal in the true as well as the time-series sense. These changes in the fundamentals would not occur without the initial change in the exchange rate.

Under the maintained assumption that the U.S. price level is independently determined by the Fed, Hypothesis 3 corresponds to our basic proposition that the appreciating yen caused the Japanese price level (rate of relative price deflation) and the BoJ's long-run monetary policy.

**An Economic Model of Domestic and External Shocks to the Japanese Price Level**

In this section, we first model the causal relationship between the yen/dollar rate and Japanese prices (Hypothesis 1 versus Hypotheses 2 and 3) theoretically by positing an economic structure unique to the problem at hand--unlike the popular Ganger and Sims tests or VAR methodology. We then test this economic model empirically by looking at the price behavior of Japanese manufactured goods. We ask the question:
when general inflation or deflation occurs, did domestic prices or internationally exposed prices change first? By comparing the prices of similar goods destined for home or foreign markets, we can show whether recent Japanese inflation—or, more often, deflation—is homemade or externally imposed.

The model can be construed to describe either the entire economy or individual industries. Like us, Marston [1991] also uses Japanese sectoral data to see how yen appreciations affect the relative price structure—namely, how Japanese firms set their export price relative to the same good’s domestic price. Marston defines this exchange rate-induced price discrimination as the "pricing-to-market" effect. While his and our studies share a similar dataset, Marston begins his investigation by assuming causation from the exchange rate to prices. In contrast, our aim is to test for the direction of causality itself.

All goods are assumed to be tradable, differing only in degree. All variables are in logarithms, and refer to the manufacturing sector of the Japanese economy.

Let the average (i.e., domestic sales and exports combined) price level be:

\[ P = \theta P_D + (1-\theta)P_X \]  

where \( P_D \) is the domestic sales price, \( P_X \) is the external price (export or import price, depending on whether the good is mostly exported or imported), and \( \theta \) is the share of domestic sales in total sales. Assuming for simplicity that PPP always holds for the external price, we have:

\[ P_X = E + P_X^* \]

where \( E \) is the nominal exchange rate (domestic currency/foreign currency). \( P_X^* \) is the
foreign (dollar) price which is assumed—or controlled—to be given.

We assume that the interaction of domestic aggregate demand and aggregate supply determines the domestic price as in the standard macroeconomic model. Thus, the domestic price can be written in a reduced-form,

\[ P_D = P_D(\alpha, \gamma) \]  

where \( \alpha \) and \( \gamma \) are various shift parameters of the aggregate demand and supply functions, respectively. For example, \( \alpha \) includes fiscal and monetary policies and autonomous changes in consumption and investment. \( \gamma \) includes productivity shocks, wage push, etc.

In this simplified framework, let us consider whether domestic price changes are driven mainly by domestic shocks or by exchange-rate shocks. Two cases are examined below: (i) price changes precede exchange-rate changes as per Hypothesis 1; and (ii) exchange-rate changes precede price changes as per Hypotheses 2 or 3. In distinguishing these two cases, we confine our empirical analysis to the period from 1985 to early 1995—when yen appreciation and Japanese price deflation were most severe.

Case (i): \( P \rightarrow E \)

In this case representing Hypothesis 1, an initial shift in the domestic parameter (either \( \alpha \) or \( \gamma \)) lowers the domestic price. Subsequently, the exchange rate gradually adjusts to reflect the new relative price between home and abroad: the change in \( P \) precedes the change in \( E \). This exchange-rate dynamics can be described as follows:

\[ \dot{E} = \lambda (P - E), \quad \lambda > 0 \]  

where \( (P - E) \) is the deviation from tradable PPP and \( \lambda \) is the adjustment speed. (Recall
that the foreign price is assumed to be fixed throughout.) Suppose, for instance, that monetary tightening causes absorption (total domestic spending) to contract. This will lower $P_D$ according to Eq.(5). Since $P_D$ is part of $P$ (Eq.(3)), $P$ also declines. This creates a temporary deviation from PPP ($P-E<0$), prompting $E$ to passively and gradually adjust to the new relative price between home and abroad. $P_X$ also moves in tandem with $E$, because of Eq.(4).

The entire sequence can be summarized as:

$$ (\alpha, \gamma) \rightarrow P_D \downarrow \rightarrow P \downarrow \rightarrow E \downarrow \rightarrow P_X \downarrow $$

where "$\rightarrow$" indicates an immediate effect and "$\rightarrow$" a lagged effect. Figure 8 depicts the movement of each variable after a domestic shock induced domestic price deflation.

Note that the average price level ($P$) and the internal relative price ($P_X/P_D$) move in opposite directions--i.e., they are negatively correlated.

**Case (ii): $E \rightarrow P$**

In this case representing hypothese 2 or 3, the exchange rate first appreciates independently from the current fundamentals, lowering $P_X$ according to Eq.(4). Since the reduction in $P$ is proportionally not as large as the appreciation of $E$, this creates an overvaluation of the home currency ($P-E > 0$). Assuming Japan to be the home country, the yen's overvaluation leads to *endaka fukyo* (high yen-induced recession) and the hollowing out of domestic industries, both of which reduce absorption (especially investment):

$$ \dot{A} = -\mu (P-E), \quad \mu > 0 $$

where $A$ is absorption. As $A$ declines, $P_D$ also falls due to Eq.(5)--currency overvaluation.
is part of the demand shift parameter $\alpha$.

The causal sequence can be summed up as follows:

$$E \downarrow \rightarrow P_X \downarrow \rightarrow P \downarrow \rightarrow A \downarrow \rightarrow P_D \downarrow$$

This is consistent with Hypothesis 3. Solid lines in Figure 9 describe the changes in the key variables after an exogenous exchange-rate shock. At the time of the shock, the movements of the average price level ($P$) and the internal relative price ($P_X/P_D$) are positively correlated—unlike case (i).

Alternatively, if Hypothesis 2 is true when the exchange rate appreciates, the key variables behave according to the dotted lines in Figure 9. In this case, the exchange rate changes in anticipation of the future downward jumps in $A$ and $P_D$. $P_X$ immediately declines proportionally to the appreciation but the domestic price does not change very much until the fundamentals actually change later. (However, from the initial overvaluation, absorption and $P_D$ begin to adjust downward slowly.) In this case also, the average price level and the internal relative price are positively correlated.

The Dornbusch overshooting model is perhaps the most famous of the exchange rate as a forward-looking variable. However, the assumptions of our model differ from Dornbusch’s. Most importantly, prices are sticky in his model but prices in immediately impacted markets are assumed to be flexible in ours. In other markets, however, the dynamics of our model allow for a lagged response of the exchange rate to the relative price as per eq.(6), or for a slow change in absorption due to exchange-rate overvaluation as per eq.(7). The assumption that prices in directly impacted markets can change fairly fast is not inconsistent with Japanese data. A large movement of the
yen/dollar exchange rate is passed through--albeit incompletely--to yen export or import prices rather quickly.

Data Analysis

Using our economic model, we can distinguish Hypothesis 1 from Hypotheses 2 or 3 by examining the correlation between the average price level (P) and the ratio of the export price relative to the domestic price in the same product category (P_x/P_D).

In order to remove global price drift, the Japanese "average" price level, including both domestic and export goods as per eq. (3), is deflated by the U.S. producer price index for the corresponding industry. Thus, the corrected P, now really P/P*, measures Japanese inflation relative to U.S. inflation. If P/P* and P_x/P_D are negatively correlated, Hypothesis 1 is accepted. If they are positively correlated, we accept Hypotheses 2 or 3.

The wholesale price index (WPI) for the entire manufacturing industry, as well as WPIs for seven 2-digit level industries (food, wood products, chemicals, general machinery, electrical machinery, transport machinery, and precision machinery) are examined. Selection of individual industries is dictated by the comparability of Japanese and U.S. price indices.

The domestic price data are taken from the Bank of Japan's "Domestic Wholesale Price Index." For the external price, the BoJ's "Export Price Index" is used. Because imports are greater than exports for food and wood products, we use instead the BoJ's "Import Price Index" for these industries.

To capture causality between the yen/dollar rate and Japanese prices when
deflationary pressure on Japan was greatest, i.e., after the Plaza Agreement, the sample period is 1985:Q4-1994:Q4. Observations are based on quarterly rates of price change, from the last month of the previous quarter to that of the current quarter. Figure 10 plots $P/P^*$ against $P_X/P_D$ for all these time series observations, and also displays the overall correlation coefficient between the two within each product category.

Figure 10(a) shows the plot for the whole of Japanese manufacturing industry, while Figures 10(b) through 10(h) show those for individual industries. For all industries except food and chemicals, the correlation between $P/P^*$ and $P_X/P_D$ is positive and statistically significant at the 5 percent level (the critical value is $\pm 0.35$). In particular, electrical machinery--key export industry of Japan--carries a high positive correlation coefficient of 0.813. For all of manufacturing together, this correlation is 0.449 and statistically significant.

These results confirm the existence of positive correlation between the Japanese price level and its internal relative price (with a few exceptions)--and thus are supportive of Hypotheses 2 or 3. In the decade before 1995, a large part of Japanese price instability originated in externally exposed prices, and major inflations and deflations rarely began with domestic price changes. Thus we can safely reject Hypothesis I.

**Distinguishing Hypothesis 2 from Hypothesis 3: The Monetary Reaction of the Bank of Japan**

But is the true causation from anticipated domestic prices (as determined by future fundamentals such as monetary policy) to the exchange rate under Hypothesis 2,
or from the exchange rate to future prices under Hypothesis 3? In other words, is the yen/dollar rate an "anticipatory" variable or a "forcing" one for determining macroeconomic conditions in Japan?

To answer this question, we focus on the monetary policy of the Bank of Japan as the key fundamental variable. While there are other fundamentals (fiscal policy, current-account balance, product innovation, demand shift, etc.), it is not unreasonable to single out the BoJ's monetary policy because (i) it is widely recognized that monetary policy is one of the most important determinants of the exchange rate and aggregate demand; and (ii) monetary policy is more flexibly implemented than fiscal policy; and (iii) changes the monetary stance of the BoJ can be measured--albeit imperfectly.

Monetary policy is part of $\alpha$ (the shift parameter in the aggregate demand function) represented in eq. 5 above. If the exchange rate moves in anticipation of a future change in monetary policy, the subsequent change in monetary policy must be consistent with the initial exchange-rate movement. For example, if the market expects a monetary tightening by the BoJ and therefore appreciates the yen, and assuming that expectations are on average correct, we should see an actual tightening. When the policy is later implemented, interest rates will rise and prices will fall. These reinforce and validate the initial exchange-rate appreciation.

In contrast, if the exchange rate is an exogenous shock which truly causes undesirable price variation, the subsequent monetary policy should tend to offset the exchange-rate impact on the macroeconomy. In this case, the exchange rate is the cause and monetary policy the effect.
We propose to distinguish Hypothesis 2 from 3 by observing the typical monetary policy reaction immediately after a large change in the yen/dollar exchange rate. More specifically, we will first investigate informally the policy intentions of the BoJ when it changes the official discount rate. Secondly, we will statistically estimate the monetary reaction function of the BoJ to see whether its policy tends to validate or offset the yen's preceding movement.

The existing literature (Yoshino and Yoshimura, 1995) shows that the BoJ's principal policy instrument is the manipulation of short-term interest rates, changes in the official discount rate and guidance of the call money rate, rather than high-powered money. Nor, according to Takatoshi Ito (1992, p. 132), did the BoJ aim in practice to control systematically any monetary aggregate as an intermediate target—even the "official" target of growth in M2 + CD. Our study also accepts that changes in short-term interest rates are the best representation of the BoJ's policy intentions, and examines their correlation with the exchange rate.

Figure 7 plots the actual and PPP yen/dollar exchange rates since 1975, while Figure 11 displays the divergence between these two exchange rates since October 1985. The decade 1985-1994 can be divided into three distinct periods: the first period, beginning in the spring of 1985, in which the yen appreciated sharply above PPP and continued appreciating into 1988; the second period of moderate yen depreciation from 1989 to briefly return to PPP by mid 1990; and the third period of prolonged yen appreciation from 1990 through 1994 taking the yen even further above PPP—until the joint interventions of May-August 1995 finally reversed this trend (figure 3).
Over the same decade, the BoJ’s policy toward the discount rate and the call rate was correlated with these large movements in the yen/dollar exchange rate. Between 1986 and 1995, the discount rate was changed 19 times. The call rate was also guided to trace the changes in the discount rate—as can be seen in Figure 12. The discount rate was lowered in steps from 1986 to early 1987, then kept constant at a low level until mid 1989 (it was maintained at 2.5 percent for 27 months), followed by rapid increases up to the summer of 1990. After that, a long period of discount-rate reduction ensued.

Comparing figures 11 and 12, yen appreciation and the falling discount rate roughly coincide, as do yen depreciation and the rising discount rate. Moreover, turning points in the real exchange rate precede those in short-term interest rates by a few months to a year. We conclude from these figures that, since the Plaza Agreement, the BoJ conducted interest-rate policy to offset, rather than validate, movements in the yen/dollar rate. It has attempted to slow down or reverse sharp movements in the yen, and to alleviate the deflationary impact of yen appreciation on the macroeconomy.

The BoJ’s concern over exchange-rate shocks is also documented by its official statements when the discount rate was changed—see Table 1. During the period of yen appreciation in 1986-87, the BoJ sought to counter the high yen and weak domestic business conditions. Increased interest rates in 1989-90 was designed to prevent inflation caused by the now lower yen. (This monetary tightening in the late 1980s was also intended to end the domestic asset bubble, which was the delayed consequence of the BoJ trying to dampen the yen’s appreciation in the mid 1980s and the first endaka fukyo [Ueda, 1992].) Subsequently, discount-rate reductions, which took the entire interest-rate
structure to historically low levels by 1994, were designed to stimulate a domestic
economy reeling from the bursting of the asset bubble and the second endaka fukyo.

We conclude that the BoJ regards the movement of the yen/dollar rate to be an
exogenous shock to the Japanese economy and reacts to stop its trend or to ameliorate
its more extreme effects—but without succeeding in preventing them altogether. These
results support Hypothesis 3: that yen appreciation was a forcing variable in causing price
deflation in Japan. Indeed, it is hard to believe Hypothesis 2: that the BoJ intended to
allow the WPI to fall from 1985 to 1995 (figure 2), and that the exchange rate was just
anticipating this deflationary policy.

Estimating the BoJ’s Reaction Function

But to confirm our intuition, we need a more precise statistical technique for
showing how the BoJ reacts to, and tries to offset, what it regards as exogenous shocks in
the yen/dollar rate. We shall directly estimate the policy reaction function of the BoJ to
test whether it guides short-term interest rates to offset exchange-rate movements.

The policy reaction function, estimated by Yoshino and Yoshimura (1995), shows
that the BoJ responded both to domestic business conditions and to the exchange rate.
Ueda [1992, 1995] even accuses the BoJ of over-reacting to the current-account surpluses
and yen appreciations of the early 1970s and the mid 1980s by creating too much
domestic liquidity that ignited domestic inflation and the asset bubble.

Let us estimate the BoJ’s policy reaction function with a slightly different
specification from that of Yoshino and Yoshimura’s. Let the monetary policy reaction
function be:

(8) \[ i_t = \beta_0 + \beta_1 i_{t-1} + \beta_2 \pi_{t-1} + \beta_3 y_{t-1} + \beta_4 s_{t-1} + \eta_t \]

where \( i_t \) is the call rate, \( \pi \) is the inflation rate, \( y \) is the output gap, \( s \) is the real exchange rate, and \( \eta \) is the error term. The output gap is the deviation of the index of industrial production from its log-linear trend. The real exchange rate is measured as the deviation of the actual exchange from PPP—as shown in Figure 11. An increase in \( s \) indicates yen depreciation against the dollar, and vice versa.

Monthly data are used, and all explanatory variables are lagged one month in equation 8. Alternatively, if two-month lags are taken for the explanatory variables (except the lagged call rate itself), we have:

(9) \[ i_t = \delta_0 + \delta_1 i_{t-1} + \delta_2 \pi_{t-2} + \delta_3 y_{t-2} + \delta_4 s_{t-2} + \nu_t \]

The explanatory variables are lagged because of the delays in recognition and action associated with interest-rate policy. These lags reflect the time required for the BoJ to collect the data needed to initiate an action, and are perhaps a month or two in duration. Although inflation and business statistics are officially announced after two months or so, the BoJ usually has earlier access to preliminary data. As to the real exchange rate, the nominal exchange rate is known without delay but the prices with which to deflate it also come with lags. Technically, these lags also enable us to lessen the simultaneous equation bias in the estimation of any policy reaction function.

For price data, the wholesale price index (WPI) and the consumer price index
(CPI), up to t-1 or t-2, are used as alternatives. We posit that the BoJ does not react to a temporary blip, but does react to a sustained movement in the price level. How many months constitute a "sustained" period cannot be determined a priori. Experimentation showed that monthly price variation contains too much noise, while a 12-month movement would be too long because the BoJ reacts sooner. Somewhat arbitrarily, we choose the cumulative change over either 3-month or 6-month intervals to be the "sustained" price movement to which the BOJ reacts. For example, in equation (8), \( \pi_{t-1} \) is the cumulative price change from 4 months before to 1 month before, or from 7 months before to 1 month before.

Tables 2 and 3 report the results of estimating Equations (8) and (9), respectively, by the method of ordinary least squares (OLS).

In Table 2, where the explanatory variables are lagged one month, parameters in all specifications carry the correct signs (they should all be positive) regardless of whether the WPI or CPI is used. In response to inflation, a business boom, or yen depreciation, the BoJ raises the short-term interest rate--and vice versa. Although the coefficients of the inflation indexes are statistically insignificant at the 5 percent level, the output coefficient is generally significant--except under specifications <1> and <2> where the WPI, but not the real exchange rate, is included.

The outstanding feature of Table 2 is that the real exchange rate induces a positive and significant policy reaction in all cases. The importance of the real exchange rate is also revealed in Durbin's h statistics. Without inclusion of the real exchange rate, h is significant at the 5 percent level (exceeding 1.96) and points to the possibilities of
misspecification or a missing variable. The adjusted $R^2$ also improves slightly when the real exchange rate is included.

A possible reason for the insignificance of the inflation indexes in table 2 is that the real exchange rate already provides the information needed to forecast future price movements. Thus the actual (lagged) price data become superfluous. This interpretation is consistent with Hypothesis 3, which states that exchange-rate shocks are the primary cause of (future) domestic inflation.

Table 3 extends the lags on the explanatory variables (except on the call rate itself) to two months as per equation (9). Here, all parameters also carry the correct signs--except for the output gap in specification $<2>$, which is insignificant. Inflation now seems to be more significant. However, in the BoJ's reaction function, the main story again is the importance of the yen/dollar rate's deviations from PPP. Not only is the real exchange rate highly significant when measured by its t-statistics, but the adjusted $R^2$ and Durbin's h both improve--and the effects of the output gap become more positive--when the exchange rate is included.

Like the results found by Yoshino and Yoshimura [1995] and Ueda [1992, 1995], our results for the 1985-94 period also show that the BoJ reacts systematically to the exchange rate, as well as to domestic output and inflation. In the short run, movements in the yen/dollar rate are not accommodated but instead are partially counteracted.

How then does our statistical study differ from these earlier ones? We consider these reactions of the BoJ together with our finding of positive correlation between $P$ and $P_X/P_D$. Together, these confirm the validity of our Hypothesis 3.
Conclusion

The second part of this paper presented a series of new causality tests for price movements and exchange-rate fluctuations based on Japanese monetary and price data since the Plaza Agreement. We discovered that exchange rate movements precede changes in relative national price levels, and that any initial movement of the exchange rate not only anticipates the BoJ's long-run policy but actually causes it. True, in the short run, the BoJ reacts by adjusting its call money rate to resist these exchange rate movements. But this resistance was insufficient to prevent a long-term downward trend in Japanese prices relative to those in the United States, with a parallel downward drift in the PPP value of the yen/dollar exchange rate, at least through 1995.

We showed that, on net balance, flexibility in the yen/dollar exchange rate should not be considered as an automatic stabilizer. Quite the contrary. The erratically appreciating yen has been an independent (or exogenous) source of disturbance—and imposed undue deflation on the Japanese economy in the last ten years.

The first part of the paper offered an explanation of why the yen rose in such a puzzling fashion since 1971—despite some resistance from the BoJ in the short run, particularly in the last decade. Mercantile pressure from the United States, consisting of commerical pressure from individual American companies impacted by Japanese competitors, and academic pressure to devalue the dollar (appreciate the yen) to "correct" American trade deficits, created a climate where the yen would increase episodically. Caught up in this syndrome at least up through early 1995, the Japanese authorities were too inhibited by this mercantile pressure, i.e., by threats of trade war, to
act—or be able to act—decisively to stop the yen’s appreciation. And thus Japan suffered endaka fukyo.

Only the American government’s sudden relaxation of mercantile pressure in the spring and summer of 1995, the suspension of trade hostilities combined with joint action by the Fed and BoJ to drive the yen back down that signalled the markets that the American government would now tolerate a lower value for the yen, allowed the yen to depreciate and the Japanese economy to recover somewhat in 1996. And this relaxation of commercial pressure, i.e., no new trade disputes, has continued into 1997 allowing the yen to stay closer to purchasing power parity against the dollar—with further economic recovery in Japan. But whether this remission from the syndrome of the ever-higher yen is temporary or permanent remains to be seen.
References:


Figure 1

Nominal Yen/Dollar Exchange Rate
(Semi-log scale)

Figure 2

Price Level of Tradable Goods (WPI)
(Semi-log scale, 1960:Q1=100)

Note: Each graph is taken from line 63 of IMF, International Financial Statistics, various issues. In 1985, the U.S. WPI was merged into a series on the U.S. producer price index (PPI).
Figure 3

The Yen/Dollar Exchange Rate and Japanese Foreign Exchange Reserves, 1994-97

Source: IMF International Financial Statistics
Figure 4

Nominal Appreciation against the Dollar
Cumulative percent change in 1970-94

Sources:
Figure 5

Current Account Balance
1990-94 average, in billions of dollars

U.S. | Japan | Switzerland | Taiwan | France | China | Korea | Germany | Italy | U.K. | Canada

Sources: Same as Figure 1.2.
Figure 6

Japan-U.S. Trade Balance and the Real Yen/Dollar Rate

Real exchange rate, right scale
Trade balance, left scale

In percent of total bilateral trade

1960=100, lagged 2 years

53 55 57 59 61 63 65 67 69 71 73 75 77 79 81 83 85 87 89 91 93
Note: Tradable purchasing power parity is based on the price survey of manufactured goods conducted by the Research Institute for International Price Mechanism (1993). In the fourth quarter of 1992, its estimate of the tradable PPP yen/dollar exchange rate was 150.5. This benchmark has been updated and backdated using the Japanese overall wholesale price index and the U.S. producer price index.
Figure 8

P precedes E

Figure 9

E precedes P
Figure 10

Correlation between Price Movements and Internal Relative Price

- (a) All manufacturing
  Correlation = 0.449

- (b) Food
  Correlation = -0.263

- (c) Wood products
  Correlation = 0.578

- (d) Chemicals
  Correlation = 0.270
Figure 10 (contd.)

(e) General machinery
Correlation = 0.529

(f) Electrical machinery
Correlation = 0.813

(g) Transport machinery
Correlation = 0.490

(h) Precision machinery
Correlation = 0.602

Note: On the vertical axis, Japanese price movement relative to global inflation (Japanese Overall WPI deflated by U.S. Producer Price Index) is measured. "Overall" here means the weighted average of domestic, export, and import prices. On the horizontal axis, the change in the internal relative price (the ratio of Export WPI (or Import WPI in the case of mainly imported products) to Domestic WPI) is measured. Quarterly data for 1986:Q1–1994:Q4 are used. The change is from the last quarter of the previous quarter to the last quarter of the current quarter.
Figure 11

Real Exchange Rate
(Deviation of the yen/dollar rate from tradable PPP)
Figure 12

Discount Rate and Call Rate

--- Call rate --- Discount rate
### Table 1

Changes in the Discount Rate

<table>
<thead>
<tr>
<th>Date</th>
<th>New rate</th>
<th>Reason(s) for change</th>
</tr>
</thead>
<tbody>
<tr>
<td>30/1/1986</td>
<td>4.50%</td>
<td>To stimulate domestic demand</td>
</tr>
<tr>
<td>7/3/1986</td>
<td>4%</td>
<td>To counter yen appreciation. stimulate domestic economy</td>
</tr>
<tr>
<td>19/4/1986</td>
<td>3.50%</td>
<td>To counter yen appreciation.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>participate in global monetary coordination</td>
</tr>
<tr>
<td>1/11/1986</td>
<td>3%</td>
<td>To counter yen appreciation. stimulate domestic economy</td>
</tr>
<tr>
<td>21/2/1987</td>
<td>2.50%</td>
<td>To counter yen appreciation. stimulate domestic economy</td>
</tr>
<tr>
<td>31/5/1989</td>
<td>3.25%</td>
<td>To check inflation in advance</td>
</tr>
<tr>
<td>11/10/1989</td>
<td>3.75%</td>
<td>To check inflation caused by yen depreciation in advance</td>
</tr>
<tr>
<td>25/12/1989</td>
<td>4.25%</td>
<td>To check inflation in advance</td>
</tr>
<tr>
<td>20/3/1990</td>
<td>5.25%</td>
<td>To check inflation in advance, calm financial and security markets</td>
</tr>
<tr>
<td>30/8/1990</td>
<td>6%</td>
<td>To check inflation in advance</td>
</tr>
<tr>
<td>1/7/1991</td>
<td>5.50%</td>
<td>To stimulate domestic economy</td>
</tr>
<tr>
<td>14/11/1991</td>
<td>5%</td>
<td>To prevent recession</td>
</tr>
<tr>
<td>31/12/1991</td>
<td>4.50%</td>
<td>To stimulate domestic economy</td>
</tr>
<tr>
<td>1/4/1992</td>
<td>3.75%</td>
<td>To stimulate domestic economy</td>
</tr>
<tr>
<td>27/7/1992</td>
<td>3.25%</td>
<td>To stimulate domestic economy</td>
</tr>
<tr>
<td>4/2/1993</td>
<td>2.50%</td>
<td>To stimulate domestic economy</td>
</tr>
<tr>
<td>21/9/1993</td>
<td>1.75%</td>
<td>To stimulate domestic economy</td>
</tr>
<tr>
<td>14/4/1995</td>
<td>1%</td>
<td>To stimulate domestic economy, counter yen appreciation</td>
</tr>
<tr>
<td>8/9/1995</td>
<td>0.50%</td>
<td>To stimulate domestic economy, promote yen depreciation and stock market recovery</td>
</tr>
</tbody>
</table>

Source: Japan Economic Journal, various issues.
### Table 2

**Policy Reaction Function of the Bank of Japan**

*Explanatory variables lagged one month*

**Dependent variable: call rate**

<table>
<thead>
<tr>
<th></th>
<th>Using WPI inflation</th>
<th>Using CPI inflation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$&lt;1&gt;$</td>
<td>$&lt;2&gt;$</td>
</tr>
<tr>
<td>Constant</td>
<td>0.00086</td>
<td>0.00075</td>
</tr>
<tr>
<td></td>
<td>[0.86]</td>
<td>[0.74]</td>
</tr>
<tr>
<td>Call rate (-1)</td>
<td>0.977</td>
<td>0.981</td>
</tr>
<tr>
<td></td>
<td>[42.9]</td>
<td>[41.2]</td>
</tr>
<tr>
<td>Inflation (-1)</td>
<td>0.0579</td>
<td>0.0230</td>
</tr>
<tr>
<td>3-mo. moving average</td>
<td>[1.91]</td>
<td>[0.77]</td>
</tr>
<tr>
<td>Inflation (-1)</td>
<td>0.0387</td>
<td>0.0110</td>
</tr>
<tr>
<td>6-mo. moving average</td>
<td>[1.95]</td>
<td>[1.03]</td>
</tr>
<tr>
<td>Output gap (-1)</td>
<td>0.0081</td>
<td>0.0049</td>
</tr>
<tr>
<td></td>
<td>[1.03]</td>
<td>[0.54]</td>
</tr>
<tr>
<td>Real exchange rate (-1)</td>
<td>0.0199</td>
<td>0.0198</td>
</tr>
<tr>
<td></td>
<td>[3.90]</td>
<td>[3.95]</td>
</tr>
</tbody>
</table>

| $\bar{R}^2$ | 0.976 | 0.976 | 0.978 | 0.978 | 0.975 | 0.975 | 0.979 | 0.979 |
| s.e.         | 0.00297 | 0.00297 | 0.00280 | 0.00279 | 0.00298 | 0.00299 | 0.00278 | 0.00278 |
| $h$          | 1.872 | 1.878 | 1.546 | 1.490 | 2.249 | 2.116 | 1.600 | 1.426 |

*Note: t-statistics in square brackets. The sample period is October 1985-July 1995 (n=118).*
Table 3
Policy Reaction Function of the Bank of Japan
Explanatory variables lagged two months (except call rate)

<table>
<thead>
<tr>
<th>Dependent variable: call rate</th>
<th>Using WPI inflation</th>
<th>Using CPI inflation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
</tr>
<tr>
<td>Constant</td>
<td>0.00044</td>
<td>0.00040</td>
</tr>
<tr>
<td></td>
<td>[0.44]</td>
<td>[0.40]</td>
</tr>
<tr>
<td>Call rate (-1)</td>
<td>0.989</td>
<td>0.991</td>
</tr>
<tr>
<td></td>
<td>[43.47]</td>
<td>[42.20]</td>
</tr>
<tr>
<td>Inflation (-2)</td>
<td>0.0812</td>
<td>0.0546</td>
</tr>
<tr>
<td>3-mo. moving average</td>
<td>[2.75]</td>
<td>[1.88]</td>
</tr>
<tr>
<td>Inflation (-2)</td>
<td>0.0485</td>
<td>0.0342</td>
</tr>
<tr>
<td>6-mo. moving average</td>
<td>[2.51]</td>
<td>[1.83]</td>
</tr>
<tr>
<td>Output gap (-2)</td>
<td>0.0017</td>
<td>-0.0009</td>
</tr>
<tr>
<td></td>
<td>[0.22]</td>
<td>[-0.097]</td>
</tr>
<tr>
<td>Real exchange rate (-2)</td>
<td>0.0182</td>
<td>0.0188</td>
</tr>
<tr>
<td></td>
<td>[3.58]</td>
<td>[3.74]</td>
</tr>
</tbody>
</table>

$R^2$  
0.976  0.976  0.976  0.976  0.975  0.976  0.978  0.979

s. e.  
0.00295  0.00297  0.00281  0.00281  0.00301  0.00296  0.00282  0.00277

h  
1.932  1.975  1.789  1.818  2.238  2.364  1.885  1.954

Note: t-statistics in square brackets. The sample period is October 1985-July 1995 (n=118).


396. William Poole, "When is Inflation Low?," March 1994. This paper was presented at the CEPR conference, "Monetary Policy in a Low Inflation Regime," March 4-5, 1994.


