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INTERVENTION SINCE THE PLAZA
AGREEMENT ACCOMPLISHED?

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ABSTRACT

We review the conduct and scale of official intervention by monetary authorities in the U.S.A., Japan, and West Germany since the Plaza Agreement. Relative to trading volume and the stock of internationally traded assets denominated in foreign currencies, intervention is small--scale and sporadic, hence at best limited to transitory effects. It does not appear to reduce volatility of daily exchange rates. Monetary authorities gamble that they will not suffer losses on their foreign currency holdings. Evidence in favor of sterilized foreign exchange market intervention as a way of conveying information to the private sector is far from convincing. Since changes in relative monetary growth rates are sufficient to alter bilateral exchange rates, monetary authorities can achieve their exchange rate preferences with domestic monetary policy, but at the cost of possible distortionary effects on monetary growth rates, domestic interest rates, and international capital flows.

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The rationale for central bank intervention under floating rates is that the market does not move exchange rates smoothly to equilibrium levels, produces "disorderly conditions," and sets rates at variance with fundamental economic conditions. According to the Plaza Agreement, central banks can determine better than markets the correct level of exchange rates and the proper degree of variability. Advocates of intervention justify leaning against the wind as slowing the movement of exchange rates either up or down.

1. Background

Direct official intervention to maintain the open market price of currencies within narrow limits was a feature of the Bretton Woods system and, far from diminishing under floating rates, it has since grown larger from time to time.

Central bank intervention may be conducted by a variety of institutions at the direction of the monetary authorities. Intervention in some countries is assigned to nationalized industries that borrow foreign currency in order to buy their own currency on the foreign exchange market, in Italy and the U.K. with government provision of insurance against foreign exchange loss, in France with no such provision. In Japan and sometimes in France, dollar deposits held by the government at commercial banks are used for intervention. Italian and French commercial banks intervene at the government's behest.

In the United States two agencies conduct foreign exchange operations. The Treasury Department through its Exchange Stabilization Fund, established by the Gold Reserve Act of 1934, is the senior authority in organizing exchange market operations, the Federal Reserve Bank of New York acting as its agent. In 1962 the Federal Open Market Committee of the

Federal Reserve System assumed the authority to engage in those operations on its own account.¹ In practice, however, the Treasury and Federal Reserve coordinate their exchange market intervention.²

The scale of intervention in the 1970s increased. By the end of 1980 the U.S. was intervening in the foreign exchange markets virtually on a day-to-day basis. The Reagan administration soon after taking office announced its intention to reduce the scale of intervention, to discontinue the policy of building up currency reserves, and to cut back on its short-term swap arrangements with foreign countries. In the administration's view intervention was both costly and ineffectual. It held that the way to restore exchange rate stability was by the creation of more stable domestic economic conditions. Many foreign central banks did not share the Reagan administration's views and continued their efforts to affect the exchange value of their currencies.

Through most of the four years of the first Reagan administration the dollar appreciated, reaching a peak in February 1985 that was 42 percent above its 1980 average. For many economists and for corporate officials from the real sector this was a clear case of misalignment that was responsible for a widening deficit in the U.S. merchandise trade balance and a heavy loss of jobs in the traded goods sector.

In January 1985 James A. Baker III, then White House chief of staff, and Donald Regan, Treasury Secretary, attended the G-5 meeting at which the finance ministers proposed increasing the extent of foreign exchange market intervention. That month also the two officials switched jobs. For Baker, resumption of the Treasury's dominant role in intervention was a way

to differentiate his course from that of his predecessor.

At the Plaza Hotel in New York on 22 September the finance ministers and central bank governors announced their agreement that "in view of the present and prospective change in fundamentals, some orderly appreciation of the main non-dollar currencies against the dollar is desirable. They stand ready to cooperate more closely to encourage this when to do so would be helpful." It has been reported that the central banks agreed to buy up to \$18 billion of the two currencies over the next six weeks, the Federal Reserve, the Bank of Japan, and the Bundesbank sharing the purchases. On 23 September the U.S. authorities played their hand by buying yen and marks in the New York market.

Repeated meetings of the participants reaffirmed the principles of the Plaza Agreement until the Group of Six major industrial countries met at the Louvre Palace on 22 February 1987, when they announced that existing exchange rate ranges were broadly consistent with economic fundamentals and that they would "cooperate closely to foster stability of exchange rates around current levels." Countries in surplus on current account undertook to strengthen domestic demand while maintaining price stability, and deficit countries undertook to encourage steady low-inflation growth while reducing their internal and external deficits. The leading surplus countries were West Germany and Japan, the leading deficit country, the United States.

The rhetoric in support of the desirability and feasibility of direct exchange rate policy has not abated in the four years since the Plaza Agreement was reached. Enough time has elapsed to make it worthwhile to

examine the concrete results of the new exchange rate policy that the U.S. authorities introduced in 1985. Is there qualitative or quantitative evidence of the effectiveness of intervention?

In section 2, we discuss the determinants of foreign exchange rates and theories of the way foreign exchange intervention influences their movements. In section 3, we report the dates and size of intervention since 1985. These data are available in official publications of the U.S. monetary authorities and the Bundesbank. For Japan this information is not available in an official English language or a secondary source. We also examine three aspects of intervention: (1) Given the size of foreign exchange markets and the known figures on the scale of intervention, is it reasonable to suppose that intervention could have moved the level of exchange rates in the directions sought by the countries that signed the Plaza Agreement and subsequent communiqués? (2) Has intervention served to smooth volatility? (3) What information is available on the budgetary consequences of intervention? In section 4, we examine other available empirical evidence on the effects of intervention since the Plaza Agreement. We summarize our investigation in section 5.

2. Determinants of Foreign Exchange Rates

Longer-run fluctuations in exchange markets are fundamentally determined by differences in relative rates of money growth that central banks choose. These differences affect expectations about the revival or subsidence of inflation and ultimately of actual inflation rates in the countries concerned. The differences in actual and expected inflation rates among

these countries in turn produce either exchange rate depreciation or appreciation.

Day-to-day fluctuations in exchange markets like fluctuations in stock markets are noisy, reflecting random influences of "news" and rumors. The news may include indications of official intervention, evidence on the adjustment of external balances, interest rate differentials among the major currencies, and expectations regarding economic policy changes.³

What is widely accepted is that longer-run fluctuations primarily reflect monetary influences. That process may be observed in the behavior of relative monetary growth and the bilateral yen/dollar and D-mark/dollar exchange rates since the Plaza Agreement. Two years of unprecedented high rates of monetary growth in 1985-86 in the United States were accompanied, beginning February 1985, by depreciation of the dollar against both currencies. In 1985-86, the U.S. monetary growth rate for M1 lies above the corresponding M1 growth rates for West Germany and Japan (see Figure 1a). The pattern is less marked for M2 growth rates (not shown here). The depreciation of the dollar against marks and yen may be observed in Figure 1b. A generally appreciating dollar exchange rate since 1987 has been associated with deceleration of monetary growth in the United States while it has accelerated in Japan and West Germany. Since 1987 the U.S. monetary growth rate for M1 lies below the M1 growth rates for West Germany and Japan (see Figure 2a). The pattern is equally marked for M2 growth rates (not shown here). The appreciation of the dollar against both currencies may be observed in Figure 2b.

(Figures 1a, 1b, 2a, 2b belong here.)

The relationship the figures illustrate between relative changes in nominal money growth rates and bilateral exchange rate movements in essence is unaffected when for each of the three countries its money growth rate is corrected for the growth rate of its real output.

If the rise in U.S. monetary growth that began in June 1989 and the relative decline abroad is sustained, a reversal of the strong dollar exchange rate against the D-mark and the yen is predictable.

If changes in relative monetary growth rates are sufficient to alter bilateral exchange rates, what role does official intervention play? Whether official intervention affects national money supplies depends on whether or not a central bank sterilizes its sales or purchases of foreign currencies. When a central bank intervenes to support the dollar against its currency, it purchases dollars in the foreign exchange market and issues its own currency to pay for them. Unless it sells off other domestic assets to withdraw the additional currency it has injected into the domestic monetary system -- it sterilizes its purchases -- it will have expanded monetary growth. A similar operation occurs when a central bank intervenes to depreciate the dollar against its currency. It then sells dollars in the foreign exchange market, and collects its own currency in payment. Unless it purchases other domestic assets to match what it has withdrawn from the domestic monetary system -- it sterilizes its sales -- it will have contracted monetary growth.

The question concerning official intervention boils down to the

effectiveness of sterilized intervention. Nonsterilized intervention is monetary policy based on open market operations in foreign rather than domestic assets. It could just as well be conducted as domestic monetary policy.⁴ But if sterilized intervention does not change the national money supply, how does it affect exchange rates?

The literature distinguishes between the effectiveness of unilateral and coordinated central bank intervention. With respect to unilateral intervention, three theoretical channels have been identified: (1) a portfolio balance channel; (2) an announcement channel that assumes market inefficiencies; (3) an announcement channel that assumes monetary authorities possess superior information that they provide the private market by signaling their future intentions (Mussa 1981; Loopesko 1984).

The portfolio balance channel works only if foreign and domestic securities are imperfect substitutes. If so, it posits a realignment of asset returns that requires a change in the current exchange rate to achieve portfolio balance as a consequence of sterilized intervention. If private investors make no distinction between domestic and foreign securities, the channel does not work.

The first announcement channel assumes an inefficient foreign exchange market in which traders ignore available information. The second announcement channel assumes that sterilized intervention can perform a signaling role. It conveys additional inside information that the central bank truthfully provides the market and thus influences actual exchange rates and exchange rate expectations.

With respect to coordinated central bank intervention, it is assumed

that the second announcement channel serves to provide multiple coordinated signals that both increases the importance of a given signal and increases the probability that the signal is true (Dominguez 1989). Another suggested motivation for coordinated central bank intervention is the opportunity it affords for one bank not to honor its monetary policy commitment, making it difficult for the market to learn that its signal is false.

3. Conduct and Scale of Intervention

Private dealers in the foreign exchange market execute transactions for monetary authorities. Usually the authorities assign varying amounts of the total sale or purchase among several dealers. Since dealers are in telephone communication with each other throughout the business day, word of the fact of intervention is quickly transmitted to the market. The size of the intervention, however, is a guess.⁵ Each dealer knows the amount that he has executed, but never reveals that information to his counterparts. The proportion of the total assigned to him in past interventions, after the authorities have made known the size of their action, forms the basis for the dealer's estimate of the size of the current intervention. The market then learns of the varying estimates of the dealers involved. Rumors are endemic.

Trading in the spot market for foreign exchange has become an important source of income for banks and other financial institutions. They hire young traders to take a series of very short-term open, but not necessarily small, positions that are closed out by the end of the day, making profits from the bid-ask spread. The trading that takes place is mainly on account of customers other than monetary authorities.

3.1. Record of Intervention

The Federal Reserve System sterilizes and other central banks do not sterilize all their exchange market intervention. In 1985-86 the U.S. monetary authorities increased their foreign exchange reserves, but from the Louvre Accord until June 1988, they sold foreign currencies to prevent dollar depreciation. Since June 1988, the U.S. monetary authorities have generally bought foreign currencies to prevent dollar appreciation.

In 1985-86 both West Germany and Japan on net increased their foreign currency reserves, but, as already noted, their monetary growth tended to be lower than in the United States.

Japan bought dollars in virtually every month from February 1987 until April 1989 in a vain effort to prevent dollar depreciation. It has not fully sterilized its foreign exchange intervention. West Germany, because of its concerns about exchange rate relationships within the European Monetary System, acquired dollars on a lesser scale until December 1987. Thereafter it sold dollars until early 1989 and essentially has maintained its foreign exchange reserves at that level since. Monetary growth was expansionary in both countries while from 1987 until mid-1989 the Federal Reserve was restrictive in permitting monetary growth. As a result of the differences in monetary growth rates, inflation rates in the U. S. that in 1987-88 were creeping higher, since have been restrained, but relatively resurgent in the other countries. Exchange rates have reflected the differences in monetary growth and inflation rates.

At what dates and in what amounts have monetary authorities intervened? Tables 1-3 report what is known. Table 1 shows the dates and

amounts of the open-market purchases or sales of D-marks and yen by the Federal Reserve and the Treasury Exchange Stabilization Fund, as reported in their quarterly retrospective accounts. Table 2 gives quarterly estimates of foreign currency market interventions, valued in D-marks, of the German Bundesbank. Column 1 shows changes in its total foreign exchange reserves. Column 2 shows changes in the central bank's European Monetary System claims. Column 3 shows changes in claims on nonresidents. The difference between changes in total reserves and the sum of changes in its European Monetary System and other claims represents changes in holdings of foreign currency assets (column 4). There is no breakdown of the individual currencies acquired. A record of foreign exchange acquisitions of the Bank of Japan, comparable to that for the U.S. or Germany, is not available.

(Tables 1 and 2 belong here.)

Table 3 shows the monthly dollar value of foreign currency reserves of the Federal Reserve, the Bundesbank, and Bank of Japan. These are not exclusively central bank holdings, but include also net foreign claims of other government agencies and, in the case of Japan, of private firms that engage in intervention at the direction of the Ministry of Finance. In addition, the numbers add changes in the dollar value of nondollar currency holdings, owing to exchange rate fluctuations. In view of German EMS interventions, the figures for Japan more reliably reflect dollar acquisitions. Column 4 shows the change in the combined dollar value of the foreign currency holdings of the three countries. That column is a measure of coordinated intervention.

(Table 3 belongs here.)

It is clear from Table 1 that U.S. intervention has been episodic and the amounts of intervention highly variable. It is not clear from Table 2 that the German monetary authorities have been more continuously active in the foreign exchange market than the U.S. authorities, but their purchases and sales have been as variable in magnitude as in the case of the U.S.⁶ The size of combined intervention of the two plus Japan, to judge from Table 3, col. 4, has ranged in some months from \$28 million to \$20 billion.

3.2. Intervention Relative to Size of Foreign Exchange Market

One obvious question is whether intervention is on a scale that is large enough to move exchange rates. Although intervention may not be negligible, if one judges by trading volume, it is difficult to believe that in most of the period since 1985 it has been large enough to do more than nudge exchange rates. In April 1989 foreign exchange trading, according to the Bank for International Settlements, totaled \$129 billion per day (eliminating double counting). The total exceeds \$400 billion if trading in London and Tokyo is included.⁷ If one judges by the stock of internationally traded assets denominated in U.S. dollars and other major currencies -- amounting to trillions of dollars -- it is even more difficult to believe (see Table 4 for U.S. private assets abroad and non-official foreign assets in the U.S. -- a fraction of total internationally traded assets).⁸

(Table 4 belongs here.)

Moreover, intervention has been sporadic since the Plaza Agreement, completely absent on the part of the U.S. authorities in 1986. The dollar exchange rates, nonetheless, fell in 1986, although it is not obvious that Japan and West Germany increased the scale of their intervention to compensate for U.S. abstention.

In the case of an official action, whose size traders can only guess, they in effect read tea leaves. What can it mean becomes the market's concern. Does it confirm the presumed target range or does it indicate a change in the target range? Has the action no relation to the presumed target range? The main consequence of intervention appears to be an increase in uncertainty in the foreign exchange market.⁹

3.3. Does Intervention Stabilize Exchange Rates?

If that is the main consequence of intervention, it should be possible to show that it does not stabilize exchange rates by reducing volatility. We calculated the standard deviations of the daily dollar-D mark and dollar-yen exchange rates monthly and correlated each with the absolute values of the change in the combined foreign exchange holdings of the U.S., West German, and Japanese monetary authorities (Table 3, col. 4), 1985-89. If intervention smoothed exchange rate movements, the correlations would have negative signs. Both are positive, though not significant:¹⁰

$$r = .055 \text{ (} t = .401 \text{) dollar-D-mark}$$

$$r = .173 \text{ (} t = 1.280 \text{) dollar-yen}$$

3.4. Profitability of Intervention

Although monetary authorities do not aim at turning a profit from their intervention actions, research effort has been devoted to determining the profitability of the activity. Estimated profits from dollar-mark and dollar-yen intervention by the U.S. Treasury and the Federal Reserve from September 1985 through January 1988, calculated in a research paper, amount to \$1.2 billion and \$0.6 billion, respectively. The estimates, however, are subject to change to the extent that exchange rates and U.S. and foreign interest rates change before the foreign currency positions are closed out. During the two-and-a-third year period covered, interest earnings were a small portion of total estimated profits (Leahy 1989).

Computation of profits associated with intervention requires proper measurement of the opportunity costs -- the interest cost of funds used to make intervention purchases should be deducted from the interest earnings on the assets acquired -- as well as proper valuation of positions in foreign currencies -- it is sensitive to the choice of period, and whether the exchange value at the terminal date could in fact be realized if the currencies were sold (Leahy 1989).

The Federal Reserve and the Treasury report realized and unrealized profits (see Table 5). Profits are realized only when purchases or sales have been reversed. The result is based on a choice of accounting method for the cost of foreign currencies resold to the market -- FIFO, LIFO, or average cost. The unrealized portion of profits -- the change in the cumulative valuation profit -- is clearly subject to choice of end-of-period exchange rate evaluation. An unrealized gain reflects not

only exchange rate change but also a change in the composition of the foreign currency portfolio. The Federal Reserve and Treasury figures do not include interest earned on foreign currency holdings nor interest foregone on U.S. dollar securities. No realized losses are reported. Realized gains for the two authorities combined range from \$15 million to \$1.4 billion. Unrealized gains are about equally divided between negative and positive changes, on the whole larger in magnitude than realized gains.

(Table 5 belongs here.)

Other countries have reported small gains and losses and occasional large losses on their foreign currency acquisitions, usually dollars. West Germany is reported to have lost 9 billion D-marks in the fourth quarter of 1987 (Obstfeld 1988). The Netherlands is estimated to have lost 600 million guilder on dollar interventions in 1986 and 1987 (Fase and Huijser 1989). Japanese insurance companies and other financial institutions are said to have "lost tens of billions of dollars trying to stabilize the dollar's decline" in those two years (Summers 1989). Large foreign currency positions are vulnerable to loss, one may conclude. Is there justification for monetary authorities to engage in such gambles?

4. Empirical Research on the Effectiveness of Sterilized Foreign Exchange Market Intervention

In this section we review the empirical evidence of possible ways that would make sterilized intervention effective.

4.1. Unilateral Intervention Effects on Portfolios

To examine the portfolio balance channel as a possible source of the

effectiveness of intervention, early research efforts concentrated on determining whether domestic and foreign securities were perfect substitutes. If so, sterilized intervention could have no effect on the exchange rate. Investigators tested the joint hypotheses of uncovered interest parity -- equality of returns between the securities of two countries adjusted for expected change in the exchange rate -- and speculative efficiency in the exchange market -- the current spot exchange rate is the best predictor of next period's spot rate. Because the data failed to reject these hypotheses, most studies in the 1970s concluded in favor of perfect substitution (Mussa 1979).

Subsequent research that has analyzed longer data sets with different econometric techniques has led to the opposite conclusion, namely, actual returns on securities denominated in different currencies differ by more than a random factor. The explanation for this finding, according to the later studies, is that risk-averse investors regard securities denominated in different currencies as imperfect substitutes, and their returns are therefore separated by a time-varying risk premium (Hodrick 1987). Relative supplies of domestic and foreign securities are the variables thought to determine the risk premium. Success of sterilized intervention would then depend on changing relative supplies of domestic and foreign assets enough to change the risk premium.

The empirical evidence is not strongly supportive of this proposition. The risk premium measure is not significantly affected by relative asset supplies in regressions testing for this effect (Frankel 1982 for risk premia on six currencies and country securities; Rogoff 1984 for the U.S.

and Canadian dollars and their respective bonds). This evidence favors perfect substitutability, as do also regressions of the exchange rate on domestic and foreign money supplies and domestic and foreign assets and wealth that report coefficients on domestic and foreign securities not significantly different from each other.

Recent studies using capital asset pricing models with time varying risk premia and consumption-based asset pricing models have low explanatory power in validating the portfolio balance justification for sterilized intervention in the foreign exchange market (Obstfeld 1988). The evidence to date on risk premia has not been able to account for the deviations from equality of returns on securities of different countries denominated in different currencies and for determining any effects on exchange rates.

One study, however, reports findings generally favorable for the effectiveness of intervention (Dominguez and Frankel 1990). The findings include statistically significant effects through the portfolio channel and also through an expectations channel. When an equation for the portfolio channel was estimated, using instrumental variables, perfect substitutability of mark and dollar assets was rejected for the sample period, October 1984-December 1987, implying that Federal Reserve intervention had an effect on exchange rates even if sterilized. According to the investigators, the effect is small regardless of whether the intervention is sterilized or nonsterilized. The effect, however, is heightened if the public has information about the intervention. The expectations channel operates to reduce the ratio of the portfolio demand for marks to the portfolio demand for dollars and thus leads to a

depreciation of the mark exchange rate. It remains to be seen whether the foregoing results will hold up in subsequent studies.

Three possible ways of rationalizing these inconclusive results have been suggested (Marston 1988): (a) ex post interest differentials may reflect not risk premia but the failure of traders to take advantage of profit opportunities in the foreign exchange market; (b) risk premia may explain the differentials, but changing asset supplies may have little effect on the exchange rate; (c) economists possibly lack the technical skills to measure the effects of sterilized intervention on portfolio decisions.

4.2. Unilateral Intervention Effects from Improving Market Efficiency

The argument here is that, if the foreign exchange market is inefficient, and traders fail to recognize profit opportunities, intervention somehow conveys information to them that they otherwise overlook. The scenario fails to explain why traders are stupid and government bureaucrats are smarter. Since traders can only guess at the message of intervention when it has taken place, the advantage of this means of conveying information, whatever its content, is not explained.

4.3. Unilateral Intervention Effects from Signaling

The argument here is that intervention signals a change in the monetary policy intentions of the authorities. The signal activates a response from the private sector to move foreign exchange rates in the direction the authorities seek. The issue raised in the preceding paragraph applies here also. If monetary authorities choose not to announce intervention actions

until some time after the fact, how can they be signaling anything?

Analysis of intervention signals is amorphous. One attempt compares the Carter administration's unsuccessful use of sterilized intervention to support the dollar in late 1978 and the Plaza Agreement, which the author interprets as having succeeded in bringing down dollar exchange rates thanks to credible policy announcements (Marston 1988).

One econometric study reports evidence that Federal Reserve interventions in the 1977-81 period provided information useful to predict future monetary policy (Dominguez 1988). The author found a significant positive relationship from October 1979 to the following spring between money surprises -- the difference between weekly money supply growth rates and market forecasts of those growth rates -- and the authorities' purchases of foreign currencies between forecast and actual money announcements. Intervention, according to this study, signaled information about money that the earlier forecast did not contain.

Obstfeld (1988) suggests that intervention may provide more information than public debt management policies because unanticipated exchange rate changes can have an effect on government's net worth. His example is sterilized purchases of foreign exchange. They signal future depreciation of the currency. If the currency appreciates, it will cost the government greater losses than it would otherwise have lost. To avoid this embarrassment, the government's intervention will prove credible to the market even with perfect substitutability of different country securities.

Obstfeld's example has a different resonance in 1989. In Federal Reserve announcements since Alan Greenspan became Chairman the central bank

has staked its credibility on achieving zero inflation over a five-year period. Those announcements signal an appreciating dollar. Yet in the thirteen months from June 1988 to July 1989, sterilized purchases of foreign currencies by the Federal Reserve sent a contrary signal. Losses on foreign currencies in 1988 and possibly in 1989 do not appear to provide the kind of information that Obstfeld envisaged. Budgetary effects do not appear to act as a strong constraint on intervention.

A study of the Bundesbank's operations provides an alternative approach to signaling information conveyed by intervention (von Hagen 1989). The author finds perfect short-run and imperfect long-run sterilization by the Bundesbank. In the short run it completely offsets intervention effects on the monetary base. Over six-month periods, however, it is willing to give more weight to exchange rate considerations than to its monetary targets, although it does not invariably do so. Effects on growth of the monetary base occur only when the mark is relatively strong or weak against both the dollar and EMS currencies. In periods when strength or weakness of the mark differs as between the two markets, exchange rate policies have no significant effect on monetary control.

The market's awareness of the distinction between the short and long run, according to the author, affects its expectations, leading participants to interpret short-run sterilized intervention as a signal about future growth of the money supply.

Since in some cases short-run sterilization is followed by long-run sterilization and in some cases is not, it is not clear how the market determines what short-run sterilization is signaling. In any event, the

German case, with its dual exchange market constraints, does not obviously apply to the U.S. or Japanese case.

4.4. Coordinated Sterilized Intervention Effects from Signaling

Models of coordinated compared to unilateral intervention are not available. In this research area it is assumed that coordinated intervention is more effective, and that it is signaling by several central banks rather than one alone that leads to desired exchange rate changes. A study of daily intervention data for the Bundesbank and the Federal Reserve from 1985 to 1987 shows that coordinated and unilateral sterilized intervention have different and significant effects on the exchange rate risk premium (Dominguez 1989). The investigator finds the stronger effects of coordinated than of unilateral intervention to be evidence that market participants interpret policy coordination as a sign of credible commitment. On the other hand, a central bank that participated in a coordinated intervention that signaled a policy change that it did not intend to implement would lose credibility when the foreign exchange market learned of the duplicity.

It is curious that the literature on announcement effects is the creation of American economists. Economists of other countries have not thus far sought to validate sterilized intervention by attributing announcement effects to it. In any event monetary authorities in other countries are not committed to sterilizing as fully as the Federal Reserve is, so their interventions may be monetary policy based on foreign rather than domestic assets.

Three questions may be raised regarding a putative signal that sterilized intervention conveys (Obstfeld 1988): (a) Is the intervention information an addition to the policy announcement that either accompanies or substitutes for intervention? (b) Why is sterilized foreign exchange intervention more effective as a signal, say, than an open market sale of domestic securities that is sterilized by an increase in central bank loans to commercial banks? (c) If one assumes that signaling is in fact taking place, are the intentions that sterilized intervention signals accepted at face value by the market?

A skeptical answer to these questions reflects the view that central banks need not engage in such a devious way of informing the public of its objectives and the policies it favors to achieve them.

5. Conclusion

A misconception that pervades the advocacy of intervention as a legitimate extension of monetary authority activity is the belief that it is possible to control the exchange rate by fairly direct means, separately from the inflation rate and monetary growth rate. The fact is that all three are mutually determined.

The principles that guide central bank governors and finance ministers in their choice of exchange rates to support have never been explained. It is doubtful that, even if they were seriously committed to stabilizing exchange rates, they could do so by intervention.

Foreign exchange market intervention tends to introduce distortionary effects on monetary growth rates, on domestic interest rates, and on international capital flows. It encourages central banks to disregard their monetary targets. Since the Plaza Agreement, it has led to an expansion of the capacity of central banks to increase the world money supply. Until the end of 1986, in pursuit of a weaker dollar, U. S. monetary growth expanded. From the end of 1986 to the end of 1988, when the exchange value of the dollar was adjudged weak by finance ministers of the G-countries, central banks loaded their portfolios with huge dollar holdings, thus creating domestic money. Since then intervention has aimed at supporting the mark and recently the yen. Central banks, especially the Federal Reserve, have increased their holdings of marks and yen to historically high levels, exposing themselves to possible losses on their holdings.

If the central banks sterilize by selling corresponding amounts of domestic assets in the open market, as the Federal Reserve invariably does and the other central banks do intermittently, they raise domestic interest rates. Action by the Bank of Japan and the Bundesbank to sterilize in response to the Plaza Agreement was hardly the direction for interest rates to move if the objective was to lower the exchange value of the dollar.

Finally, foreign exchange market intervention distorts foreign currency prices. The foreign private sector, for example, withdrew from the market for U.S. Treasury securities in 1987, leaving purchases wholly to foreign official institutions (Federal Reserve Bulletin, November 1988, Table 3.25). Intervention interfered with market adjustment of the exchange

value of the dollar.

The evidence we have examined suggests to us that intervention has only a tenuous economic basis. Unsterilized intervention is monetary policy based on foreign assets. Its effects on exchange rates, if conducted with domestic assets, would be identical. However, as just indicated, its effects on other economic variables may be contradictory, if not also pernicious. To find economic grounds for sterilized intervention economists have created a literature of announcement effects that is as nebulous in theory as is the effort to find empirical verification of it.

The scale of intervention relative to the magnitude of flows in recent years in the foreign exchange market and relative to the magnitude of stocks of private foreign assets is insignificant. Intervention has been sporadic. Traders in the market know whether a bid or ask originated with the authorities, but they guess at its size and meaning. Intervention simply adds noise to the decisions traders make about pricing currencies. Estimates of the profitability of intervention for authorities are dependent on the dates at which initial and terminal currency holdings are evaluated. In any event, authorities provide incomplete data in their published reports of actual profits.

The notion that central bank governors and finance ministers can determine better than markets the correct level of exchange rates is an illusion. Experience since the Plaza Agreement teaches that these officials had no magic means through intervention to mold entirely to their liking what their currencies command in foreign exchange, neither on a day-to-day basis nor over longer runs.

Dollar exchange rates depreciated in 1985-86 as the market reacted to relative monetary growth rates of the industrialized countries. What mattered was that the U.S. monetary authorities were expanding the money supply by buying assets, whether domestic or foreign, at a higher rate than authorities elsewhere were expanding their money supplies by buying more domestic assets than they sold dollars.

The announcement at the Louvre Palace meeting in February 1987 that the authorities would stabilize existing exchange rate ranges because they deemed them to be broadly consistent with economic fundamentals was misguided. . . . Despite the rhetoric, the markets have since shown that, as relative monetary growth rates have changed, so have exchange rates.

Authorities could learn from King Canute. They decided at the Louvre, on the advice of some economists who flattered the authorities' ability to manipulate the market for currencies, that further movement of exchange rates was not desirable. Canute rebuked the flattery of his courtiers by noting that the advancing waves paid no heed to his command that they halt, thus demonstrating his powerlessness.

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Notes

1. Auerbach (1990) acribes the internal Federal Reserve decision to authorize intervention to the aim of acquiring an "unlimited pocketbook," freeing it from the need to obtain Congressional budgetary approval.
2. Possible conflicts between the Treasury's exchange rate objectives and the Federal Reserve's monetary policy objectives may exist (Dominguez 1989, p. 5).
3. A contrary view is that day-to-day fluctuations in financial markets are reactions not to news but to noise, that traders in the marketplace are not processing new information gleaned from the economy but simply reacting to the buy-and-sell decisions of other traders (Dornbusch and Frankel 1987). This is not an issue to be resolved here.
4. The Bundesbank, for example, creates base money mainly through the purchase of foreign assets since there is virtually no open market for government securities in Germany.

5. Dominguez (1989, p. 9) states that "discussion with market participants suggest that those taking positions in the market quickly learn the source and magnitude of central bank intervention operations." In fact, participants learn the magnitude of the intervention only after the lapse of an interval until the reporting cycle of the central bank occurs. On January 4, 1990, the Bundesbank intervened, but the precise amount was not known. The intervention was described as small, at about \$50 million to \$100 million (Wall Street Journal, January 5, 1990).
6. Dominguez (1989) obtained confidential daily intervention data from the German Bundesbank. She excluded interventions mandated within the European Monetary System. How many days in the 1985-87 period that she covered intervention by the Bundesbank took place she does not report. She reports coordinated intervention of the U.S., Germany, and Japan (based on qualitative information for the latter) on 81 out of 760 trading days.
7. Gross trading volumes in March 1986 were as follows: \$50 billion a day among banks, \$34 billion among brokers and other financial institutions in the U.S. foreign exchange market; \$90 billion a day in London; \$48 billion a day in Tokyo; \$29 to \$37 billion in the rest of the Pacific; \$50 billion in Zurich and Frankfurt (Dornbusch and Frankel 1987).
8. An objection to this comparison is that all the assets are not continuously traded. They are all, however, tradable. Market size is

not limited to the actual trades that take place, now that multinational acquisitions of firms, real estate, patents, and so on are no longer exotic events.

As Rich (1989, p. 8) notes: "Considering the size of private portfolios of foreign assets, central banks must intervene on a large scale if they are to make a significant imprint on the foreign exchange market."

This view has been challenged on the ground that small changes in quantities can produce large changes in prices if price elasticities of excess demand are small. If that were the case, small scale private transactions would also induce large swings in exchange rates. We do not observe such effects.

9. See the Wall Street Journal (January 5, 1990) for a report of the confused response of market participants to Bundesbank intervention the day before.
10. Changes in foreign exchange holdings do not necessarily represent official interventions. They may, for example, represent drawings on a country's reserve position in the IMF. The results are as follows if the correlations are based on months of Federal Reserve interventions (see Table 1) in D-marks and yen respectively:

$$r = -.095 \quad (t = .448) \quad \text{dollar/D-mark}$$

$$r = .174 \quad (t = .75) \quad \text{dollar/yen}$$

The result is negative for the dollar/D-mark exchange rate but again not significant. It remains positive for the dollar/yen exchange rate. In using the data in Table 1, we distributed a total covering a period

that straddled two months according to the number of days of intervention in each month. We divided equally between D-marks and yen an intervention total reported for both currencies combined.

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Table 1
Federal Reserve and Treasury Exchange Rate Interventions
(million dollars)

Dates	Purchases of		Sales of	
	Yen	D-Marks	Yen	D-Marks
<u>1985</u>				
1/28-1/30		94.0		
2/1-2/10	40.6	208.6		
2/27-3/1		257.2		
9/23-10/4	262.0	199.0		
10/7-10/18	617.6	1,550.2		
10/21-10/31	482.9	87.0		
11/7	77.2	25.0		
<u>1986</u>	0			0
<u>1987</u>				
1/28			50	
5/1-5/4			20	140
5/19				133
6/2			103	410
11/2-11/10			379	717
11/27-12/4				272
12/10-12/11				351
12/16-12/31				1,707
<u>1988</u>				
1/4-1/15				685
1/21			30	
3/25-3/29			318	
4/14-4/15			260	240
6/27-7/29				2,900
8/5-8/23				1,806
9/14-9/26				230
9/26				100
10/31			200	
11/1-11/2			350	
11/17-12/2			795	630

Table 1 (continued)

Dates	Purchases of		Sales of	
	Yen	D-Marks	Yen	D-Marks
<u>1989</u>				
1/1-1/31		1,880		
2/2-2/6		350		
3/8-3/30	100	1,419		
4/28	50	50		
5/1-5/8	400	550		
5/12-5/31	2,785	3,000		
5/18-5/19		2,000		
6/6-6/30	3,822.5	1,129.5		
7/11-7/21	230			

Source: Federal Reserve Bulletin, Feb., May, Aug., Nov. issues with reports of Treasury and Federal Reserve Foreign Exchange Operations for quarters ending six months earlier.

Table 2

Estimates of German Bundesbank Interventions in Foreign Exchange Markets
(million marks)

	Total Reserves (1)	<u>C h a n g e s i n</u> EMCF Claims (2)	Claims on Nonresidents (3)	Exchange Rate Interventions (1) - (2) - (3) (4)
1985.1	-6595	-1522	1843	-6916
1985.2	3415	-1075	168	4322
1985.3	3485	854	85	2546
1985.4	1627	4588	1090	-4051
1986.1	1497	-2044	366	3175
1986.2	-3179	-1077	3805	-5907
1986.3	8011	2268	128	5615
1986.4	1708	-12	919	801
1987.1	13355	7070	-783	7068
1987.2	4132	-1669	-1370	7171
1987.3	2041	5438	3402	-6799
1987.4	9072	1793	-4571	11850
1988.1	-4356	-3658	-1288	590
1988.2	-8678	732	215	-9625
1988.3	-11148	-2364	9300	-18084
1988.4	-1321	-2109	-1212	2000
1989.1	-2384	-137	6420	-8667
1989.2	2458	-270	10854	-8128
1989.3	430	-5020	4105	1345
1989.4	2336	1176	3014	-1854

Source: Monthly Report of the Deutsche Bundesbank, 1985-1990, Table IX.

Table 3

Foreign Exchange Holdings of U.S., German and Japanese Monetary Authorities,
and Monthly Change of Combined Holdings, 1985-89
(million dollars)

End of Month	U.S. (1)	Germany (2)	Japan (3)	Total intervention (4)
1985.01	6,270	34,203	22,544	
1985.02	6,300	33,139	22,302	-1,276
1985.03	7,040	32,101	22,479	-121
1985.04	7,050	32,829	22,782	1,041
1985.05	7,160	33,781	23,191	1,471
1985.06	7,410	34,412	23,379	1,069
1985.07	7,960	35,937	23,787	2,483
1985.08	7,890	36,870	24,106	1,182
1985.09	8,670	37,556	23,106	466
1985.10	11,800	35,735	21,957	160
1985.11	12,550	39,003	21,994	4,055
1985.12	12,860	39,025	22,328	666
1986.01	13,320	39,653	22,769	1,529
1986.02	14,280	41,000	23,193	2,731
1986.03	13,970	39,865	23,540	-1,098
1986.04	15,060	39,930	26,686	4,301
1986.05	14,320	37,732	28,197	-1,427
1986.06	15,230	38,955	29,450	3,386
1986.07	16,150	39,607	33,778	5,900
1986.08	16,810	40,960	36,646	4,881
1986.09	16,790	43,260	36,956	2,590
1986.10	16,360	47,286	37,220	3,860
1986.11	16,790	45,792	37,419	-865
1986.12	17,330	45,866	37,657	852
1987.01	17,980	56,317	46,693	20,137
1987.02	17,960	56,480	46,963	413
1987.03	17,290	54,022	53,439	3,348
1987.04	14,890	55,949	62,934	9,022
1987.05	14,420	57,360	63,638	1,645
1987.06	13,900	56,320	63,952	-1,246
1987.07	13,470	55,030	64,508	-1,164
1987.08	14,560	56,059	65,299	2,910
1987.09	14,000	57,862	66,768	2,712
1987.10	14,590	60,967	67,549	4,476
1987.11	14,390	70,421	72,336	14,041
1987.12	13,090	72,893	75,657	4,493

Table 3 (continued)

End of Month	U.S. (1)	Germany (2)	Japan (3)	Total Intervention (4)
1988.01	11,320	70,848	77,817	-1,655
1988.02	11,800	67,663	78,261	-2,261
1988.03	11,580	67,211	78,905	-28
1988.04	11,280	68,177	80,366	2,127
1988.05	10,910	65,778	80,736	-2,399
1988.06	10,790	59,439	81,304	-5,891
1988.07	14,060	56,060	82,467	1,054
1988.08	18,020	53,762	83,606	2,801
1988.09	18,020	52,705	84,446	-217
1988.10	19,600	54,540	85,502	4,471
1988.11	18,000	56,332	89,964	4,654
1988.12	17,360	53,324	90,514	-3,098
1989.01	18,320	49,934	91,223	-1,721
1989.02	19,310	50,660	91,981	2,474
1989.03	20,300	50,157	92,739	1,245
1989.04	20,730	51,384	93,471	2,389
1989.05	26,230	50,682	89,262	589
1989.06	31,520	51,108	82,855	-691
1989.07	34,000	52,101	82,181	2,799
1989.08	33,410	52,250	81,931	-691

Source: International Financial Statistics, 1985-1989.

Table 4
Stocks of Internationally Traded Foreign Assets
(trillion dollars)

	End-of-Year			
	1985	1986	1987	1988
U.S. private assets abroad	0.8	0.9	1.0	1.1
Non-official foreign assets in the U.S.	0.9	1.1	1.3	1.5

Source: Survey of Current Business, June 1989

Table 5

Net Profits (+) or Losses (-) on United States Treasury and
Federal Reserve Current Foreign Exchange Operations
(million dollars)

End of Quarter*	Federal Reserve		U.S. Treasury	
	Realized Gains (1)	Change in Unrealized Gains (2)	Realized Gains (3)	Change in Unrealized Gains (4)
1/31/85				
4/30/85	0	+82.6	0	+59.4
7/31/85	0	+423.4	0	+262.9
10/31/85	0	+420.1	0	+375.6
1/31/86	0	+603.2	0	+94.0
4/30/86	0	+810.7	0	+734.7
7/31/86	0	+435.7	0	+439.0
10/31/86	0	-57.3	0	-180.3
1/30/87	8.0	+981.5	6.6	+684.9
4/30/87	688.1	-341.5	571.9	-165.2
7/31/87	103.2	-401.1	109.7	-387.0
10/31/87	92.6	+519.7	117.2	+367.9
1/31/88	612.4	-253.1	749.7	-340.2
4/30/88	89.9	-93.2	50.9	-32.3
7/31/88	0	-652.4	0	-461.5
10/31/88	0	+435.7	0	+402.2
1/31/89	155.3	-532.1	155.4	-469.5
4/30/89	0	-62.9	0	-54.9
7/31/89	0	+103.6	77.3	-231.7

*Realized gains are gains during quarter, valuation gains are as of end of quarter.

Source: Federal Reserve Bulletin, as for Table 1.

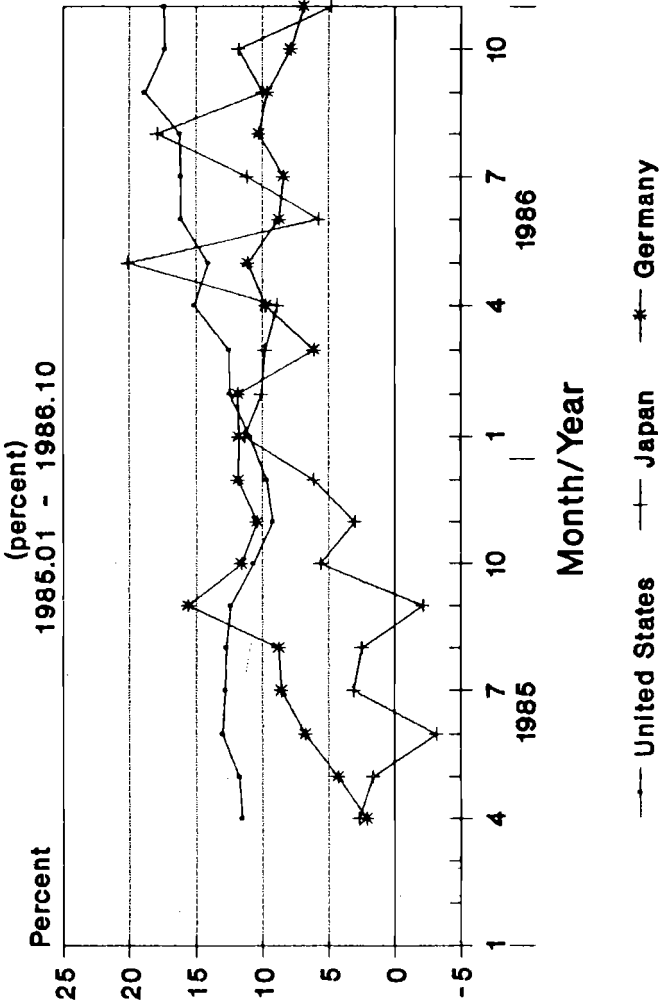
Legend for Figures 1a and 1b

Figure 1a shows money growth in the U.S. generally higher than in West Germany (except for 6 observations from September 1985 to February 1986) and Japan (except for spikes in May and August 1986). Figure 1b shows exchange rates for the dollar against D-marks and yen generally depreciating.

Legend for Figures 2a and 2b

Figure 2a shows money growth in the U. S. generally lower than in West Germany (from March 1987 on) and than in Japan (except for August 1987 and June 1988). The exchange rates, however, did not begin to appreciate until early 1988 for the dollar/D-mark and late 1988 for the dollar/yen.

FIGURE 1a
U.S., Japan, and German M1 Growth
6 Month Annualized Rates of Change



Source: Federal Reserve Bank of St. Louis Data Base

FIGURE 1b
YEN/\$, DEUTSCHEMARK/\$ EXCHANGE RATES
 (Monthly Averages of Daily Figures)

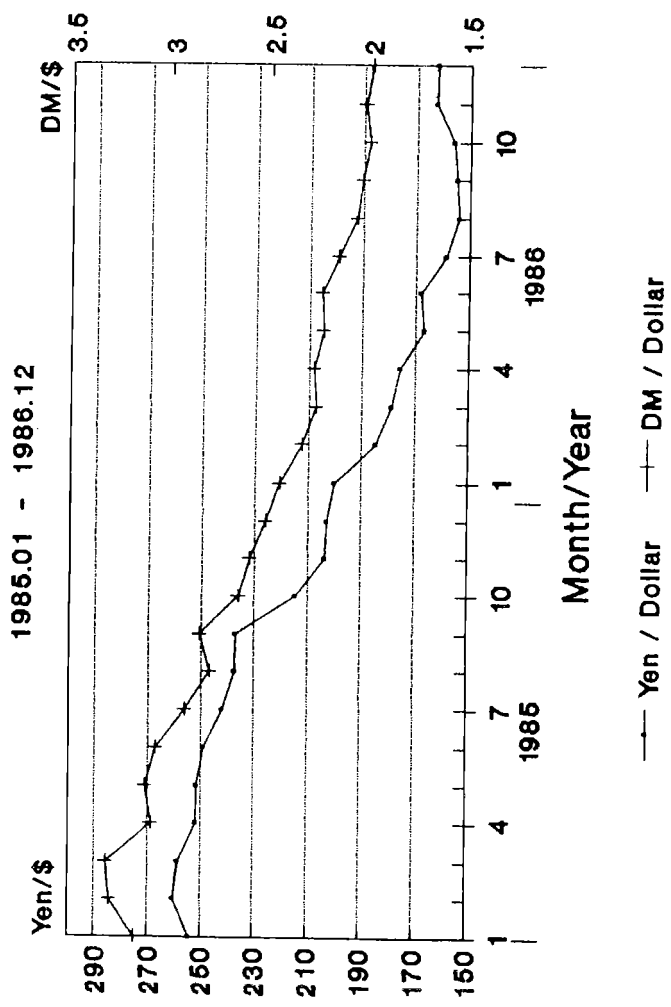
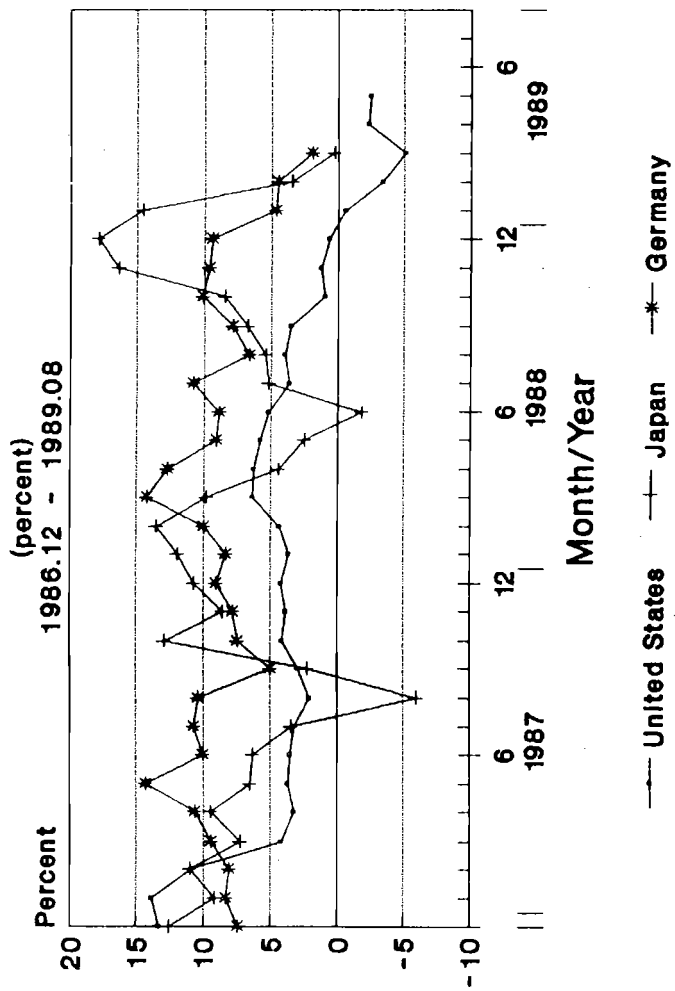


FIGURE 2a
U.S., Japan, and German M1 Growth
6 Month Annualized Rates of Change



Source: Federal Reserve Bank of St. Louis Data Base

FIGURE 2b
YEN/\$, DEUTSCHEMARK/\$ EXCHANGE RATES
 (Monthly Averages of Daily Figures)

