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Recent U.S. Intervention: Is Less More?

by Owen F. Humpage

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Introduction

In the past seven years, U.S. interventions in the foreign exchange market have become increasingly rare.[1] This paper offers an explanation for the reluctance to intervene. The apparent frequency with which recent U.S. interventions have stabilized key dollar exchange rates seems attributable primarily to the random-walk nature of movements in these rates. Official transactions by U.S. monetary authorities generally do not appear to improve the efficiency with which the foreign exchange market obtains information.

As discussed in the next section, U.S. interventions do not seem to affect fundamental determinants of exchange rates; rather, they change the way the market perceives and interprets information about those fundamentals. Sections II and III offer a definition of a successful intervention and ask if exchange rate movements consistent with this definition occur more frequently when the United States intervenes. Although the success criterion used is somewhat arbitrary, it encompasses outcomes that most economists would consider desirable. The empirical tests follow a methodology proposed by Merton (1981) and Henriksson and Merton (1981) and applied by Leahy (1995) in a study of U.S. profits from intervention. The results are given in section IV, and section V concludes with a brief discussion of some shortcomings that limit the interpretation of the results.

I. Intervention and the Channels of Influence

Economists' doubts about the effectiveness of U.S. intervention originate with the Federal Reserve's practice of preventing official exchange-market transactions from interfering with monetary policy.[2] When, for example, the United States sells German marks in an attempt to prevent a dollar depreciation, the Federal Reserve receives payment in dollars

■ 1 Under the Gold Reserve Act of 1934, the U.S. Treasury, through its Exchange Stabilization Fund (ESF), maintains primary responsibility for the nation's interventions. The Federal Reserve intervenes both as the ESF's agent and on its own behalf, typically splitting any transactions equally between the two accounts.

■ 2 Almekinders (1995), Dominguez and Frankel (1993), and Edison (1993) provide useful surveys of exchange-market intervention.

by debiting the reserve accounts of the appropriate commercial banks. Other things being equal, this action shrinks bank reserves, the monetary base, and ultimately the U.S. money stock. The German money stock will tend to rise. Although dollar exchange rates should respond favorably, the mechanism can interfere with the inflation objectives of monetary policy when the initial underlying cause of the dollar's depreciation is anything other than a domestic monetary impulse. Moreover, if the Federal Reserve tolerated such interference, the U.S. Treasury, which has primacy regarding intervention in this country, could influence monetary policy and violate the Fed's independence (see Humpage [1994]).

To avoid possible conflicts between exchange rate and domestic price objectives, the Federal Reserve routinely offsets the monetary-base effects of U.S. intervention through open-market transactions in Treasury securities. To continue with the example of the mark begun earlier, the Fed purchases Treasuries and credits banks' reserve accounts. (The Bundesbank tends to do likewise.) Although this eliminates the most obvious, direct influence on exchange rates—relative changes in the U.S. and German money stocks—the process alters the currency composition of publicly held government debt. After the offset, the public holds fewer dollar-denominated securities and more mark-denominated securities. According to the portfolio-balance approach to determining exchange rates, if Ricardian equivalence does not hold and if investors regard these bonds as imperfect substitutes, changes in the currency composition of outstanding debt will cause the dollar to depreciate, independent of our monetary policy stance. Unfortunately, empirical studies find virtually no evidence that intervention alters exchange rates through this channel (see Edison [1993]).

Even if intervention does not alter market fundamentals, it could still influence exchange rates by affecting either the market's perception of current fundamentals or expectations about how they might change. Foreign exchange dealers face strong incentives to acquire all possible information about current and anticipated economic developments that could influence exchange rates. If these dealers are successful, current quotations will incorporate all available information, and only new information that revises traders' expectations will affect exchange rates. To the extent that traders formulate their expectations without systematic errors, revision will be random, and exchange rate changes will approximate a random walk.

Although economists generally regard foreign exchange markets as highly efficient processors of information, markets do not always respond to news instantaneously or completely. Information is costly, and some time must elapse—whether minutes, hours, or days—between the receipt of new information and its full incorporation into exchange rates. Traders' expectations can be dissimilar or highly uncertain. Consequently, monetary authorities could sometimes possess better information than other market players and could use intervention to convey it to the market. For example, a central bank could have superior knowledge about an impending change in monetary policy. Nevertheless, the notion that it *routinely* has better information than the market—even about monetary policy—remains debatable.

II. Success Criterion

If U.S. monetary authorities can routinely affect the information flow within the foreign exchange market, then one would regularly observe an adjustment in the spot exchange rate when intervention occurs. Furthermore, if intervention can promote an exchange rate policy, one would expect these adjustments to conform to that policy's objective.

The stated aim of U.S. intervention policy is to counter disorderly market conditions, a goal that eludes a simple, precise, or even impartial definition. Sometimes, reported interpretations of this objective, such as reintroducing a sense of two-way risk, also elude a verifiable description in terms of exchange rate movements. At other times—especially over the period considered in this study—U.S. actions seem to signal support for the initiative of other central banks, rather than ardent conviction about the dollar. Nevertheless, official descriptions of efforts since May 1, 1990, suggest that U.S. monetary officials usually determine the success or failure of their interventions with reference to movements in spot dollar exchange rates.[3] Although the success criterion offered below is somewhat arbitrary, it is nevertheless consistent with the objective of countering disorderly markets and is readily verifiable. One could, of course, propose and test other criteria.

■ **3** This statement is based on a survey of "Treasury and Federal Reserve Foreign Exchange Operations," which appeared quarterly in the *Federal Reserve Bulletin* between October 1990 and June 1997.

A General Success Criterion

Since one is never precisely certain whether the intended goal of intervention on any given day is to dampen exchange rate movements, to reverse their direction, or to encourage them along their present path, I adopt a broad success criterion—jointly expressed by (1a) and (1b) below—that subsumes all of these purposes. For U.S. sales of foreign exchange,

$$\text{(1a)} \quad ws_t = \begin{cases} 1 & \text{if } I_t > 0 \text{ and } \Delta S_t > 0 \text{ or} \\ & \Delta S_t > \Delta SAM_t, \text{ and} \\ 0 & \text{otherwise.} \end{cases}$$

For U.S. purchases of foreign exchange,

$$\text{(1b)} \quad wb_t = \begin{cases} 1 & \text{if } I_t < 0 \text{ and } \Delta S_t < 0 \text{ or} \\ & \Delta S_t < \Delta SAM_t, \text{ and} \\ 0 & \text{otherwise.} \end{cases}$$

The variables are defined as follows:

ws_t and wb_t are dichotomous success variables,

I_t is official U.S. intervention, with positive values indicating sales of foreign exchange and negative values designating purchases,

ΔS_t measures the change in the exchange rate between the morning opening of the New York market (9:00 a.m.) and the afternoon closing (4:00 p.m.), and

ΔSAM_t measures the change in the exchange rate from the morning opening on day $t-1$ to the morning opening on day t.

The respective parts of the dichotomous success criterion (ws_t and wb_t) take a value of one if U.S. intervention sales or purchases of foreign exchange are successful. An intervention sale of foreign exchange ($I_t > 0$) is successful if it is associated with a dollar appreciation ($\Delta S_t > 0$) or a smaller depreciation ($\Delta S_t > \Delta SAM_t$) when both ΔS_t and ΔSAM_t are negative. An intervention purchase of foreign exchange ($I_t < 0$) is successful if it is associated with a dollar depreciation ($\Delta S_t < 0$) or a smaller appreciation ($\Delta S_t < \Delta SAM_t$) when both ΔS_t and ΔSAM_t are positive.

In this paper, I_t refers to official data on actions against German marks or Japanese yen, the only foreign currencies that are subject to U.S. intervention. I assume that all such events occur in the New York market between its morning opening and afternoon closing (see Goodhart and Hesse [1993]). All exchange rates are bid quotes in German marks per dollar or Japanese yen per dollar.

The criterion pertains to movements in the exchange rate during the current day or compares current changes with movements over the previous 24 hours. In a highly efficient market, dealers' quotations will quickly incorporate useful information arising from intervention. In considering U.S. actions alone, the following tests assume that the market fully processes the relevant news about intervention on the day of the official transaction.

Because the United States and foreign monetary authorities closely coordinated their interventions during the sample period, I modified the success criterion slightly to lengthen the timing convention and to capture possible effects of foreign intervention. This was done by substituting ΔSPM_t for ΔS_t and ΔSPM_{t-1} for ΔSAM_t in expressions (1a) and (1b), where SPM is the afternoon closing exchange-rate quotation for the New York market. These substitutions measure success by comparing changes in today's closing quotation with yesterday's and by comparing movements in today's and yesterday's exchange rate. Foreign interventions, undertaken before the U.S. market opens and possibly with the acquiescence of U.S. officials, could affect the opening quotation in New York before American authorities act. Subsequent U.S. intervention may not supply any further information to the market or have any effect on the exchange rate, but one might wish to consider the overall intervention (domestic and foreign) a success.[4]

Sample Period: May 1, 1990–March 19, 1997

I applied the success criterion described in expressions (1a) and (1b) to U.S. interventions between May 1, 1990 and March 19, 1997. During this period, the nation demonstrated a growing reluctance to intervene. Initially, this hesitation appears to have resulted from a series of dissents on Federal Open Market Committee votes related to U.S. intervention policies in late 1989 and early 1990. These dissents touched on various aspects of official policy, but generally expressed skepticism about the efficacy

4 The tests utilize only official U.S. intervention data because foreign data are unavailable.

TABLE 1

U.S. Intervention Amounts and Frequencies

	Count	Mean[a]	Standard Deviation[a]	Min[a]	Max[a]
Louvre Period: February 23, 1987–April 30, 1990					
Against German marks					
Absolute value	147	146.6	114.2	15.0	695.0
Sales of marks	110	155.1	116.6	25.0	695.0
Purchases of marks	37	121.2	104.1	15.0	395.0
Against Japanese yen					
Absolute value	147	148.6	121.8	3.0	720.2
Sales of yen	83	156.7	110.7	6.0	555.0
Purchases of yen	64	138.2	135.0	3.0	720.2
Number of observations = 805					
Sample Period: May 1, 1990–March 19, 1997					
Against German marks					
Absolute value	45	220.6	226.5	20.0	850.0
Sales of marks	39	241.2	236.8	20.0	850.0
Purchases of marks	6	86.7	21.6	21.6	100.0
Against Japanese yen					
Absolute value	21	331.6	215.5	30.0	800.0
Sales of yen	17	396.1	186.2	165.0	800.0
Purchases of yen	4	57.5	29.9	30.0	100.0
Number of observations = 1,733					

a. In millions of dollars.
SOURCE: Author's calculations.

of intervention and concern about adverse spillovers onto monetary policy (see Humpage [1994]). At this writing, the United States has not intervened in the foreign exchange market since August 15, 1995—the longest period of abstinence since the dollar began to float.[5]

Between May 1, 1990 and March 19, 1997, the United States intervened on 45 occasions against the mark and on 21 occasions against the yen (see table 1). The vast majority of these events involved official sales of marks or yen. The number of actions during this period was far smaller than in the previous one, which had been influenced by the Louvre Accord of February 1987. In addition, instances of intervention in the sample period usually did not persist as they did in the 1987–90 period immediately following the Accord (see figure 1). Often, they lasted no more than a single day.

Although the frequency was lower, the average amount of intervention *sales* of marks or yen was substantially greater during the sample period than in 1987–90. The average amount of intervention *purchases* of foreign exchange was smaller during the sample period, but the United States undertook very few of these.

I also break the sample period into subperiods: May 1 to July 31, 1990 and August 1, 1990 to March 19, 1997. During the first subperiod, the only U.S. intervention involved selling marks on 17 occasions. The Federal Reserve undertook these sales as agent for the Treasury's ESF. The operations were intended to adjust ESF balances and to facilitate a reversal of outstanding warehousing operations with the Federal Reserve System. A warehousing operation is a swap transaction between the ESF and the System, whereby the System acquires foreign exchange (German marks in this case) and the ESF receives U.S. dollars. The warehousing operation unwinds at a set future date (see Humpage [1994]). Although these transactions were not designed to affect the mark–dollar exchange rate, they remain interesting because even interventions without any intended effect on exchange rates should frequently appear successful when rates follow a random walk.[6]

Success and the Random Walk

In a highly efficient market, exchange rate changes will approximate a random walk (see Baillie and McMahon [1989]). Consequently, even completely ineffectual interventions frequently seem successful.

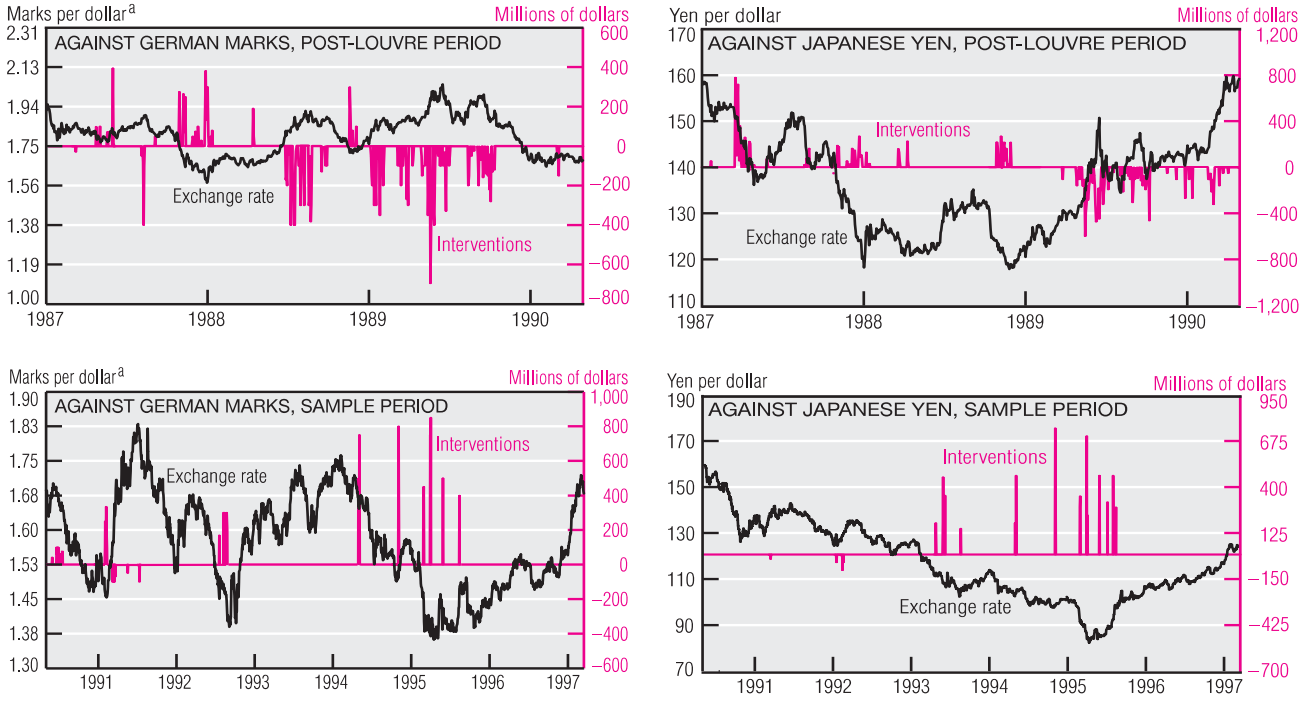
Figure 2 illustrates this point. Imagine that at the beginning of day $t - 1$, 1.85 German marks trade for one dollar, but that over the day, the dollar depreciates 5 percent against the mark. At the start of day t, therefore, 1.76 marks trade for one dollar. Under the random-walk hypothesis, the best guess for the mark–dollar exchange rate on day $t + 1$ is 1.76, but an appreciation or a depreciation away from 1.76 is equally probable. Consequently, the chance of observing a dollar appreciation (depreciation) following the sale (purchase) of foreign exchange—even when the effort is completely ineffectual—will approach 50 percent. (One must also allow for the chance of no change.) Indeed, during the sample period, the dollar depreciated against the mark 48 percent of the time, appreciated against the mark 48 percent of

5 I base this statement on official published summaries of "Treasury and Federal Reserve Foreign Exchange Operations" and news accounts of currency markets. Official data used in this paper terminate in December 1995.

6 The "Foreign Exchange" column of the *Wall Street Journal* made no mention of these interventions on the days they took place.

FIGURE 1

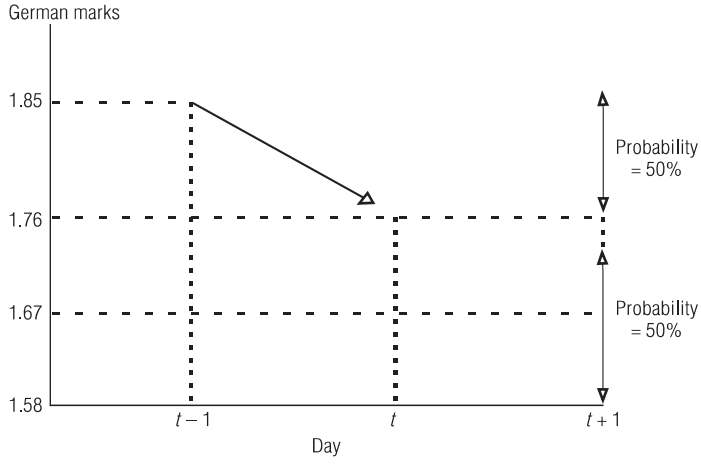
U.S. Interventions



a. Rounding to two decimal places causes the appearance of variation among intervals.
SOURCES: Board of Governors of the Federal Reserve System; and U.S. Department of Commerce, Bureau of Economic Analysis.

FIGURE 2

Random Walk and the Probability of Success



SOURCE: Author's calculations.

the time, and otherwise remained unchanged. The results are similar for the yen–dollar exchange rate, and dropping observations that include intervention does not substantially alter the proportions.

If the 5 percent depreciation of the dollar on day $t - 1$ continued throughout day t, the exchange rate would be 1.67 at the start of day $t + 1$. As figure 2 demonstrates, the probability of seeing an appreciation (or a smaller depreciation) on day $t + 1$ must be greater than 50 percent. Hence, we expect that the probability of observing a success according to the general criterion—expressions (1a) and (1b)—will exceed 50 percent. The frequency of observing exchange rate movements consistent with these definitions is approximately 63 percent for the entire sample (that is, with or without interventions). This probability does not change when one drops intervention days from the sample (see Humpage [1996]).

III. The Probability of Success

If exchange rate changes followed a random walk without any drift, one could view each change as an independent event and analyze the frequency of success using standard statistical distributions (see Humpage [1996]). Exchange rate changes, however, are generally not strict random walks. Even when they exhibit such behavior over an entire, lengthy sample, they may deviate from a random walk around times when intervention occurs.[7]

Merton (1981) and Henriksson and Merton (1981) develop a nonparametric test to evaluate investment managers' ability to predict the relative performance of stocks and bonds, which have statistical properties similar to those of exchange rates. To apply the test, I treat expression (1) as an official forecast of near-term exchange rate movements that U.S. monetary authorities reveal by intervening. When the Federal Reserve sells foreign exchange, for example, it forecasts a near-term appreciation of the dollar or a smaller depreciation than recently observed. A purchase of foreign exchange has a corresponding interpretation. Evidence of exceptional forecasting skills would suggest that U.S. monetary authorities act with better information than the market and successfully convey that information to it.

The chief advantage of this procedure is that it does not require specific assumptions about either the distribution of exchange rate changes or the probabilities of individual events. A disadvantage is that it investigates only the number of times intervention is successful, not the magnitude of any effect.

To illustrate the test, consider U.S. intervention sales of foreign exchange. Following Merton, I define the conditional probabilities as:

(2a) $$p1 = \text{prob}\,[I > 0 \mid \Delta S > 0 \text{ or } \Delta S > \Delta SAM], \text{ and}$$

(2b) $$1 - p1 = \text{prob}\,[I \leq 0 \mid \Delta S > 0 \text{ or } \Delta S > \Delta SAM].$$

(2c) $$p2 = \text{prob}\,[I \leq 0 \mid \Delta S \leq 0 \text{ or } \Delta S \leq \Delta SAM], \text{ and}$$

(2d) $$1 - p2 = \text{prob}\,[I > 0 \mid \Delta S \leq 0 \text{ or } \Delta S \leq \Delta SAM].$$

Expression (2a) is the probability that the exchange rate behaves in a manner consistent with the criterion for success—expression (1a)—and the United States intervenes. Expression (2c) is the probability that the exchange rate does *not* conform with the success criterion and the United States does *not* sell foreign exchange. The conditional probabilities defined in (2b) and (2d) are for events complementary to those considered in (2a) and (2c).

U.S. intervention sales would have no value as a forecast of the success criterion if the probability of observing an official sale of foreign exchange given a dollar appreciation or smaller depreciation ($p1$) was no greater than the probability of observing an official sale of foreign exchange given exchange rate behavior inconsistent with the success criterion ($1 - p2$). In a test of the forecast value of intervention, the null hypothesis—that U.S. intervention has no predictive value—becomes

(3) $$H_0: p1 = 1 - p2 \Rightarrow p1 + p2 = 1.$$

In this case, traders would not modify their prior estimates of the distribution of exchange rate movements as a result of intervention.[8] Intervention has positive forecast value if $p1 + p2 > 1$. If, for example, intervention conveyed perfect information to the market, then $p1 = 1$, $p2 = 1$, and $p1 + p2 = 2$. Similarly, intervention would have negative forecast value if $p1 + p2 < 1$.[9]

I obtain estimates of conditional probabilities from the sample data (see table 2). In the case of U.S. sales of German marks, for example, $n1$ is the number of successful mark sales (23); $n2$ represents unsuccessful mark sales (16 = 39 – 23); $N1$ is the number of *virtual successes*, that is, the number of days on which the dollar–mark exchange rate appreciates or dampens a depreciation (1,101); and $N2$ is the remaining number of observations (632 = 1,733 – 1,101). It follows that $E\,(n1/N1) = p1$ and $E\,(n2/N2) = 1 - p2$. Hence, $\hat{p}1 + \hat{p}2 = 0.996$.

Henriksson and Merton (1981) show that under the null hypothesis ($p1 + p2 = 1$), the number of correct interventions will have a hypergeometric distribution. This provides a direct test of the null hypothesis that depends neither on the underlying exchange-rate process nor on an underlying guess of the probability of an

7 The author thanks an anonymous referee for comments about the random-walk hypothesis.

8 Merton (1981; proposition III, p. 384) shows this to be a necessary and sufficient condition for the forecast to have no value.

9 Ironically, an intervention that is consistently wrong also conveys useful information to the market. The market can profit by betting against the intervention: Buy when the Federal Reserve sells foreign exchange.

TABLE 2

Analysis of U.S. Interventions: May 1, 1990–March 19, 1997

	Count	Intervention Successes	Percentage	Virtual Successes	Percentage	$p1$	$p2$	$p1 + p2$	$1 - CDF$
Against German marks									
Opening to closing									
Purchases	6	4	66.7	1,147	66.2	0.003	0.997	1.000	0.341
Sales	39	23	59.0	1,101	63.5	0.021	0.975	0.996	0.670
Closing to closing									
Purchases	6	3	50.0	1,058	61.1	0.003	0.996	0.998	0.566
Sales	39	24	61.5	1,048	60.5	0.023	0.978	1.001	0.385
Number of observations = 1,733									
Against Japanese yen									
Opening to closing									
Purchases	4	3	75.0	1,131	65.3	0.003	0.998	1.001	0.181
Sales	17	12	70.6	1,143	66.0	0.010	0.992	1.002	0.260
Closing to closing									
Purchases	4	2	50.0	1,048	60.5	0.002	0.997	0.999	0.483
Sales	17	13	76.5	1,066	61.5	0.012	0.994	1.006	0.059
Number of observations = 1,733									

SOURCE: Author's calculations.

individual success (see Humpage [1996]). Assuming that $n1$ is a hypergeometric random variable, I reject the null hypothesis that $p1 + p2 = 1$ in favor of $p1 + p2 > 1$, if the probability of observing an equal or greater number of successes—that is, one minus the cumulative density function ($1 - CDF$)—is very small. I reject the null hypothesis in favor of $p1 + p2 < 1$ if the probability of observing an equal or greater number of successes ($1 - CDF$) is very large.

IV. Empirical Results

Table 2 reports the results of the experiment for the entire period (May 1, 1990–March 19, 1997), and table 3 breaks out two subperiods. As the first column of each table indicates, I test both purchases and sales of German marks and Japanese yen against the success criterion defined with opening-to-closing and with closing-to-closing changes in the exchange rate. As noted above, the longer time frame accommodates cooperation between U.S. and foreign monetary authorities, which occurred frequently over the sample period. Columns 2 and 3 indicate the number of interventions and successful interventions, respectively, for each category listed in column 1. Approximately 64 percent of the interventions succeeded according to criteria (1a) and (1b). In column 4, this statistic ranged from a low of 50 percent to a high of 76.5 percent. Over the sample period, U.S. interventions generally seem more successful against yen than against marks. Column 5 counts the virtual successes, that is, the number of days over which exchange rate movements conformed with the general success criteria, irrespective of U.S. intervention. When I measure exchange rate changes from opening to closing, the frequency of a virtual success is approximately 65 percent. When I measure exchange rate changes from closing to closing, the frequency is somewhat lower (approximately 61 percent). In general, therefore, the frequency of a successful intervention is not substantially different from the frequency of a virtual success. Random interventions would seem to have done as well.

Estimates of the relevant conditional probabilities follow in columns 7 and 8. It is unsettling that the value of $p1$ is very low in cases where the number of interventions is small, but nearly all are successful, as in the case of U.S. purchases of Japanese yen. Nevertheless, if all interventions were successful, $p2$ alone would equal one, and the statistical test would always reject the null hypothesis.

TABLE 3

Analysis of U.S. Intervention: Two Subperiod Samples

	Count	Intervention Successes	Percentage	Virtual Successes	Percentage	$p1$	$p2$	$p1 + p2$	$1 - CDF$
				May 1, 1990–July 31, 1990					
Against German marks									
Opening to closing									
Purchases	0	0	—	40	62.5	—	—	—	—
Sales	17	11	64.7	39	60.9	0.282	0.996	1.279	0.256
Closing to closing									
Purchases	0	0	—	40	62.5	—	—	—	—
Sales	17	10	58.8	38	59.4	0.263	0.996	1.259	0.411
Number of observations = 64									
				August 1, 1990–March 19, 1997					
Against German marks[a]									
Opening to closing									
Purchases	6	4	66.7	1,107	66.3	0.004	0.997	1.000	0.344
Sales	22	12	54.5	1,062	63.6	0.011	0.985	0.996	0.751
Closing to closing									
Purchases	6	3	50.0	1,018	61.0	0.003	0.996	0.999	0.565
Sales	22	14	63.6	1,010	60.5	0.014	0.989	1.003	0.306
Number of observations = 1,669									
Against Japanese yen									
Opening to closing									
Purchases	4	3	75.0	1,090	65.3	0.003	0.998	1.001	0.182
Sales	17	12	70.6	1,104	66.1	0.011	0.992	1.003	0.265
Closing to closing									
Purchases	4	2	50.0	1,008	60.4	0.002	0.997	0.999	0.482
Sales	17	13	76.5	1,027	61.5	0.013	0.994	1.007	0.059
Number of observations = 1,669									

a. Excludes interventions associated with warehousing.
SOURCE: Author's calculations.

Column 9 records the test statistic for the null hypothesis of no forecast value, which I assume to have a hypergeometric distribution. As the final column indicates, I can reject the null hypothesis in only one case—that of U.S. sales of Japanese yen when exchange rates are measured from closing to closing. Here, one can reject the null with 94 percent confidence in favor of the positive forecast value. The inability to reject the null hypothesis for U.S. sales of Japanese yen when the tests include opening-to-closing exchange rate movements suggests that foreign, not U.S., intervention may have provided the forecast value, but I did not test this proposition directly.

The findings do not change when I remove the 17 sales of German marks that were undertaken to adjust the ESF's portfolio and unwind its warehousing operation. The results shown in table 3 parallel those in table 2, implying that, with the exception already noted, recent U.S. intervention did not systematically affect the mark–dollar or yen–dollar exchange rates.

V. Conclusion

This paper investigates the forecast value of U.S. intervention policy, using a methodology that Merton (1981) and Henriksson and Merton (1981) proposed and that Leahy (1995) applied to an analysis of intervention profits. Evidence of superior forecasting skill would imply that U.S. monetary authorities typically act with better information than the market and that intervention could alter foreign exchange traders'

expectations about rates. My analysis, however, indicates that for recent U.S. interventions (May 1, 1990–March 19, 1997), this was not the case. The random-walk nature of exchange rate movements—rather than superior information—seems capable of explaining the frequency of success.

This paper has some shortcomings that limit its interpretation. For one thing, although broad and readily verifiable, the success criterion used is necessarily arbitrary. Under some alternative criteria, intervention could appear successful and have positive forecast value. In addition, the time frame for analysis is short. A narrow period—opening to closing or closing to closing—is consistent with the notion that exchange markets are highly efficient processors of information. A broader time frame, however, might produce different results. A third shortcoming is my treatment of success as a dichotomous variable. I do not consider the possibility that the magnitude of exchange rate movements during the limited instances of successful interventions may be substantially different than at other times. Moreover, this study does not condition the probability of success on whether the United States coordinated its interventions or on the size of its transactions. Humpage (1996) found that coordination—and, to a lesser extent, large dollar amounts—increased the probability of an intervention's success. Despite these shortcomings, the results offer a plausible reason for not expecting more from less intervention.

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