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## Appendix 2

### Empirical Method for Assessing Success Counts

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#### A2.1 Introduction

This appendix explains the empirical methodology that we use in chapters 5 and 6 to evaluate US intervention during the floating exchange-rate period. It draws heavily on Bordo, Humpage, and Schwartz (2012). Following a methodology developed in Humpage (1999, 2000), we define three success criteria based on the correspondence between intervention and subsequent exchange-rate movements and count the number of observed successes under each criterion.<sup>1</sup> Then we test to see if counts exceed, or fall short of, a number that might occur randomly given the near-martingale nature of daily exchange-rate changes. A count that is statistically different from random suggests that US intervention has value as a forecast of near-term exchange-rate patterns and conveys information useful for price discovery.

Bordo, Humpage, and Schwartz (2012) also present further empirical results for this sample. They test to see if various factors, including the amount and frequency of interventions and whether the intervention was coordinated, affect the probability of success. They find that larger interventions increase the probability of success, but no other factor does so.

This appendix proceeds as follows: The next section defines our three success criteria, explains our data, and describes some key underlying assumptions. Section 3 evaluates our success counts assuming that successes are hypergeometric random variables. Table A2.1, which does not appear in the body of this book, provides results for the entire 1973 to 1995 sample period. Tables A2.2 and A2.3 provided a summary of results for intervention against German marks and Japanese yen respectively for key subperiods of our sample. Tables A2.4 through A2.9 provide the detailed results for those

subperiods from which we constructed the abbreviated tables that appear in chapters five and six.

## A2.2 Success Counts

We evaluate the success of US foreign-exchange operations using two specific criteria and a general criterion that incorporates the first two. In all of the definitions that follow,  $I_t$  designates US intervention on day  $t$ , with positive and negative values being sales and purchases of foreign exchange, respectively.  $S_t$  is the opening (9:00 a.m.) spot bid for foreign exchange in the New York market on day  $t$  measured in foreign-currency units per US dollar, and  $\Delta S_t = S_{t+1} - S_t$ . The change in the exchange rate from the opening on day  $t$  to the opening on day  $t+1$  brackets US interventions on day  $t$ .<sup>2</sup> The target exchange rate is either German marks per dollar or Japanese yen per dollar, and  $I_t$  consists only of the corresponding intervention, that is, dollars against German marks or dollars against Japanese yen.

Our first binomial success criterion ( $SC_1$ ) counts an official US sale or purchase of foreign exchange on a particular day as a success ( $SC_1 = 1$ ) if the dollar appreciates or depreciates, as the case may be, over that same day:

$$(1) \quad SC_1 = \begin{cases} 1 & \left\{ \begin{array}{l} \text{if } I_t > 0, \text{ and } \Delta S_t > 0, \text{ or} \\ \text{if } I_t < 0, \text{ and } \Delta S_t < 0; \end{array} \right. \\ 0 & \text{otherwise.} \end{cases}$$

Our second success criterion ( $SC_2$ ) scores an intervention as a success ( $SC_2 = 1$ ) if the United States sells foreign exchange and the dollar continues to depreciate, but does so by less than over the previous day. Likewise, this criterion counts intervention as a success if the United States buys foreign exchange and the dollar continues to appreciate, but does so by less than over the previous day. (For completeness, we include  $\Delta S_t = 0$  in this criterion.)

$$(2) \quad SC_2 = \begin{cases} 1 & \left\{ \begin{array}{l} \text{if } I_t > 0, \text{ and } \Delta S_{t-1} < 0, \text{ and } \Delta S_t \leq 0, \text{ and } \Delta S_t > \Delta S_{t-1}, \text{ or} \\ \text{if } I_t < 0, \text{ and } \Delta S_{t-1} > 0, \text{ and } \Delta S_t \geq 0, \text{ and } \Delta S_t < \Delta S_{t-1}; \end{array} \right. \\ 0 & \text{otherwise.} \end{cases}$$

Our general success criterion ( $SC_3$ ) incorporates  $SC_1$  and  $SC_2$ . Accordingly, an intervention sale of foreign exchange on a particular day is successful ( $SC_3 = 1$ ) if the dollar appreciates or if it depreciates by less than on the previous day. A corresponding rule holds for dollar purchases of foreign exchange.

$$(3) \quad SC_3 = \begin{cases} 1 & \left\{ \begin{array}{l} \text{if } I_t > 0, \text{ and } \Delta S_t > 0, \text{ or } \Delta S_t > \Delta S_{t-1} \text{ or} \\ \text{if } I_t < 0, \text{ and } \Delta S_t < 0, \text{ or } \Delta S_t < \Delta S_{t-1}; \end{array} \right. \\ 0 & \text{otherwise.} \end{cases}$$

We measure success over a single day, which some may find unduly restrictive (Goodhart and Hesse 1993; Fatum and Hutchison 2002). Despite the narrow window, the chance that we might fail to count an intervention as successful because the appropriate exchange-rate movement occurred beyond the opening on day  $t + 1$  seems remote. Chang and Taylor (1998), Cheung and Chinn (2001), and Dominguez (2003), among others, suggest that exchange markets begin to respond to intervention within minutes or hours, not days. Likewise, a majority of central bank officials in Neely's (2001) survey contended that exchange rates reflect the full effects of intervention within hours. Alternatively, by keeping the window narrow, we may count an intervention as a success even though the exchange-rate change that led us to that conclusion subsequently disappears. Opening the event window beyond a single day to limit this problem, however, quickly causes overlap among interventions, making inferences about the likelihood of an intervention's success impossible.

We assume, as in Dominguez (2003, 34), that US monetary authorities base a decision to intervene on day  $t$  only on past information about exchange rates. We believe this to be an accurate characterization of how US policymakers generally reach their decision to intervene, although the desk may sometimes adjust the amount of an intervention in response to market reactions (Neely 2001; Baillie and Osterberg 1997). If exchange-rate changes and interventions are jointly determined on day  $t$ , our counts could contain a bias (Neely 2005).

Although we do not model a specific transmission mechanism for intervention, we assume that intervention operates through an expectations channel. We are testing to see if US monetary authorities have an informational advantage that they impart to the market through their interventions (Popper and Montgomery 2001). If central-bank intervention does indeed impart new information to the market, private traders will immediately incorporate it into their exchange-rate quotes. This information may be positive; that is, the market may interpret the intervention in the manner that the central bank intends. Alternatively, this information may be negative; that is, the market may react to an intervention in the opposite manner than the central bank desires. Our tests look to uncover this behavior.

### **A2.3 Evaluation: How to Read the Tables**

Following Henriksson and Merton (1981) and Merton (1981), we evaluate our success counts under the assumption that the number of successes is a hypergeometric random variable. The hypergeometric distribution seems appropriate because it does not require individual interventions to be independent events and does not depend on a presumed probability of an individual success. To apply the Henriksson and Merton methodology, we must consider intervention sales and purchases of foreign exchange separately.

Our null hypothesis compares the actual and the expected success counts. We reject the null and conclude that intervention has positive forecast value if the success count exceeds the expected number by two standard deviations. In this case, a private dealer could profit on average by trading with the Federal Reserve. We reject the null and conclude that intervention has negative forecast value if the actual number of successes lies below the expected number by more than two standard deviations. In this case, private dealers could profit on average by trading against the Federal Reserve. If we cannot reject the null hypothesis, we conclude that the number of successes is not different than a number that could randomly occur given the near martingale nature of daily exchange-rate changes.

This approach also assumes that intervention does not change fundamental macroeconomic determinants of exchange rates. This supposition seems appropriate given that the Federal Reserve routinely sterilizes all US interventions and given the lack of evidence that sterilized intervention works through a portfolio-balance mechanism. The failure of this assumption to hold would bias our results toward finding a high number of successes in any sample.

Table A2.1, which does not correspond to any table in the body of this book, presents our results for the entire sample period, 2 March 1973 through 19 March 1997.<sup>3</sup> During these 6,274 business days, the United States intervened on 971 days against German marks and on 243 days against Japanese yen.<sup>4</sup> The first intervention against German marks took place on 10 July 1973, and the first intervention against Japanese yen followed on 24 January 1974.

The first column in table A2.1 lists the success criteria for the German marks (top section) and Japanese yen (bottom section). The second column shows official US intervention purchases and sales. Between 2 March 1973 and 19 March 1997, for example, the United States sold German marks on 469 days and bought German marks on 502 days. The next two columns of data show intervention successes. Of the 469 US sales of German marks, 136, or 29.0 percent, were successful under criterion SC<sub>1</sub>; that is, each of these 136 interventions was associated with a same-day dollar appreciation. The next two columns show virtual successes. Virtual successes follow the respective success criteria outlined in equations 1 through 3, absent any consideration of intervention. The dollar, for example, appreciated against the German mark—whether or not the United States intervened against marks—on 2,951, or 47.0 percent, of the 6,274 business days in our sample.

The final two columns in table A2.1 refer to the hypergeometric distribution. If successes are hypergeometric random variables, then in a sample of 6,274 observations with a virtual success rate of 47.0 percent, we would expect to observe 221 successes in 469 interventions, purely by chance. The observed number of successes, 136, falls more than two standard deviations below the expected value, implying that the United States had negative fore-

**Table A2.1** Success counts for US intervention, 2 March 1973 to 19 March 1997

Opening bid quotes							
	Total (#)	Intervention successes		Virtual successes		Expected successes (#)	Standard deviation (#)
		(#)	(%)	(#)	(%)		
German marks							
Observations	6,274						
Criterion SC <sub>1</sub>							
Sell marks	469	136	29.0	2,951	47.0	220.6	8
Buy marks	502	192	38.2	3,007	47.9	240.6	9
Total	971	328	33.8				
Criterion SC <sub>2</sub>							
Sell marks	469	117	24.9	820	13.1	61.30	4
Buy marks	502	110	21.9	807	12.9	64.57	4
Total	971	227	23.4				
Criterion SC <sub>3</sub>							
Sell marks	469	253	53.9	3,771	60.1	282	12
Buy marks	502	302	60.2	3,814	60.8	305	13
Total	971	555	57.2				
Japanese yen							
Observations	6,274						
Criterion SC <sub>1</sub>							
Sell yen	94	47	50.0	3,000	47.8	45	5
Buy yen	149	63	42.3	2,836	45.2	67	5
Total	243	110	45.3				
Criterion SC <sub>2</sub>							
Sell yen	94	19	20.2	740	11.8	11	1
Buy yen	149	28	18.8	829	13.2	20	2
Total	243	47	19.3				
Criterion SC <sub>3</sub>							
Sell yen	94	66	70.2	3,740	59.6	56	6
Buy yen	149	92	61.7	3,665	58.4	87	7
Total	243	158	65.0				

cast value. This value is so low that market participants, who knew when the United States intervened, could have bet against the United States—bought German marks on day  $t$ —and made money on average. From an expectations-channel perspective, a US sale of German marks signaled that the dollar would depreciate over the same day as the intervention. Similar results hold for purchases of German marks, implying that the United States had negative forecast value in this case too. The corresponding success counts for US official interventions against Japanese yen, however, were no different than random.

In contrast to the results under success criterion  $SC_1$ , the success counts under  $SC_2$ , for both US interventions against German marks and Japanese yen, are more than two standard deviations *above* their expected values, indicating that US interventions had positive forecast value with respect to criterion  $SC_2$ . When the dollar is depreciating and the United States sells foreign exchange, it is a good bet that the dollar will continue to depreciate, but will do so by less than on the day prior to the intervention. Likewise, when the dollar is appreciating and the United States buys foreign exchange, it is a good bet that the dollar will continue to appreciate, but will do so by less than on the day prior to the intervention.

While the successes under criterion  $SC_2$  clearly exceed the expected number, the overall frequency of this type of success is fairly low. Only 23 percent of all US interventions against German marks and 19 percent of all US interventions against Japanese yen were successful under the  $SC_2$  criterion.

The final, general success criterion,  $SC_3$ , combines  $SC_1$  and  $SC_2$ . Generally, we expect that approximately 60 percent of all interventions will be successful under at least one of our success criteria purely by chance. (See the virtual counts under  $SC_3$  in table A2.1.) The total number of actual successes under  $SC_3$  is—in all but one case—no better than random. The exception is the total for US sales of German marks, which falls more than two standard deviations below the expected number.

#### A2.4 Subperiods Appearing in Chapters 5 and 6

Tables A2.2 and A2.3 provides a one-stop comparison of the results for the various subperiods that appear in chapters 5 and 6 and for some more comprehensive time periods. This overall summary informed our conclusions about intervention under floating exchange rates. In tables A2.2 and A2.3,  $N$  and  $P$  indicate whether intervention had negative or positive forecast value for a designated criterion. An  $R$  in the tables indicates that the observed number of successes was no different than the number that we expect purely by chance.

The table cautions that overall conclusions about intervention are not necessarily robust across time periods or across currencies within any time period. Nevertheless, some relatively persistent patterns stand out. First, US intervention in German marks prior to 17 April 1981 universally had negative forecast value ( $N$ ) with respect to criterion  $SC_1$  and universally had positive forecast value ( $P$ ) with respect to criterion  $SC_2$  (see table A2.2). As discussed in chapter 5, during this time period—certainly before 15 September 1977—the United States feared that private traders might interpret an intervention as a sign that the dollar was fundamentally weak and that market participants might bet against the Federal Reserve's interventions. Our results validate this concern. In addition, US policymakers usually only

**Table A2.2** A summary of the success counts across time periods, German marks

US intervention against German marks								
Success criterion			SC <sub>1</sub>	SC <sub>1</sub>	SC <sub>2</sub>	SC <sub>2</sub>	SC <sub>3</sub>	SC <sub>3</sub>
Sell/buy foreign exchange	sell	buy	sell	buy	sell	buy	sell	buy
2 March 73–19 March 97	469	502	<i>N</i>	<i>N</i>	<i>P</i>	<i>P</i>	<i>N</i>	<i>R</i>
2 March 73–17 April 81	391	348	<i>N</i>	<i>N</i>	<i>P</i>	<i>P</i>	<i>N</i>	<i>R</i>
2 March 73–14 September 77	161	176	<i>N</i>	<i>N</i>	<i>P</i>	<i>P</i>	<i>N</i>	<i>R</i>
15 September 77–5 October 79	175	58	<i>N</i>	<i>N</i>	<i>P</i>	<i>P</i>	<i>R</i>	<i>N</i>
8 October 81–17 April 81	55	114	<i>N</i>	<i>N</i>	<i>P</i>	<i>P</i>	<i>R</i>	<i>R</i>
20 April 81–19 March 97	78	154	<i>R</i>	<i>R</i>	<i>P</i>	<i>P</i>	<i>R</i>	<i>R</i>
20 April 81–29 March 85	1	24	<i>N</i>	<i>N</i>	<i>R</i>	<i>P</i>	<i>N</i>	<i>R</i>
1 April 85–29 April 88	33	19	<i>R</i>	<i>R</i>	<i>P</i>	<i>P</i>	<i>R</i>	<i>R</i>
2 May 88–19 March 97	44	111	<i>R</i>	<i>R</i>	<i>R</i>	<i>R</i>	<i>R</i>	<i>R</i>

Notes: *N* = negative forecast value (observed number of successes falls below the expected number of successes by more than two standard deviations). *P* = positive forecast value (observed number of successes exceeds the expected number of successes by more than two standard deviations). *R* = random (observed number of success falls within two standard deviations of the expected number of successes).

**Table A2.3** A summary of the success counts across time periods, Japanese yen

US intervention against Japanese yen								
Success criterion			SC <sub>1</sub>	SC <sub>1</sub>	SC <sub>2</sub>	SC <sub>2</sub>	SC <sub>3</sub>	SC <sub>3</sub>
Sell/buy foreign exchange	sell	buy	sell	buy	sell	buy	sell	buy
2 March 73–19 March 97	94	149	<i>R</i>	<i>R</i>	<i>P</i>	<i>P</i>	<i>R</i>	<i>R</i>
2 March 73–17 April 81	11	31	<i>R</i>	<i>R</i>	<i>R</i>	<i>P</i>	<i>R</i>	<i>R</i>
2 March 73–14 September 77	0	2	(none)	<i>R</i>	(none)	<i>R</i>	(none)	<i>R</i>
15 September 77–5 October 79	10	19	<i>R</i>	<i>N</i>	<i>R</i>	<i>P</i>	<i>R</i>	<i>R</i>
8 October 81–17 April 81	1	10	<i>R</i>	<i>R</i>	<i>R</i>	<i>R</i>	<i>R</i>	<i>R</i>
20 April 81–19 March 97	83	118	<i>R</i>	<i>R</i>	<i>P</i>	<i>P</i>	<i>R</i>	<i>R</i>
20 April 81–29 March 85	0	11	(none)	<i>R</i>	(none)	<i>P</i>	(none)	<i>R</i>
1 April 85–29 April 88	52	20	<i>R</i>	<i>R</i>	<i>P</i>	<i>R</i>	<i>R</i>	<i>R</i>
2 May 88–19 March 97	31	87	<i>R</i>	<i>R</i>	<i>P</i>	<i>R</i>	<i>R</i>	<i>R</i>

Notes: *N* = negative forecast value (observed number of successes falls below the expected number of successes by more than two standard deviations). *P* = positive forecast value (observed number of successes exceeds the expected number of successes by more than two standard deviations). *R* = random (observed number of success falls within two standard deviations of the expected number of successes).



hoped to smooth exchange-rate movements over this time period; that is, the United States usually cared more about  $SC_2$  than  $SC_1$ .

Second, US interventions against Japanese yen prior to the Plaza Accord—with few exceptions—seem unsuccessful under each of our three criteria (see table A2.3). Prior to the Plaza Accord, however, the United States rarely intervened against Japanese yen. With so few observations, drawing firm conclusions about the success of US interventions against Japanese yen may be risky. (A similar caveat applies to the interventions against German marks over the 20 April 1981 through 29 March 1985 minimalist period.)

Third, the large US interventions associated with the Plaza and Louvre accords (1 April 1985 through 29 April 1988) and with the US Treasury-led interventions of the very late 1980s and early 1990s, had overall success counts that were not obviously different than previous episodes (see chapter 6). Economists have often regarded the interventions following the Plaza and Louvre accords as highly successful.

Fourth, US interventions lack positive forecast value under success criterion  $SC_3$  during every subperiod portrayed in tables A2.2 and A2.3. Our overall finding that fewer than 60 percent of US interventions had positive forecast value seems consistent across time periods and currencies.

Tables A2.4 through A2.9, which follow, contain a complete set of results for each of the subperiods that we discussed in chapters 5 and 6 of the book following the format in table A2.1. In chapters 5 and 6 we present abridged results from these tables.

**Table A2.4** Success counts for US intervention, 2 March 1973 to 14 September 1977

Opening bid quotes							
	Total (#)	Intervention successes		Virtual successes		Expected successes (#)	Standard deviation (#)
		(#)	(%)	(#)	(%)		
German marks							
Observations	1184						
Criterion SC <sub>1</sub>							
Sell marks	161	45	28.0	541	45.7	74	4
Buy marks	176	67	38.1	560	47.3	83	5
Total	337	112	33.2				
Criterion SC <sub>2</sub>							
Sell marks	161	34	21.1	151	12.8	21	2
Buy marks	176	45	25.6	163	13.8	24	2
Total	337	79	23.4				
Criterion SC <sub>3</sub>							
Sell marks	161	79	49.1	692	58.4	94	6
Buy marks	176	112	63.6	723	61.1	107	7
Total	337	191	56.7				
Japanese yen							
Observations	1,184						
Criterion SC <sub>1</sub>							
Sell yen	0	0	na	524	44.3	0	0
Buy yen	2	2	100.0	478	40.4	1	1
Total	2	2	100.0				
Criterion SC <sub>2</sub>							
Sell yen	0	0	na	139	11.7	0	0
Buy yen	2	0	na	181	15.3	0	0
Total	2	0	na				
Criterion SC <sub>3</sub>							
Sell yen	0	0	na	663	56.0	0	0
Buy yen	2	2	100.0	659	55.7	1	1
Total	2	2	100.0				

*Note:* This table corresponds to table 5.2 in chapter 5.

**Table A2.5** Success counts for US intervention, 15 September 1977 to 5 October 1979

Opening bid quotes							
	Total (#)	Intervention successes		Virtual successes		Expected successes (#)	Standard deviation (#)
		(#)	(%)	(#)	(%)		
German marks							
Observations	537						
Criterion SC <sub>1</sub>							
Sell marks	175	43	24.6	222	41.3	72	4
Buy marks	58	16	27.6	284	52.9	31	3
Total	233	59	25.3				
Criterion SC <sub>2</sub>							
Sell marks	175	49	28.0	95	17.7	31	3
Buy marks	58	12	20.7	53	9.9	6	1
Total	233	61	26.2				
Criterion SC <sub>3</sub>							
Sell marks	175	92	52.6	317	59.0	103	6
Buy marks	58	28	48.3	337	62.8	36	4
Total	233	120	51.5				
Japanese yen							
Observations	537						
Criterion SC <sub>1</sub>							
Sell yen	10	6	60.0	248	46.2	5	2
Buy yen	19	5	26.3	255	47.5	9	2
Total	29	11	37.9				
Criterion SC <sub>2</sub>							
Sell yen	10	1	10.0	72	13.4	1	0
Buy yen	19	6	31.6	68	12.7	2	1
Total	29	7	24.1				
Criterion SC <sub>3</sub>							
Sell yen	10	7	70.0	320	59.6	6	2
Buy yen	19	11	57.9	323	60.1	11	3
Total	29	18	62.1				

Note: This table corresponds to table 5.3 in chapter 5.

**Table A2.6** Success counts for US intervention, 8 October 1979 to 17 April 1981

Opening bid quotes							
	Total (#)	Intervention successes		Virtual successes		Expected successes (#)	Standard deviation (#)
		(#)	(%)	(#)	(%)		
German marks							
Observations	400						
Criterion SC <sub>1</sub>							
Sell marks	55	15	27.3	201	50.3	28	3
Buy marks	114	41	36.0	177	44.3	50	4
Total	169	56	33.1				
Criterion SC <sub>2</sub>							
sell marks	55	17	30.9	50	12.5	7	1
Buy marks	114	25	21.9	60	15.0	17	2
Total	169	42	24.9				
Criterion SC <sub>3</sub>							
Sell marks	55	32	58.2	251	62.8	35	4
Buy marks	114	66	57.9	237	59.3	68	5
Total	169	98	58.0				
Japanese yen							
Observations	400						
Criterion SC <sub>1</sub>							
Sell yen	1	1	100.0	204	51.0	1	1
Buy yen	10	4	40.0	177	44.3	4	1
Total	11	5	45.5				
Criterion SC <sub>2</sub>							
Sell yen	1	0	0.0	44	11.0	0	0
Buy yen	10	1	10.0	49	12.3	1	0
Total	11	1	9.1				
Criterion SC <sub>3</sub>							
Sell yen	1	1	100.0	248	62.0	1	0
Buy yen	10	5	50.0	226	56.5	6	2
Total	11	6	54.5				

*Note:* This table corresponds to table 5.4 in chapter 5.

**Table A2.7** Success counts for US intervention, 20 April 1981 to 29 March 1985

Opening bid quotes							
	Total (#)	Intervention successes		Virtual successes		Expected successes (#)	Standard deviation (#)
		(#)	(%)	(#)	(%)		
German marks							
Observations	1,030						
Criterion SC <sub>1</sub>							
Sell marks	1	0	0.0	517	50.2	1	0
Buy marks	24	6	25.0	464	45.0	11	2
Total	25	6	24.0				
Criterion SC <sub>2</sub>							
Sell marks	1	0	0.0	118	11.5	0	0
Buy marks	24	7	29.2	146	14.2	3	1
Total	25	7	28.0				
Criterion SC <sub>3</sub>							
Sell marks	1	0	0.0	635	61.7	1	0
Buy marks	24	13	54.2	610	59.2	14	3
Total	25	13	52.0				
Japanese yen							
Observations	1030						
Criterion SC <sub>1</sub>							
Sell yen	0	0	na	519	50.4	0	0
Buy yen	11	4	36.4	449	43.6	5	1
Total	11	4	36.4				
Criterion SC <sub>2</sub>							
Sell yen	0	0	na	102	9.9	0	0
Buy yen	11	5	45.5	142	13.8	2	1
Total	11	5	45.5				
Criterion SC <sub>3</sub>							
Sell yen	0	0	na	621	60.3	0	0
Buy yen	11	9	81.8	591	57.4	6	2
Total	11	9	81.8				

Note: This table corresponds to table 6.2 in chapter 6.

**Table A2.8** Success counts for US intervention, 1 April 1985 to 29 April 1988

Opening bid quotes							
	Total (#)	Intervention successes		Virtual successes		Expected successes (#)	Standard deviation (#)
		(#)	(%)	(#)	(%)		
German marks	805						
Observations	805						
Criterion SC <sub>1</sub>							
Sell marks	33	11	33.3	349	43.4	14	2
Buy marks	19	8	42.1	421	52.3	10	2
Total	52	19	36.5				
Criterion SC <sub>2</sub>							
Sell marks	33	11	33.3	132	16.4	5	1
Buy marks	19	4	21.1	80	9.9	2	1
Total	52	15	28.8				
Criterion SC <sub>3</sub>							
Sell marks	33	22	66.7	481	59.8	20	4
Buy marks	19	12	63.2	501	62.2	12	3
Total	52	34	65.4				
Japanese yen							
Observations	805						
Criterion SC <sub>1</sub>							
Sell yen	52	25	48.1	349	43.4	23	3
Buy yen	20	10	50.0	412	51.2	10	2
Total	72	35	48.6				
Criterion SC <sub>2</sub>							
Sell yen	52	10	19.2	111	13.8	7	1
Buy yen	20	2	10.0	84	10.4	2	0
Total	72	12	16.7				
Criterion SC <sub>3</sub>							
Sell yen	52	35	67.3	460	57.1	30	4
Buy yen	20	12	60.0	496	61.6	12	3
Total	72	47	65.3				

*Note:* This table corresponds to table 6.3 in chapter 6.

**Table A2.9** Success counts for US intervention, 2 May 1988 to 19 March 1997

Opening bid quotes							
	Total (#)	Intervention successes		Virtual successes		Expected successes (#)	Standard deviation (#)
		(#)	(%)	(#)	(%)		
German marks	2,318						
Observations	2,318						
Criterion SC <sub>1</sub>							
Sell marks	44	22	50.0	1,121	48.4	21	3
Buy marks	111	54	48.6	1,100	47.5	53	5
Total	155	76	49.0				
Criterion SC <sub>2</sub>							
Sell marks	44	6	13.6	274	11.8	5	1
Buy marks	111	17	15.3	305	13.2	15	1
Total	155	23	14.8				
Criterion SC <sub>3</sub>							
Sell marks	44	28	63.6	1,395	60.2	26	4
Buy marks	111	71	64.0	1,405	60.6	67	6
Total	155	99	63.9				
Japanese yen							
Observations	2,317						
Criterion SC <sub>1</sub>							
Sell yen	31	15	48.4	1,156	49.9	15	3
Buy yen	87	38	43.7	1,064	45.9	40	4
Total	118	53	44.9				
Criterion SC <sub>2</sub>							
Sell yen	31	8	25.8	272	11.7	4	1
Buy yen	87	14	16.1	305	13.2	11	1
Total	118	22	18.6				
Criterion SC <sub>3</sub>							
Sell yen	31	23	74.2	1,428	61.6	19	4
Buy yen	87	52	59.8	1,369	59.1	51	5
Total	118	75	63.6				

Note: This table corresponds to table 6.4 in chapter 6.