The Effect of Forward Exchange Intervention: Comment

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THE EFFECT OF FORWARD EXCHANGE INTERVENTION: COMMENT*

I. INTRODUCTION

In a recent paper in this Journal, Aliber [2] inferred that forward intervention could result in an adverse rather than beneficial effect on the spot exchange rate if we take into account the effect of a movement of the forward exchange rate on the expected spot rate.[1] While Aliber is correct that forward intervention can influence forward and spot speculation, the conditions he postulates when forward intervention is more efficient[2] than spot intervention are vague and at times imprecise. By not considering all possible cases some of his conditions do not apply in all situations. This paper reduces the effect of forward intervention to two equations. One equation is used when the arbitrage function is infinitely elastic and the other is used in all other cases. This paper first proceeds by deriving both equations and showing how they relate to the literature in the field. Aliber states that "forward intervention may be more efficient than spot intervention" when

1. the arbitrage supply function is highly elastic.
2. speculation in the spot market is a close substitute for speculation in the forward market so that as the forward discount increases, speculators are diverted to the spot market.
3. an increase in the forward discount might lead to an increase in the speculative demand, in the sense of a shift in the function.
4. speculators are more sensitive to changes in reported reserves than the sum of reported changes in spot reserves and unreported changes in the forward position [2, 466–467].

This paper argues that the correct forward intervention policy will depend on the elasticities of the arbitrage and speculative schedules and the exact influence of forward intervention on the expected spot exchange rate. In the relationships which are derived to show the conditions when forward intervention will be successful it is noted that in some cases forward intervention will result in a "trade off" if there is a shift in the speculative demand function even if the arbitrage function is perfectly elastic. Aliber does not consider this situation. In order to show this result a modification of Reading's Model [7] is used.

II. THE MODEL

If S is the spot exchange rate,[3] F the 90 day forward rate, S^e the expected spot rate in 90 days, and i^f and i^d the foreign and domestic 90 day interest rates respectively, then interest parity implies

$$F(1 + i^f) = S(1 + i^d). \tag{1}$$

If we let

$$F^* \equiv S(1 + i^d)/(1 + i^f), \tag{2}$$

there will be an outflow (inflow) of funds from the domestic country if F is greater (less) than F^*. If C_{at} is the desired stock of forward contracts held by arbitragers in period t then[4]

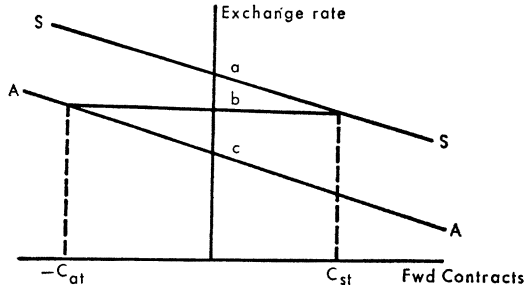
* I am indebted to Professor Robert Aliber, Harry Johnson and other members of the University of Chicago International Trade Workshop. Any remaining errors are my responsibility.

[1] Through forward intervention the authorities may cause the arbitragers to move capital into the country (or out of the country at a slower rate). Under some conditions this intervention will cause increased incentives for speculators to move funds out of the country (or into the country at a slower rate). Since the effect on the balance of payments is opposite a trade off arises from these two occurrences.

[2] Intervention is more efficient as defined by Aliber if the volume or exchange dealings by the authorities is smaller [2, 466].

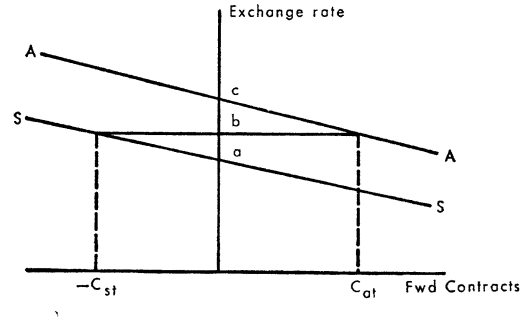
[3] All exchange rates are quoted as the domestic currency price of one unit of the foreign currency. t subscripts are ignored where no confusion would result. What Aliber calls a discount appears in my model as $F > F^*$.

[4] The argument that there will be an outflow (inflow) if F is greater (less) than F^* does not imply that adjustment will take place such that interest parity holds (i.e., $F = F^*$). Recent contributions to the literature have shown this to be a special case. In terms of equation this would imply that $\phi = -\infty$.



Note a= S^e, b=F, c=F*

FIGURE 1.



Note a=S^e, b=F, c=F*

FIGURE 2.

$$C_{at} = \phi(F - F^*) \quad \text{where } \phi < 0. \quad (3)$$

Forward speculators sell (buy) the foreign currency forward if F is greater (less) than S^e. If C_{st} is the desired stock of forward contracts held by forward speculators in period t then

$$C_{st} = \Psi(F - S^e) \quad \text{where } \Psi < 0.^5 \quad (4)$$

Parity in the spot speculation market implies that

$$S(1 + i^d) = S^e(1 + i^f). \quad (5)$$

By combining (5) and (2) we note that spot speculators will acquire the foreign (domestic) currency spot if S^e is greater (less) than F^*. If $C_{\hat{s}t}$ is the desired stock of the domestic currency held by spot speculators in period t then

$$C_{\hat{s}t} = Z(S^e - F^*) \quad \text{where } Z < 0. \quad (6)$$

Equations (3) and (4) have been represented on Figures 1 and 2 as the AA and SS curve respectively where $a = S^e$, $b = F$ and $c = F^*$.[6] Equation (6) is considered implicitly although the exact amount of $C_{\hat{s}t}$ is not plotted. Figure 1 represents an initial arbitrage outflow position; Figure 2 represents an initial arbitrage inflow position. If there is no governmental intervention $|C_{at}| = |C_{st}|$.

Aliber argues (see his condition three) that the effect of forward intervention may be to shift the SS curve since S^e changes.[7] Consider Figure 1 which, assuming the UK is the domestic country, represents an arbitrage and spot speculative outflow from the UK because $F > F^*$ and $S^e > F^*$, respectively. If the central bank were to lower F (to slow the arbitrage outflow) then it is possible that S^e might rise as speculators become aware of the magnitude of the intervention.

In a situation where the market suddenly becomes aware of large scale governmental intervention (often a desperate attempt by the central bank to support a currency) it seems theoretically possible for $\partial S^e/\partial F$ to be negative. The implication of this is that as F is lowered, with the expressed purpose of lowering the arbitrage outflow margin or increasing the arbitrage inflow margin, there will be increased incentives for forward

[5] In addition to taking into account the demands of forward speculators equation (4) implicitly considers the demand for forward contracts of forward triangular arbitragers and traders.

[6] Grubel [5], using a portfolio selection model, showed that the arbitrage AA and the speculative SS functions can be represented as straight lines (as opposed to step functions).

[7] If the domestic interest rate were to rise (fall) or the spot rate were to rise (fall), or the foreign interest rate were to fall (rise) the function AA would shift up (down). There are two ways in which we can visualize the effect of forward intervention on the expected spot rate and thus on the SS function. I prefer to think of S^e changing as a consequence of forward intervention. Aliber thinks of S^e not changing due to forward intervention. Mathematically both are similar since as a consequence of the interventions S^e will be at a different level.

speculation against the domestic currency (since the margin $| F - S^e |$ is larger than it would be if $\partial S^e/\partial F$ were equal to zero). The most important effect will be to increase spot speculation against the domestic currency since $| F^* - S^e |$ is now greater. The net effect on the balance of payments is unclear unless we are able to specify the elasticities of the arbitrage, spot and forward speculative functions and their interrelationships. This is done in the next section.

By differentiating (3) and (6) with respect to F and combining we can derive an expression for the net flow of money to the domestic country dM_d due to forward intervention. This reduces to

$$dM_d = dF[(\partial S^e/\partial F)Z + \phi] \qquad (7)$$

where we initially assume there is no effect of forward intervention on F^*.[8] Aliber is right that the larger the elasticity of the arbitrage function the more efficient forward intervention, since for a given change in F more capital would flow. A better word might be predictable rather than efficient since the larger ϕ is in absolute value the more certainty we have that forward intervention can ease the pressure on a currency. In the limiting case of interest parity where $\phi = -\infty$ and the AA schedule is perfectly flat the authorities cannot move the forward rate. The effect of forward intervention on the net flow of money where $\phi = -\infty$ reduces to

$$dM_d = dI[(\partial S^e/\partial I)Z + 1] \qquad (8)$$

where I = the dollar amount of forward contracts of the foreign currency sold by the central bank.[9]

[8] I later show this is not a serious assumption. It is made only to simplify the discussion.

[9] Actually in equations (7) and (8) the arbitrage inflow is overstated. If V units of the foreign currency were bought by arbitragers wishing to take funds home in 90 days there must have been an inflow of $V/(1 + i^d)$, which is less than V. A similar argument holds for an outflow. For the purposes of the ease of presentation this small correction has been left off equations (7) and (8), since what is most important is the sign of M_d.

Aliber [1, 613; 2, 467] (see his condition four) has raised the interesting point that speculators may "become more concerned about an increase in the official forward commitment whose magnitude is unknown than about a reported decrease in official reserves." If the speculators' view increases in I as a sign of weakness (strength) then $\partial S^e/\partial I$ will be positive (negative).

If $Z = 0$ and \$10 of pounds were sold forward this would cause an arbitrage inflow of \$10 into the United States assuming that $\phi = -\infty$. If $\phi \neq -\infty$ the inflow will be given by equation (7). The amount of flow will be directly proportional to the amount that the forward rate falls and inversely proportional to ϕ. Assuming $Z \neq 0$ and $\phi = -\infty$ the crucial variable becomes the sign and magnitude of $\partial S^e/\partial I$. If the speculators, who only have a vague feeling of the amount of intervention, feel that the authorities will be successful in defending the currency they will revise their spot expectations down causing an additional inflow equal to $dI(\partial S^e/\partial I)Z$. If speculators believe the government will not be able to avoid devaluation, spot expectations will go the opposite way and the reverse will be held. If $(\partial S^e/\partial I)Z < -1$ the sale of the foreign currency forward by the central bank will be unsuccessful in defending the domestic currency.[10] Because the exact level of S^e is unknown to the government the first sign they have when the "game plan" goes awry is when the capital account worsens.

III. A REAPPRAISAL OF ALIBER'S FOUR CONDITIONS IN TERMS OF THE MODEL

Aliber's second condition refers to the situation where as pressure develops against a currency S^e rises (resulting in the SS

[10] In the more general formulation (equation (7)) where $\phi \neq -\infty$, if $[(\partial S^e/\partial F)Z + \phi] > 0$ forward intervention will not work in the desired direction. This is probably what happened to the United Kingdom in 1967 where forward intervention appeared to worsen the capital account while improving the net arbitrage inflow into the United Kingdom.

schedule rising) causing the return on spot speculation ($|S^e - F^*|$) to rise relative to the return on forward speculation ($|F - S^e|$). The less elastic the arbitrage function the more the relative return on spot speculation rises since the smaller $|\phi|$ the more F rises. If spot speculation is a close substitute for forward speculation Aliber argues that this is an argument for forward intervention since otherwise there will be increased pressure on the spot rate that is a function of the funds that are diverted. This analysis is correct as far as it goes. The problem is that the very act of forward intervention may itself cause the return to spot speculation to rise still further in relation to forward speculation. This takes into account the effect of forward intervention on the expected spot rate. What is wanted is for forward intervention to divert funds from spot speculation tc forward speculation while at the same time reducing the incentives for arbitrage capital to leave the country.[11] The following analysis looks at the conditions that have to be met for this to be true. Consider Figure 1; if F is lowered and S^e falls (i.e., $\partial S^e/\partial F > 0$) it is unclear whether the forward speculation margin, $|F - S^e|$, will widen or narrow. If it becomes more narrow this implies that $\partial S^e/\partial F > 1$. The forward speculation margin will rise in all other cases. If we assume that the forward speculation margin becomes more narrow this will release $\Psi[\partial(S^e - F)/\partial F]$ funds which may flow into spot speculation.[12] This will raise Z in absolute value. The net effect on the spot speculation outflow is unclear because, while the absolute value of Z rises which will tend to increase the outflow, the fact that $|S^e - F^*|$ also falls will operate in the opposite direction. It is important to note that that in this situation the fact that funds are diverted away from forward speculation is an adverse factor tending to make forward intervention not as efficient. If these funds were not diverted there would be less of a spot speculative outflow. Hence if $\partial S^e/\partial F > 1$ the greater the substitutability of spot speculation for forward speculation the less efficient forward intervention.

Take a different case where $0 < \partial S^e/\partial F < 1$. Here the forward speculation margin is widened by forward intervention and the spot speculation margin is narrowed. If funds are diverted to forward speculation then Z will fall in absolute value and Ψ will rise in absolute value (implying a flatter SS curve). The result will be less immediate pressure on the spot exchange rate. In this situation a case can be made for forward intervention. This is the situation Aliber had in mind.

If $\partial S^e/\partial F < 0$ then there would clearly be no shift in funds to spot speculation as the incentives for both forward and spot speculation have gone up.

The arguments in the above paragraphs have refined and corrected Aliber's argument in the following manner.

1. It was shown that when the arbitrage function is perfectly elastic there can be no change in the forward exchange rate unless there is some interest rate change in the two countries or the spot exchange rate changes (i.e., F^* changes). Even in this case forward intervention was shown to worsen the capital

[11] In some senses it can be argued that while spot speculation represents immediate pressure on a currency, forward speculation represents delayed pressure. In this sense spot speculation is assumed to be worse. This was first mentioned by Tsiang [8, 104]. Auten [3, 52] pointed out that Tsiang is not correct if the forward exchange rate is continually pegged. Since in the context of this paper forward intervention is assumed to be short run, Tsiang's analysis holds.

[12] The functions represented by (3), (4) and (6) may be interrelated in the sense that funds can be diverted from one operation to another. However in practice the extent of the diversion is limited by legal and institutional arrangements. For example, banks are limited by law to arbitrage. Forward speculators do not generally have funds available in the present period; as a consequence they would find it difficult to be diverted to spot speculation. As the return to spot speculation falls funds probably could be diverted to arbitrage. However in this case the fixed nature of the arrangement would be a limiting factor. Because there generally are three specific groups it seems justifiable to use functions of the form of (3), (4) and (6).

account if $(\partial S^e/\partial I)Z$ was less than -1. (See equation (8).)

2. Diverting funds from forward speculation to spot speculation was shown to worsen the current capital account. The only possible case where diverting funds would help was if funds were shifted from the spot speculation market to the forward speculation market. In this case the pressure on domestic currency would be postponed. This will only happen if $0 < \partial S^e/\partial F < 1$. The net effect of any forward intervention can be shown by looking at equation (7) or (8).

3. Aliber's third condition relates to how forward intervention can shift the speculation function. I have shown that there are three general types of shifts: $\partial S^e/\partial F < 0$, $0 < \partial S^e/\partial F < 1$, and $\partial S^e/\partial F \geq 1$. The first type of shift, usually associated with an exchange crisis, is a factor tending to weaken the beneficial effect of forward intervention. The second type of shift is beneficial to the efficiency of forward intervention while the third type of shift can be either beneficial or harmful depending on the degree in which forward speculators are diverted to the spot speculation market. When we derived equations (7) and (8) we assumed that forward intervention did not change F^*. Now we can relax this assumption and note that it does not change the analysis. F^* will rise (fall) if S rises (falls), i^d rises (falls) or i^f falls (rises). These changes can only come about if there is a net money flow. In other words we would expect F^* to fall (rise) as M^d takes on positive (negative) values. A fall (rise) in F^* causes both arbitrage and spot speculative funds to leave (come to) the domestic country. Since both effects are in the same direction, ignoring the effect of forward intervention on F^* and looking only at M^d is a good assumption for ease of analysis.

4. Aliber's fourth condition refers to whether speculators are more sensitive to changes in reported reserves or unreported changes in the forward position. If speculators ignored unreported changes in the government forward position $\partial S^e/\partial I$ would be zero. In the situation where there is a perfectly elastic arbitrage market forward intervention clearly can cause an inflow. If $\partial S^e/\partial I$ were negative intervention would be even more efficient. In the absence of a perfectly elastic arbitrage function the relevant variable becomes $\partial S^e/\partial F$. If speculators do not believe it is the government lowering F, S^e may fall making intervention more efficient than in the case $\partial S^e/\partial F = 0$.[13] If $\partial S^e/\partial F$ were negative or $\partial S^e/\partial I$ were positive then Aliber is right since in this case the speculators are betting that the central bank will not be successful; intervention has made matters worse.

IV. CONCLUSION

This note has discussed and attempted to quantify the effects of forward intervention on spot speculation, forward speculation arbitrage and the capital account. The results indicate that if the central bank commitment is known, it must be strong enough and decisive enough so that there is little doubt in the speculators' minds that the central bank will be able to hold the exchange rate. If this condition is not met forward intervention appears to be good only as a very short range exchange stabilization tool.[14]

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[13] Fleming and Mundell [4, 13] believe that in the short run $\partial S^e/\partial F$ is positive unless the extent of forward intervention is believed to be large.

[14] Monroe [6] has found that in the first three exchange crises during the period 1964–1967, British forward intervention policy was able to roll back speculative attacks on the pound. In these cases the intervention characteristically came too late and was at times constrained. In late 1967 the forward intervention was not sufficiently decisive to counter rising speculative feeling that the pound would be devalued. Even though the government established a continuing incentive for arbitragers to make an inflow into the United Kingdom, speculative pressure, presumably fanned by reports of large scale governmental forward intervention, forced the pound to be devalued.

REFERENCES

1. Aliber, Robert Z., "Counter Speculation and the Forward Exchange Market: A Comment," *Journal of Political Economy*, December 1962, 609–613.
2. ———, "A Note on Counter Speculation in Support of Sterling," *Southern Economic Journal*, April 1970, 465–469.
3. Auten, J. H., "Counter Speculation and the Forward Exchange Market," *Journal of Political Economy*, February 1961, 49–55.
4. Fleming, J. M. and Mundell, Robert A., "Official Intervention on the Forward Exchange Market," *IMF Staff Papers*, March 1964, 1–17.
5. Grubel, Herbert. *Forward Exchange Speculation and the International Flow of Capital*. Stanford: Stanford University Press, 1966.
6. Monroe, Wilbur, "Evaluation of Foreign Exchange Market Intervention: The Pound Sterling 1964–1968," *Nebraska Journal of Economics and Business*, Summer 1970, 25–36.
7. Reading, B. "The Forward Pound, 1951–1959," *Economic Journal*, June 1960, 304–19.
8. Tsiang, S., "The Theory of Forward Exchanges and the Effects of Governmental Intervention on the Foreign Exchange Market," *IMF Staff Papers*, April 1959, 79–106.