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STEPHEN H. GOODMAN*

Introduction

FOREIGN EXCHANGE RATE FORECASTING is a growth industry. At least 23 commercial services throughout the world, employing a variety of techniques, now provide foreign exchange rate forecasts.

The purpose of this paper is to review and evaluate these techniques and services and to consider the implications of the findings for business and policy. The paper first considers whether foreign exchange rate forecasting is futile in light of the evidence that the foreign exchange market is an efficient market. Ten major forecasting services that rely in whole, or in large part, on formal models or decision rules are then evaluated on the basis of their predictive accuracy. Finally, the implications of the findings are considered for corporations trying to manage their foreign exchange exposure and for policy makers concerned about exchange rate stability.

Futility of Forecasts

It is often argued that it is futile to attempt to forecast foreign exchange rates because the foreign exchange market is an efficient market. The market is efficient in that the major participants are believed to have access to, and have digested, all current information that may impact on price and, consequently, this information is already reflected in the price (strong efficiency) or that—at the very least—the historical record of exchange rates contains no information which can be used by market participants to accurately forecast future spot exchange rates (weak efficiency). The foreign exchange market, in effect, is a fair game; no trading rule, including one based on foreign exchange rate forecasts, can be profitable.

Most empirical studies of exchange market efficiency have not examined the profitability of specific trading rules but rather have used spectral analysis or more sophisticated Box Jenkins models in an effort to uncover any systematic pattern in the historical exchange rate data. These studies have consistently concluded that the exchange rate data appear to be white noise (there is no significant pattern). Spectral analysis and Box Jenkins models are not especially powerful tests of market efficiency, however; they will simply identify time dependent patterns in the historical exchange rate data, not demonstrate that the foreign exchange market is an efficient market.

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A few studies have found evidence of profit-making opportunities—albeit only marginally profitable—in the exchange market (as well as in the stock market, which is also generally thought to be efficient, see Alexander (1)), based upon the concept of speculative runs; a currency that has risen significantly is likely to continue to rise and a currency that has fallen significantly will continue to fall. Logue and Sweeney (8) in their study of the Franc/Dollar spot rate in the January 1970—March 1974 period found that while the data seemed to be white noise using spectral analysis, there were a number of simple trading rules which yielded at least marginal profits. The trading rules used by Logue and Sweeney were k percent rules—buy a currency after it has risen k percent from its previous low and sell it after it has fallen k percent from its previous high. A more recent study by Logue, Sweeney and Willett (9) for a later period, including a larger number of currencies but the same trading rules, apparently comes to a very different conclusion—that the foreign exchange market is now at least weakly efficient. An examination of their results, however, shows most k percent rules yielding substantial profits as compared with a buy and hold strategy.¹

Tests of market efficiency in the foreign exchange market (and in the other markets) should clearly be directed against specific trading rules, including rules more complex than those examined by Logue and Sweeney. If rules can be found which are consistently profitable over a reasonable period, then the market is not efficient. Only if consistently profitable rules cannot be found may the market be assumed to be efficient, although this conclusion has to be reconfirmed as new decision rules are developed and tested.

This paper, in evaluating the predictive accuracy of ten major foreign exchange rate forecasting services using a variety of techniques, some quite sophisticated, provides a good test of market efficiency in the foreign exchange market—probably the best test to date.

A frequent (but not necessary) corollary to the view that the foreign exchange market is efficient is the claim that the forward exchange rate is a good and unbiased predictor of the future spot rate. Forward exchange rates, however, fundamentally reflect the total demand and supply for a currency in both the spot and forward markets, linked by interest rate parity, not simply the net demand for open positions in a currency based on speculator's expectations about future spot rates.

The ratio of the forward to spot rate between two currencies will be equal to the ratio of their interest rates for equivalent borrowers/lenders and instruments in the same political jurisdiction.

Empirical studies of the relationship between the forward rate and the future spot rate have generally found the forward rate to be a poor predictor. Cornell (4), for example, found the best simple auto-regressive models generally provided a more accurate indication of the future spot rate than did the forward rate. Giddy and Dufey (6), similarly, found the forward rate was outperformed by a number of simple models, with martingale and submartingale models generally doing the best.

¹ A one percent rule, for example, was more profitable over the entire period than a buy and hold strategy for six of the seven currencies studied; over the most recent period a one percent rule was more profitable for all currencies.

Description of the Services

Foreign exchange rate forecasting services may be divided into three broad groups: 1) those that rely on an overall subjective evaluation of economic and/or technical factors to predict future spot exchange rates, 2) those that rely in whole, or in large part, on economic models, and 3) those that rely fully, or almost so, on technically-oriented decision rules such as the k percent or persistence type rules described previously. The predictive accuracy of the forecasts provided by ser-

Table 1
Evaluation of Economics-Oriented Services
Accuracy of Prediction of Direction of Trend
Three-Month Forecasts

Currency	Forward Rate	Berkeley Consulting Group	D.R.I.	Forex Research	Predex	Service 5	Service 6	Arithmetic Average (Services Only)
Canadian Dollar								
I	20	90	40 ^P	NA	20	40	NA	48
II	100	100	60	NA	40	30	NA	58
III	67	60	60	NA	30	22	NA	43
Total	62	83	53	NA	30	31	NA	50
French Franc								
I	90	100	100 ^P	50	70	70	NA	78
II	20	90	30	20	60	10	50 ^P	43
III	0	0	0	20	90	0	0	18
Total	37	63	43	30	73	27	25	46
German Mark								
I	40	70	80 ^P	60	50	50	80	65
II	80	50	60	70	80	30	90	63
III	80	50	90	50	90	56	20	59
Total	67	57	77	60	73	45	63	62
Japanese Yen								
I	33	90	80 ^P	80	40	80	NA	74
II	40	60	90	50	30	20	NA	50
III	89	0	30	70	70	10	NA	36
Total	54	50	67	67	47	37	NA	53
Swiss Franc								
I	90	NA	NA	NA	20	NA	NA	20
II	60	NA	NA	NA	50	NA	NA	50
III	90	NA	NA	NA	70	NA	10	40
Total	80	NA	NA	NA	47	NA	10	37
U.K. Pound								
I	90	70	100 ^P	90	60	50	NA	74
II	20	60	50	30	20	20	17 ^P	33
III	40	50	40	60	50	40	40	47
Total	50	60	63	60	43	37	29	51
Arithmetic Average Total	58	63	61	54	52	35	32	50

p = based on part period data

Totals for arithmetic average column represent vertical sum.

Figures shown are share of forecasts in which the spot exchange rate moved in the indicated direction.

Table 2
Evaluation of Economics-Oriented Services
Accuracy of Point Estimates of Future Spot Rates
Three-Month Forecasts

Currency	Berkeley Consulting Group	D.R.I.	Forex Research	Predex	Service 5	Service 6	Arithmetic Average (Services Only)
Canadian Dollar							
I	80	0 ^P	NA	0	80	NA	40
II	70	50	NA	30	10	NA	40
III	30	30	NA	10	22	NA	23
Total	60	27	NA	13	37	NA	34
French Franc							
I	70	40 ^P	30	40	40	NA	44
II	100	50	70	20	40	83 ^P	61
III	0	10	44	60	33	30	30
Total	57	33	48	40	38	57	45
German Mark							
I	20	80 ^P	70	50	50	60	55
II	10	40	50	44	20	80	41
III	43	70	50	30	30	20	41
Total	24	63	57	41	33	53	46
Japanese Yen							
I	50	60 ^P	60	0	30	NA	40
II	60	90	60	30	20	NA	52
III	0	30	67	60	10	NA	33
Total	37	60	62	30	20	NA	42
Swiss Franc							
I	NA	NA	NA	0	NA	NA	0
II	NA	NA	NA	50	NA	NA	50
III	NA	NA	NA	40	NA	10	25
Total	NA	NA	NA	30	NA	10	25
U.K. Pound							
I	60	20 ^P	60	40	30	NA	42
II	100	40	30	60	40	66 ^P	56
III	50	40	50	40	50	30	43
Total	70	33	47	47	40	48	47
Arithmetic							
Average Total	50	43	54	34	34	42	40

p = based on part period data

Totals for arithmetic average column represent vertical sum.

Figures shown are share of forecasts in which predicted rate was closer to spot than was comparable forward rate.

vices in the first group—which includes 13 of the 23 services—are not evaluated in this paper as the predictions of these services are not tied to any replicative formal model or decision rule, but rather, reflect the subjective judgment of a potentially changing group of individuals.

Six of the foreign exchange rate forecasting services rely in whole, or in large part, on formal economic models. The models include factors such as interest rate differentials, relative inflation rates, balance-of-payments flows and reserve asset positions; one service also includes as a key explanatory variable a measure

of the sentiment of foreign exchange market participants as reflected in their portfolio asset composition.

Five of these economics-oriented services provide each month point estimates, generally of quarterly average exchange rates, for the major currencies, typically for the next six quarters. The sixth service provides forecasts in the form of graphs highlighting the turning points for the major currencies for the next year. All of the economics-oriented services stress their potential contribution for planning, not their use in managing a hedging program.

Two of the foreign exchange rate forecasting services rely exclusively on technically-oriented decision rules using mathematical momentum models (a form of persistence type rule) to relate the historical record of exchange rates to the future trend in rates. A third technically-oriented service also uses a mathematical model and the fourth a chartist approach in relating past market movements and the underlying fundamentals to the future trend in rates. All of the technically-oriented services provide indications of exchange market movements rather than point estimates of future spot exchange rates. They are intended to be useful in helping manage a hedging program, not in planning.

Evaluation of the Services

The ten services (the six economics-oriented services and the four technically-oriented services) are evaluated on the basis of their predictive accuracy for six currencies against the dollar—the Canadian dollar, French franc, German mark, Japanese yen, Swiss Franc and U.K. pound—in the January 1976—June 1978 period.² Different evaluation protocols are followed for the economics-oriented services and the technically-oriented services reflecting the difference in the type of forecast they provide.

The economics-oriented services are evaluated using three measures—accuracy in predicting trend, accuracy of their point estimates, and speculative return on capital at risk—for forecasts three and six months ahead (two common market trading intervals). The first two measures will suggest how useful the services may be for planning over a three- to six-month horizon, the third measure will suggest how useful these forecasts may be in managing a hedging program or in speculating.

Accuracy in predicting trend, is defined as the share of each month's forecasts for which the spot exchange rate moves in the predicted direction in the three-month period following the forecast (for the three-month forecast) or in the six-month period following the forecast (for the six-month forecast). Accuracy of the point estimate, is defined as the share of each month's forecast for which the predicted rate is closer to the spot rate, three and six months later (for the three-month and six-month forecasts, respectively) than is the three-month and six-month forward rate at the time of the forecast.

Speculative return on capital at risk—the most important measure in assessing market efficiency—is defined as the return, at an annual percentage rate, on the

² For some currencies and services it was necessary to use a shorter period or exclude the service entirely but in no case are results reported for a period shorter than 18 months.

total open position in a currency if a speculator each month blindly followed the services' recommendations.³ The speculative return on capital at risk is equal, given interest rate parity, to the *incremental return* above the US dollar interest rate a speculator would earn if he blindly altered the currency composition of his assets based on the forecasted change in exchange rates relative to the forward market premium and discount. The actual return on *capital employed* for the speculator using the forward market would be substantially larger depending on the margin requirement, and would be infinite where there is no margin requirement.

To evaluate the services relative to these measures, it was necessary to make some simplifying assumptions. First, most of the economics-oriented services provide estimates of quarterly average exchange rates. Through interpolation of successive quarterly forecasts, we converted the average quarterly forecasts to a set of point estimates of the future spot exchange rate three and six months following the forecast. These point estimates are used in the evaluation. Second, the different forecasts are available at different times during the month and the same forecast may not even be available on the same day each month or on the same day for each consumer. It was conservatively assumed that all of the forecasts are available only on the last day of the month in which they are published. The evaluation consequently was undertaken on the basis of the forward and spot exchange rates (New York opening) at the end of each month.⁴

The technically-oriented services are evaluated using only one measure—speculative return on capital at risk. Because the technically-oriented services generally do not provide point estimates of future spot exchange rates it was not possible to evaluate them using the other evaluation measures employed for the economics-oriented services.

The speculative return on capital at risk is calculated in a similar manner as for the economics-oriented service. It is the return at an annual percentage rate if a speculator *each time an indication was given* blindly followed the services' recommendations, buying the currency (and closing any outstanding forward sales) when the service gave a "buy" signal and selling the currency (and closing any outstanding forward purchases) when the service gave a "sell" signal. If there is no change in signal during a three-month period, the contract is rolled over at maturity. The evaluation was undertaken on the basis of the forward and spot exchange rates (New York opening) at the time an indication was given. Where a forward contract was closed prior to maturity (because of a change in signal) the appropriate forward premium or discount for the remaining maturity was interpolated from the premium and discount data for standard maturity contracts.

Results of the Evaluation

The results of the evaluation for the economics-oriented services are presented in Tables 1 through 5. The results for accuracy in predicting trend and providing

³ The speculator would buy the currency forward three months in the interbank market paying the associated premium or discount when the three-month forecast is above the three-month forward rate at the time of the forecast, and would sell the currency when the forecasted rate is below the comparable forward rate, reversing these purchases or sales three months later.

⁴ While this may bias the results somewhat against the forecasts, some of which are generally available about mid-month, the bias does not appear to be significant based on a spot check of the forecasts and of exchange rate movements between the middle and the end of the month.

point estimates of future spot exchange rates are shown in Tables 1 through 4 for the total January 1976–June 1978 period and separately for three equal sub-periods—January 1976–October 1976, November 1976–August 1977 and September 1977–June 1978. Also shown is the accuracy of the forward rate in predicting trend. The results are presented separately for the three month and six month forecasts.

The speculative return on capital at risk is shown in Table 5 for all transactions and for purchases and sales separately. The separate purchase and sale results should provide an indication of the performance of the forecasts both in rising

Table 3
Evaluation of Economics-Oriented Services
Accuracy of Prediction of Direction of Trend
Six-Month Forecasts

Currency	Forward Rate	Berkeley Consulting Group	D.R.I.	Forex Research	Predex	Service 5	Service 6	Arithmetic Average (Services Only)
Canadian Dollar								
I	10	80	20 ^P	NA	10	80	NA	48
II	100	90	90	NA	70	40	NA	73
III	100	60	50	NA	0	10	NA	30
Total	70	77	53	NA	27	43	NA	50
French Franc								
I	90	100	NA	43 ^P	100	80	NA	81
II	50	100	60	50	30	20	NA	52
III	0	0	0	0	100	0	NA	20
Total	47	67	30	31	77	33	NA	51
German Mark								
I	80	60	NA	71 ^P	80	70	NA	70
II	100	60	70	80	100	50	NA	72
III	100	50	90	80	100	60	NA	76
Total	93	57	80	77	93	60	NA	73
Japanese Yen								
I	20	100	71 ^P	100 ^P	20	70	NA	72
II	20	90	90	100	0	50	NA	66
III	60	0	60	100	80	0	NA	48
Total	33	63	74	100	33	40	NA	62
Swiss Franc								
I	100	NA	NA	NA	70	NA	NA	70
II	40	NA	NA	NA	80	NA	NA	80
III	100	NA	NA	NA	100	NA	NA	100
Total	80	NA	NA	NA	83	NA	NA	83
U. K. Pound								
I	100	89	NA	86 ^P	50	70	NA	74
II	40	80	40	30	20	20	NA	38
III	10	50	33	30	30	20	NA	33
Total	50	73	37	49	33	37	NA	48
Arithmetic								
Average Total	62	67	55	64	58	43	NA	61

p = based on part period data

Totals for arithmetic average column represent vertical sum.

Figures shown are share of forecasts in which spot exchange rate moved in the indicated direction.

and falling markets. Also shown is the speculative return on capital at risk for a buy-and-hold strategy (consistently purchase a currency three months forward).

On average the economics-oriented services do rather poorly over the relatively short-time horizon considered in this study. They accurately predict the direction of trend for the spot exchange rate only 50% of the time over a three month forecast horizon (Table 1) and only 61% of the time over a six month forecast horizon (Table 3). In both cases the forward rate provides a somewhat better—albeit still not very reliable—indication of the direction of trend.

The best performance is by the Berkeley Consulting Group, who on average outperform the forward rate. Two of the services—the two that chose not to be identified—are more often wrong about the direction of trend than they are right. None of the services, nor is the forward rate, a particularly consistent indicator of the direction of trend; the performance of a given service for a particular currency may vary from always providing a correct trend indication in one sub-period to never providing a correct trend indication in another. The pattern of results does not vary significantly by currency.

The economics-oriented services similarly do poorly in their point estimates of future spot exchange rates. On average the forecast rate is further from the future spot rate than the comparable forward rate for the three month forecast (Table 2) and is only as accurate as the forward rate for the six month forecast (Table 4). Forex Research outperforms the forward rate over a three month forecast horizon while Forex Research, Berkeley Consulting and DRI all outperform the forward rate over a six month forecast horizon.

Both the absolute performance of the services and their performance relative to the forward rate, both in predicting the direction of trend and providing point estimates of future spot exchange rates, improves as the forecast horizon lengthens from three to six months.

Blindly following the economics-oriented services' forecasts is profitable, but only marginally so. It is generally less profitable than a buy and hold strategy, reflecting the general weakening of the dollar against most currencies during the period. The speculative return on capital at risk averages 1.12% annually before transactions costs (Table 5); assuming costs of .05% per transaction, representing the spread between the bid and ask price in the interbank market or the brokerage commission in the currency futures market (IMM), the speculative return on capital at risk average .92% per annum. In contrast, the speculative return on capital at risk for a buy and hold strategy averages 2.86% per annum before transactions costs and 2.46% per annum after transactions cost.⁵ Blindly following any of the economics-oriented services' indications or a buy and hold strategy would have led to intermittent periods with considerable losses for most currencies (periods that would dishearten, if not bankrupt, most individual speculators).

The results of the evaluation for the technically-oriented services are presented in Table 6. Also shown is the average number of transactions per year if each service's indications are blindly followed.

All of the technically-oriented services do remarkably well. The speculative

⁵ The return on capital employed after transactions costs averages a remarkable 18% for the economics-oriented services and 49% for a buy and hold strategy when positions are established on the currency futures market, assuming an average margin of 5%.

Table 4
Evaluation of Economics-Oriented Services
Accuracy of Point Estimates of Future Spot Rates
Six-Month Forecasts

Currency	Berkeley Consulting Group	D.R.I.	Forex Research	Predex	Service 5	Service 6	Arithmetic Average (Services Only)
Canadian Dollar							
I	100	100 ^P	NA	0	100	NA	75
II	60	90	NA	60	0	NA	53
III	40	30	NA	0	10	NA	20
Total	67	73	NA	20	37	NA	49
French Franc							
I	70	NA	29 ^P	60	50	NA	52
II	100	67	90	20	50	NA	65
III	40	10	80	30	60	NA	44
Total	70	39	66	37	53	NA	54
German Mark							
I	30	NA	43 ^P	50	40	NA	41
II	10	50	60	100	40	NA	52
III	30	80	56	90	30	NA	57
Total	23	65	53	80	37	NA	50
Japanese Yen							
I	70	67 ^P	100 ^P	0	60	NA	59
II	80	80	100	10	60	NA	66
III	0	40	90	80	0	NA	42
Total	50	62	97	30	40	NA	56
Swiss Franc							
I	NA	NA	NA	10	NA	NA	10
II	NA	NA	NA	60	NA	NA	60
III	NA	NA	NA	90	NA	NA	90
Total	NA	NA	NA	53	NA	NA	53
U.K. Pound							
I	80	NA	57 ^P	40	50	NA	57
II	60	50	40	40	30	NA	44
III	60	33	20	20	0	NA	27
Total	67	42	39	33	27	NA	43
Arithmetic							
Average Total	55	56	64	42	39	NA	51

p = based on part period data

Totals for arithmetic average column represent vertical sum.

Figures shown are share of forecasts in which predicted rate was closer to spot than was comparable forward rate.

return on capital at risk for each of the services averages between 7.28% and 10.46% annually before transactions costs, compared with a 2.86% return for a buy and hold strategy.⁶ The average performance of the poorest technically-oriented services is far better than the average performance of the best economics-oriented service.

⁶ The return on capital employed after transactions cost averages a phenomenal 156% for the technically-oriented services on the currency futures market. Blindly following any of the services' indications, however, would have led to intermittent periods with considerable losses for most currencies.

Table 5
Evaluation of Economics-Oriented Services
Speculative Return on Capital at Risk
Three-Month Forecasts
(Percent at Annual Rate)

Currency	Buy and Hold	Berkeley Consulting Group	D.R.I.	Forex Research	Predex	Service 5	Service 6	Arithmetic Average (Services Only)
Canadian Dollar								
Buy	(15.12)	2.52	(2.88) ^P	NA	(4.96)	(.60)	NA	(1.48)
Sell		6.88	5.16 ^P	NA	(2.08)	3.52	NA	3.37
Total	(15.12)	4.40	1.64 ^P	NA	(3.60)	.28	NA	.68
French Franc								
Buy	3.20	7.32	5.76 ^P	2.40	7.20	3.24	10.08 ^P	6.00
Sell		2.28	(.64) ^P	(3.16)	3.68	(2.68)	13.80 ^P	(2.39)
Total	3.20	4.20	1.40 ^P	.02	5.92	.08	2.60 ^P	2.37
German Mark								
Buy	6.80	5.72	13.00 ^P	6.52	7.56	16.08	10.84	9.95
Sell		(13.92)	(1.96) ^P	(7.00)	(4.40)	(4.04)	(4.88)	(6.03)
Total	6.80	(1.56)	5.80 ^P	(1.60)	4.68	.64	.36	1.39
Japanese Yen								
Buy	12.52	7.36	15.56 ^P	12.92	21.08	4.80	NA	12.34
Sell		(16.40)	(13.68) ^P	(8.92)	(9.56)	(15.76)	NA	(12.86)
Total	12.52	(5.32)	3.88	6.16	(2.40)	(7.96)	NA	(1.13)
Swiss Franc								
Buy	9.64	NA	NA	NA	18.80	NA	NA	18.80
Sell		NA	NA	NA	(6.12)	NA	NA	(6.12)
Total	9.64	NA	NA	NA	.52	NA	NA	.52
U. K. Pound								
Buy	.12	14.04	4.56 ^P	8.40	2.76	2.16	6.20 ^P	6.35
Sell		10.48	(12.40) ^P	4.68	2.44	1.12	(9.32) ^P	(.50)
Total	.12	12.04	(2.24) ^P	6.04	2.60	1.52	(2.52) ^P	2.91
Arithmetic								
Average Total	2.86	2.75	2.10	2.66	1.29	(1.09)	.15	1.12

p = based on part period data

Note: Brackets indicate a negative.

Total is the return on all transactions both buy and sell; it is equal to the weighted average of the return on buys and on sells where the weights are the share of transactions which are buys and sells respectively.

Totals for arithmetic average column represent horizontal sum; arithmetic average for arithmetic average column represents vertical sum of Totals.

Service 4 has the best average performance, but the results are influenced by the failure to forecast the French franc for which the average performance of the other services is relatively low. The service is extremely sensitive to shifts in the exchange market, averaging 22 transactions annually or almost a transaction every other week (which considerably reduces the service's usefulness for corporations trying to manage their foreign currency exposure). Including transactions costs the speculative return on capital at risk for Service 4 averages 9.36%, still the best performance for the technically-oriented services. Service 3 is the second best performer of all of the technically-oriented services, hurt by a relatively poor

Table 6
Evaluation of Technically-Oriented Services
Speculative Return on Capital at Risk
(Percent at Annual Rate)

Currency	Service 1	Service 2	Service 3	Service 4	Arithmetic Average
Canadian Dollar					
Buy	.99	2.50	.51	4.61	2.15
Sell	4.60	6.22	5.40	5.19	5.35
Total	5.59	8.72	5.91	9.80	7.51
No of Trans.	5	11	6	17	10
French Franc					
Buy	(2.42)	3.82	3.10	NA	1.50
Sell	(3.66)	.53	1.12	NA	(.67)
Total	(6.08)	4.35	4.21	NA	.83
No. of Trans.	5	15	8	NA	9
German Mark					
Buy	10.49	7.53	6.82	8.78	8.41
Sell	2.46	1.19	4.03	3.02	2.68
Total	12.95	8.72	10.85	11.80	11.08
No. of Trans.	5	13	12	25	14
Japanese Yen					
Buy	12.42	11.78	3.86	10.95	9.75
Sell	(1.73)	(1.52)	(2.10)	(1.63)	(1.75)
Total	10.69	10.26	1.76	9.32	8.01
No. of Trans.	5	12	7	21	11
Swiss Franc					
Buy	9.52	2.76	11.11	12.99	9.10
Sell	2.07	(10.28)	11.38	3.11	1.57
Total	11.60	(7.52)	22.49	16.10	10.67
No. of Trans.	5	14	11	22	13
U.K. Pound					
Buy	6.70	9.24	7.68	2.62	6.56
Sell	5.55	9.93	4.40	2.64	5.63
Total	12.25	19.17	12.08	5.26	12.19
No. of Trans.	4	12	6	24	12
Arithmetic					
Average					
Total	7.83	7.28	9.55	10.46	8.38
No. of Trans.	5	13	8	22	12

Note: Brackets indicate a negative

Total is the return on all transactions both buy and sell.

No. of Trans. is the average number of transactions per year.

Totals for arithmetic average column represent horizontal sum; arithmetic average for arithmetic average column represents vertical sum of Totals

showing for the Japanese yen. After transactions costs the speculative return on capital at risk averages 9.15%.

Services 1 and 2—the two services that rely exclusively on the historical record of exchange rates and exclude all fundamental factors in predicting the future trend in rates—do the poorest of the technically-oriented services but they still considerably outperform a buy and hold strategy. The results for Service 1 are hurt by a poor performance for the French franc and the results for Service 2 are

hurt by a poor performance for the Swiss Franc. Service 2 is more sensitive to shifts in the exchange market averaging 13 transactions annually compared with 5 transactions per year for Service 1, but this fails on average to improve the return even before transactions costs. After transactions costs the speculative return on capital at risk averages 7.58% for Service 1 and 6.63% for Service 2.

Implications for Business and Policy

The implications of the findings differ for the economics-oriented and the technically-oriented services reflecting the substantial difference in the results. The predictive accuracy of most—but not all—of the economics-oriented foreign exchange rate forecasting services is so poor that they are likely to be of little use for corporations trying to manage their foreign exchange exposure. The performance of these services clearly does not provide evidence to refute the view that the foreign exchange market is an efficient market.

The results are quite different for the technically-oriented services. Their consistently very strong predictive performance supports the view that speculative runs do occur in the exchange market and that the foreign exchange market is not efficient.

This has clear implications for corporations trying to manage their foreign currency exposure. It suggests they might wish to subscribe to one or more of the technically-oriented foreign exchange rate forecasting services. It also suggests they should hedge outstanding short positions when a currency is rising, particularly if it is rising at an accelerating rate, and hedge outstanding long positions when a currency is falling, particularly if it is falling at an accelerating rate. Unfortunately, the technically-oriented services generally do not provide point estimates of future spot exchange rates and would be of little use in planning.

The finding that speculative runs are prevalent in the exchange market also has implications for policy makers. It suggests that exchange rates, if allowed to fluctuate freely, will consistently overshoot—and may never reach—equilibrium. It also suggests that intervention to be successful in preventing overshooting must come at the right time in terms of the technical forces in the market and must be of sufficient magnitude and duration to decisively break the momentum in a currency's movement.

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