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How Much is Purchasing Power Parity Worth?

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Updating Bilson's (1984) investment strategy using an out-of-sample forecast procedure, we find much smaller profits from a trading strategy based on purchasing power parity. Though the total profit is significant at a 5 percent level, it is substantially lower than what Bilson found. Our results suggest Bilson's excess profits are due to the sample of data used and the in-sample nature of the tests. Hence, this paper demonstrates that the simple investment strategy leads to the same conclusion that econometric testing does; namely, that purchasing power parity is only marginally useful in forecasting exchange rates.

INTRODUCTION

The theory of purchasing power parity (PPP) states that the exchange rate between two currencies is related to the relative prices in the two countries so that exchange rate-adjusted prices will be equal between the two countries. Many impediments exist, however, that could prevent the equilibrium in prices described by the theory of purchasing power parity. Information costs, transactions costs, transportation costs, and government-imposed restriction are just a few of the market imperfections that may thwart purchasing power parity. Thus, it is not surprising that the empirical support of purchasing power parity is weak. Early studies of purchasing power parity such as Frenkel (1981), Baille and Selover (1987), Corbae and Ouliaris (1988), and Taylor (1988) using postwar data do not find support for this condition. More recent studies using cointegration tests are somewhat more favorable for purchasing power parity. For example, Johansen and Juselius (1992) find support for purchasing power parity using data for the United Kingdom, but only when interest rate parity is included in the system.

Bilson (1984) proposes an alternative testing procedure. He argues that if the condition were useful for investors, then the significance of purchasing power parity could be determined from its value in choosing an optimal currency portfolio, Thus, he designs a simple trading strategy that allows investors to select currency investments based on the

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purchasing power parity condition. The trading strategy is surprisingly successful, and substantial profits are made, at least in-sample, using the purchasing power parity condition. The success indicates, according to Bilson, support for the existence of the purchasing power parity condition. But, as observed by Cornell (1984) the results are "too good," as investors should have been able to use information from purchasing power parity conditions to take advantage of these profit opportunities.

In this paper, we extend Bilson's study by investigating the returns to his trading strategy using a longer span of data and out-of-sample tests. In contrast to Bilson, we do not find substantial profits to the trading strategy, implying that purchasing power parity is only marginally valued for forecasting exchange rates.

TESTING THE USEFULNESS OF THE PURCHASING POWER PARITY CONDITION

Bilson maintains that tests of purchasing power parity using the traditional econometric tests are unsatisfactory. The valuation of a forecasting equation always has been performed by evaluating the forecasts from a system of equations. The evaluation of the accuracy of forecasted spot rates in traditional econometrics, however, is a concern as it does not mimic the behavior of a rational trader. Usually the forecasted values of spot rates are evaluated according to some norm, such as mean squared error. Such a norm uniformly weights the errors in forecasts across currencies. A rational trader, however, would weight his/her investment according to the expected returns of the forecast. In this example the trader would weight the forecast of a currency more if the currency's forecast is far from the forward rate and confidence in the forecast is relatively high. Bilson's contribution is his trading strategy that evaluates the forecasts from a standard regression using a process that mimics a trader's behavior.

Bilson's trading strategy is a simple portfolio adjustment model, where agents hold currencies according to the highest expected return relative to the risk of these investments. In periods where little is known the investor will hedge by diversifying currency holdings appropriately. In times when he/she feels that a currency is out of line, the portfolio will emphasize this currency. If the regression were useless for the investor, the currency portfolio would remain hedged throughout the time period. Only if the regression provides some information will the investor take a position. Therefore, the trading strategy provides a means for testing the importance of the information provided by the regression by allowing the trader to weight the forecasts according to a utility function. In contrast, a standard mean squared error measure would weight each of the forecasted spot rates equally and would only be able to show if, on average, the forecasted spot rates were better forecasted with the regression than with some other regression.[1]

[1] For example, in Meese and Rogoff (1983) this type of forecasting experiment is performed to judge whether the exchange rate theories of the 1970s have any useful information in forecasting exchange rates. These root mean squared errors then are compared to the root mean squared error of a random walk forecast. The conclusion is that, on average, the random walk forecast is as good (or bad) as exchange rate theory forecasts, implying that the information from exchange rate theories is not useful. For a discussion of trading strategies in foreign exchange markets, see Surajaras and Sweeney (1992).

The procedure consists of two parts. The first part estimates the forecast regression. The forecasts from this regression then are used to form the speculator's optimal currency portfolio in the second part of the procedure.

ESTIMATION AND FORECASTING USING THE PURCHASING POWER PARITY CONDITION

To begin we need to discuss how we can estimate the purchasing power parity condition and how it can be used for forecast purposes. The main purpose of this paper is to determine whether the startling results reported by Bilson can be reproduced with updated data. To make our results comparable to Bilson's results we need to use the identical forecasting equation. Bilson does not derive this forecasting equation in his paper, but merely states that this would be an intuitive way of forecasting spot exchange rates. Instead of just accepting the ad hoc forecasting equation used by Bilson, we derive the forecasting equation from an unconstrained vector autoregression (VAR) and show what assumptions are necessary to derive the equation used in Bilson. The validity of some of these assumptions is doubtful; it is thus even more surprising that Bilson finds such strong results. We show how the forecasting equation can be derived and proceed by examining out-of-sample results for an equation identical to Bilson. The unrestricted purchasing power parity condition is:[2]

$$(1)\ X_{i,t+1} = \mu_i + \sum_{j=0}^{\infty} \gamma_i\, X_{i,t-j} + U_{i,t}$$

where:

μ_i	=	A constant capturing the potential time trend in the level of the spot rate for country i;
$U_{i,t}$	=	The random error term;
γ_i	=	A coefficient to be estimated for country i;
X_i	=	$[S_i\ P_i,\ P^{US}]$;
j	=	Varies from 0 to ∞;
$X_{i,t-j}$	=	The jth lag of X_i;
S_i	=	The spot rate for the dollar in terms of the currency in country i;
P^{US}	=	The price index for the United States; and
P_i	=	The price index for country i.

These variables have been treated as I(1) variables in most of the recent literature.[3] This implies that working with the data in levels is not useful. Treating this system as a first order integrated system, we can solve for the regression used by Bilson with two additional assumptions. First, strong exogeneity of the price variables has to be imposed.[4]

[2] An unrestricted vector autoregression includes three equations, not just the spot rate equation presented in Bilson. Below we show the conditions that would make the vector error correction model resemble the equation tested by Bilson.

[3] See Cheung and Lai (1993), Johansen and Juselius (1992), and Pippenger (1993).

[4] This is a necessary assumption to achieve an equation that is identical to Bilson's. This assumption, however, is questionable. Norrbin and Reffett (1994), for example, find the causality to be opposite.

This means that when there is a deviation from the purchasing power parity equilibrium condition:

(2) $S_{i,t} = P_{i,t} - P^{us}$

then the exchange rate will adjust to such an equilibrium, where the two price levels are strongly exogenous to the equilibrium condition. Second, we assume that the dynamics of the X_i variables are first order autoregressive.[5] Under these assumptions, we derive an error correction equation similar to the one used by Bilson:

(3) $\Delta S_{i,t+1} = \mu_i + \alpha_i \; PPP_{i,t} + \upsilon_{i,t}$

where:

$\Delta S_{i,t+1}$ = The change in the spot rate for currency i; and

$PPP_{i,t}$ = The disequilibrium for the purchasing power parity condition.[6]

The coefficient α_i is the adjustment coefficient on the purchasing power parity relationship and the key parameter for assessing the importance of the purchasing power parity condition.

Bilson also allows for a forward premium variable because the spot rate could potentially be forecasted using the forward premium. Thus, equation (3) becomes:

(4) $\Delta S_{i,t+1} = \mu_i + \alpha_i \; PPP_{i,t} + \gamma_i \; (F - S)_{i,t} + \upsilon_{i,t}$

where:

$(F - S)_{i,t}$ = The premium or discount on the dollar measured in the foreign currency.

We estimate this forecast equation for a five currency system using a seemingly unrelated regression because the errors of different currencies may be correlated. As in Bilson, we constrain the coefficients on the parity disequilibria to be the same across currencies to further improve the efficiency of the estimates. Testing this restriction with a F-test results in a test-statistic of 0.606 for the common coefficient restriction on the purchasing power parity variable, and 1.149 for the forward premium variable. Both are insignificant at the 5 percent level. Thus we can estimate the equation:

(5) $\Delta S_{i,t+1} = (\mu + k)_i + \alpha_i \; PPP_{i,t} + \gamma_i \; (F - S)_{i,t} + \upsilon_{i,t}$

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[5] We could allow for longer lag lengths but the data are consistent with a first order vector autoregression.

[6] The $PPP_{i,t}$ variable is defined as:

$P_{i,t} - P_{US,t} - S_{i,t} + k_{i,t}$

where:

$k_{i,t}$ = A parameter capturing a constant difference in the purchasing power parity relationship, such as a real exchange rate relationship.

where the adjustment coefficients, α and γ, are constrained to be the same, but where $(\mu + k)_i$, the constant and the purchasing power parity parameter k, are allowed to differ across currencies.

REGRESSION ESTIMATES OF PURCHASING POWER PARITY CONDITION

We collect the data in our study to be comparable to Bilson. The data are primarily from the IFS database distributed by the International Monetary Fund on compact disk, though more recent data are collected from the financial news and market reports section of the *Financial Times* newspaper. Price levels are quarterly, end-of-period consumer price indexes. The spot rate and the forward rate are end-of-quarter values. All variables are in natural log form.[7] A more detailed discussion of the data sources is provided in the data appendix.

Table 1 shows the estimates for regression equation (5) for the period 1974:1 to 1994:4. The adjustment coefficient on the purchasing power parity variable is significant at the 95 percent confidence level using the standard t-distribution.[8] This means that if the purchasing power parity relationship is not in equilibrium, then next period's spot exchange rate will increase to reduce the disequilibrium. These in-sample results demonstrate that an investor may find the purchasing power parity relationship at least marginally useful in predicting the spot exchange rate. This potential forecasting ability is tested in the next section using a trading strategy based on purchasing power parity. In contrast to the purchasing power parity variable, the adjustment coefficient on the forward premium variable is insignificant, whereas the intercepts are significant for all currencies except the Swiss franc.

THE TRADING STRATEGY TEST

In this section we discuss the trading strategy as described in Bilson. We then evaluate the trading strategy using more recent data and an out-of-sample forecasting method.

THE SPECULATIVE STRATEGY

In Bilson's trading strategy agents are assumed to have a constant risk aversion utility function of the following form:

(6) $U(E(R),V(R)) = E(R) - (1/2g)\ V(R)$

where:

E(R)	=	The expected profit;
V(R)	=	The expected variance of profits; and
g	=	A risk aversion parameter.

[7] Some data points are determined to be outliers and are corrected as described in the data appendix. These discrepancies point to a serious problem for empirical research in international finance when a common source of data (IFS) may have unreliable data. If we use the uncorrected data reported by the IMF, the profits are more than ten times higher than the profit reported in the paper, mostly as a result of the two outliers.

[8] If we use the MacKinnon (1991) critical values, however, the purchasing power parity variable is insignificant. The appropriate MacKinnon critical value is 4.30 using the 95 percent confidence interval. The inference using the standard t-statistics is more appropriate, in this case, as purchasing power parity is assumed to be a stationary variable.

Table 1—Estimates for Regression of Future Spot Rate Changes Against Purchasing Power Parity and Forward Parity Variables Using Constrained SUR (Equation (5))

$$\Delta S_{i,t+1} = (\mu + k)_i + \underset{(3.46)}{0.063}\, PPP_{i,t} - \underset{(-1.62)}{0.376}(F - S)_{i,t}$$

Currency	$(\mu + k)$
British Pound	-0.024*
	(-2.169)
French Franc	0.122*
	(3.477)
German Mark	0.034*
	(2.939)
Dutch Guilder	0.044*
	(2.708)
Swiss Franc	0.021
	(1.655)

In the above regression future spot rate changes, $\Delta S_{i,t+1}$, for each currency i are regressed against variables representing deviations from purchasing power parity (PPP) and the forward premium or discount (F - P) on the foreign exchange

$\Delta S_{i,t+1}$ = The log of next period's spot rate minus the log of this period's spot rate

PPP = The price index of the foreign country minus the U.S. price index minus the spot rate, with all variables in log form

F - P = The log of the forward rate minus the log of the spot rate

The seemingly unrelated regression is constrained so that coefficients on PPP or F - P are the same for all countries. The values in parentheses are t-statistics. The constant term, $(\mu + k)$, is allowed to vary across currencies and those significantly different from zero at a 5 percent significance level using the standard t-distribution are denoted *. The data for the above regression are from the International Monetary Fund, OECD, and the *Financial Times* for the period 1974:1 to 1994:4

The trader's utility is expressed in terms of profits rather than returns because the strategy does not require any initial investment. In Bilson's strategy a foreign exchange trader undertakes positions in three month forwards based on expected changes in spot rates, given information from forward parity and purchasing power parity. The only initial capital required may be funds placed in an interest-bearing certificate of deposit or margin account.

The expected profit and variance of profit from the trading strategy are:

(7) $E(R) = q'r$

(8) $V(R) = q'Vq$

where:

q = An $N \times 1$ vector of the dollar value of currency positions taken in the nth currency. Currency positions need not be strictly positive, as short positions are allowed as well.

r = An $N \times 1$ column vector of expected biases in the forward rate, i.e. the expected future spot rate from regression (5) minus the forward rate;

V = The variance-covariance matrix of the forecast errors (expected future spot rates from regression (5) minus realized future spot rates).

The optimal trading strategy is to choose currency positions that maximize the expected utility defined in equation (6). The solution is given by:

(9) $q = V^{-1} rg$

where g, the risk aversion parameter, is set to 100 in Bilson's strategy. This choice is inconsequential to the evaluation of the trading strategy's success or failure because increasing g would magnify the returns and losses to the strategy equally. In effect, equation (9) indicates that the trader will attempt to make $100 when the expected profit is one standard deviation above zero. The position taken depends on the forecast errors and the expected bias of the forward rate. If the certainty of the forecast is low, for example, then this uncertainty will reduce the position taken in that currency. If the expected bias in the forward rate is large such that the forward rate is much lower than that predicted by forward rate parity and purchasing power parity, for example, the strategy places more weight in this currency to exploit the future currency appreciation.

In Bilson's study the coefficients for regression equation (5) and V, the variance-covariance matrix of the forecast errors, are estimated with the entire sample of data and then used to determine currency positions in each in-sample quarter. Thus, Bilson's trading strategy impounds future information into parameters r and V not actually available to a speculator. In this paper we first replicate Bilson's results and then use a rolling regression to test the trading strategy using only information available to the investor at that point in time.

THE RESULTS OF THE SPECULATIVE STRATEGY

To replicate Bilson's results, we first estimate coefficients for equation (5) for the base period 1974:1 to 1982:4. We then use a rolling regression to generate out-of-sample estimates for equation (5) one quarter at a time such that the strategy has only the use of current information. The q matrix is calculated for an out-of-sample period from 1983:1 to 1994:4, extending the results in Bilson.

The out-of-sample positions generated are shown in Table 2. A negative entry means that a long position is taken in that currency (short in U.S. dollars), whereas a positive entry means that the investor adopts a short position or borrows in that currency. For example, the largest long position in the table is $11,489 of Dutch guilders in the first quarter of 1991. The largest short position is $7584 of German marks in that same quarter. The counteracting positions result in a net dollar position of $322 in this quarter. Here, the trading strategy invests heavily in the Dutch guilder and shorts the mark as German inflation grew faster than Dutch inflation. Traditionally the guilder and mark are closely tied due to the conservative nature of both central banks. In this instance though, German inflation was higher due to the political and monetary unification of Germany; hence, the trading strategy shorted the mark.

Table 2—Currency Positions Using an Out-of-Sample Methodology

	British Pound	French Franc	German Mark	Dutch Guilder	Swiss Franc	U.S. Dollar
1983 Q1	201	-1294	-3832	4798	137	-10
1983 Q2	788	-1103	-1112	1535	-61	-48
1983 Q3	776	-909	-994	815	301	12
1983 Q4	843	-817	-1348	1307	130	-115
1984 Q1	947	-838	-977	864	244	-240
1984 Q2	697	-1054	-5658	6600	32	-617
1984 Q3	457	208	-1463	1217	-216	-203
1984 Q4	265	153	-1263	1520	-819	145
1985 Q1	-506	354	-786	-625	1024	538
1985 Q2	-206	669	929	-1978	17	569
1985 Q3	43	445	1105	-1603	-302	313
1985 Q4	-323	1198	-1286	31	193	186
1986 Q1	-219	1653	-131	-967	-474	139
1986 Q2	166	2303	1761	-3855	-365	-11
1986 Q3	-656	2013	-888	-649	-74	252
1986 Q4	-531	1479	-748	-490	52	239
1987 Q1	-45	1565	1398	-2830	-3	-85
1987 Q2	349	1274	2405	-3565	-226	-236
1987 Q3	26	1674	-429	-985	19	-305
1987 Q4	448	571	-463	-301	307	563
1988 Q1	386	1401	-685	-739	200	-564
1988 Q2	87	1588	-1990	377	336	-398
1988 Q3	-220	1846	-1540	-127	245	-203
1988 Q4	-62	1703	-879	256	-670	348
1989 Q1	76	2128	365	-2180	-66	-324
1989 Q2	-388	2229	-451	-930	-542	82
1989 Q3	-429	3058	-934	-1436	-301	43
1989 Q4	-224	2005	3186	-4332	-940	305
1990 Q1	-127	2074	5036	-6830	-492	340
1990 Q2	10	2144	3858	-6127	-121	237
1990 Q3	-377	2349	-2446	331	138	4
1990 Q4	376	1404	1772	-3445	-232	125
1991 Q1	710	3248	7584	-11489	-375	322
1991 Q2	238	2061	-2035	-807	377	166
1991 Q3	627	2096	-82	-2723	2	80
1991 Q4	369	1967	-352	-2506	301	220
1992 Q1	276	2093	-1784	-343	-473	231
1992 Q2	755	1821	1865	-4489	-166	214
1992 Q3	225	1236	-4513	2574	52	126
1992 Q4	284	54	-5534	4437	600	160
1993 Q1	536	617	-716	-1045	424	184
1993 Q2	294	1863	-2385	-291	427	92
1993 Q3	366	1351	-765	-1327	300	76
1993 Q4	243	1704	-547	-1421	23	-2
1994 Q1	351	1345	-115	-1911	340	-10
1994 Q2	519	1561	1176	-3054	17	-219
1994 Q3	420	1741	892	-2920	194	-326

The above currency positions are undertaken by the trading strategy using an out-of-sample methodology based on purchasing power parity and forward parity. A negative entry means that a long position is taken in that currency (short in U.S. dollars), whereas a positive entry means that the investor adopts a short position or borrows in that currency. The U.S. dollar column is the negative sum of the other columns

Table 3—Quarterly and Cumulative Performance of the Trading Strategy

	Expected Profit	Actual Profit	Cumulative Actual Profit
1983 Q1	48	-19	0
1983 Q2	26	-11	-19
1983 Q3	24	0	-29
1983 Q4	23	53	-29
1984 Q1	23	29	24
1984 Q2	82	65	52
1984 Q3	9	18	117
1984 Q4	20	-43	135
1985 Q1	26	23	93
1985 Q2	17	59	116
1985 Q3	8	20	175
1985 Q4	16	-5	196
1986 Q1	24	64	190
1986 Q2	50	71	254
1986 Q3	35	21	325
1986 Q4	20	22	346
1987 Q1	22	9	368
1987 Q2	23	-9	377
1987 Q3	21	-31	368
1987 Q4	13	7	337
1988 Q1	23	33	343
1988 Q2	25	22	376
1988 Q3	26	-12	399
1988 Q4	25	-24	386
1989 Q1	31	20	362
1989 Q2	35	-13	382
1989 Q3	63	-37	369
1989 Q4	47	17	332
1990 Q1	65	47	349
1990 Q2	56	-10	396
1990 Q3	42	42	386
1990 Q4	26	-18	428
1991 Q1	178	-16	409
1991 Q2	50	29	394
1991 Q3	54	30	422
1991 Q4	48	-25	452
1992 Q1	51	-2	427
1992 Q2	57	136	425
1992 Q3	40	0	560
1992 Q4	44	30	561
1993 Q1	23	-53	591
1993 Q2	43	83	538
1993 Q3	25	-57	621
1993 Q4	25	6	565
1994 Q1	22	9	570
1994 Q2	25	-17	580
1994 Q3	28	29	563
			592

The above profits are from a trading strategy using an out-of-sample methodology based on purchasing power parity and forward parity. A negative entry denotes a loss and a positive entry denotes a gain. Profits are in U.S. dollars

To assess the success and failure of the trading strategy over time we examine the expected and actual returns for the out-of-sample methodology in Table 3. The expected returns, E(R), are given in equation (7) and the actual profit is:

(10) $\pi = (F - S_{t+1})q$

where $(F - S_{t+1})$ is the actual misforecast. We use the actual misforecast instead of the actual change in the spot rate because the speculator invests in deposits according to the forward premium.[9] The actual profit is positive 62 percent of the time, which is insignificantly different from 50 percent by a one-tailed sign test. The total profit is \$592 or \$12 a quarter, higher than the zero profit that one expects from a fair gamble. Using the test statistic developed by Bilson, the t-statistic associated with this profit being zero is 2.43.[10] Thus the null hypothesis that the profit is zero can be rejected at a 5 percent significance level. The profit is much lower than that in Bilson, however. In Bilson's in-sample tests the trading strategy realizes a total profit of \$3141 or \$80 a quarter. Profits are positive 69 percent of the time, and his largest gain is almost five times his largest loss. Further, his test rejects the null hypothesis that the profit is zero at a higher significance level as the t-statistic is 5.6.

THE UTILITY OF FORECASTING VARIABLES

To determine the influence of forecasting variables we examine changes in utility from their omission in the trading strategy. The constant risk aversion utility function implies that the utility equals half of the profit. Table 4 presents a comparison of the utility from the forecasting variables. The first model includes all forecasting variables, resulting in a utility level of \$296. Excluding the purchasing power parity variable reduces the utility by 36 percent to \$190. The reduction in utility is even higher, 44 percent, if we exclude the forward premium model. The latter result is surprising, considering that our regression results show the forward premium variable to be insignificant. This finding is similar to the finding in Bilson, who attributes this to either the interaction between Dutch guilder and German mark currencies or the potential similarity in information conveyed by both purchasing power parity and forward parity variables. Specifically, the latter explanation means that omitting only one variable does not lead to

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[9] The forward premium equals the interest differential according to the covered interest parity condition. Thus, the trader speculates by borrowing in a low interest currency and investing in a high interest currency.

[10] From Bilson (1984), the variance of profits in any one period can be defined as:

$$V(R) = E(R)*g = (t*t)*(g*g)$$

where:

g	=	A risk aversion parameter set to \$100;
E(R)	=	Expected returns; and
t	=	The t-statistic.

To calculate this on an *ex post* basis we use the actual instead of expected returns because these are the profits that are important to the success of the trading strategy.

Table 4—Utility From the Trading Strategy Under Various Informational Assumptions

Model	Utility	Discount	t-statistic
Purchasing Power Parity & Forward Premium	$296		2.43
Forward Premium	$190	36%	1.95
Purchasing Power Parity	$166	44%	1.82
Excluding Both Variables	$83	72%	1.29

Assuming constant risk aversion for the trader, the utility from the trading strategy is calculated as half the actual cumulative profits. The four models make different assumptions about what information is available to the trader. For example, in the forward premium model the trader only has information from the forward premium on which to base his/her currency positions. The discount gives the amount of utility lost using reduced models. The t-statistic tests the null hypothesis that the cumulative actual profits are zero. Only the profits from the full model are significantly different from zero at a 5 percent significance level using the standard t-distribution. The utilities are calculated for trading profits during the period of 1983:1 to 1994:3 using the out-of-sample methodology

substantial losses in profits, as the trader can use information in either to earn substantial profits.

This latter conjecture is supported by the utility remaining after exclusion of both variables (the last line in Table 4). A 72 percent reduction in utility occurs if both variables are excluded and only an intercept is used that captures the potential deterministic trend in the levels of the exchange rate. This result implies that even though a forecast model using only the deterministic trends perform better than zero, the agent loses 72 percent of his/her utility from losing the information in both variables.

The third column in Table 4 shows the t-statistics testing the null hypothesis that the profit equals zero. The t-statistic for the model including only the purchasing power parity variable is 1.82. Hence, we cannot reject the null hypothesis that the profit is zero when we include the purchasing power parity variable alone, at a 5 percent significance level. This indicates that the information from purchasing power parity is not sufficient to make any trading profits. Moreover using the forward premium by itself produces only marginally significant profits. Only jointly do the two variables produce enough information to produce significant profits.

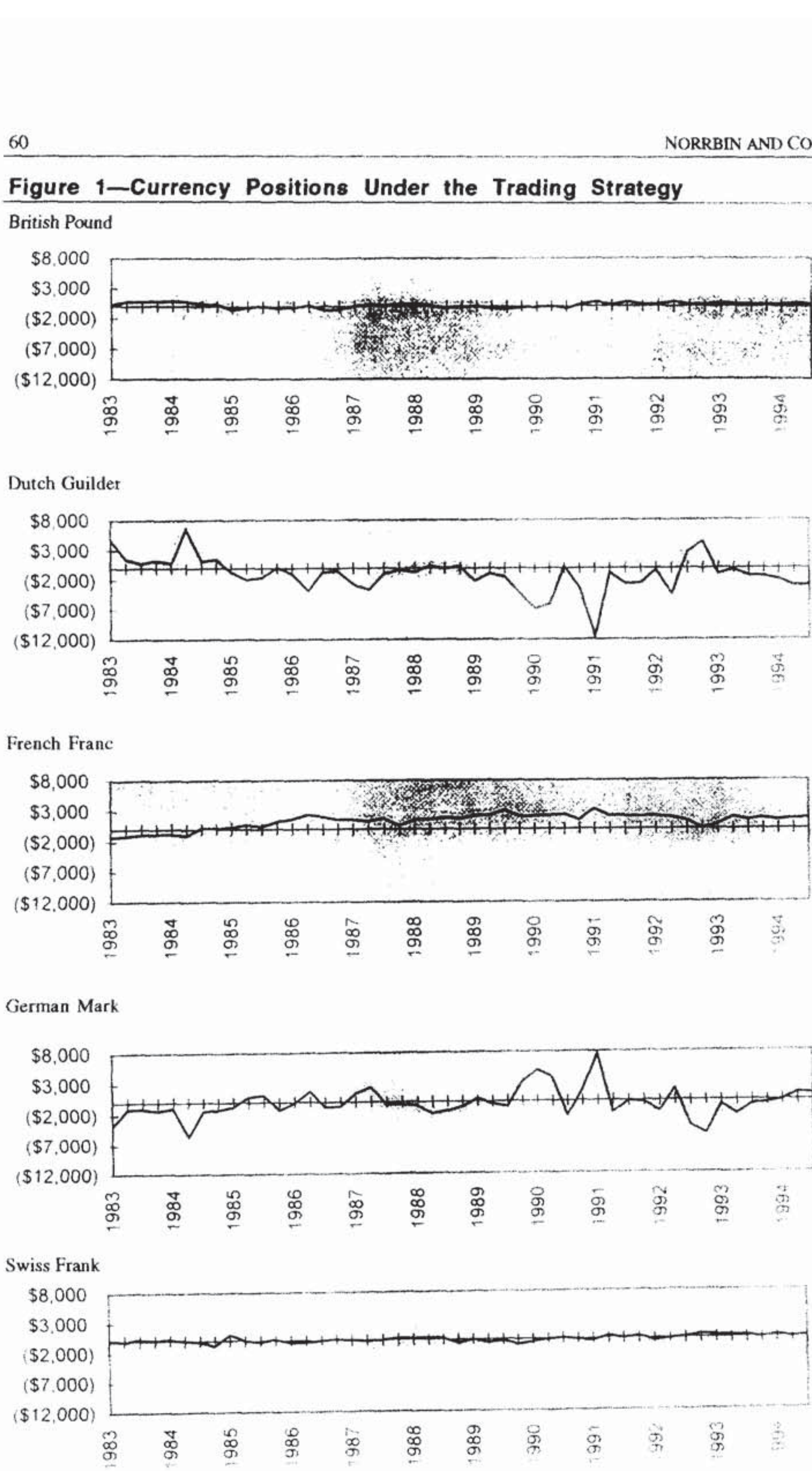
PROFITS FROM A FOUR CURRENCY TRADING STRATEGY

Much of the speculative activity in Table 2 and Figure 1 centers around the Dutch guilder. To examine the robustness of our results and Bilson's results to the choice of currencies, we reexamine the profit to the trading strategy excluding the Dutch guilder. If we replicate Bilson's in-sample trading, the profits drop to $1552, about half his $3141. If we replicate our out-of-sample trading without the guilder, our profits drop more than half from $592 to $241, which is insignificantly different from zero at a 5 percent significance level. That one currency in a five currency model influences trading profits so much suggests that the profits to the trading strategy are a function of the data used.

SUMMARY AND CONCLUSIONS

Though econometric testing only offers marginal support for the purchasing power parity condition, Bilson (1984) finds substantial profits to a trading strategy based on purchasing power parity. Instead of the traditional econometric tests, he proposes a trading

Figure 1—Currency Positions Under the Trading Strategy



strategy test that evaluates the value of purchasing power parity for forecasting exchange rates from a currency trader's perspective. Bilson finds significant profits to his trading strategy, offering support for purchasing power parity.

This paper has extended the work of Bilson by updating his data and using an out-of-sample version of the trading strategy methodology. In contrast to Bilson, we find limited support for purchasing power parity using a trading strategy. Though the total profit is significant at a 5 percent level, it is substantially lower than what Bilson found. Our results suggest that Bilson's excess profits are due to the sample of data used and the in-sample nature of the tests. Hence, this paper demonstrates that the simple trading strategy leads to the same conclusion that econometric testing does, namely, that purchasing power parity is only marginally useful in forecasting exchange rates.

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DATA APPENDIX

The main data source is from the IFS database as reported by *Data Service & Information GMBH International Statistical Yearbook*, 1993 version on CD-ROM. The series used are from the IFS database on the previously mentioned CD-ROM and include AC for the end-of-period spot rates, 60f for forward premia, and 64 for consumer prices.

The spot rates and forward premia are inspected for possible outliers because in the case of the investment strategy, such outliers become profitable trading opportunities. Each large trading position is examined for possible mistakes. Several are found. The spot rate for 1977:3 for Switzerland is determined to have one incorrect digit when we compare it to the spot exchange rate from OECD main economic indicators (from the same CD-ROM, series 68560200). Therefore we replace the 1977:3 value with the value from the OECD data. Two large positions for the Dutch guilder for 1989:4 and 1990:2 also are determined to be outliers, because the forward premia from the *Financial Times* shows no sign of large profit opportunities. Therefore we replace both spot and forward rates for these two quarters (so we would have a consistent measure of the premium) by the average of bid and ask rates of the spot and 90 day forward rates reported in the *Financial Times* financial news and market reports section, issues 1/2/90 and 7/2/90.

Two other data adjustments are made. First, the British pound forward data are not reported throughout the period in the IFS data; therefore we use the 90 day forward rate from the OECD main economic indicators (series 26560300), again from the same CD-ROM source. The spot rates from the IFS and OECD for other countries match, implying that using the forward rate from OECD should not result in inconsistencies. Second, to extend our sample from 1991:1 until 1994:4, we use the average bid and ask rates for the spot and forward rates found in the financial news and market reports section of the *Financial Times* for the last trading day of each quarter. We source this data by using the *Financial Times* issue published immediately after the end of each quarter. The *Financial Times* issues used for this period are 4/1/91, 7/1/91, 10/1/91, 1/2/92, 4/1/92, 7/1/92, 10/1/92, 1/2/93, 4/1/93, 7/1/93, 10/1/93, 1/1/94, 4/1/94, 7/1/94, 10/1/94, 1/2/95. We obtain price data for this period from the bound version of the *International Monetary Fund's International Financial Statistics Yearbook*.