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Forward and Futures Prices: Evidence from the Foreign Exchange Markets

CAROLYN W. CHANG and JACK S. K. CHANG*

CORNELL AND REINGANUM (1981), hereafter CR, report that price differentials for future contracts and forward contracts are statistically insignificant in foreign exchange markets. Based on this finding, CR conclude that marking-to-market is insignificant in the formulation of currency futures prices. This note identifies two potential concerns with the CR tests. One problem relates to the timing of delivery dates for “matched” contracts. A second problem relates to the time period for the CR study. We show that correcting for these problems does not affect the overall conclusions of the CR study; marking-to-market does not appear to have a significant effect on currency futures prices.

I. Delivery Dates for Forward and Futures Contracts

As described in Riehl and Rodriguez (1977) and Hodrick and Srivastava (1985), the delivery date for a U.S. purchase of spot foreign currency is typically two business days after the purchase. (In the case of Canadian Dollars and Mexican Pesos, the delivery date is one business day after the purchase). This delivery date is known as the spot value date. The delivery date for a forward contract is determined relative to the spot value date. For example, to find the delivery date of a one-month forward contract, one must first find the corresponding spot value date and then determine whether that date in the next month is a business day in both countries. If it is, that date is the forward delivery date. Otherwise, the following business date is used.

To minimize the potential for mismatching in forward-futures comparisons, one can adopt the following procedure. For a given futures delivery date, first check to see whether the numerical date was a business date in both countries. If it was, the date two business days prior to the numerical date should be used as the comparison date for the forward and the futures prices. Otherwise, the observation should be dropped because of the mismatch in delivery dates. For example, in the month prior to 6/19/74 (a delivery date for a futures contract), the numerical date for the forward contract was 5/19/74, which fell on a Saturday;

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hence, a synchronous comparison date was not possible. On the other hand, the numerical date in the month prior to 12/18/74 (also a delivery date for a futures contract) was 11/18/74, which fell on a Monday. Hence, Thursday, 11/14/74 (two business days prior to the Monday) was a valid comparison data.

Table I reports our replication results (CC) vis-à-vis the CR findings for the period 1974–1979. Our matching procedure produced a smaller number of synchronous comparisons as shown in the last two columns of the table. In the modified replication none of the price differentials is statistically significant at the 5% level. In contrast, CR report two significant differentials at the 5% level. This comparison suggests that the nonsynchronous matching problem is nontrivial.

Table I
Summary Statistics for Futures and Forward Price
Differentials, 1974–1979

In this table we replicate the Cornell-Reinganum test of futures and forward price differentials based upon a correct procedure of matching their maturities. The price difference is defined as the futures price minus the forward price. The mean differences and the *t*-statistics are computed for five currencies and four maturities, respectively. CR stands for Cornell-Reinganum's original results. CC stands for our new results. *N* stands for the total number of synchronized comparisons available for the time period.

Currency	Maturity (month)	(1) Mean (Fut-For)		(2) <i>t</i> -Statistics		(3) <i>N</i>	
		CR	CC	CR	CC	CR	CC
British Pound ^a	1	-3.26	-13.25	0.39	0.60	21	8
	2	-13.91	11.00	-1.48	0.09	21	16
	3	-32.16*	-9.62	-4.05	-0.08	21	21
	6	-17.89	-24.33	-1.54	-0.44	21	18
Canadian Dollar ^a	1	-4.73*	-1.39	-2.59	-0.22	21	9
	2	1.16	-1.59	0.74	-0.22	21	16
	3	0.51	2.78	0.57	0.33	21	18
	6	-1.37	-4.57	-0.37	-0.94	21	14
German Mark ^a	1	0.26	2.38	0.27	0.44	21	8
	2	1.31	-0.16	1.15	-0.02	21	16
	3	2.01	3.19	1.55	0.46	21	21
	6	0.34	0.00	0.19	0.00	21	20
Japanese Yen ^b	1	3.06	0.00	1.54	0.00	20	7
	2	-1.91	1.80	-1.24	0.54	17	10
	3	-1.71	0.93	-0.70	0.13	20	14
	6	-4.17	-2.03	-0.95	-0.23	17	12
Swiss Franc ^a	1	3.99	-5.25	1.15	-0.29	20	8
	2	-0.47	1.47	-0.23	0.22	21	16
	3	0.71	0.86	0.26	0.14	21	21
	6	2.16	-8.59	1.04	-0.25	20	17

^a Unit is \$0.0001.

^b Unit is \$0.000001.

* Significant at the 5% level.

II. Sample Period

The sample period for the CR study (June 1974 to June 1979) was dominated by an economic cycle in which interest rates were volatile but currency rates were not. The theoretical effect of marking-to-market is smaller with stable cash prices (Richard and Sundaresan (1981) and Cox, Ingersoll, and Ross (1981)). Hence, there is a downward bias (in the direction of statistical insignificance) in the CR test results.

To provide a fairer test of the price effect of marking-to-market, we repeated the CR test for a period (September 1979 to June 1987) when currency rates as well as interest rates were volatile. During the alternative sample period, the three-month Treasury bill rates climbed from around 10% to a historic high of

Table II
Summary Statistics for Futures and Forward
Price Differentials, 1979–1987

This table provides summary statistics for the futures and forward price differentials in a volatile economic environment. The price difference is defined as the futures price minus the forward price. Mean differences and *t*-statistics are computed for five currencies and four maturities, respectively. *N* stands for the total number of synchronized comparisons available for the time period.

Currency	Maturity (month)	(1) Mean (Fut-For)	(2) <i>t</i> -Statistic	(3) <i>N</i>
British Pound ^a	1	4.08	0.55	13
	2	5.95	1.10	22
	3	-15.87	-0.94	30
	6	-29.3	-1.45	30
Canadian Dollar ^a	1	1.64	1.02	14
	2	0.86	0.32	22
	3	2.30	1.43	30
	6	0.00	0.00	30
German Mark ^a	1	2.54	1.42	13
	2	-2.39	-0.49	23
	3	2.30*	1.79	30
	6	1.57	1.19	30
Japanese Yen ^b	1	-0.08	-0.05	13
	2	1.48	0.96	23
	3	2.10	1.12	30
	6	-0.87	-0.63	30
Swiss Franc ^a	1	4.92	0.92	13
	2	6.00	1.66	23
	3	20.07	0.93	30
	6	1.83	0.68	30

^a Unit is \$0.0001.

^b Unit is \$0.000001.

* Significant at the 10% level.

around 15% and then dropped back to around 7%, and the U.S. dollar experienced its widest post-war swing with a near 40% devaluation from peak to bottom against most major foreign currencies.

Table II reports our findings for the more volatile period. Only one price differential is statistically significant at the 10% level. Thus, as in the case of the modified matching procedure, we find that correcting for the unusual sample period of the CR study reinforces the overall conclusion; the price effect of marking-to-market in the currency markets would indeed appear to be trivial.

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