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FOREIGN EXCHANGE MARKET "EFFICIENCY" AND CURRENCY INCONVERTIBILITY: THE CASE OF THE EXCHANGE RATES OF THE PORTUGUESE ESCUDO AGAINST THE U.S. DOLLAR 1973-78

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This paper analyzes the foreign exchange markets of the Portuguese escudo against the U.S. dollar during the recent period of generalized float. The Portuguese experience is interesting because both the official foreign exchange market and the money market have been tightly controlled by the central bank and "free" spot and forward markets have developed in Lisbon and New York respectively.

After a description of these various markets, in Section I, an "equilibrium" exchange rate based on interest rate differentials in constructed in Section II, and "efficiency" tests are applied to the official and black markets in Section III, using regression techniques and causality tests.

The absence of covered interest arbitrage is shown not to prevent acceptance of the tests for weak efficiency of the forward market when the official rate is used. On the other hand, the linkage between the official and black market rate is rejected both by the inefficiency of the forward market using the black market rate and by the independence of the official and black market rates.

I. The Foreign Exchanges

1. The existence and the operation of markets where the Portuguese escudo is exchanged for other currencies is surrounded with some mystery. The central bank sets twice daily spot rates of exchange of the escudo against 17 major currencies,[1] and these rates are used in the transactions of commercial banks with the public. Transactions in foreign currencies are, in principle, restricted to authorized residents. Foreign holders of escudo and unauthorized residents are thus excluded from the "official" exchange market. On the other hand, authorizations to residents are restricted to holders of import and export licenses granted less than 120 days ago. With respect to receipts from invisible trade, namely private remittances, no authorization is needed.

Therefore, prior registration of imports and exports of goods in the form of a bulletin (BRI for imports, BRE for exports) is required. For all exports and imports free of quantitative restrictions, the purpose of this registration is to enforce the surrender of foreign exchange of the monetary authorities. The commercial banks themselves can only deal in foreign exchange with the Bank of Portugal and are not expected to solicit foreign exchange transactions with banks abroad or to enter into arbitrage operations in foreign markets. The gross holdings of foreign exchange by commercial banks and their net foreign asset position are also subject to control by the central bank.

The official spot market for the escudo relies therefore on a two tier structure. On one level the bulleting holders and the commercial banks, on the other the commercial banks and the Bank of Portugal, whereby

[1] See the Annual Reports on Exchange Restrictions of the IMF, since the 1951 supplement.

the former balance flow demand and supply of foreign exchange given their working balances on foreign currency.

The rate set by the Central Bank is influence both by the reported excess demand for and supply of foreign exchange commercial banks and by the outlook on the cross rates between the currencies quoted by the central bank. Excess demand and supply for foreign exchange by the commercial banks is in turn related, with leads for imports and lags for exports, to the bulletins granted by the Directorate General of Foreign Trade. The central bank may balance these demands and supplies either by changing the rate or by selling reserves to the commercial banks. The analysis of exchange rate policies in Portugal suggests, however, that considerations other than the daily balancing of commercial banks demand and supply have been determinant in the setting of the official rate by the central bank.[1]

There has been no official forward market for the escudo, except from September 1977 to April 1978, during which period the Bank of Portugal provided forward cover in ten major currencies. The commercial banks are authorized to enter into swap transactions with the Bank of Portugal and also into forward transactions with individual customers, provided that the forward rate lies within the spot bid-ask spread, which is equivalent to suppress a forward premium as such.

2. In sum, the official market for foreign exchange is devised to remain predominantly located in Portual, and access to it is tightly controlled by the Central Bank and the Directorate General of Foreign Trade, except for supply of foreign exchange associated with invisible trade and unrequited transfers. It can be argued that such a tightly controlled exchange regime provides strong incentives for the development of unofficial markets where the price of foreign exchange that equates desired to actual stocks of foreign exchange by domestic residents and of domestic

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[1] See Macedo (1979b) and (1979c).

currency by foreign residents is determined.[1] And, indeed, evidence of capital flight from Portugal in the years after the revolution, together with the great importance of invisible receipts from tourism and emigrants, would ensure a regular supply of foreign exchange to these unofficial markets, even if bulletin holders would always surrender or request the authorized amount of foreign exchange, which is widely believed not to be the case. In fact, forward premia on the escudo are quoted in New York[2] and unauthorized dealers in foreign exchange in Geneva, New York, and Rio de Janeiro, have created an unofficial spot market for the escudo mostly located in Lisbon.[3]

Data on the official forward rates and the ones quoted in New York during the brief overlap (see Table 1) show a spread of the same order of magnitude as the spread between bid and offer, even though in the last month of overlap, April 1978, it was as high as 6 percent for the 6 month forward rate. Furthermore, alternative sources on the escudo black market rate against the dollar roughly agree with each other

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[1] See Macedo (1979_a).

[2] I owe the information of the existence of such a market to D. Danker. Einzig (1967) mentions occasional operations in London, but no regular quotes on forward premia are recorded. Reuter and Samuel Montagu appear to report data on the escudo occasionally but the main source is International Reports Inc., New York. I am grateful to Ms. Gail Weisgrau for making this data available. On the subject of forward facilities in non-industrial countries see the discussion of Gerakis-Danker (1977).

[3] Weekly escudo-dollar rates in the "inland parallel market in bank notes" are quoted in IR Statistical Market Letter and monthly rates are collected in Pick's Currency Yearbook. In the early 50's furthermore, a montly "free market rate" for escudo notes exchanged in Switzerland was reported in IFS. For 1977, Pick writes in characteristic style: "the black market continued to boom, as banknote smuggling under the protection of diplomatic immunity became big business, with corners carrying as many as esc. million in bank notes in one shipment. Meanwhile, an efficient "Payments Lisbon" network was now operating, centered in New York, Brazil and Zurich." (p. 495). There are also regular reports on the escudo in International Currency Review.

(see Table 2), even though in some cases there are percentage differences close to the black market premium using black market and spot rates from the same source. We include in Figures 5 to 7 a summary of the available weekly data from International Reports.[4]

In Figure 1, the weekly one month bid and offer forward discount of the escudo against the dollar are shown from January 5, 1973 to August 18, 1978.[5] It is noteworthy that in Figure 1 the spread between bid and offer discount became quite large since the announcement of the crawling peg cum forward rates in September 1977 after having declined fairly steadily since the period 1973-75. The speculative pattern of 1974-75, however, is different from the consistently large spread of mid 1973 and mid 1977 to 1978. In these two periods the persistence of the spread showed heterogenous expectations about revaluation and the ex-post rate of crawl respectively. In the interim period it was probably due to large individual operations. In Figure 2 the average between bid and offer is plotted for

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[4]The rates published in the Bank of Portugal Reports are averages of bid and offer. IFS reproduces these rates since December 1972 and the spot rate in IR is the bid rate in New York. The spread is generally small (for instance it was .23 escudo on 12/31/75 and .46 on 12/31/77). The spread of the forward discount in New York is larger and is discussed in the text. In Figure 5 the bid discount is higher since the forward rate is then lower than the asked one.

[5]The data has been interpolated for missing observations in the last week of each year and also when no quotations were available. There are three major cases, from May 18 to June 15, 1973, from June 20 to August 15, 1975 and from February 20 to May 7, 1976. Other cases when more than two consecutive observations are missing are December 25, 1975 to January 16, 1976, June 18 to July 2, 1976, August 6 to August 20, 1976, September 24 to October 8 and August 26 to September 9, 1977. In 294 observations, a total of 53 where interpolated. An attempt at using a natural spline of degree 2 (or a cubic spline) for that purposed proved insatisfactory because very large values would occur in the interpolated intervals. Thus the best compromise seemed to be the spline of degree zero (which is like the linear interpolation). Against interpolation in similar circumstances, see Levich (1979a), p. 134.

Table 1

End of Month Forward Rates Against the Dollar
(Average of bid and Offer)

	1 Month		3 Months		6 Months	
	Official	Free	Official	Free	Official	Free
1977; 9	41.25	41.72	42.10	43.51	43.42	44.37
1977;10	40.89	41.23	41.73	43.07	43.02	44.33
1977;11	41.26	41.65	42.19	43.70	43.59	44.83
1977;12	40.30	40.60	41.21	42.43	42.58	43.66
1978; 1	40.55	41.12	41.41	43.08	42.69	43.98
1978; 2	40.55	40.96	41.39	42.86	42.63	44.18
1978; 3	41.35	41.86	42.16	43.85	43.38	45.26
1978; 4	42.36	43.03	43.22	44.95	44.48	47.16

Note: Official forward quotations were discontinued on May 4, 1978.

Source: Official: Bank of Portugal Annual Report, 1977, p. 295 and 1978 p. 339.

"Free": Computed from forward discounts in New York from International Reports.

Table 2

Escudo Dollar Exchange Rates

	Black Market (Bid)				Official	
					(Bid)	(Average)
	(1)	(2)	(3)	(4)	(5)	(6)
1974, 4	25.98	26.32	25.00	25.5(1)	27.40	n.a.
1975,12	26.46	25.97	25.35	27.5(1)	24.69	24.710*
1975, 1	25.91	25.64	25.30	27.5(1)	24.21	24.530
1975, 3	26.29	26.67	28.00	32.0(2)	24.24	24.205
1975, 5	26.19	25.32	24.80	37.0(2)	24.30	24.457
1975, 9	39.26	37.04	36.00	40.0(2)	27.49	27.014
1976, 1	37.19	37.04	41.00	36.0(1)	27.44	27.381
1977, 1	36.10	35.84	35.00	39.0(1)	32.16	31.994
1977, 4	41.07	44.05	n.a.	42.5(1.5)	38.72	38.773
5	42.26	41.07	"	42.5(1.5)	38.79	38.727
6	40.57	39.37	"	43.0(1)	38.82	38.732
7	41.03	40.82	"	42.5(1)	38.68	38.478
8	45.57	48.00	"	44.0(1.5)	38.98	38.796
9	46.47	45.05	"	45.0(1.5)	40.79	40.601
10	43.72	44.44	"	45.0(1.5)	40.08	40.628
11	44.59	44.44	"	45.5(1.5)	41.18	40.646
12	45.26	47.62	"	46.5(1.5)	39.50	40.276
1978, 1	48.78	48.78	"	45.5(1)	40.18	40.134
2	43.83	41.84	"	45.5(1)	39.98	40.233
3	42.36	41.15	"	46.0(1.5)	41.14	40.751
4	42.70	43.48	"	45.0(1)	41.93	41.402
5	45.52	46.51	"	47.0(1)	45.94	45.151
6	45.78	45.45	"	47.0(1.5)	45.74	45.741
7	44.65	45.56	"	47.5(1.5)	45.56	45.548
8	45.45	45.45	"	47.0(1)	45.82	45.294
9	47.59	54.05	"	47.5(1)	45.46	45.447
10	50.00	50.00	"	47.0(1)	44.33	44.643
11	50.00	50.00	"	48.0(1)	46.96	46.435
12	49.32	47.62	"	n.a.	45.89	46.470
1979, 1	48.80	50.00	"	"	47.06	n.a.
2	48.98	47.62	"	"	47.62	n.a.
3	47.35	46.95	"	"	48.25	n.a.

Note: (4) Records have been destroyed before 1977;4 and numbers reported above the line are thus approximate.

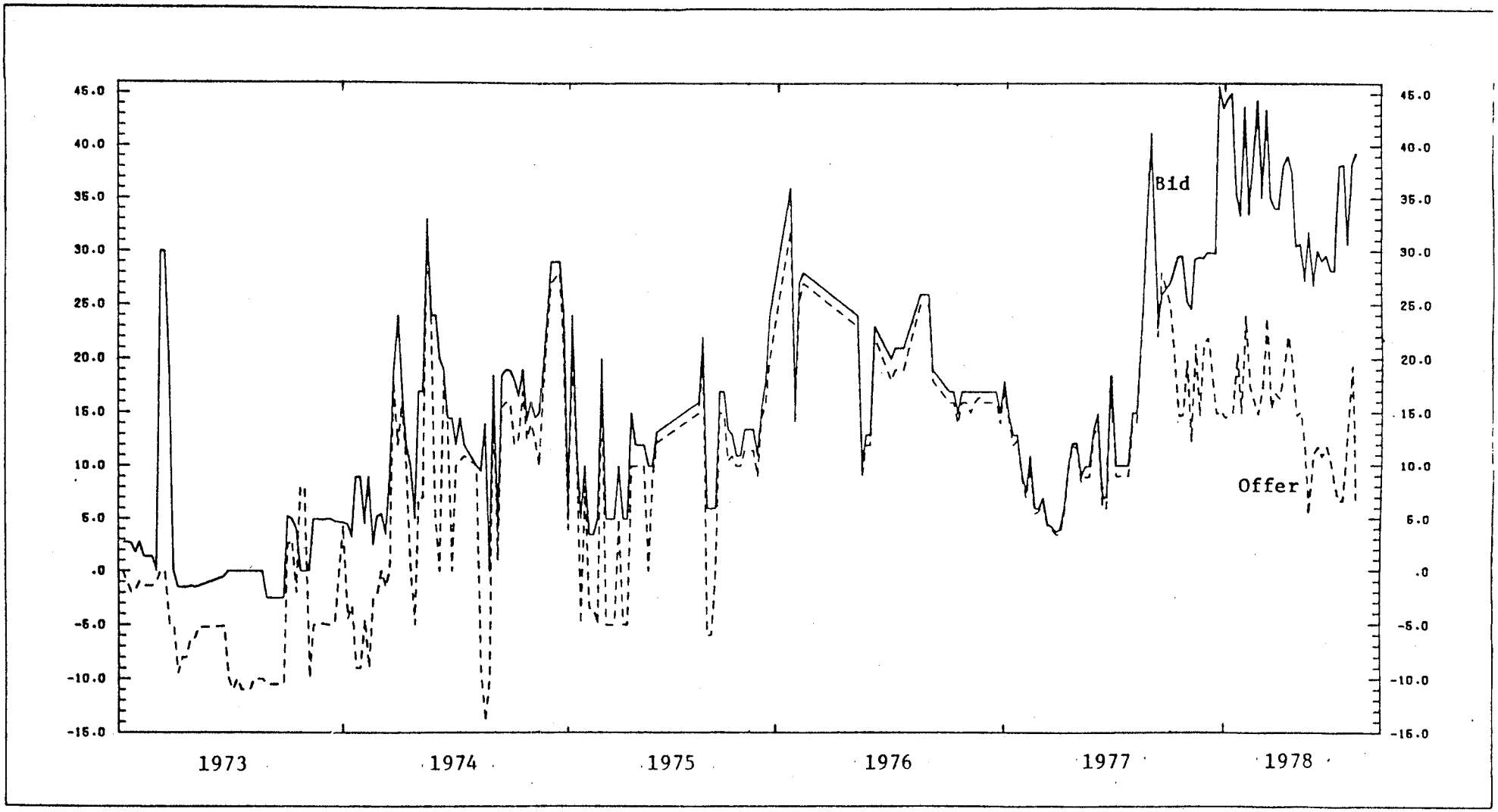
*Bid end of period

Sources: (1) International Reports bid in Lisbon: average of weekly data
(2) International Reports bid in Lisbon: last Thursday of the month
(3) Pick's Currency Yearbook 1976-77, New York, 1978, p. 494.
(4) Withheld by request based in Rio, Brazil, bid in Lisbon. spread between bid and offer in escudos in parentheses.
(5) International Reports bid in New York: last Thursday of the month
(6) Banco de Portugal Annual Report; monthly average of bid and offered in Lisb

Figure 1

1 MONTH FORWARD DISCOUNT ON THE ESCUDO AGAINST THE DOLLAR

(In percent per annum)

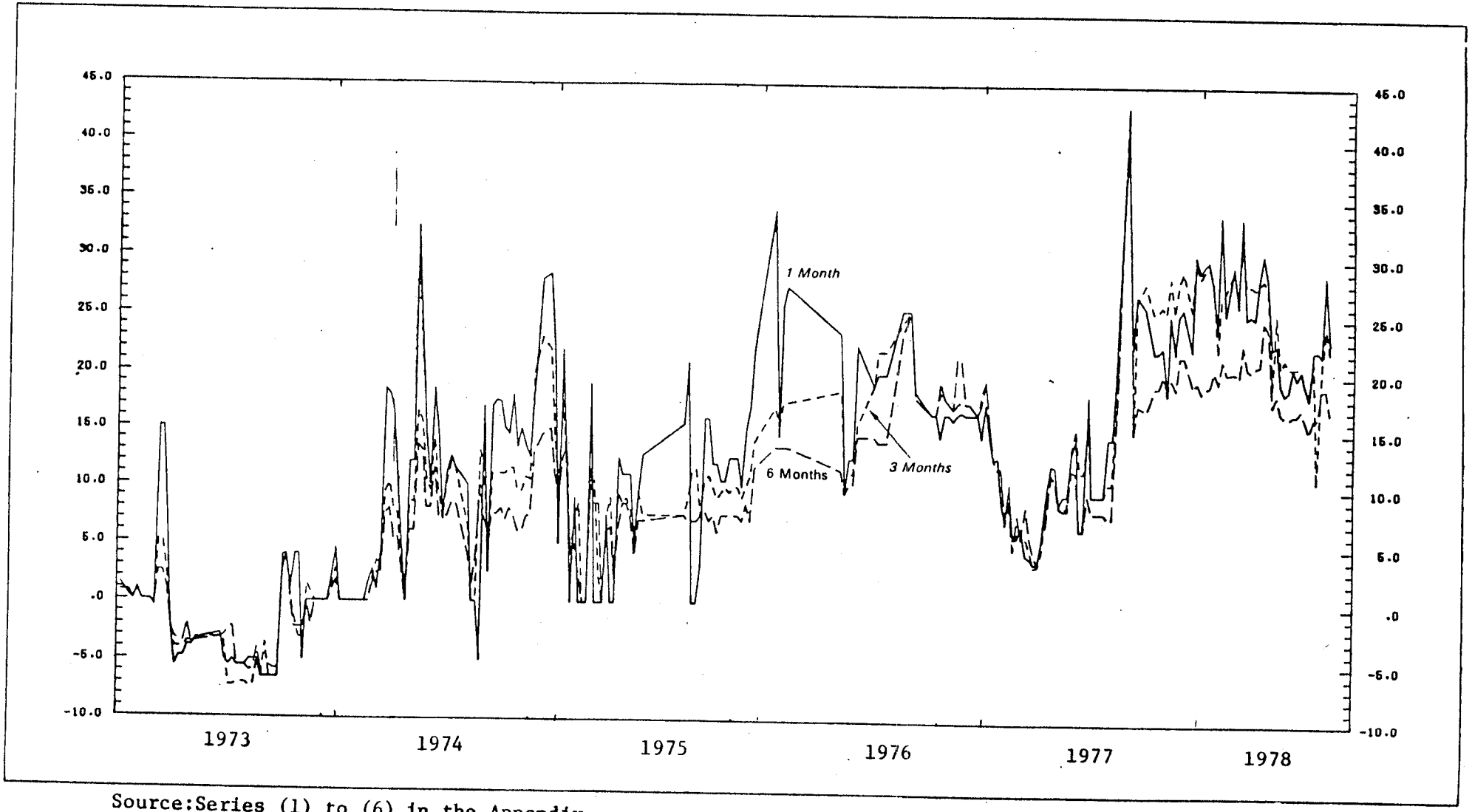


Source:Series (1) and (3) in the Appendix

Figure 2

FORWARD DISCOUNT ON THE ESCUDO AGAINST THE DOLLAR

(In percent per annuam)

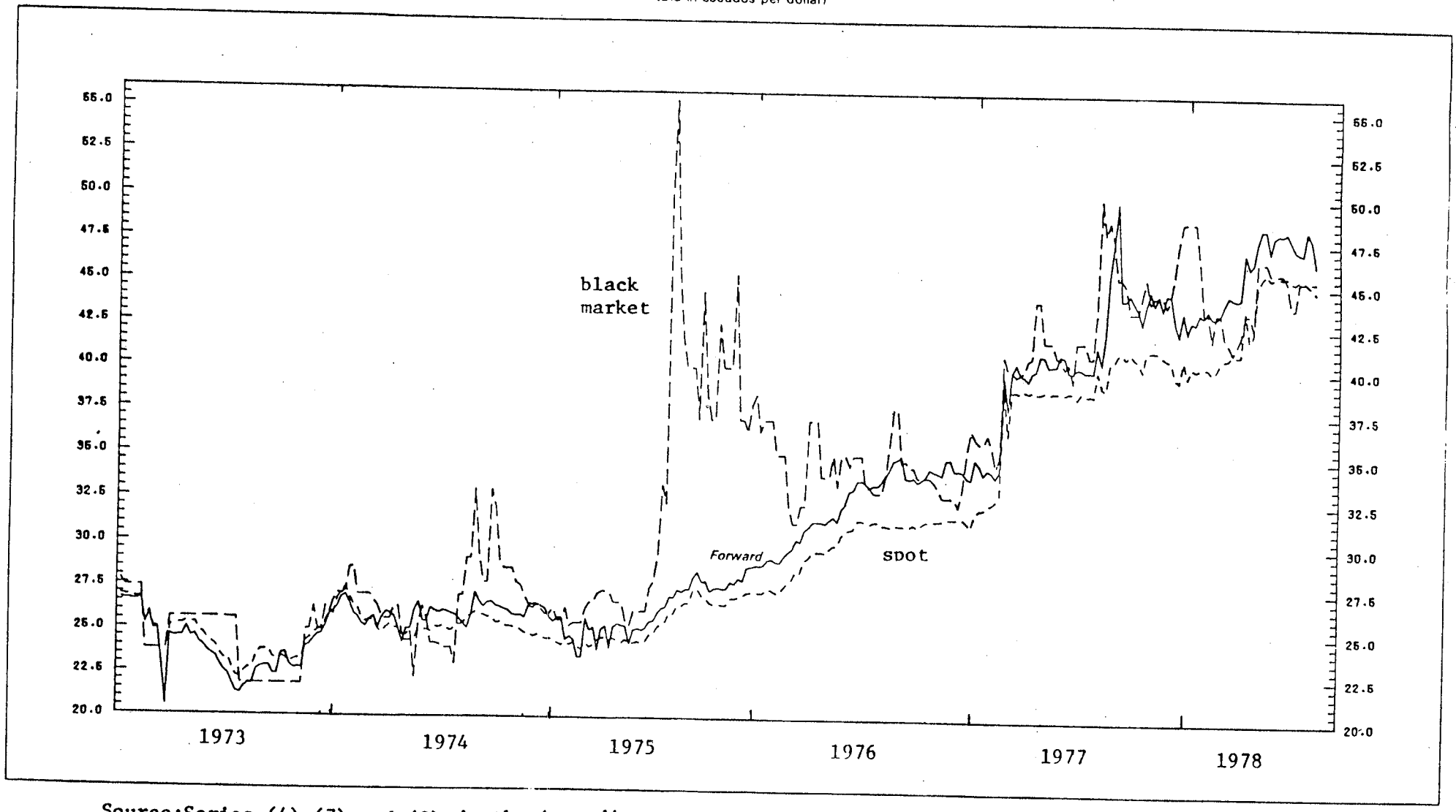


Source:Series (1) to (6) in the Appendix

Figure 3

Spot, forward and black market exchange rates

(Bid in escudos per dollar)



Source: Series (4), (7) and (8) in the Appendix

the three available maturities.[1] Even though one would presume that longer term expectations have a larger variance, the discounting factor and probably the amount of transactions are stronger in this case and the greatest variability is displayed by the one month segment.

In Figure 3 we use the bid discount with the higher maturity to obtain the 6 month bid forward rate and we plot it together with the bid spot rate used in the calculation and the bid black market rate for reference. With a few exceptions in the beginning of the period and in during the first half of 1975, the forward rate is consistently above the spot rate, thus displaying the so-called "peso problem", a reference to a similar situation in the Mexican foreign exchange market.[2]

As far as the black market rate is concerned, a much greater variability than the spot and forward rates is evident. During the periods of civil strife in late 1974 and in the second half of 1975 the black market rate becomes quite larger (113 percent on August 15, the week of the resistance to the Marxist Fifth Provisional Government and 69 percent on November 28, when Lisbon was under state of siege). Then, just before the introduction of the crawling peg in late August 1977 and when the negotiations with the IMF led to the fall of the First Constitutional Government in late 1977 the premium reached 20 percent. In other cases, namely during early 1973 and after February 1978, the black market rate is below the official rate.

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[1] In a few cases 12 month rates were quoted. 4/12/73 PAR - 10.33 Premium; 6/22/73 1.06 P - 4.05 P; 5/2/75 9:00 D - 3.00 D; 5/28/76 10.50 D - 10.00 D; 10/15/76 17.00 D - 16.00 D.

[2] See Krugman (1977), Frankel (1978) and Krasker (1979).

The assess intuitively whether the information contained in the spot rate is used by the market in generating the forward discount we take the end of month values of the mid-point forward rate for the most popular maturity, 3 months, and plot the lagged values together with the official mid point spot rate and the bid black market rate in Figure 4. The divergence is clear not only for the black market rate, which confirms that the two markets serve different purposes, since the black market rate refers basically to bank notes, but also for the official rate. Excluding overlapping contracts by the use of end of quarter data we confirm in Figure 5 that there is little agreement between the actual depreciation and the one expected by the market. Nevertheless, using, standard weak inefficiency tests, it is shown in Section III that the null hypothesis of efficiency cannot be rejected for the one month and three monthly segments of the market (there are not enough observations to carry out these tests for the six month segment) which is a way of emphasizing the virtues of taking expected values.

II. An "Equilibrium" Exchange Rate

Before inquiring further on the efficiency hypothesis we recall the Fisher equation according to which the forward rate is equal to the interest rate differential or

$$F_{t,t+1} = \frac{1+R_{t,t+1}}{1+R^{*}_{t,\,t+1}} \cdot S_t = (1+d_{t,t+1})S_t$$

where d is the forward discount.

Now given comparable securities yielding R in the domestic economy and R* in the foreign economy, in an interval determined by transactions costs, covered interest rate arbitrage is supposed to bring about interest rate parity.[1] In Figure 6 we compare the hypothetical three month domestic interest

[1] On empirical evidence for this type of arbitrage amongst the major currencies and new estimates of the transactions costs, see Frenkel-Levich (1975) and (1977).

Figure 4
OFFICIAL AND BLACK MARKET RATES AND 3-MONTH FORWARD RATE LAGGED
(End of period)

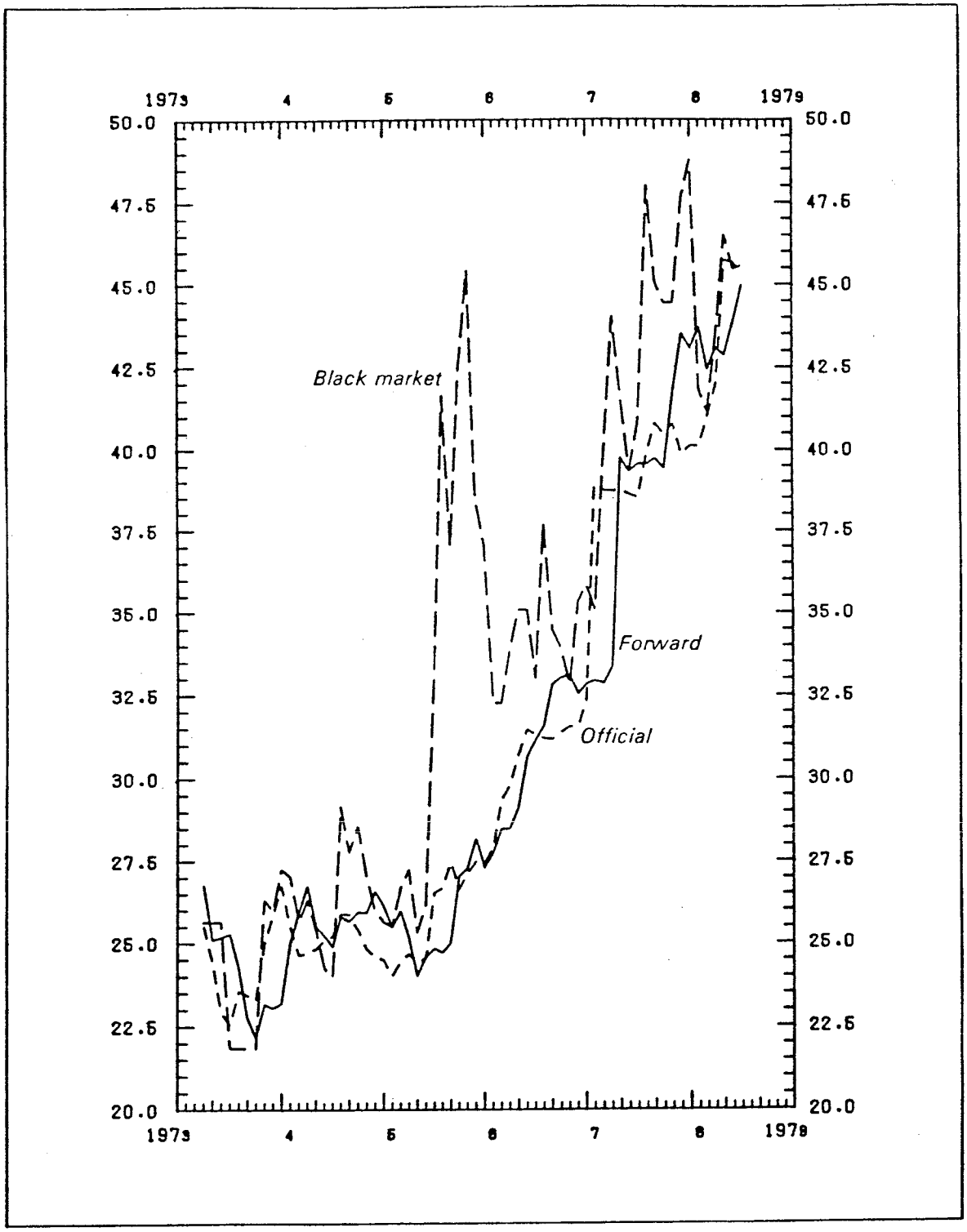
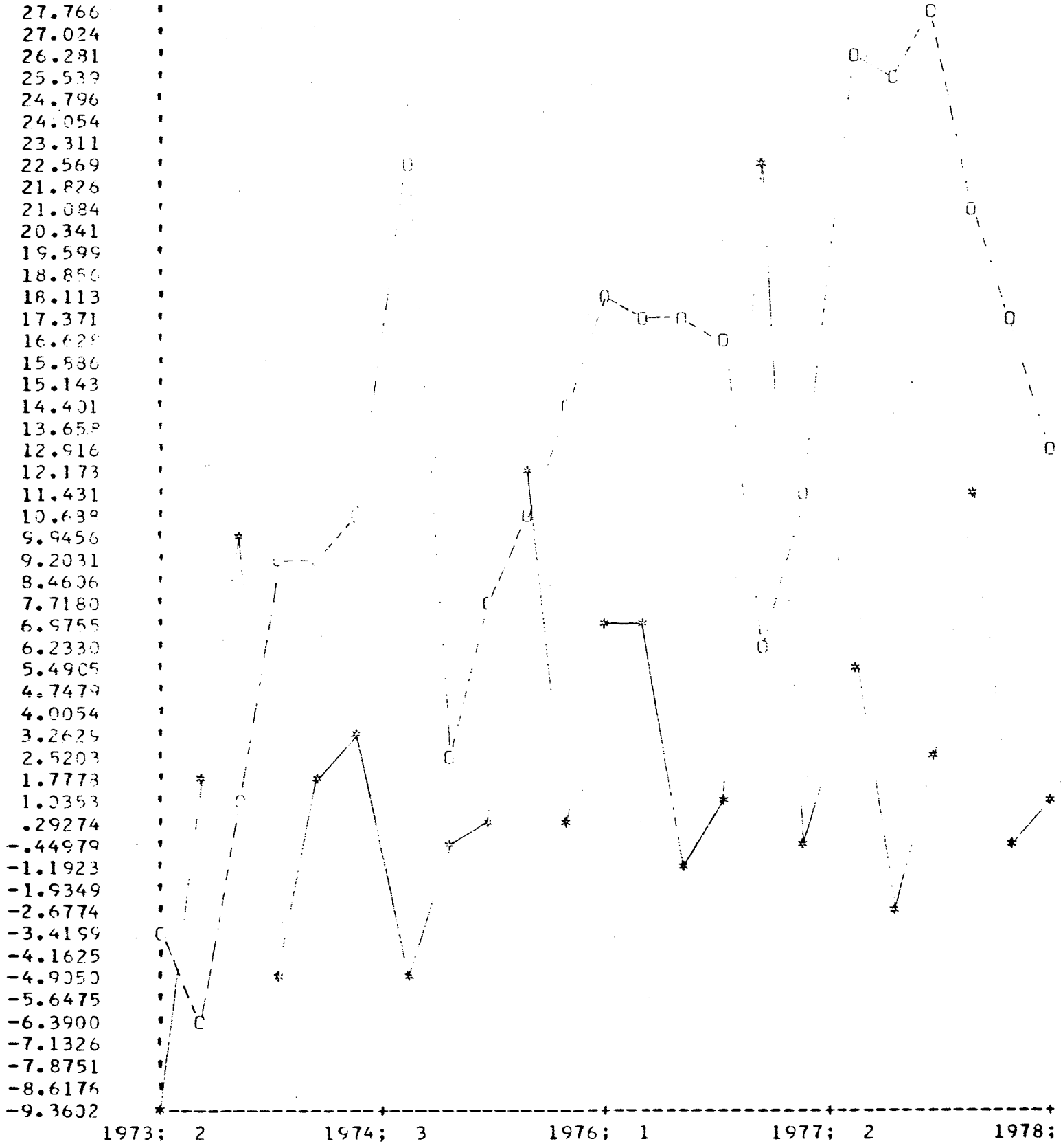


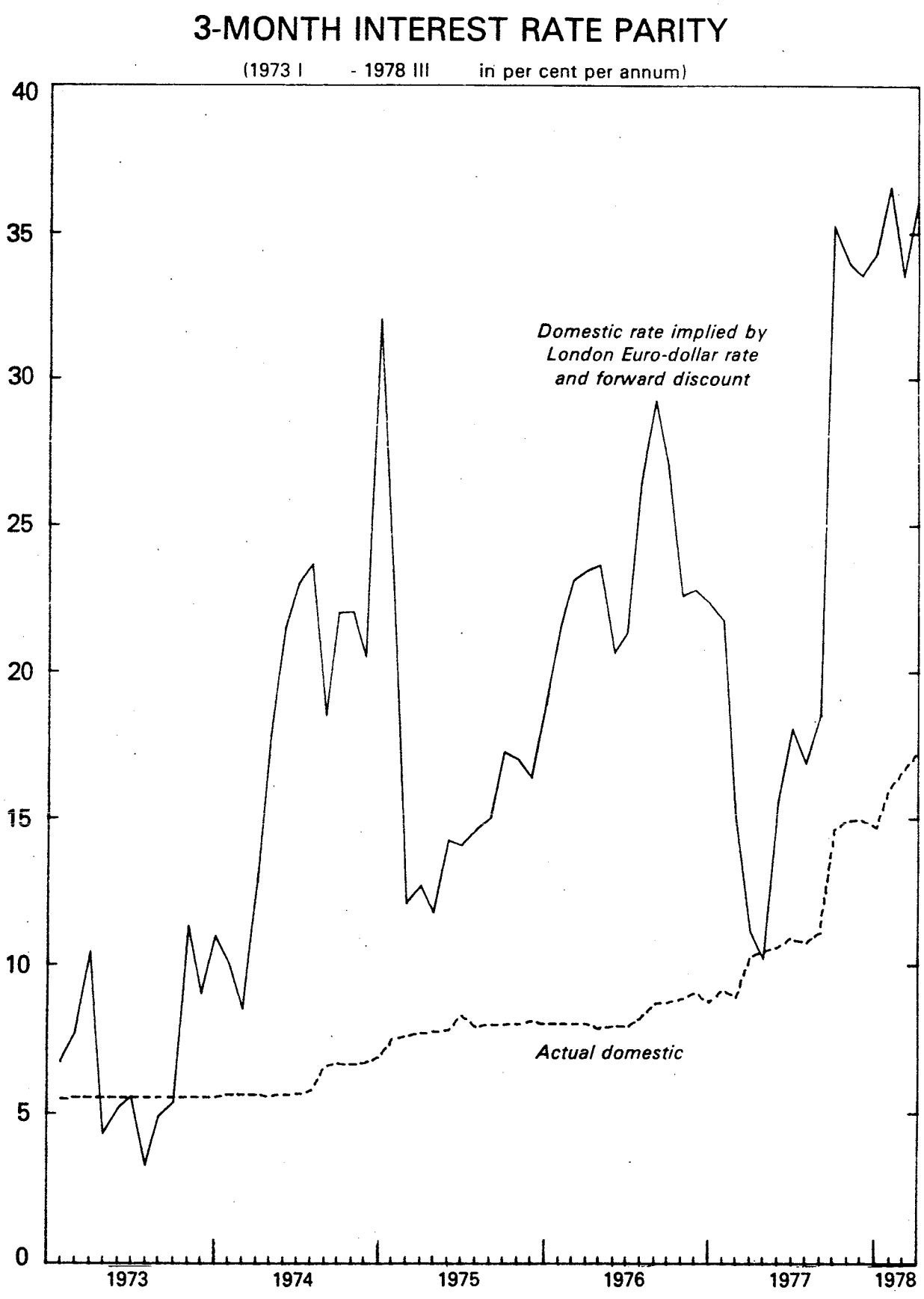
Figure 5

Expected and Actual Depreciation
Against the Dollar (% p.a.)



—*—Rate of Change of the Dollar Rate
--O--3 month discount against the dollar lagged, from series (2) and (4)

Figure 6



Source:Series (13) and (16) in the Appendix

rate implied by the 3 month forward discount on the dollar and the 3 month eurodollar rate to the actual 3 month domestic bill rate. The difference is, of course, very large. Exchange controls, an administratively set interest rate, and a sizable probability of default[1] can explain why the weakest manifestation of short term asset arbitrage across countries does not take place between the Portuguese money market and the euro-dollar market.[2]

Even if covered interest rate arbitrage does not obtain, because the domestic interest rate and the official spot rate are administratively set, we can nevertheless think of the difference between the spot rate and an "equilibrium" spot rate as a measure of interest rate differentials. In fact, by recursive use of the Fisher equation interpreted as a condition for uncovered interest rate arbitrage, or saying that the expected spot rate, $\tilde{S}$, is equal to the forward rate, we can, if expectations are consistent, write the expected spot rate τ periods ahead as;[3]

---

[1]From about 3% of the amount of discounted bills in 1973, the percentage shot up to 47 in 1975 and down to about 7 in early 1978. See Barcuo Portugues do Atlantico, Conjuntura, August 1978, Figure 27.

[2]For the computation of escudo yields on securities denominated in foreign currency using the actual depreciation of the escudo see Barbosa-Beleza (1979 Table 6): With Germany the differential was 33% in 1977 and 23% in 1978. The issue is discussed in Dornbusch-Taylor (1977) and Dornbusch (1979), who, using the Brazilian experience, argue that the implied disincentive is small nevertheless and in Diaz (1979b) who, using the Argentinian one, points to the dangers of excessive financial inflows.

[3]See Kouri-Macedo (1978), p. 130. Also Dornsbusch (1978) defines the spot rate as the expected rate discounted at the (nominal) interest rate differential.

$$\tilde{S}_{t,\tau} = (1+d_{t,t+1})(1+d_{t+1,t+2})\ (1+d_{t+2\ t+3})\ \cdots\ (1+d_{\ -1,\ \tau})S_t$$

or approximately:

$$\log(\tilde{S}_{t,\tau}/S_t) = \sum_{i=0}^{\tau} d_{t+i,t+i+1}$$

By incorporating a long run inflation differential we interpret d as the real forward discount. Now if we assume that the real forward discount is a random walk, the long run equilibrium rate based on information available at time t, S_t, can simply be written as

$$\tilde{S}_t = S_t \exp\ (d/1-b)$$

For empirical purposes, we define the 1 month real forward discount as the nominal discount adjusted for relative consumer price inflation averaged over the previous twelve months or

$$rd_t^1 = F_t^1 - S_t + \sum_{i=0}^{12} (\log P_{t-1} - \log P_{t-i-1} - \log P^*_{t-i} + \log P^*_{t-i-1})$$

In Table 4 we include summary statistics on the nominal discount of the escudo against the dollar, the inflation differential and the real discount and then the results of a regression of the real discount on its lagged value and a constant. The constant being significant shows that there is a drift and therefore that convergence is not achieved with the

stochastic process postulated,[1] which is not surprising given the risk factors mentioned above. In fact, the real discount implies that, at its mean value, the exchange rate would be expected to increase by over 100 percent p.a.[2]

In Figure 11 the spot rate, the black market rate and the hypothetical 'equilibrium' rate are plotted together. Except for the summer of 1975, there is a much greater conformity between the equilibrium and the black market rates than between the equilibrium and the official spot rate, showing that there is some tendency for the forces of arbitrage to work in the black market rather than the official market.

4. How strong are these forces can be seen ex-post, but it is nevertheless interesting to inquire about the sizes of these free markets for the escudo.[3]

Dealers are of course, less certain about the size of the market than they are about prices therein. Nevertheless, one source claims that there is some agreement that the amount of black market transactions in a given year should be about $50 million, 40 percent of which carried out in Lisbon.

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[1] In fact $\log (\tilde{S}t/St) = a \sum_{i=0}^{\bar{\tau}} (\tau - i)\, b^i + d_{t,t+1} \sum_{i=0}^{\tau} b^i$. The first term diverges unless a = 0. In fact we have denoting $-\log b = \alpha$

$$\sum_{i=0}^{\tau-1} (\tau - i)\, b^i = e^{\alpha} (\tau-1) [1-\alpha-\tau (\alpha^2-1)/\alpha] + \tau/\alpha - 1$$

[2] With rd^1 = 20.7 percent p.a. $\tilde{S}-S/S$ = 102.5 percent p.a.

[3] The old argument about stabilizing or destabilizing speculation reduces of course, to whether there is enough of it. Machlup (1972) argues that there is, and more convincingly, McKinnon (1979) argues that the evidence points the other way. Indeed, Grossman-Stiglitz (1976) have shown that divergence of expectations imply the rejection of the "strong efficient market hypothesis", according to which market prices capture all available information, when information is costly to acquire.

TABLE 3

The "Equilibrium" Spot Rate
(Monthly Data 1973; 1-1977;12)

Summary Statistics (% p.a.)

d^1	11.013	10.062	-6.5	28.25
$\pi - \pi^*$	9.653	7.441	-2.5	32.73
rd^1	20.666	14.392	-5.88	42.60

Regression (number per month)

$$rd^1_t = .00407 + .78538\ rd^1_{t-1}$$

$$(.001517)\ (.07725)$$

$R^2 = .6446$

Durbin h = -1.291

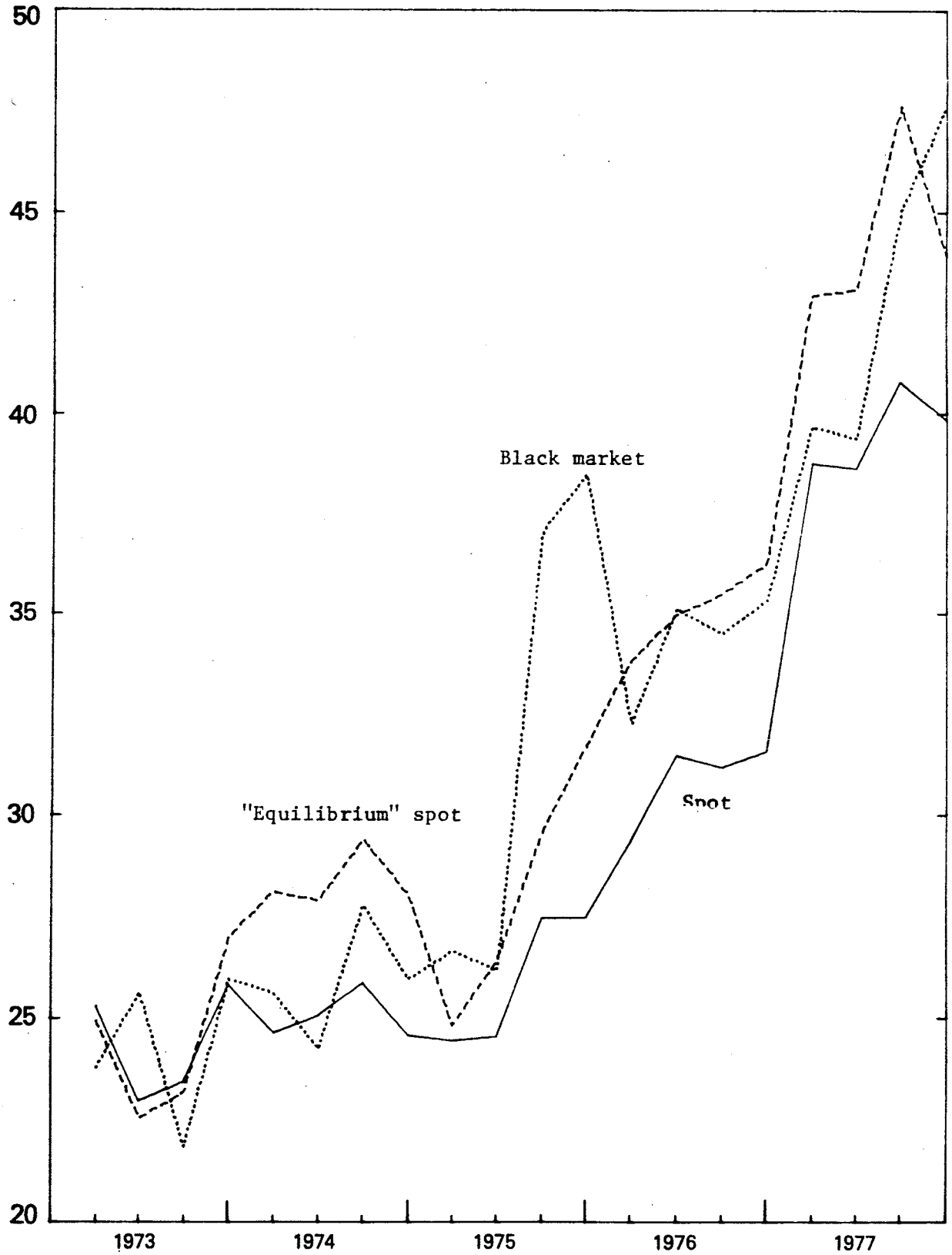
S.e.r. = .99711

Notes: Standard errors in parenthesis

Source: Average of end of month values of series (1) and (4), and series (9) to (11) in the Appendix

Figure 7

SPOT RATE, "EQUILIBRIUM" SPOT RATE AND BLACK MARKET RATE (End of quarter)



Source: Series 12 and end of quarter (7) and (8) in the Appendix

Other sources put the size of the market at $260 million, no less than 12 percent of imports, whereas the analysis of partner country data has shown that underinvoicing of exports from 1973 to 1977 was about $225 million, with half for 1975 alone[1], or 2 percent of f.o.b. exports over the same period.

That the flows in the market are small does not imply that foreign exchange balances of Portuguese residents are negligible since the black market rate equilibrates a stock and the flows are basically a link between the official current account transactions and the ability to increase or decrease that stock. The variability of the black market rate responds to valuation changes rather than actual transactions, as implied by portfolio models of exchange rate determination.[2]

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[1]The flow estimates are reported in Toscano (1978) from Lisbon experts on the unofficial market. The estimates from partner country data are in Barbosa-Beleza (1979, Table 7).

[2]See Macedo (1979c).

III. Efficiency of the Foreign Exchange Markets

1. As we pointed out above, even if cover interest arbitrage does not obtain, a market in non-interest bearing assets denominated in different currencies can still develop, based on the expectations of capital gains on the future price of foreign exchange. It is therefore useful to assess whether the links between the official market, the forward market and the black market for the escudo against the dollar are sufficient to ensure weak 'efficiency'.[1] Standard tests are available for this purpose, which are really "inefficiency" tests.[2]

The basic conditions for all of the information about the future spot rate, S, to be captured by the forward rate, F are[3]

a) the absence of persistent bias, testable by a regression like

$$S_t - F_{t-1} = a$$

$$a = 0$$

b) the absence of serial correlation of prediction errors, testable by a regression like

$$S_t - F_{t-1} = a(1-\rho) + \rho(S_{t-1} - F_{t-2})$$

$$a = \rho = 0$$

---

1 Efficiency tests are in fact testing a joint hypothesis about equilibrium rates and the efficient use of information. Tests developed below are addressed to the second aspect. See Levich (1978) and Jensen (1978).

2 In fact profitable rules may exist which were not captured by the model. Dooley-Shafer (1975) find x per cent filters to be profitable in some situations but not for all currencies and subperiods.

3 See Krugman (1977) p. 32-33 and Frankel (1977) for similar approaches.

c) The absence of information about prediction errors in the forward rate itself, testable by a regression like

$$S_t - \rho S_{t-1} = a\,(1-\rho) + b(F_{t-1} - \rho F_{t-2})$$

$$a = \rho = 0 \quad b = 1$$

d) the absence of information in past values of the spot rate, testable by a regression like

$$S_t - \rho S_{t-1} = a\,(1-\rho) + b(F_{t-1} - \rho F_{t-2}) + c(S_{t-2} - \rho S_{t-3})$$

$$a = \rho = c = 0 \quad b = 1$$

The major assumptions underlying these tests are first the absence of a risk premium, which if constant, would imply $a \neq 0$[1]. Second that forward contracts do not overlap, that is to say that the maturity matches or is smaller than the observation period. Rationality would, in fact, imply a fourth order moving average process for the prediction of the one month forward rate with weekly data, an MA(3) for the prediciton of the 3 month forward rate using monthly data etc.

This would lead to $\rho \neq o$ and also to inconsistent estimates since the error term will not be spherical normal.[2]

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1 On the existence of the risk premium, see Kouri (1975), Frankel (1978) and Stockman (1978), who derives and estimates a constant risk premium. See also Brillembourg (1978) who argues for an analysis of the predictability of the future forward rate, rather than the usual procedure or concentrating on the future spot rate, and estimates the term structure on the risk premium.

2 See Frankel (1977), Appendix I and Obstfeld (1978), p. 8. In fact, if the error term ε_t can be written as $\varepsilon_t = a_t(1+\theta_1 B + \theta_2 B^2 + \theta_3 B^3)$ where a_t is white noise and B is the MA operator then ε_t will be correlated with ε_{t-1} through ε_{t+3} and so on. Levich (1978), interested in forecasting errors of alternative models, does not mention the problem.

Third, that there is no forward intervention by the central bank.[1]

There is also the paradox derived from the fact that, from Jensen's inequality, $E(\tilde{S}_t) > F_t$ and therefore that, even under risk-neutrality, the anticipated domestic price of foreign currency, S_t, will be larger than the forward price, if expectations are not held with certainty.[2] This is however, empirically unimportant except under conditions of hyperinflation and, by using logs, the definition of the exchange rate as the domestic price of foreign currency or its inverse does not matter.[3]

For our purposes the third assumption is not troublesome given the offshore nature of the forward market. The second implies however that only the one month segment of the market can readily be tested with monthly data and the three month segment with quarterly data. The weekly series in fact, has overlapping contracts.[4]

Nevertheless, the application of these tests to the prediction of the Portuguese official spot rate would involve basically a guess about the speculative use of foreign exchange by bulletin holders which is not is reflected on the official forward rates. It seems that the tests should also be directed to the "free" spot rate, where the rationale for unexploited profits can be more readily accepted.

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1 Obstfeld (1978) emphasizes that this aspect has received little attention. See, however, Siegel's (1972) p. 307 analysis of the 1969 pound crisis.

2 See Siegel (1972).

3 See McCulloch (1975), Krugman (1977) who uses a common deflator for the German hyperinflation case and Dooley-Shafer (1976) p. 32 footnote (7).

4 Stockman (1978) imposes the MA(4) and estimates the coefficients by assuming that it corresponds to the learning of the market, and thus does not allow for a term structure in the risk premium, as Brillembourg (1978) pointed out. Obstfeld (1978) uses an ingenious estimation technique in order to find consistent estimates without the Gauss-Markov assumptions.

The difficulty lies on the fact that there is no 'black forward' market and therefore that the forward rate in New York has to be corrected for the premium of the black market rate over the official spot rate. Furthermore, there is no way of comparing two different maintained hypotheses, namely that

$$E(OS_t/I^0_{t-1}) = F_{t-1}$$

where E is the expectations operator

I is the relevant information set

OS is the log of the official spot rate

F is the log of the forward rate in New York

or that

$$E(BS_t/I^B_{t-1}) = F_{t-1} + (BS_{t-1} - OS_{t-1})$$

where BS is the log of the black market spot rate.

Even if both sets of tests were accepted, there would be no implication about how the two spot rates relate to each other. We will take up this question again below, using explicit causality tests.

We start with the official rate and run the regressions described above, the results being reported in Table 4 for monthly data and the one month forward rate and in Table 5 for quarterly data and the three month forward rate.

The tests on each one of the restrictions are found in Table 6. The first is a simple t-test whereas the others use the fact that by comparing the difference in the residual sum of squares of the unconstrained regression and the sum of the squared forecast errors to the residual sum of squares of the unconstrained regression we are in effect computing the log of the likelihood ratio, which is asymptotically distributed as $\chi^2(q)$ where q is the number of restrictions imposed.[1] The results are overwhelmingly favorable to the null

1 See Theil (1971) p. 396. This procedure is used in Krugman (1977) who nevertheless uses an implicit sequence of tests.

Table 4. One month Forward and Official Spot Market 'Efficiency' (monthly data 1973; 7-1978;7=61)

	a	b	c	R^2	D.W.	ρ	SSR
1.	.000042 (.0043)			-	1.81	-	.0675
2.	-.000020 (.0047)				1.98	.092 (.016)	.0670
3.	.0615 (.0755)	.982 (.022)		.97	1.97	.100 (.016)	.0662
4.	.0684 (.0937)	.832 (.127)	.149 (.132)	.96	1.94	.244	.0651

Equations

1. $OS_t - F_{t-1} = a$ estimated by OLS
2. $OS_t - F_{t-1} = a$ estimated by Cochrane-Orcutt
3. $OS_t = a + bF_{t-1}$ " " "
4. $OS_t = a + b\,F_{t-1} + c0\,S_{t-2}$ " " "

Memo: $\sum_t (OS_t - F_{t-1})^2 = .0675$

Table 5. Three Month Forward and Official Spot Market 'Efficiency' (quarterly data 1973; 4-1978; 4 N=21)

	a	b	c	R^2	D.W.	ρ	SSR
1.	-.00128 (.0140)			-	2.16	-	.0829
2.	-.00192 (.0118)			-	1.87	-.175 (0.46)	.0802
3.	.181 (.179)	.947 (.051)		.96	1.91	-.157 (.046)	.0761
4.	.044 (.238)	.724 (.231)	.266 (251)	.92	1.94	.078 (.05)	.0647

Same equations as in Table 1.

Memo: $SSR_{,c}$ =.0830

Table 6. Efficiency Tests: Official Rate

Propositions tested	Test	95% level	Estimated value monthly	Estimated value quarterly	Eq^{n}	Row
A. $a=c=\rho=0$ $b=1$	$\chi^2(4)$	9.49	2.249	5.940	4	1
$a=\rho=0$ $b=1$	$\chi^2(3)$	7.81	1.198	1.904	3	2
$a=\rho=0$	$\chi^2(2)$	5.99	.455	.733	2	3
$a=0$	t	1.96	.010	-.091	1	4
					Sign. level	
B. $a=c=0$ $b=1$	F(3,58)	2.76	.279	-	84.1	
	F(3,18)	3.16		.720	55.6	
$\rho=0$	u.D.W.(4,61)	1.68	1.90			
	u.D.W.(4,2)	1.67		1.82		

hypothesis, both when the absence of autocorrelation is tested by means of the D.W. statistic and the linear constraints by means of an F. tests (panel B) and when all restrictions are simultaneously tested by means of a χ^2 test (panel A, row 1). It should, however, be pointed out that the construction of the forward rate based on the discount adjusted from a per cent per annum basis brings the one month forward rate very close indeed to the official spot rate.

The regressions on the forward rate and the black market premium, defined as

$$p = BS-OS$$

have, overall, less favorable results, which are reported in Tables 7 and 8 for monthly and quarterly samples respectively. A similar set of tests is reported in Table 9 . The interpretation there is slightly less immediate, since the χ^2 tests comes close to acceptance of "efficiency" for monthly data whereas the F test rejects it. The converse holds for quarterly data. The precision of the estimate of the black market premium is, however, quite different for both samples. The monthly sample yields a coefficient of $.83\pm.13$ and the quarterly sample a coefficient of $.28\pm.26$. The lack of precision of the latter estimate leads to an acceptance of the restriction $b_1=b_2$ whereas this is not the case for the other sample. When both coefficients are constrained to be unity, the quarterly sample fails the test. Note finally that the F test has a wider confidence interval since it is conditional on the test for the absence of autocorrelation. Furthermore, Tables 6 and 9 also provide results on the partial tests, which are however of limited interest when a test of all the restrictions can be derived.

Table 7. One Month Forward and Black Market 'Efficiency'

(monthly data 1973;7 - 1978;7 N=61)

	a	b_1	b_2	c	R^2	D.W.	ρ	SSR
1.	-.0017 (.0112)					1.99		.461639
2.	-.0017 (.0113)					1.95	.003 (.016)	.461592
3.	.0949 (.187)	.980 (.055)	.687 (.093)		.84	1.93	.151 (.016)	.389814
4.	.1056 (.1818)	1.058 (.1369)	.7679 (.1336)	-.0082 (.1320)	.86	1.93	.078 (.016)	.389985

Equations

1. $BS_t - F_{t-1} - p_{t-1} = a$ estimated by OLS
2. $BS_t - F_{t-1} - p_{t-1} = a$ estimated by Coch-Orcutt
3. $BS_t = a + b\ F_{t-1} + b_2 p_{t-1}$ " " "
4. $BS_t = a + b_1\ F_{t-1} + b_2\ p_{t-1} + cBS_{t-2}$ estimated by Coch-Orcutt

Memo: $\sum_t (BS_t - F_{t-1} - p_{t-1})^2 = .46177$

Table 8. Three Month Forward and Black Market 'Efficiency'

(quarterly data 1973;4 - 1978;4 N=21)

	a	b_1	b_2	c	R^2	D.W.	ρ	SSR
1.	.00605 (.0274)				-	2.205	-	.314699
2.	.00560 (.0227)				-	2.025	-.19 (.046)	.302604
3.	.48055 (.53565)	.8902 (.1546)	-.1189 (.255)		.853	1.9055	.462 (.037)	.195548
4.	.30352 (.4573)	.88653 (.2466)	.1574 (.2915)	.04712 (.2414)	.764	1.894	.244 (.047)	.195713

Same equations as in Table 1a.

Memo SSR_c = .34497

Table 9. Efficiency Tests: Black Market Rate

	Proposition tested	Test	95% level	monthly	Quarterly	Eq^{n}	Row
A.	$a=c=\rho=0$ $b_1=b_2=1$	$\chi^2(5)$	11.07	11.23	16.01	4	1
	$a=\rho=0$ $b_1=b_2=1$	$\chi^2(4)$	9.49	11.26	16.05	3	2
	$a=\rho=0$	$\chi^2(2)$	5.99	.024	2.94	2	3
	$a=0$	t	1.96	-.143	.221	1	4.
							Sign. Level
B.	$a=c=0$ $b_1=b_2$	F(3,59)	2.76	3.47			2.1
		F(3,17)	3.20		3.06		5.6
	$\rho=0$	u.D.W.(4,61)	1.68	1.95			
		u,D.W.(4,21)	1.67		1.75		

2. We now use an alternative technique, to test 'efficiency' in the free foreign exchange market for the Portuguese escudo. Here the market will be said to be 'efficient' when a test for the randomness of the series capturing new information is accepted. For the forward market, the implication is that the series of forward premia on non-overlapping contracts should be "white noise".

Table 10 reports the values of Box-Pierce χ^2 test for randomness with lags that are roughly a fourth of the series. The lower the value, the closer one is to accepting randomness. Choosing the .10 significance level, we would accept the hypothesis that the 3 and 6 month discounts are "white noise" but we would then allow for a large type II error. In fact we know that the problem of overlapping contracts would be particularly serious for 3 and 6 month discounts.

To investigate further the stochastic behavior of the series with which the discounts were presumably constructed, we used the spot rate from the same source and obtained series of bid forward rates.

Table 11 summarizes the identification and estimation of ARMA processes to the logarithmic differences of the weekly series of the official bid spot rate (S1), the black market bid rate (S2), and the 1, 3, and 6 month bid forward rates of the escudo against the dollar. It is noteworthy that a simple ARMA (2,2) process filters S2, F3 and F6 at the 85 per cent confidence level or better. In panel 3 we find the most complete filter that was found, which namely for the 3 month forward rate is somewhat complicated. In fact, the spike of the autocorrelation function at a mid year lag may be more pronounced simply because this is usually the most developed part of what otherwise is taken to be a fairly thin market.

Table 12 reports causality tests on the original and filtered variables, and they are particularly robust since no causality result changes except that

with four lags a net effect of the spot and the one month forward rate on the 6 month forward rate are found.[1]

The pattern of causality suggests that the spot exchange rate determines the 3 month rate which in turn determines both the 1 month and 6 month forward rate. On the other hand the black market rate, more sensitive as it is to expectations, is caused by the 3 and 6 month rates, rather than by the official spot rate.

The absence of causality ordering between the official and the spot market implies that the earlier sets of efficiency sets cannot be sorted out by an hypothesis about the relevant spot rate. The underlying regressions of the first differences in the lags of the two rates have the summary characteristics indicated in Table 13.

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1. The regressions of the spot rate on the black market gave rather poor results (see Table 13). The best fit was obtained in the one month forward market (.6 to .7). The other segments gave R^2 of .2 to .4.

Table 10. Forward discount (average of bid and offered)

Tests for randomness

	χ^2		signif. level	
	W	M	W	M
1 month	88.80	23.49	.01	.04
3 months	57.21	13.93	.54	.38
6 months	47.31	18.37	.86	.14

W weekly data 294 observations, 59 degrees of freedom series (1) to (6) in Appendix 4

M monthly data (end of period) 67 observations, 13 degrees of freedom

Table 11. ARIMA Identification and Estimation

1. Original Series: Test for Randomness with 59 degrees of freedom

	χ^2	Significance level
DLSI	43.40	.9362
DLFI	48.99	.8205
DLS2	60.69	.4148
DLF6	75.41	.0736
DLF3	80.68	.0319

2. ARMA Process of Order 2: Test for Randomness of residuals with 56 d.f.

	AR 2	MA 2	χ^2	s.e.
DLS2	-.869	-.787	67.03	.1486
	(.110)	(.138)		
DLF6	.161	.331	58.41	.3868
	(.323)	(.309)		
DLF3	-.581	-.413	67.30	.1433
	(217)	(.243)		

3. Other Processes

DLS2	MA 8	MA 25	χ^2	s.e.
(56 d.f.)	-.182	.161	47.70	.7773
	(.056)	(.056)		

DLF3	AR 2	MA 1	MA 2	MA 2		
(54 d.f.)	-.525	.227	-.397	.231	27.49	.9990
	(.116)	(.054)	(.118)	(.054)		

Note: Logarithms first differences (DL) of the weekly bid spot rate (S1), black market (S2), 1 month forward rate (F1), 3 month forward rate (F3) and 6 month forward rate (F6) .293 observations from 1/12/78 to 8/18/78.

Table 12. Causality patterns with 24 lags

	DLS1	DLF1	DLF3	DLF6	DLS2
DLS1		0	→	0	0
DLF1			←	0	0
DLF3				0	→
DLF6					→
DLS2					

Note: Based on χ^2 test at .9 confidence level,.9 contemporaneous variables →(←) row (column) variable causes column (row) variable. The pattern is the same when processes described in panel 3 of Table 8 are used as filters for F3, F6 and S2 and when only 12 lags are considered. With 4 lags it is found that S1→F6 and F1→F6.

Table 13. Official and Black Market Rates

Regression	R^2		F.prob.		Signif. coef.	
	0	Filt.	0	Filt	0	Filt
S1 on lagged S2	.12	.12	.75	.72	c,0,-16	c,0
S1 on lagged and led S2	.19	.18	.36	.34	0	0,-8
S2 on lagged S1	.12	.10	.77	.50	0,-17	0
S2 on lagged and led S1	.18	.14	.34	.05	0	0

Note: Weekly observations on the logarithmic first differences of the variables indicated N=293. 24 lags. Lags of coefficients with t>2 are indicated in the "signif. coef" column. F.prob. measures the confidence level of the F tests that all coefficients are zero.

Appendix

Data

A/Weekly Data

Sample Period: 1/3/73 to 8/18/78

1. OITSI = Offer one month discount of the escudo against the dollar in New York in percent per annum, missing data interpolated with a spline of degree zero--see footnote 5 page 5 in the text.
2. O3TSI1 = Offer three month discount, same as (1)
3. O6TSI1 - Offer six month discount, same as (1)
4. B1TSI1 = Bid one month discount, same as (1)
5. B3TSI1 = Bid three month discount, same as (1)
6. B6TSI1 = Bid six month discount, same as (1)
7. SP10I = Bid official market spot rate in New York in escudos per dollar
8. SP20I = Bid black market rate for banknotes in Lisbon in escudos per dollar

Source: IR

B/Monthly Data

Sample Period: 1973; 1 to 1977; 12 unless otherwise noted

9. INFPORT = Portuguese inflation. 12 month moving average of the annualized percentage rate of change of (13) over the preceding month.
10. USINF = U.S. inflation, same as above, source IFS, line 64.

11. RFI = Real end of period one month real forward discount of the escudo against the dollar in % per annum. Average of end of month of (1) and (4), minus (26) plus (27).

12. ESPOT = "Equilibrium" end of period spot rate in escudo per dollar. Line ae from IFS times the exponential of (28) in number per month.

13. IR3 = Portuguese three month commercial paper rate in % per annum. Source Estatisticas Monetarias e Financeiras (data to 1978; 3).

14. EURO = Three month euro-dollar rate in London in % per annum from IFS, 112 line 60 (data to 1978; 3).

15. MFB = Three month forward discount of the escudo against the dollar in % per annum, monthly average of (2) and (5) (updated to 1978; 3).

16. IIR = Implied escudo 3 month interest rate in % per annum, (31) plus (32).

			D1TSI1	B1TSI1	D3TSI1	B3TSI1	D6TSI1	B6TSI1
1973	JAN	05	2.75	0.00	3.00	-1.50	3.00	-1.50
1973	JAN	12	2.75	-1.00	3.00	-1.50	3.00	-1.50
1973	JAN	19	2.63	-2.00	3.00	-1.50	3.00	-1.50
1973	JAN	26	1.75	-1.75	1.50	-1.50	1.50	-1.50
1973	FEB	02	2.75	-1.00	3.00	-1.00	3.00	-1.00
1973	FEB	09	1.38	-1.38	1.38	-1.38	0.38	-0.38
1973	FEB	16	1.38	-1.38	1.32	-1.32	0.57	-0.57
1973	FEB	23	1.38	-1.38	1.25	-1.25	0.75	-0.75
1973	MAR	02	0.00	-1.00	0.00	-1.00	0.00	-1.00
1973	MAR	09	30.00	0.00	10.50	0.00	5.00	0.00
1973	MAR	16	30.00	0.00	10.00	0.00	5.00	0.00
1973	MAR	23	19.00	-5.00	6.50	-2.00	3.25	-1.25
1973	MAR	30	0.00	-5.00	-0.50	-4.00	-0.50	-4.00
1973	APR	06	-1.50	-9.50	-1.50	-6.50	-0.88	-5.50
1973	APR	13	-1.50	-8.00	-1.50	-6.50	-1.50	-5.50
1973	APR	20	-1.50	-8.00	-1.50	-6.50	-1.50	-5.50
1973	APR	27	-1.38	-6.25	-1.00	-6.00	-1.25	-2.50
1973	MAY	04	-1.50	-6.25	-1.13	-6.00	-1.25	-6.25
1973	MAY	11	-1.38	-5.25	-1.25	-5.25	-1.50	-5.50
1973	MAY	18	-1.24	-5.23	-1.18	-5.28	-1.39	-5.51
1973	MAY	25	-1.09	-5.20	-1.12	-5.32	-1.28	-5.51
1973	JUN	01	-0.95	-5.18	-1.05	-5.35	-1.18	-5.52
1973	JUN	08	-0.80	-5.16	-0.98	-5.38	-1.07	-5.53
1973	JUN	15	-0.66	-5.13	-0.92	-5.42	-0.96	-5.53
1973	JUN	22	-0.51	-5.11	-0.85	-5.45	-0.85	-5.54
1973	JUN	29	0.00	-10.00	0.00	-7.00	0.00	-6.00
1973	JUL	06	0.00	-11.00	-3.50	-11.00	3.50	-8.25
1973	JUL	13	0.00	-10.00	-3.50	-11.00	3.63	-8.00
1973	JUL	20	0.00	-11.00	-3.00	-11.00	-3.00	-8.00
1973	JUL	27	0.00	-11.00	-3.00	-11.00	-3.00	-8.00
1973	AUG	03	0.00	-11.00	-3.00	-11.00	-3.00	-8.00
1973	AUG	10	0.00	-10.00	-3.58	-11.00	-3.58	-8.25
1973	AUG	17	0.00	-10.00	-3.50	-11.00	-3.50	-8.00
1973	AUG	24	0.00	-10.00	-1.00	-9.00	-1.00	-7.00
1973	AUG	31	-2.50	-10.50	-2.50	-10.50	-3.00	-8.50
1973	SEP	07	-2.50	-10.50	-2.63	-4.50	-3.00	-8.00
1973	SEP	14	-2.50	-10.50	-2.50	-10.50	-3.00	-8.00
1973	SEP	21	-2.50	-10.50	-2.50	-10.50	-3.50	-8.00
1973	SEP	28	-2.50	-10.50	-2.50	-10.50	-3.50	-8.00
1973	OCT	05	5.25	2.50	3.50	1.75	3.50	1.50
1973	OCT	12	5.00	3.00	5.00	3.00	5.00	3.00
1973	OCT	19	4.00	-2.00	5.25	-4.25	0.88	-0.88
1973	OCT	26	0.00	8.00	0.00	-3.00	0.00	-4.50
1973	NOV	02	0.00	8.00	0.00	-6.00	0.00	-4.50
1973	NOV	09	0.00	-10.00	0.00	-7.00	0.00	-4.50
1973	NOV	16	5.00	-5.00	4.00	-1.00	2.63	-2.63
1973	NOV	23	5.00	-5.00	2.50	-1.00	-1.00	-3.00
1973	NOV	30	4.88	-4.88	4.00	-4.00	2.50	-2.50
1973	DEC	07	5.00	-5.00	3.25	-3.25	2.00	-2.00
1973	DEC	14	5.00	-5.00	3.00	-3.00	2.00	-2.00
1973	DEC	21	4.75	-4.75	3.00	-3.00	2.00	-2.00
1973	DEC	28	4.69	-0.18	3.00	-0.25	2.00	-0.25

	D1TSI1	B1TSI1	D3TSI1	B3TSI1	D6TSI1	B6TSI1
1974 JAN 04	4.63	4.38	3.00	2.50	2.00	1.50
1974 JAN 11	4.50	-4.50	3.00	-3.00	3.75	-3.75
1974 JAN 18	3.25	-3.25	3.00	-3.00	1.88	-1.88
1974 JAN 25	9.00	-9.00	4.50	-4.50	3.00	-3.00
1974 FEB 01	9.00	-9.00	3.00	-3.00	3.00	-3.00
1974 FEB 08	4.50	-4.50	3.00	-3.00	3.75	-3.75
1974 FEB 15	9.00	-9.00	3.00	-3.00	4.00	-4.00
1974 FEB 22	2.50	-2.50	1.50	-1.50	2.50	-2.50
1974 MAR 01	5.25	-2.00	1.50	-1.50	2.25	-2.25
1974 MAR 08	5.50	0.00	4.00	0.00	3.00	0.00
1974 MAR 15	3.50	-1.50	5.00	2.00	3.00	2.00
1974 MAR 22	9.00	0.00	6.00	0.00	5.00	0.00
1974 MAR 29	19.00	18.00	10.00	9.00	8.00	7.00
1974 APR 05	24.00	12.00	11.25	9.25	9.00	7.00
1974 APR 12	17.00	16.00	9.00	7.00	5.75	4.75
1974 APR 19	12.00	10.00	8.00	7.00	6.00	5.00
1974 APR 26	10.00	0.00	6.50	0.00	5.00	0.00
1974 MAY 03	5.00	-5.00	1.75	-1.75	1.00	-1.00
1974 MAY 10	17.00	7.00	9.00	8.00	6.50	5.50
1974 MAY 17	17.00	7.00	9.00	8.00	6.50	5.50
1974 MAY 24	33.00	32.00	17.00	16.00	14.00	13.00
1974 MAY 31	24.00	23.00	16.00	15.00	13.50	12.50
1974 JUN 07	24.00	5.00	16.00	5.00	12.00	4.00
1974 JUN 14	20.00	0.00	16.00	3.00	12.00	4.00
1974 JUN 21	19.00	18.00	14.50	13.50	12.00	11.00
1974 JUN 28	14.50	14.00	9.63	9.13	7.50	7.00
1974 JUL 05	14.50	0.00	9.50	4.50	7.75	6.75
1974 JUL 12	12.00	10.00	11.25	9.25	7.75	6.75
1974 JUL 19	14.50	10.50	13.00	11.00	8.88	7.88
1974 JUL 26	12.00	11.00	12.00	11.00	9.00	8.00
1974 AUG 02	11.33	10.67	11.33	8.33	8.67	5.33
1974 AUG 09	10.67	10.33	10.67	5.67	8.33	2.67
1974 AUG 16	10.00	10.00	10.00	3.00	8.00	0.00
1974 AUG 23	9.50	-9.50	6.00	-6.00	7.50	-5.00
1974 AUG 30	14.00	-14.00	12.50	-12.50	8.25	0.00
1974 SEP 06	0.00	-10.00	15.50	10.50	11.50	8.50
1974 SEP 13	18.50	15.50	12.50	10.50	8.50	5.50
1974 SEP 20	4.00	1.00	4.50	1.50	7.75	3.50
1974 SEP 27	18.50	15.50	12.50	9.50	8.50	6.50
1974 OCT 04	19.00	16.00	12.00	10.00	8.50	6.50
1974 OCT 11	18.88	15.88	12.50	9.50	8.50	7.50
1974 OCT 18	18.00	12.00	12.50	9.50	7.50	6.50
1974 OCT 25	16.50	12.50	12.50	10.50	8.50	7.50
1974 NOV 01	19.00	17.00	12.50	10.50	7.50	7.00
1974 NOV 08	14.25	12.50	10.00	9.00	6.50	5.50
1974 NOV 15	16.00	14.00	10.00	9.00	6.50	5.50
1974 NOV 22	14.50	12.50	11.25	10.25	7.75	6.75
1974 NOV 29	15.00	10.00	11.00	10.00	8.00	7.00
1974 DEC 06	19.00	17.00	21.00	19.00	14.00	12.00
1974 DEC 13	24.00	22.00	22.50	20.50	14.50	13.00
1974 DEC 20	29.00	27.00	24.00	22.00	15.00	14.00
1974 DEC 27	29.00	27.50	23.50	21.50	15.50	14.00

D1TSI1 E1TSI1 D3TSI1 B3TSI1 D6TSI1 B6TSI1

1975	JAN	03	29.00	28.00	23.00	21.00	16.00	14.00
1975	JAN	10	24.00	20.00	16.00	12.00	12.00	10.00
1975	JAN	17	6.00	4.00	12.00	8.00	10.00	8.00
1975	JAN	24	24.00	20.00	18.00	17.00	13.00	12.00
1975	JAN	31	12.50	11.50	11.50	10.50	14.00	13.00
1975	FEB	07	5.00	-5.00	8.00	0.00	7.00	1.00
1975	FEB	14	10.00	8.00	8.00	6.00	6.00	4.00
1975	FEB	21	3.50	-3.50	10.00	7.00	4.00	1.00
1975	FEB	28	3.50	-3.50	3.50	-3.50	5.00	-5.00
1975	MAR	07	5.00	-5.00	4.00	-4.00	4.00	-4.00
1975	MAR	14	20.00	18.00	11.00	10.00	12.00	11.00
1975	MAR	21	5.00	-5.00	11.00	10.00	9.00	8.00
1975	MAR	28	5.00	-5.00	10.00	-5.00	9.00	8.00
1975	APR	04	5.00	-5.00	5.00	-5.00	5.00	-5.00
1975	APR	11	10.00	5.00	10.00	5.00	8.00	4.00
1975	APR	18	5.00	-5.00	10.00	8.00	8.00	5.00
1975	APR	25	5.00	-5.00	10.00	-5.00	8.00	-4.00
1975	MAY	02	15.00	10.00	11.00	8.00	8.00	5.00
1975	MAY	09	12.00	10.00	9.00	8.00	9.00	8.00
1975	MAY	16	12.00	10.00	10.00	8.00	9.00	8.00
1975	MAY	23	12.00	10.00	9.00	7.00	8.00	6.00
1975	MAY	30	10.00	0.00	10.00	0.00	8.00	0.00
1975	JUN	06	10.00	9.00	10.00	9.00	8.00	6.00
1975	JUN	13	13.25	12.25	8.00	7.00	8.00	6.00
1975	JUN	20	13.53	12.53	8.00	7.00	8.00	6.10
1975	JUN	27	13.80	12.80	8.00	7.00	8.00	6.20
1975	JUL	04	14.07	13.07	8.00	7.00	8.00	6.30
1975	JUL	11	14.35	13.35	8.00	7.00	8.00	6.40
1975	JUL	18	14.63	13.63	8.00	7.00	8.00	6.50
1975	JUL	25	14.90	13.90	8.00	7.00	8.00	6.60
1975	AUG	01	15.18	14.18	8.00	7.00	8.00	6.70
1975	AUG	08	15.45	14.45	8.00	7.00	8.00	6.80
1975	AUG	15	15.72	14.72	8.00	7.00	8.00	6.90
1975	AUG	22	16.00	15.00	8.00	7.00	8.00	7.00
1975	AUG	29	22.00	20.00	10.00	8.00	8.00	6.00
1975	SEP	05	6.00	-6.00	13.00	10.00	8.00	6.00
1975	SEP	12	6.00	-6.00	13.00	10.00	8.00	6.00
1975	SEP	19	6.00	0.00	10.00	5.00	10.00	5.00
1975	SEP	26	17.00	15.00	11.50	9.50	9.00	7.00
1975	OCT	03	17.00	15.00	12.00	10.00	8.00	6.00
1975	OCT	10	13.50	10.50	10.50	9.50	8.00	7.00
1975	OCT	17	13.00	11.00	10.00	8.00	7.00	5.00
1975	OCT	24	11.00	10.00	10.00	9.00	8.00	7.00
1975	OCT	31	11.00	10.00	10.50	9.50	8.00	7.00
1975	NOV	07	13.50	11.50	10.50	8.50	8.00	7.00
1975	NOV	14	13.50	11.50	10.50	9.50	8.00	7.00
1975	NOV	21	13.50	11.50	10.50	9.50	8.00	7.00
1975	NOV	28	11.00	9.00	10.00	8.00	8.00	6.00
1975	DEC	05	15.50	14.50	10.50	9.50	9.00	8.00
1975	DEC	12	18.00	16.00	12.00	10.00	8.00	6.00
1975	DEC	19	24.00	20.00	15.00	13.00	12.80	10.50
1975	DEC	26	26.40	22.40	15.60	13.60	13.24	10.80

	D1TSI1	B1TSI1	D3TSI1	B3TSI1	D6TSI1	B6TSI1
1976 JAN 02	28.80	24.80	16.20	14.20	13.68	11.10
1976 JAN 09	31.20	27.20	16.80	14.80	14.12	11.40
1976 JAN 16	33.60	29.60	17.40	15.40	14.56	11.70
1976 JAN 23	36.00	32.00	18.00	16.00	15.00	12.00
1976 JAN 30	15.00	14.00	16.00	15.00	14.00	13.00
1976 FEB 06	27.00	25.00	18.00	17.00	14.00	13.00
1976 FEB 13	28.00	27.00	18.00	17.00	14.00	13.00
1976 FEB 20	27.69	26.69	18.08	17.08	13.85	12.85
1976 FEB 27	27.38	26.38	18.15	17.15	13.69	12.69
1976 MAR 05	27.08	26.08	18.23	17.23	13.54	12.54
1976 MAR 12	26.77	25.77	18.31	17.31	13.38	12.38
1976 MAR 19	26.46	25.46	18.38	17.38	13.23	12.23
1976 MAR 26	26.15	25.15	18.46	17.46	13.08	12.08
1976 APR 02	25.85	24.85	18.54	17.54	12.92	11.92
1976 APR 09	25.54	24.54	18.62	17.62	12.77	11.77
1976 APR 16	25.23	24.23	18.69	17.69	12.62	11.62
1976 APR 23	24.92	23.92	18.77	17.77	12.46	11.46
1976 APR 30	24.62	23.62	18.85	17.85	12.31	11.31
1976 MAY 07	24.31	23.31	18.92	17.92	12.15	11.15
1976 MAY 14	24.00	23.00	19.00	18.00	12.00	11.00
1976 MAY 21	10.00	9.00	11.00	10.00	10.00	9.00
1976 MAY 28	13.00	12.00	11.50	11.00	10.50	10.00
1976 JUN 04	13.00	12.00	11.50	11.00	10.50	10.00
1976 JUN 11	23.00	22.00	16.00	15.00	15.00	14.00
1976 JUN 18	22.25	21.00	17.00	15.75	15.00	14.00
1976 JUN 25	21.50	20.00	18.00	16.50	15.00	14.00
1976 JUL 02	20.75	19.00	19.00	17.25	15.00	14.00
1976 JUL 09	20.00	18.00	20.00	18.00	15.00	14.00
1976 JUL 16	21.00	19.00	23.00	21.00	15.00	13.00
1976 JUL 23	21.00	19.00	23.00	21.00	15.00	13.00
1976 JUL 30	21.00	19.00	23.00	21.00	15.00	13.00
1976 AUG 06	22.25	20.50	23.50	21.75	17.25	15.50
1976 AUG 13	23.50	22.00	24.00	22.50	19.50	18.00
1976 AUG 20	24.75	23.50	24.50	23.25	21.75	20.50
1976 AUG 27	26.00	25.00	25.00	24.00	24.00	23.00
1976 SEP 03	26.00	25.00	25.50	24.50	25.00	24.00
1976 SEP 10	26.00	25.00	26.00	25.00	26.00	25.00
1976 SEP 17	19.00	18.00	18.50	17.50	18.50	17.50
1976 SEP 24	18.50	17.50	18.13	17.13	18.13	17.13
1976 OCT 01	18.00	17.00	17.75	16.75	17.75	16.75
1976 OCT 08	17.50	16.50	17.38	16.38	17.38	16.38
1976 OCT 15	17.00	16.00	17.00	16.00	17.00	16.00
1976 OCT 22	17.00	16.00	17.00	16.00	17.00	16.00
1976 OCT 29	15.00	14.00	19.00	18.00	20.00	19.00
1976 NOV 05	17.00	16.00	18.50	17.50	18.50	17.50
1976 NOV 12	17.00	16.00	18.00	17.00	18.00	17.00
1976 NOV 19	17.00	15.00	18.00	16.00	18.00	16.00
1976 NOV 26	17.00	16.00	18.00	17.00	22.00	21.00
1976 DEC 03	17.00	16.50	18.00	17.50	22.00	21.00
1976 DEC 10	17.00	16.00	18.00	17.00	18.00	17.00
1976 DEC 17	17.00	16.00	18.00	17.00	18.00	17.00
1976 DEC 24	17.00	16.00	17.50	16.50	17.50	16.50
1976 DEC 31	17.00	16.00	17.00	16.00	17.00	16.00

			D1TSI1	B1TSI1	D3TSI1	B3TSI1	D6TSI1	B6TSI1
1977	JAN	07	15.00	14.00	19.00	18.00	18.00	17.00
1977	JAN	14	18.00	17.00	20.00	19.00	20.00	19.00
1977	JAN	21	14.75	14.25	16.00	15.50	16.00	15.50
1977	JAN	28	13.00	12.00	13.00	12.00	13.00	12.00
1977	FEB	04	13.00	12.50	12.00	11.50	13.00	12.50
1977	FEB	11	9.25	8.75	12.00	11.00	12.00	11.00
1977	FEB	18	7.50	7.00	7.25	6.70	8.25	7.75
1977	FEB	25	11.00	10.00	9.50	9.00	8.75	8.25
1977	MAR	04	6.00	5.50	6.00	5.50	5.00	4.50
1977	MAR	11	6.00	5.75	6.50	6.00	8.00	7.50
1977	MAR	18	7.00	6.50	6.50	6.00	6.00	5.50
1977	MAR	25	4.50	4.25	6.25	5.75	8.75	8.25
1977	APR	01	4.25	4.00	5.00	4.75	6.00	5.75
1977	APR	08	3.75	3.50	3.50	3.25	4.50	4.25
1977	APR	15	4.00	3.50	3.63	3.38	3.75	3.50
1977	APR	22	6.00	5.50	5.00	4.50	6.00	5.50
1977	APR	29	10.00	9.50	9.50	8.00	7.50	7.00
1977	MAY	06	12.25	12.00	11.25	11.00	11.50	11.25
1977	MAY	13	12.25	11.75	11.00	10.50	11.00	10.50
1977	MAY	20	9.00	8.50	9.00	8.50	8.75	8.25
1977	MAY	27	10.00	9.00	9.00	8.00	8.50	8.00
1977	JUN	03	10.00	9.00	9.00	8.00	8.50	8.00
1977	JUN	10	13.50	13.00	14.00	13.50	12.00	11.50
1977	JUN	17	15.00	14.00	16.00	15.00	12.00	11.00
1977	JUN	24	7.00	6.00	12.00	11.00	7.00	6.00
1977	JUL	01	7.00	6.00	12.00	11.00	7.00	6.00
1977	JUL	08	18.50	18.00	16.00	15.00	10.00	9.00
1977	JUL	15	10.00	9.00	10.00	9.00	9.00	7.00
1977	JUL	22	10.00	9.00	10.00	9.00	9.00	7.00
1977	JUL	29	10.00	9.00	10.00	9.00	9.00	7.00
1977	AUG	05	10.00	9.00	10.00	9.00	9.00	7.00
1977	AUG	12	15.00	14.00	11.00	10.00	8.00	7.00
1977	AUG	19	15.00	14.00	11.00	10.00	8.00	7.00
1977	AUG	26	21.57	20.74	18.78	17.92	16.84	16.01
1977	SEP	02	28.15	27.48	26.56	25.84	25.68	25.01
1977	SEP	09	34.72	34.22	34.33	33.77	34.51	34.02
1977	SEP	16	41.29	40.96	42.11	41.69	43.35	43.02
1977	SEP	23	23.00	22.00	20.00	10.00	15.00	15.00
1977	SEP	30	26.00	28.00	27.00	26.00	18.00	17.00
1977	OCT	07	26.50	26.50	28.00	26.50	18.00	16.50
1977	OCT	14	27.00	25.00	29.00	27.00	18.00	16.00
1977	OCT	21	28.23	19.86	31.69	21.85	21.28	14.76
1977	OCT	28	29.47	14.73	34.38	16.70	24.56	13.51
1977	NOV	04	29.57	14.78	34.50	16.76	24.64	13.55
1977	NOV	11	25.28	19.87	30.69	21.59	23.28	17.13
1977	NOV	18	24.55	12.27	34.37	16.69	24.55	13.25
1977	NOV	25	29.24	21.37	33.19	23.85	23.28	16.33
1977	DEC	02	29.44	14.72	34.34	16.68	24.53	13.24
1977	DEC	09	29.31	21.40	32.78	23.40	24.85	18.67
1977	DEC	16	29.88	21.94	33.86	24.43	24.90	18.69
1977	DEC	23	29.83	18.41	34.30	20.65	24.86	16.04
1977	DEC	30	29.77	14.88	34.73	16.87	24.81	13.39

			D1TSI1	B1TSI1	D3TSI1	B3TSI1	D6TSI1	B6TSI1
1978	JAN	06	45.74	15.24	42.69	17.28	25.41	13.72
1978	JAN	13	43.58	14.52	40.67	16.46	24.21	13.07
1978	JAN	20	44.52	14.84	41.55	16.81	24.73	13.35
1978	JAN	27	45.05	15.01	42.05	17.02	25.03	13.51
1978	FEB	03	35.43	20.48	35.93	20.97	25.21	15.98
1978	FEB	10	33.28	14.93	25.88	18.42	24.61	14.43
1978	FEB	17	43.77	23.93	34.79	18.91	26.11	16.93
1978	FEB	24	33.40	17.47	34.41	20.46	24.19	16.47
1978	MAR	03	38.89	16.13	38.07	18.61	25.66	15.14
1978	MAR	10	44.38	14.79	41.73	16.76	27.12	13.81
1978	MAR	17	35.00	17.33	34.53	19.31	24.21	15.84
1978	MAR	24	43.49	23.83	39.03	24.50	27.66	17.94
1978	MAR	31	35.00	15.33	34.53	21.00	25.66	15.94
1978	APR	07	34.00	16.83	34.03	22.00	25.17	15.95
1978	APR	14	33.95	16.31	33.98	21.47	25.63	16.42
1978	APR	21	38.18	18.72	35.24	20.84	26.95	15.33
1978	APR	28	39.03	22.17	33.23	23.76	29.35	20.27
1978	MAY	05	37.33	19.61	34.41	21.16	28.72	19.70
1978	MAY	12	30.45	14.66	23.63	14.49	23.79	11.32
1978	MAY	19	30.71	15.11	33.45	17.42	24.59	12.27
1978	MAY	26	27.18	11.61	28.92	12.92	23.07	10.76
1978	JUN	02	31.80	5.30	35.34	7.95	26.50	6.62
1978	JUN	09	26.73	11.12	28.98	12.93	22.61	10.27
1978	JUN	16	30.06	11.79	29.02	12.94	22.64	10.79
1978	JUN	23	29.07	10.79	29.03	12.94	22.65	10.78
1978	JUN	30	29.57	11.78	29.03	12.94	23.15	11.28
1978	JUL	07	28.16	10.30	27.12	11.46	22.22	10.30
1978	JUL	14	28.07	8.28	27.04	9.84	22.15	8.28
1978	JUL	21	38.15	6.57	35.08	7.89	26.31	6.57
1978	JUL	28	38.24	6.59	17.58	3.95	26.37	6.59
1978	AUG	04	30.62	13.29	28.58	13.45	24.68	13.29
1978	AUG	11	38.33	19.33	33.78	15.00	25.83	12.33
1978	AUG	18	39.27	6.77	36.11	8.12	27.08	6.77

	SP1POI	SP2POI
1973 JAN 05	26.8817000	27.7780000
1973 JAN 12	26.8097000	27.3724000
1973 JAN 19	26.8096000	27.3724000
1973 JAN 26	26.7379000	27.3724000
1973 FEB 02	26.6667000	27.3724000
1973 FEB 09	26.7379000	27.3724000
1973 FEB 16	25.2525000	23.8000000
1973 FEB 23	25.9067000	23.8000000
1973 MAR 02	25.0000000	23.8000000
1973 MAR 09	25.0000000	23.8000000
1973 MAR 16	22.9885000	23.8000000
1973 MAR 23	20.6612000	23.8000000
1973 MAR 30	25.1256000	25.6410000
1973 APR 06	25.1889000	25.6410000
1973 APR 13	25.2525000	25.6410000
1973 APR 20	25.2525000	25.6410000
1973 APR 27	25.3807000	25.6410000
1973 MAY 04	25.3004000	25.6410000
1973 MAY 11	25.3165000	25.6410000
1973 MAY 18	24.8756000	25.6410000
1973 MAY 25	24.6913000	25.6410000
1973 JUN 01	24.3902000	25.6410000
1973 JUN 08	24.2131000	25.6410000
1973 JUN 15	24.0385000	25.6410000
1973 JUN 22	23.5849000	25.6410000
1973 JUN 29	23.2558000	25.6410000
1973 JUL 06	22.3214000	25.6000000
1973 JUL 13	22.7273000	25.6000000
1973 JUL 20	22.2200000	25.6000000
1973 JUL 27	22.1239000	21.8341000
1973 AUG 03	22.5225000	21.8341000
1973 AUG 10	22.7273000	21.8341000
1973 AUG 17	22.7273000	21.8341000
1973 AUG 24	23.4742000	21.8341000
1973 AUG 31	23.8095000	21.8341000
1973 SEP 07	23.8095000	21.8341000
1973 SEP 14	23.8095000	21.8341000
1973 SEP 21	23.3100000	21.8341000
1973 SEP 28	23.3100000	21.8341000
1973 OCT 05	23.4192000	21.8341000
1973 OCT 12	23.3100000	21.8341000
1973 OCT 19	23.0415000	21.8341000
1973 OCT 26	23.2558000	21.8341000
1973 NOV 02	23.3100000	21.8341000
1973 NOV 09	23.2558000	21.8341000
1973 NOV 16	24.3309000	25.0000000
1973 NOV 23	24.5048000	25.0000000
1973 NOV 30	24.7525000	26.3100000
1973 DEC 07	24.9376000	25.0000000
1973 DEC 14	25.0000000	25.0000000
1973 DEC 21	25.4500000	26.3100000
1973 DEC 28	25.9067000	25.9740000

	SP1POI	SP2POI
1974 JAN 04	25.8397000	26.6700000
1974 JAN 11	26.8097000	27.1000000
1974 JAN 18	27.1003000	27.0300000
1974 JAN 25	27.3970000	27.2500000
1974 FEB 01	26.8817000	28.5714000
1974 FEB 08	26.3900000	28.6000000
1974 FEB 15	26.2467000	27.0270000
1974 FEB 22	25.6410000	27.0270000
1974 MAR 01	25.4452000	27.0270000
1974 MAR 08	25.5754000	27.0270000
1974 MAR 15	25.5102000	26.6700000
1974 MAR 22	25.0000000	26.3158000
1974 MAR 29	24.8139000	25.6400000
1974 APR 05	25.1256000	25.6400000
1974 APR 12	25.3165000	25.6400000
1974 APR 19	25.1256000	26.3200000
1974 APR 26	25.0000000	26.3200000
1974 MAY 03	24.3900000	24.6900000
1974 MAY 10	24.3900000	24.6900000
1974 MAY 17	24.3900000	25.0000000
1974 MAY 24	24.5100000	22.2000000
1974 MAY 31	25.0000000	25.4100000
1974 JUN 07	25.0000000	26.3200000
1974 JUN 14	25.0000000	25.6400000
1974 JUN 21	24.8756000	24.2500000
1974 JUN 28	25.1889000	24.2500000
1974 JUL 05	25.1256000	24.1800000
1974 JUL 12	25.2525000	24.0000000
1974 JUL 19	25.0627000	24.0000000
1974 JUL 26	24.9377000	24.0000000
1974 AUG 02	25.1889000	23.0000000
1974 AUG 09	25.3007000	27.0000000
1974 AUG 16	25.3807000	27.0000000
1974 AUG 23	25.7069000	29.1500000
1974 AUG 30	25.8732000	29.1500000
1974 SEP 06	26.0417000	33.0000000
1974 SEP 13	25.9403000	29.4120000
1974 SEP 20	25.8732000	27.7800000
1974 SEP 27	25.7732000	27.7800000
1974 OCT 04	25.8065000	33.0000000
1974 OCT 11	25.4453000	32.0000000
1974 OCT 18	25.5102000	28.9860000
1974 OCT 25	25.2844000	28.5714000
1974 NOV 01	25.2525000	28.5714000
1974 NOV 08	25.2207000	28.5714000
1974 NOV 15	25.1889000	27.7800000
1974 NOV 22	25.0627000	27.6200000
1974 NOV 29	24.8756000	27.0300000
1974 DEC 06	24.9372000	26.5252000
1974 DEC 13	24.6914000	26.5252000
1974 DEC 20	24.8139000	26.5252000
1974 DEC 27	24.6919500	26.2496000

	SP1POI	SP2POI
1975 JAN 03	24.5700000	25.9740000
1975 JAN 10	24.5700000	25.9740000
1975 JAN 17	24.5700000	26.3158000
1975 JAN 24	24.3310000	25.6410000
1975 JAN 31	24.2131000	25.6410000
1975 FEB 07	24.3902000	26.3157000
1975 FEB 14	24.2424000	25.3165000
1975 FEB 21	24.3902000	25.5100000
1975 FEB 28	24.0964000	25.5100000
1975 MAR 07	23.9808000	25.5100000
1975 MAR 14	24.3902000	26.3157000
1975 MAR 21	24.0964000	26.6670000
1975 MAR 28	24.2424000	26.6670000
1975 APR 04	24.5098000	27.1739000
1975 APR 11	24.6305000	27.3224000
1975 APR 18	24.6914000	27.3224000
1975 APR 25	24.5098000	27.2479000
1975 MAY 02	24.6305000	26.6700000
1975 MAY 09	24.4798000	26.6700000
1975 MAY 16	24.3605000	26.6700000
1975 MAY 23	24.5700000	25.6400000
1975 MAY 30	24.3013000	25.3160000
1975 JUN 06	24.3902000	26.1780000
1975 JUN 13	24.4499000	26.1780000
1975 JUN 20	24.3605000	26.1780000
1975 JUN 27	24.4798000	26.1780000
1975 JUL 04	24.8447000	27.5482000
1975 JUL 11	24.8756000	27.9330000
1975 JUL 18	25.2525000	29.4118000
1975 JUL 25	25.5000000	33.3300000
1975 AUG 01	25.5773000	32.2581000
1975 AUG 08	26.1097000	50.0000000
1975 AUG 15	26.0417000	55.5500000
1975 AUG 22	26.4900000	45.4600000
1975 AUG 29	26.4900000	41.6700000
1975 SEP 05	26.6600000	40.0000000
1975 SEP 12	26.6460000	40.0000000
1975 SEP 19	27.4500000	40.0000000
1975 SEP 26	27.4900000	37.0370000
1975 OCT 03	27.0750000	44.4400000
1975 OCT 10	26.9900000	38.4600000
1975 OCT 17	26.6600000	37.0400000
1975 OCT 24	26.5800000	37.0400000
1975 OCT 31	26.6300000	42.5500000
1975 NOV 07	26.5500000	40.0000000
1975 NOV 14	26.5800000	40.0000000
1975 NOV 21	26.9500000	40.0000000
1975 NOV 28	26.9400000	45.4500000
1975 DEC 05	27.0270000	37.0400000
1975 DEC 12	27.1000000	37.0400000
1975 DEC 19	27.2800000	36.3600000
1975 DEC 26	27.3000000	37.9100000

	SP1POI	SP2POI
1976 JAN 02	27.3200000	38.4700000
1976 JAN 09	27.2600000	36.3600000
1976 JAN 16	27.2800000	37.0400000
1976 JAN 23	27.5200000	37.0400000
1976 JAN 30	27.4400000	37.0400000
1976 FEB 06	27.2900000	35.0900000
1976 FEB 13	27.2500000	35.0900000
1976 FEB 20	27.6100000	35.0900000
1976 FEB 27	27.8700000	32.2600000
1976 MAR 05	28.0700000	31.2500000
1976 MAR 12	28.5700000	31.2500000
1976 MAR 19	28.4700000	32.2600000
1976 MAR 26	29.1600000	32.2600000
1976 APR 02	29.3300000	37.0400000
1976 APR 09	29.6300000	37.0400000
1976 APR 16	29.6600000	37.0400000
1976 APR 23	29.6600000	33.8900000
1976 APR 30	29.6000000	33.8900000
1976 MAY 07	29.8400000	33.8900000
1976 MAY 14	30.0300000	35.0900000
1976 MAY 21	30.0300000	33.3300000
1976 MAY 28	30.5800000	35.0900000
1976 JUN 04	30.8600000	35.0900000
1976 JUN 11	30.9600000	34.4800000
1976 JUN 18	31.0100000	35.0900000
1976 JUN 25	31.4700000	35.0900000
1976 JUL 02	31.5000000	35.0900000
1976 JUL 09	31.3500000	33.3300000
1976 JUL 16	31.3000000	33.3300000
1976 JUL 23	31.4200000	33.0000000
1976 JUL 30	31.4000000	33.0000000
1976 AUG 06	31.2300000	33.0000000
1976 AUG 13	31.2000000	33.9000000
1976 AUG 20	31.1500000	35.7100000
1976 AUG 27	31.2600000	37.7400000
1976 SEP 03	31.2200000	37.7400000
1976 SEP 10	31.2000000	34.7200000
1976 SEP 17	31.1500000	34.8400000
1976 SEP 24	31.1500000	34.4800000
1976 OCT 01	31.3000000	34.4800000
1976 OCT 08	31.1000000	33.9000000
1976 OCT 15	31.3000000	33.9000000
1976 OCT 22	31.4500000	33.9000000
1976 OCT 29	31.4200000	33.9000000
1976 NOV 05	31.5000000	33.6700000
1976 NOV 12	31.5000000	33.3300000
1976 NOV 19	31.5200000	32.7900000
1976 NOV 26	31.6000000	32.7900000
1976 DEC 03	31.6200000	32.7900000
1976 DEC 10	31.6200000	32.7900000
1976 DEC 17	31.6500000	32.2600000
1976 DEC 24	31.6521191	33.3131348
1976 DEC 31	31.4200000	35.3300000

			SP1POI	SP2POI
1977	JAN	07	31.1600000	36.6300000
1977	JAN	14	31.9200000	36.1000000
1977	JAN	21	32.1500000	35.8400000
1977	JAN	28	32.1600000	35.8400000
1977	FEB	04	32.3800000	36.3600000
1977	FEB	11	32.4700000	35.7100000
1977	FEB	18	32.6600000	34.4800000
1977	FEB	25	33.0000000	35.0900000
1977	MAR	04	38.7600000	40.8200000
1977	MAR	11	36.3600000	40.0000000
1977	MAR	18	38.8300000	40.0000000
1977	MAR	25	38.8300000	39.6800000
1977	APR	01	38.7200000	39.8400000
1977	APR	08	38.8800000	40.0000000
1977	APR	15	38.7700000	40.6500000
1977	APR	22	38.8700000	40.8100000
1977	APR	29	38.7200000	44.0500000
1977	MAY	06	38.7400000	44.0500000
1977	MAY	13	38.8300000	41.6700000
1977	MAY	20	38.7000000	41.6700000
1977	MAY	27	38.7900000	41.6700000
1977	JUN	03	38.8000000	40.8200000
1977	JUN	10	38.7300000	40.8200000
1977	JUN	17	38.7200000	40.1600000
1977	JUN	24	38.8200000	40.4900000
1977	JUL	01	38.7600000	39.3700000
1977	JUL	08	38.4800000	41.6600000
1977	JUL	15	38.8000000	41.6600000
1977	JUL	22	38.6400000	41.6600000
1977	JUL	29	38.6800000	40.8200000
1977	AUG	05	38.6100000	40.8200000
1977	AUG	12	40.0000000	43.4800000
1977	AUG	19	39.0800000	50.0000000
1977	AUG	26	38.9800000	48.0000000
1977	SEP	02	40.5000000	48.7800000
1977	SEP	09	40.6100000	47.6200000
1977	SEP	16	41.0400000	45.4500000
1977	SEP	23	41.1400000	45.4500000
1977	SEP	30	40.7900000	45.0500000
1977	OCT	07	41.1600000	43.4800000
1977	OCT	14	40.8300000	43.4800000
1977	OCT	21	40.6700000	43.4800000
1977	OCT	28	40.0800000	44.4400000
1977	NOV	04	41.1300000	45.4500000
1977	NOV	11	41.2300000	44.0500000
1977	NOV	18	41.2300000	44.4400000
1977	NOV	25	41.1800000	44.4400000
1977	DEC	02	40.9500000	44.4400000
1977	DEC	09	40.7900000	43.8600000
1977	DEC	16	40.7300000	44.4400000
1977	DEC	23	39.7238193	45.9283966
1977	DEC	30	39.5000000	47.6200000

			SP1POI	SP2POI
1978	JAN	06	40.7400000	48.7800000
1978	JAN	13	39.7300000	48.7800000
1978	JAN	20	40.3400000	48.7800000
1978	JAN	27	40.1800000	48.7800000
1978	FEB	03	40.2900000	46.5100000
1978	FEB	10	40.3900000	43.4800000
1978	FEB	17	40.2900000	43.4800000
1978	FEB	24	39.9800000	41.8400000
1978	MAR	03	40.2000000	43.4800000
1978	MAR	10	40.6800000	43.4800000
1978	MAR	17	40.8400000	42.0200000
1978	MAR	24	40.9000000	41.6700000
1978	MAR	31	41.1400000	41.1500000
1978	APR	07	41.0500000	41.6600000
1978	APR	14	41.0800000	42.1900000
1978	APR	21	43.6400000	43.4800000
1978	APR	28	41.9300000	43.4800000
1978	MAY	05	42.3300000	42.5500000
1978	MAY	12	45.1500000	46.5100000
1978	MAY	19	45.6400000	46.5100000
1978	MAY	26	45.9400000	46.5100000
1978	JUN	02	45.5600000	45.8700000
1978	JUN	09	45.6900000	45.8700000
1978	JUN	16	45.7400000	45.8700000
1978	JUN	23	45.6900000	45.8700000
1978	JUN	30	45.7400000	45.4500000
1978	JUL	07	45.4600000	43.8600000
1978	JUL	14	45.4000000	43.8600000
1978	JUL	21	45.6100000	45.4500000
1978	JUL	28	45.5600000	45.4500000
1978	AUG	04	45.3500000	45.4500000
1978	AUG	11	45.1300000	45.4500000
1978	AUG	18	44.8500000	45.4500000

	INFPORT	USINF	RF1	ESPOT
1973. 1.	1.0800	3.5800	-2.5000	.0
1973. 2.	4.1200	3.7800	.34000	25.129
1973. 3.	3.2200	4.5500	-3.8300	24.950
1973. 4.	3.9700	4.9600	-4.8050	25.032
1973. 5.	5.9000	5.3000	-2.5467	24.204
1973. 6.	6.2000	5.7700	-4.5700	22.547
1973. 7.	6.7800	5.5400	-4.2600	22.173
1973. 8.	7.8000	7.1800	-5.8800	23.025
1973. 9.	10.640	7.0800	-2.9400	23.170
1973.10.	12.590	7.6000	8.9900	24.121
1973.11.	13.540	8.0500	5.4900	25.517
1973.12.	17.290	8.4200	11.122	26.984
1974. 1.	17.770	8.9200	8.8500	27.673
1974. 2.	21.000	9.5800	11.420	26.651
1974. 3.	25.230	9.7500	33.980	28.112
1974. 4.	23.650	9.6900	18.960	26.577
1974. 5.	22.670	10.200	35.970	28.556
1974. 6.	22.610	9.3200	27.540	27.895
1974. 7.	22.840	10.920	23.420	27.611
1974. 8.	25.350	10.430	14.920	27.428
1974. 9.	27.210	11.320	32.890	29.386
1974.10.	22.560	11.340	25.720	28.068
1974.11.	20.390	11.510	21.380	26.982
1974.12.	17.090	11.500	33.840	28.043
1975. 1.	19.960	11.110	20.850	26.562
1975. 2.	12.210	10.510	1.7000	24.179
1975. 3.	13.790	9.8200	3.9700	24.816
1975. 4.	13.690	9.7000	3.9900	25.075
1975. 5.	13.060	8.9700	9.0900	25.285
1975. 6.	15.760	9.9600	19.100	26.430
1975. 7.	15.650	9.2300	20.820	28.768
1975. 8.	10.610	8.2100	23.400	29.210
1975. 9.	10.540	7.5700	18.970	29.559
1975.10.	12.370	7.2200	15.650	28.296
1975.11.	13.780	7.0500	16.730	28.943
1975.12.	19.350	6.7900	36.960	31.703

	INFPORT	USINF	RF1	ESPOT
1976. 1.	21.360	6.5400	29.320	30.716
1976. 2.	19.100	6.1100	39.875	32.557
1976. 3.	16.810	5.9200	36.544	33.808
1976. 4.	12.040	5.8400	30.315	33.485
1976. 5.	8.7600	6.0300	15.230	32.584
1976. 6.	12.030	5.7700	27.010	34.945
1976. 7.	19.250	5.2300	34.020	35.715
1976. 8.	22.530	5.4300	42.600	36.807
1976. 9.	20.680	5.3500	33.330	35.468
1976.10.	24.860	5.1600	34.200	35.829
1976.11.	26.020	4.8100	37.710	36.521
1976.12.	24.030	4.7400	35.790	36.244
1977. 1.	18.300	5.0400	25.760	35.752
1977. 2.	22.190	5.8100	26.880	43.127
1977. 3.	28.460	6.2100	26.625	42.953
1977. 4.	35.320	6.5400	38.530	44.950
1977. 5.	39.250	6.5200	42.230	45.617
1977. 6.	28.410	6.6200	28.290	43.101
1977. 7.	19.600	6.5300	22.570	42.028
1977. 8.	19.380	6.4300	34.106	45.493
1977. 9.	19.220	6.3900	39.830	47.616
1977.10.	12.630	6.2700	28.460	45.202
1977.11.	12.010	6.4500	30.865	45.978
1977.12.	9.3000	6.4800	25.145	43.935

	IR3	EURO	MFB	IIR
1973. 1.	5.4900	6.1700	.56250	6.7325
1973. 2.	5.5300	7.4500	.25000	7.7000
1973. 3.	5.5300	8.5000	1.9500	10.450
1973. 4.	5.5100	8.1600	-3.8750	4.2850
1973. 5.	5.5300	8.4300	-3.3162	5.1138
1973. 6.	5.5200	8.8100	-3.2400	5.5700
1973. 7.	5.5400	10.370	-7.1250	3.2450
1973. 8.	5.5300	11.460	-6.6080	4.8520
1973. 9.	5.5400	11.130	-5.7662	5.3638
1973.10.	5.5500	9.9300	1.4062	11.336
1973.11.	5.5400	9.8200	-.85000	8.9700
1973.12.	5.5500	10.630	.34375	10.974
1974. 1.	5.6400	9.3700	.68750	10.057
1974. 2.	5.6000	8.5000	.0	8.5000
1974. 3.	5.6200	9.2300	3.6000	12.830
1974. 4.	5.5800	10.530	7.2500	17.780
1974. 5.	5.6300	11.670	9.8000	21.470
1974. 6.	5.6500	12.110	10.845	22.955
1974. 7.	5.7500	13.490	10.187	23.677
1974. 8.	6.5600	13.560	4.9000	18.460
1974. 9.	6.6700	12.340	9.6250	21.965
1974.10.	6.6300	10.900	11.125	22.025
1974.11.	6.7000	10.130	10.350	20.480
1974.12.	6.8900	10.310	21.750	32.060
1975. 1.	7.4800	8.5800	14.900	23.480
1975. 2.	7.6000	7.2000	4.8750	12.075
1975. 3.	7.7000	6.8500	5.8750	12.725
1975. 4.	7.7600	7.0400	4.7500	11.790
1975. 5.	7.8000	6.2500	8.0000	14.250
1975. 6.	8.3000	6.1000	8.0000	14.100
1975. 7.	7.8900	7.1300	7.5000	14.630
1975. 8.	7.9800	7.2300	7.8000	15.030
1975. 9.	7.9900	7.0500	10.250	17.300
1975.10.	8.0000	7.1300	9.9000	17.030
1975.11.	8.1000	6.7900	9.6250	16.415
1975.12.	7.9900	6.4700	12.400	18.870

	IR3	EURO	MFB	IIR
1976. 1.	8.0100	5.4800	15.980	21.460
1976. 2.	8.0300	5.5300	17.558	23.088
1976. 3.	8.0000	5.6000	17.846	23.446
1976. 4.	7.8600	5.4100	18.192	23.602
1976. 5.	7.9200	5.9600	14.668	20.628
1976. 6.	7.9000	6.2200	15.094	21.314
1976. 7.	8.2000	5.7900	20.625	26.415
1976. 8.	8.7000	5.6700	23.562	29.232
1976. 9.	8.7300	5.5700	21.531	27.101
1976.10.	8.8500	5.4500	17.125	22.575
1976.11.	9.0700	5.3000	17.500	22.800
1976.12.	8.7200	5.0100	17.312	22.322
1977. 1.	9.1300	5.1500	16.562	21.712
1977. 2.	8.9100	5.0800	9.8687	14.949
1977. 3.	10.280	5.1100	6.0625	11.172
1977. 4.	10.470	5.1300	5.0510	10.181
1977. 5.	10.590	5.7700	9.7812	15.551
1977. 6.	10.930	5.7800	12.312	18.092
1977. 7.	10.730	5.7700	11.100	16.870
1977. 8.	11.140	6.3000	12.212	18.512
1977. 9.	14.630	6.5600	28.730	35.290
1977.10.	14.950	7.1300	26.890	34.020
1977.11.	14.970	7.0800	26.455	33.535
1977.12.	14.730	7.1200	27.203	34.323
1978. 1.	16.080	7.3100	29.316	36.626
1978. 2.	16.660	7.2700	26.221	33.491
1978. 3.	17.260	7.2600	28.807	36.067

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