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POLITICAL VS. CURRENCY PREMIA IN INTERNATIONAL REAL INTEREST DIFFERENTIALS: A STUDY OF FORWARD RATES FOR 24 COUNTRIES

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ABSTRACT

Different approaches to quantifying the degree of capital mobility for a cross-section of currencies -- particularly saving-investment correlations and tests of real interest parity -- have appeared to show a surprisingly low degree of financial market integration. We use a new data set, forward rate data for 24 countries, including many small industrialized countries and seven LDCs, to decompose the real interest differential into two parts: the covered interest differential, or political premium, and the real forward discount, or currency premium. The latter in turn can be decomposed into the exchange risk premium and expected real depreciation.

We find a high degree of capital mobility across political boundaries for most of the G-11 countries, plus Hong Kong and Singapore, for our sample period of 1982 to 1987. Even for most of the other LDCs and smaller industrialized countries, for which covered interest parity clearly fails, the political premium is not as big a component of the real interest differential as the currency premium. France would appear to have higher capital mobility than most by the criterion of real interest differentials, but is seen in fact to have low capital mobility by the criterion of covered interest differentials, a clear example of the superiority of the latter criterion.

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1. The Challenge to the View of Capital as Highly Mobile

International capital mobility, at least among most major industrialized countries, is conventionally thought to have reached a very high level by the 1980s. Potentially infinite capital flows are thought to eliminate differentials among countries' expected rates of return.

The empirical validity of the conventional view has recently been challenged from several different directions. First, Feldstein and Horioka (1980) and Feldstein (1983) reasoned that if capital were indeed perfectly mobile, then a fall in private saving or in the government budget surplus in one country should not lead to crowding out of investment; the country should rather be able to borrow enough funds from abroad at the going world interest rate to make up the difference. But investment rates in fact are highly correlated with national saving rates, from which Feldstein and Horioka conclude that capital mobility is not high after all. Numerous studies have responded to Feldstein and Horioka, most of them econometric critiques. But even when econometric problems, particularly the endogeneity of national saving, are addressed, the Feldstein-Horioka empirical findings seem to hold up.

The second assault on the conventional wisdom of high capital mobility comes from tests of real interest parity. Real interest rates would have to be equalized across countries for exogenous changes in saving not to crowd out investment, since it is presumably the real interest rate, rather than nominal, on which saving and investment depend. Real interest parity can be tested directly, without most of the econometric problems of the saving-investment regressions. Mishkin (1984a, 1984b), Cumby and

Obstfeld (1984), Mark (1985), Cumby and Mishkin (1986), and Gaab, Granziol and Horner (1986) find that real interest rates are far from perfectly correlated across countries.

Many studies test uncovered, or open, interest parity, as a way of getting at investors' degree of substitutability among countries' bonds. Almost all of these studies make the rational expectations assumption: they infer investors' expectations of future exchange rates from the ex post realizations of the exchange rate in the particular sample period, arguing that the two differ only by a random expectational error. This literature, typified by Cumby and Obstfeld (1984), generally rejects statistically the hypothesis that the nominal interest differential is an unbiased estimator of exchange rate changes and interprets these findings as a rejection of uncovered interest parity. It thus constitutes a third challenge to the conventional wisdom and offers the exchange risk premium, in particular, as a prime candidate to explain international inequalities in expected real rates of return.[1]

A fourth challenge to the conventional view that international capital mobility is high is represented by Dooley and Isard (1986) and related papers. They argue that there is an historical tendency for governments of countries that go substantially into debt to foreigners to renege on that debt through some combination of capital controls, taxation, or outright default; because investors everywhere are aware of this tendency, they are increasingly reluctant to lend to a country as its international indebtedness rises. While this view of political risk is standard when applied to LDC debtors, Dooley and Isard (1986) apply it to industrialized countries as well.

2. The Degree of Capital Mobility for Different Kinds of Countries

The conventional wisdom asserts, not just that (1) the degree of capital mobility is high, but also that (2) it is higher for most of the large industrialized countries than for smaller or less developed countires and (3) it has been rising since the 1950s, and particularly since many countries dismantled their capital controls after 1973 and Euromarkets began recycling funds on a large scale. These latter two claims have also been found wanting by the same statistical criteria used to challenge the first claim.

On the question of the degree of capital mobility among different groups of countries, regression studies of national investment rates against national saving rates for broader cross sections find that the coefficient is, if anything, higher for OECD countries than for less-developed countries: Fieleke (1982; 87 countries), Summers (1985; 115 countries), and Dooley, Frankel and Mathieson (1986; 64 countries).[2] This seems to imply a lower degree of capital mobility for OECD countries, which Fieleke (p. 155), Summers (p. 21), Dooley, Frankel and Mathieson, and most others consider directly contrary to intuition.

Table 1 reports instrumental variables regressions of the investment rate against the national saving rate for three cross-section sub-groups: industrialized countries, LDCs classified (by the International Monetary Fund) as borrowing primarily from commercial sources, and LDCs classified as borrowing primarily from foreign governments and official agencies. The most common econometric source of worry in such regressions is the following point: governments endogenously respond to incipient current account imbalances with policies to change public or private saving in such a way

Table 1: Regressions of (Investment/GNP) against (National Saving/GNP)

Instrumental Variables Regressions:
Military Expenditure/GNP and Dependency Ratio

Country Group (and number of countries)	Period	Constant Term	Coefficient (of NS/GNP)
Industrial Countries	1960-73	-.013	1.078**
(14 Observations)		(.069)	(.277)
	1974-84	-.039	1.192**
		(.082)	(.362)
Market Borrowers	1960-73	.131**	.445**
(21 Observations)		(.030)	(.148)
	1974-84	.049	.878**
		(.030)	(.120)
Official Borrowers	1960-73	.128**	.366**
(14 Observations)		(.027)	(.136)
	1974-84	.120**	.678**
		(.025)	(.191)

** Significant at 99 percent level
(Standard errors are given in parenthesis)
See Dooley, Frankel and Mathieson (1986) for further results.

Data Sources

GDP at market prices, (Y) gross domestic investment, (I) and gross domestic savings (NS) are conventional national income concepts drawn from World Bank EPDNA data files. The age dependency ratio is the ratio of dependent population (under 16 and over 64) to working age population (15 to 64) drawn from the same source. Military expenditures are from data files of the U.S. Arms Control and Disarmament Agency. The definitions for official borrowers, market borrowers and combined borrowers as well as lists of countries in each category can be found on pages 173-174 of the International Monetary Fund's 1986 World Economic Outlook.

as to reduce the imbalances. This "policy reaction" argument has been made by Fieleke (1982), Tobin (1983), Westphal (1983), Caprio and Howard (1984) and Summers (1985). The two instrumental variables used here to deal with this problem, or with any other source of endogeneity of national saving, are the ratio of dependents to working-age population, considered a good instrument for the private saving rate, and the ratio of military expenditure to GNP, considered a good instrument for the public sector (dis-)saving rate.[3] In every case the saving coefficient is significantly greater than zero, suggesting a degree of crowding out of investment, or -- in Feldstein-Horioka's interpretation -- imperfect capital mobility. The coefficient is even higher, indeed is insignificantly different from 1.0, for the industrialized countries. It is also slightly higher for the market borrowers than for the official borrowers, again the counter-intuitive result. Formal tests of the hypothesis that the coefficient for industrialized countries is different from that for LDCs, and of the hypothesis that the coefficient for official borrowers is different from that for market borrowers, fail to reject equality. (Not reported.)

It should be noted that not everyone's a priori expectations are that capital mobility should be higher for industrialized countries than for LDCs, at least by the saving-investment criterion. Indeed, Harberger (1983, p. 334) criticizes on these grounds Feldstein and Horioka's conclusion that capital mobility is low for all countries:

> The point to be borne in mind here is that the evidence of the Feldstein-Horioka paper was assembled from the OECD countries only. Casting the net wider would have surely thrown up indications of much greater divergence between saving and investment rates.[4]

On the question of the evolution over time of the degree of capital mobility, there is no evidence that the coefficient in regressions of investment on saving rates has fallen over time. This finding emerges both from cross-section studies, which often report pre- and post-1973 results -- Feldstein (1983), Penati and Dooley (1984), and Dooley, Frankel and Mathieson (1986) -- and from pure time series studies -- Obstfeld (1986a,b)[5] and Frankel (1986) for the United States. In Table 1 the estimated coefficient actually increases after 1973, for each of the three sets of countries. Similar results hold for tests of interest parity. Mishkin (1984, p. 1352), for example, found even more significant rejections of real interest parity among major industrialized countries for the floating rate period after 1973/II than he did for his entire 1967/II-1979/II sample period. Caramazza et al (1986, pp. 43-47) also found that some of the major industrialized countries in the 1980s (1980.1-1985.6) moved farther from real interest parity than they had been in the 1970s (1973.7-1979.12).

3. Decomposition Using Forward Rate Data

Given the disparity between the results reported above and a priori expectations -- not just that capital mobility is high, but also that it is higher for open industrialized countries than for LDCs and that it has increased over time -- one must wonder whether tests based on saving-investment correlations or on real interest differentials are giving us the right answer. This paper breaks up the real interest differential into its components in order to shed light on these questions. The real interest differential is defined as

$$r - r^* = (i - \pi) - (i^* - \pi^*) \qquad (1)$$

where r is the real interest rate, i is the nominal interest rate, π is the expected inflation rate and asterisks represent foreign variables. Our decomposition is

$$r - r^* = (i - i^* - fd) + (fd - \Delta s^e) + (\Delta s^e - \pi + \pi^*) \qquad (2)$$

where fd is the forward discount and Δs^e is the expected rate of depreciation of the domestic currency.

The first term is the covered interest differential. The interest rates i and i^* refer to local rates in the two countries. We claim that the international covered interest differential is the appropriate measure of the degree of capital mobility, in the sense of the degree of integration of financial markets across political boundaries. In the absence of substantial transactions costs, information costs, capital controls, risk of future capital controls and default risk, the mean and variability of the covered interest differential should be small. We follow the tradition of Aliber (1973) in calling this differential the "political" premium, though "country" premium would be just as good.

We view it as no longer interesting to test covered interest parity with interest rates observed in the same Eurocurrency market as the forward discount, other than as a test for errors in the data. This condition has already been well-established.[6] Rather than artificially setting up a hypothesis of market efficiency to be tested statistically, we believe that the interesting question is to quantify the size of the covered interest differentials and thereby the barriers to international capital mobility. We take it for granted that these barriers are essentially zero within the

London eurocurrency market. One would anticipate that some countries within our sample have by the 1980s become so open and efficient financially as to constitute part of the world eurocurrency market; but this is something that should emerge from our calculations.

The other two terms have to do with the currency in question rather than the political jurisdiction per se. They may be called the exchange risk premium and expected real depreciation, respectively. Given the clear empirical failure of purchasing power parity, there is no reason why the last term should necessarily be zero. A non-zero expected rate of real depreciation would in itself open up a real interest differential even if the political and exchange risk premiums were zero. Thus real interest parity could be invalidated by imperfect integration of goods markets rather than imperfect integration of financial markets.[7] Nevertheless several authors, while recognizing the point in theory, continue to identify real interest differentials with some combination of political premiums and exchange risk premiums.

> "The incomplete linkage of real interest rates internationally appears to reflect risk premiums which vary with the size of a nation's foreign borrowing."
>
> Darby (1986, p. 420)

> "There are two major reasons why expected real interest rate may fail to be equal across countries ... In a world with risk-averse investors, differences in risk will lead to differences in expected returns ... A differential in expected real returns across countries may also be due to market segmentation or barriers to capital movements across currencies."
>
> Koraczyk (1985, p. 350)

This paper uses forward market data to decompose the real interest differential into its three components. Many tests of covered interest

parity already exist. But none to our knowledge goes beyond a small sample of a few countries. We use forward rate series quoted by Barclay's Bank in London (and reported by DRI) for 24 countries between September 1982 and March 1987. The sample includes small as well as large countries, countries with as well as without capital controls, and less developed as well as industrialized countries. In using covered interest differentials as the test of financial market integration versus segmentation for a (relatively) large cross-section of countries, we can see how well this criterion of capital mobility corresponds to the real interest differential and other criteria that have been proposed.

To state our findings in advance, the largest industrialized countries, and a few others that are known to have an absence of capital controls, by our criterion of covered interest parity show (unsurprisingly) a higher degree of financial market integration than do other countries. The deviations from real interest parity are generally much greater than the deviations from covered interest parity, suggesting that currency factors, due to exchange rate variability, are a larger source of the failure of real interest parity in the 1980s than are barriers to the flow of capital across political jurisdictions. There is no reason to doubt the correctness of conclusions, drawn from the Feldstein-Horioka tests or real interest parity tests, regarding the "crowding out" effects of changes in national saving. But these tests are not the correct criteria for measuring the degree of international capital mobility in the sense of the degree of integration of financial markets across countries.

4. Deviations from Real Interest Parity

Table 2a reports statistics on three-month real interest differentials for our 24 countries, in each case the local interest rate measured relative to the Eurodollar interest rate. For local interest rates we use the interbank rate or, where no market rate exists, the most flexibly-determined interest rate available. (See data appendix for details.) We begin by using simply the realized inflation rates during the ex post three-month period, on the assumption that ex ante expected inflation rates cannot be very far off over such a short term. (We will be using ex ante inflation forecasts below.)

Column (1) reports the mean real interest differential during the sample period, 1982 to 1987. The numbers are negative for a majority of countries, averaging -1.79 percent across all 24, which reflects the high level of real dollar interest rates during this sample period. The mean is statistically significant for most groups of countries.

The countries are classified into five groups chosen on a priori grounds. The group with real interest rates the farthest below the world rate is Mexico, South Africa, Greece and Bahrain. These four (very diverse) countries bear the burden of representing a wide class of LDCs in our sample. There are seven countries classified as LDCs that happen to have forward rate data available, and thereby appear in our sample; three East Asian LDCs that are known to have liberalized financial markets (Hong Kong, Singapore and Malaysia) are classified separately. One might object that the large negative real interest differentials in the group of four reflect administered local interest rates that are kept artificially low by "financial repression." But countries cannot maintain artifically low

Table 2b: Real Interest Differential (ex ante)

Interest Differential Less Predicted Relative Inflation
Local vs. Eurodollar
Sept. 1982 - Oct. 1986
Percent p.a.

	Regression Coefficients				Standard Deviation*
	Constant	Interest Difference (5)	Forward Discount (6)	1yr Lag Inflation (7)	of Projected Real Int. Dif. (8)
Open Atlantic DCs					
Canada	0.44	-0.07	0.00	-0.44	0.67
Germany	1.59	0.13	0.84	-0.09	1.18
Netherlands	3.72	-1.50	2.83	1.07	1.79
Switzerland	1.74	-0.11	1.10	0.69	1.88
United Kingdom	-3.17**	-6.62	6.41	1.80	2.00
Group	-0.37	-0.59	1.13	-0.25	1.58
Open Asian LDCs					
Hong Kong	-1.35	2.16	-0.90	-0.49	1.68
Malaysia	0.64	0.46	0.23**	-0.44	2.01
Singapore	1.98	0.26	0.34	0.29	0.47
Group	-0.30	0.32	0.47	-0.61	1.47
Closed LDCs					
Bahrain	12.70	1.47	0.11	1.17	2.14
Greece	-18.57**	0.13	-0.33**	0.99	2.96
Mexico	-16.49	1.02	-0.68**	0.08	8.96
South Africa	2.03**	0.43**	0.00	-0.97	3.39
Group	-0.21	0.71	-0.36	-0.48	4.92
Other European DCs					
Austria	0.19	1.27	-0.23	0.43	1.34
Belgium	1.14	-0.33	0.61	-0.79	1.44
Denmark	-2.29	1.39	-0.55	0.96	1.78
France	0.10	1.71	-0.65	-0.52**	1.84
Ireland	3.79	-0.00	0.06	-0.91**	2.19
Italy	-2.60	0.83	-0.60	0.09	2.02
Norway	0.02	2.52	-2.27	0.27	1.49
Spain	-5.15	1.71	-0.65	0.10	3.22
Sweden	-6.23	3.98	-2.25	0.38	2.68
Group	-0.51	0.97	-0.31	-0.46	2.07
Liberalizing Pacific DCs					
Australia	-0.12	0.40	-0.08	-0.26	1.15
Japan	1.86**	-2.87	3.43	0.57	1.31
New Zealand	-5.15	-0.73	0.43	1.16	3.73
Group	-1.13	-0.00	0.06	0.26	2.37
All Countries	-0.16	0.85	-0.36	-0.56	2.65

*Group standard deviations calculated with deviations around each country's mean.
**Different from zero with 95% confidence.

Table 2a: Real Interest Differentials (ex post)

Interest Differential Less Inflation Differential
Local vs. Eurodollar
Sept. 1982 - Oct. 1986
In Percent p.a.

	# of Obs	Sample Mean (1)	Standard Error Of Mean*	t Prob Mean <> zero	Sample+ Standard Deviation (2)	Root Mean Squared Error (3)	95% Band** (4)
Open Atlantic DCs							
Canada	49	-0.27	0.49	0.41	1.98	2.00	3.97
Germany	50	-1.75	0.67	0.98	2.72	3.25	6.03
Netherlands	49	-1.75	0.78	0.96	3.17	3.63	6.57
Switzerland	50	-3.31	0.81	1.00	3.31	4.71	8.45
United Kingdom	50	-0.26	0.82	0.24	3.35	3.36	5.58
Group	248	-1.47	0.32	1.00	2.93	3.47	
Open Asian LDCs							
Hong Kong	50	-2.77	1.25	0.96	5.11	5.83	12.02
Malaysia	37	1.91	1.20	0.86	4.22	4.64	8.18
Singapore	50	0.01	0.87	0.01	3.53	3.53	7.06
Group	137	-0.49	0.64	0.78	4.31	4.74	
Closed LDCs							
Bahrain	48	3.03	1.21	0.98	4.86	5.75	10.61
Greece	50	-9.51	2.16	1.00	8.80	13.03	20.92
Mexico	50	-12.38	3.60	1.00	14.69	19.29	39.13
South Africa	49	-3.96	1.26	0.99	5.10	6.49	14.27
Group	197	-5.80	1.14	1.00	9.24	12.40	
Other European DCs							
Austria	49	-2.87	0.91	0.99	3.67	4.68	8.81
Belgium	50	-0.16	0.68	0.18	2.77	2.78	4.88
Denmark	50	-4.09	1.04	1.00	4.24	5.92	9.70
France	50	-1.29	0.67	0.93	2.73	3.02	5.83
Ireland	48	0.31	0.83	0.28	3.31	3.32	6.03
Italy	48	0.49	0.92	0.40	3.69	3.72	5.94
Norway	50	-0.64	0.78	0.57	3.20	3.26	6.74
Spain	50	-1.08	1.27	0.59	5.19	5.30	11.43
Sweden	50	-0.73	1.11	0.48	4.54	4.60	8.67
Group	445	-1.13	0.31	1.00	3.75	4.16	
Liberalizing Pacific DCs							
Australia	49	0.30	0.91	0.26	3.67	3.68	6.49
Japan	49	-1.03	0.78	0.79	3.17	3.34	6.01
New Zealand	50	0.16	2.41	0.05	9.84	9.84	15.60
Group	148	-0.19	0.90	0.58	6.32	6.35	
All Countries	1175	-1.79	0.27	1.00	5.34	6.51	

*Calculated assuming N/3 independent observations.
+Group standard deviations calculated with deviations around each country's mean.
**The size of a band around zero which includes 95% of the observations.
DCs are developed countries, LDCs less developed countries. IMF designations.

correlations because countries in both groups, six of the total seven, fall into the "market borrower" classification used in the preceding section. (Only Bahrain is classified as an official borrower.)

The result in Table 2 that real interest differentials are more variable for LDCs than for industrialized countries suggests that the saving-investment correlations are not picking up the degree of equalization of real rates of return. One possibility is that sensitivity of physical investment to the real rate of interest in domestic financial markets varies across countries. Let the investment rate be given by

$$(I/Y)_i = a - br_i + \varepsilon_i . \tag{3}$$

Presumably b, the sensitivity of physical investment to the real interest rate, would be higher in OECD countries than in LDCs; in the latter, more investment is financed out of retained earnings, family wealth or government credit than by issuing debt or equity in the marketplace. Then the covariance of investment and saving rates can be written

$$\begin{aligned} \text{Cov}(I/Y, NS/Y) = &-b\ \text{Cov}(r-r^*, NS/Y) + b\ \text{Cov}(r^*, NS/Y) \\ &+ \text{Cov}(\varepsilon, NS/Y) . \end{aligned} \tag{4}$$

If the "large-country" and other endogeneity problems have been solved, i.e., r^* and ε can both be assumed uncorrelated with the saving rate (NS/Y) so that the last two terms drop out, then

$$\text{Cov}(I/Y, NS/Y) = -b\ \text{Cov}(r-r^*, NS/Y) . \tag{5}$$

We can now see how even if two countries have the same $\text{Cov}(r-r^*, NS/Y)$,

interest rates without barriers to capital outflow: these statistics reflect a low degree of capital mobility precisely as we want them to. In this respect our group of four is typical. A number of studies, including much larger LDC samples than available here, have shown the extremes to which LDC real interest rates can go, particularly some very negative levels in the 1970s.[8]

As with the other measures of interest rate differentials that we will be considering below, the mean is not always the most useful statistic. A small mean over a particular sample period may hide fluctuations of the differential in both directions. Even if a mean is statistically significant,[9] it is useful to know in addition the variability of the differential. The standard deviation is reported in column (2). We also report the root mean squared error (RMSE) in column (3); this would be a superior measure of how closely the rates are tied together if, for example, we are worried about the possibility of a large differential that is fairly constant over time because of government administration of interest rates. Finally we report in column (4) how big a band would have to be to encompass 95 percent of the deviations from real interest parity.

Country-group comparisons of the measures of real interest differential variability in some respects suit a priori expectations much better than do the saving-investment correlations reported in the preceding section. The industrialized countries generally have less variable real interest differentials than the LDCs. New Zealand is the main exception, with a high variability. Within the group of seven LDCs, the three open Asian countries come closer to real interest parity than the four closed countries. But this comparison sheds little light on the saving-investment

might expect the coefficient on the nominal interest differential to be close to 1.0 and that on the lagged inflation rate close to -1.0. But for many individual countries the coefficients are not even of the right sign.[11] When coefficients are constrained to be the same across countries within groups, they are much more sensible.

Column (8) reports the standard deviation of our projected real interest differential. The variation of the projected real interest differential in column (8) is less than that of the ex post real interest differential in column (2) confirming that a part of the movement in inflation rates was not forecastable. But the results are nevertheless similar to those in Table 2a. Again, the group of four closed LDCs is the group with the most variable real interest differentials, though Spain and New Zealand are also quite high. Singapore has the least variable ex ante real interest differential, followed by Canada, Germany, Japan and Norway.

5. The Political Factors, Represented by the Covered Interest Differential

We now use the Barclay's forward rate data to decompose the real interest differential into one part due to political factors and another due to currency factors:

$$r - r^* = (i - i^* - fd) + (fd - \pi + \pi^*) \ . \qquad (6)$$

The first component, the covered interest differential, encompasses all factors related to the political jurisdiction in which the asset is issued. This includes both existing capital controls and the risk of future capital controls, as well as transfer risk, default risk, etc. The second component, which might be called the "real forward discount,"

investment in the OECD country might suffer more crowding out, because of a higher "b", than investment in the LDC.

The measures of real interest differential variability show some results that are anomalous if they are taken to be tests of financial market integration. For example France, which had stringent capital controls at least during the early part of our sample period, appears to have a higher degree of capital mobility by the criterion of real interest differential variability than Japan, which announced liberalization of its capital controls before our sample period (1979-80). One might conceivably argue that the Japanese liberalization must not have been genuine.[10] But the French real interest differential is smaller and less variable even than those of the Netherlands and Switzerland (and, by the RMSE statistic, Germany and the United Kingdom as well), major industrialized countries that are known to be virtually free of capital controls. Only Canada, of all 24 countries, shows a smaller and less variable real interest differential, by all measures, than France.

It can be objected that the real interest rate measures reported above are invalid because they use ex post inflation rates, which investors could not have known at the beginning of each three-month period. Table 2b reports the results of projecting ex post inflation rates on a constant term and three relevant variables known to investors: the lagged inflation differential (over the preceding year), the three-month interest differential (the same one appearing in the real interest differential itself), and the three-month forward discount (which is examined more fully below). Columns (5), (6) and (7) report the estimated coefficients on these three variables. In forecasting the ex post real interest differential, one

Table 3 : Covered Interest Differential

Interest Differential Less Forward Discount
Sept. 1982 - March 1987

In Percent p.a.

	# of Obs	Sample Mean (1)	Standard Error Of Mean	t Prob Mean <> zero	Sample+ Standard Deviation (2)	Root Mean Squared Error (3)	95% Band** (4)
Open Atlantic DCs							
Canada	54	-0.05	0.03	0.94	0.19	0.20	0.37
Germany	55	0.38	0.03	1.00	0.25	0.46	0.77
Netherlands	55	0.23	0.02	1.00	0.14	0.27	0.45
Switzerland	55	0.46	0.03	1.00	0.22	0.51	0.80
United Kingdom	55	-0.13	0.03	1.00	0.22	0.25	0.43
Group	274	0.18	0.02	1.00	0.20	0.36	
Open Asian LDCs							
Hong Kong	55	0.11	0.03	1.00	0.25	0.27	0.46
Malaysia	43	-1.62	0.23	1.00	1.51	2.23	3.77
Singapore	53	-0.27	0.04	1.00	0.28	0.39	0.64
Group	151	-0.52	0.12	1.00	0.83	1.21	
Closed LDCs							
Bahrain	48	-2.23	0.17	1.00	1.18	2.55	4.22
Greece	53	-9.68	0.86	1.00	6.28	11.62	20.39
Mexico	43	-16.80	1.87	1.00	12.28	20.97	29.39
South Africa	53	-1.52	1.47	0.69	10.71	10.82	2.76
Group	197	-7.23	1.06	1.00	8.58	12.75	
Other European DCs							
Austria	54	-1.65	0.21	1.00	1.54	2.27	4.52
Belgium	55	0.08	0.04	0.96	0.27	0.29	0.60
Denmark	53	-3.52	0.24	1.00	1.76	3.97	6.75
France	55	-2.06	0.39	1.00	2.89	3.56	7.93
Ireland	55	-0.97	0.56	0.91	4.19	4.30	7.80
Italy	55	2.13	0.48	1.00	3.56	4.16	6.71
Norway	55	-2.12	0.49	1.00	3.67	4.25	13.96
Spain	55	-3.05	0.49	1.00	3.64	4.76	9.01
Sweden	55	-0.31	0.06	1.00	0.47	0.56	0.85
Group	492	-1.27	0.22	1.00	2.79	3.48	
Liberalizing Pacific DCs							
Australia	55	-0.83	0.29	0.99	2.14	2.29	3.33
Japan	54	0.15	0.03	1.00	0.19	0.24	0.43
New Zealand	55	-1.86	0.35	1.00	2.62	3.22	6.27
Group	164	-0.85	0.26	1.00	1.95	2.28	
All Countries	1278	-1.73	0.19	1.00	3.86	5.52	

+See Table 2a for notes.

encompasses factors related to the currency of denomination of the asset. It consists, in particular, of the exchange risk premium plus expected real depreciation, as we have seen. These factors are distinct from the question of international capital mobility narrowly defined.

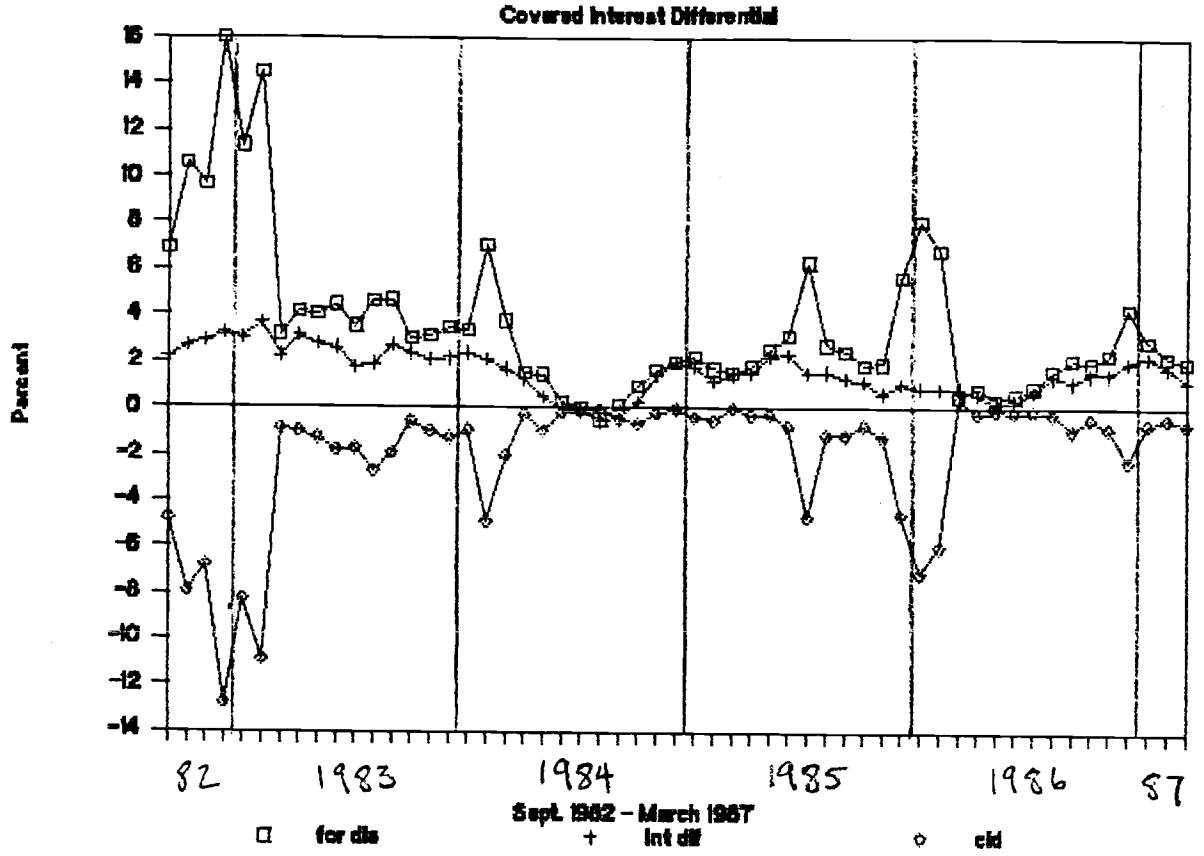
Column (1) of Table 3 reports the mean of the covered interest differential for each of our 24 countries.[12] A good rule of thumb, when the absolute magnitude of the mean or the variability of the differential indicates the existence of significant barriers, is: a negative differential vis-a-vis the Eurocurrency market indicates that, to the extent barriers exist, they are capital controls or transactions costs currently operating to discourage capital from flowing out of the country. Investors would not settle for a lower return domestically if they were free to earn abroad the higher return covered to eliminate exchange risk. This is the case for all of the LDCs in the sample, with the exception of Hong Kong, and for all of the small European countries. The negative differential that existed for the United Kingdom before Margaret Thatcher removed capital controls in 1979 is now extremely small.[13] Similarly, Canada's differential is effectively zero (as shown, e.g., by Boothe et al, 1985, p. 112). Column (4), the size of the band wide enough to encompass 95 percent of deviations from international covered interest parity, can be compared with the approach of Frenkel and Levich (1977). They tested a larger band meant to represent transactions costs between pound and dollar securities (1.0 percent for the spot and forward transactions alone, July 1973 - May 1975, p. 1215). They found, for the case of the United Kingdom, that a smaller percentage of deviations (87.6 - 89.7 percent, p. 1217) fell within the band; this confirms again that capital mobility has increased since the 1970s.

Germany is one of the few cases showing a higher interest rate locally than offshore, which suggests some barriers discouraging capital inflow: investors would not settle for a lower mark return in the Euro-market if they were free to get the higher return in Germany. But the magnitude is small, as it has been observed to be ever since Germany removed most of its controls on capital inflow in 1974 (Dooley and Isard, 1980; and Giavazzi and Pagano, 1985, p. 27). By either the criteria of the mean or of the variability measures reported in the next two columns, there is also high capital mobility for Switzerland and, especially, the Netherlands, two other European countries that are widely thought to have open financial markets.

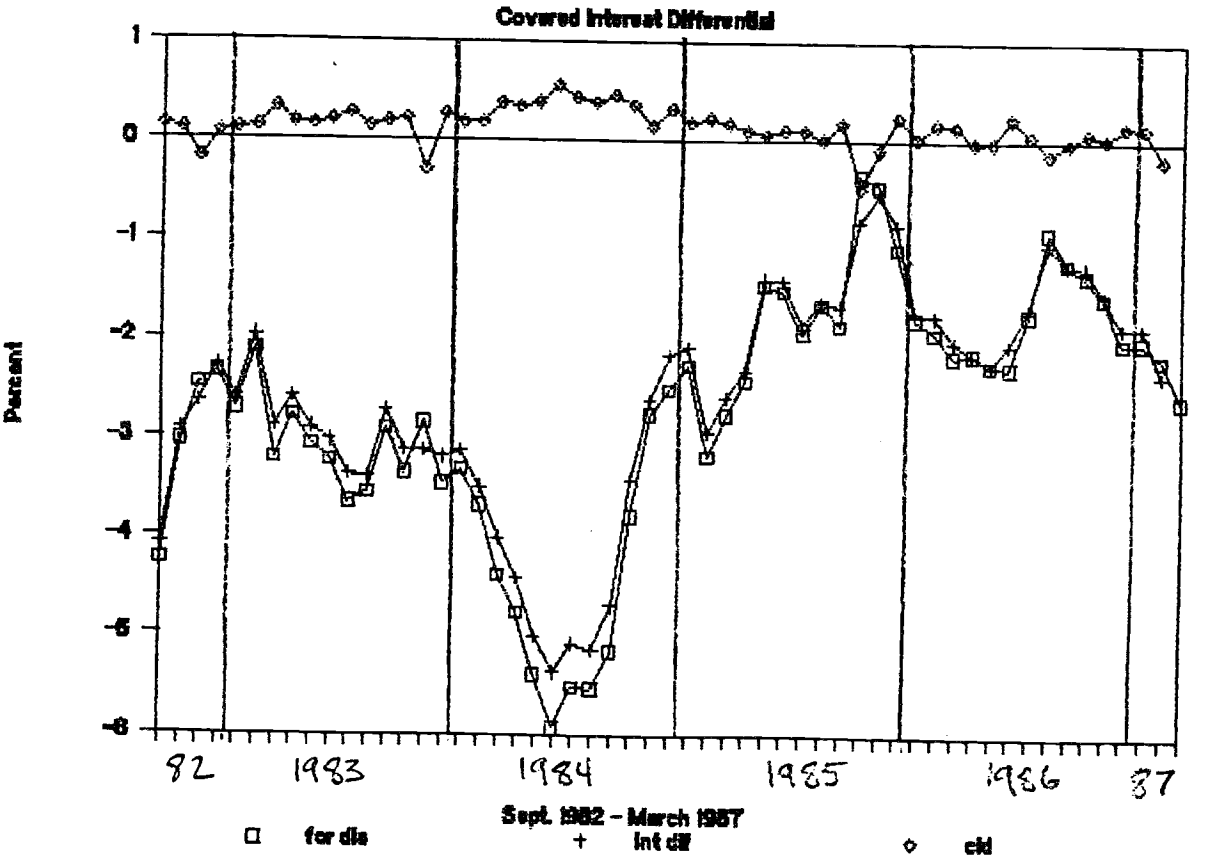
Japan has a covered differential that by all measures is smaller than Switzerland and Germany, let alone France and the smaller European countries. This might come as a surprise to those accustomed to thinking of Japanese financial markets in terms of the large barriers to capital inflow that were in place in the 1970s. The liberalization of Japanese markets, which has been documented elsewhere, continued during our sample period.[14] Although foreign residents have been free to hold many Japanese assets since 1979, such as the three-month Gensaki upon which most tests of covered interest parity (including ours) are based, calculations using the interest rate on Japanese certificates of deposit (not reported) show that liberalization in this market did not occur until April 1985.

The covered interest differential for France is much larger and more variable than that for the other major industrialized countries known to be free of capital controls. In the cases of Switzerland and the Netherlands in particular, this is the reverse of the finding from the criterion of real interest differential in Table 1. It supports the value of the cri-

France



Japan



terion of covered interest differentials as the proper test of financial market integration. The differential, with its negative sign signifying controls on French capital outflows, has been previously studied, especially its tendency to shoot up shortly before devaluations of the franc.[15] But our data indicates that the last major occurrence of this phenomenon was February 1986; since then the differential has been close to zero. Similarly, the same phenomenon that has been observed for Italy (e.g., Giavazzi and Pagano, 1985) appears to have ended after the March 22 1983 EMS realignment. Indeed the differential, which was zero by the time Giavazzi and Pagano's sample period ended in late 1984, turned suddenly positive in 1985. One possible explanation is that beginning in 1985 investor preferences shifted toward holding lira assets, and that existing controls prevented sufficient inflow to equalize lira interest rates. But a contrary possibility must be noted: in situations when -- on the basis of either large domestic or international indebtedness, political instability or a past history of controls on outflow -- one might a priori expect the local environment to be risky (i.e., riskier than the Eurodollar market), an observed positive differential might not be attributable to existing controls on inflow. In such circumstances a positive differential might be attributable rather to the risk of <u>future</u> controls on <u>outflow</u>, or of default or other penalty. The higher interest rate onshore than offshore is then the compensation necessary to induce investors voluntarily to hold risky local assets. This sort of default risk premium is more familiar in the context of long-term bonds and loans than with the three-month deposits studied here, but there is no reason why it could not apply.[16] A similar ambiguity pertains to Belgium as to Italy; the mean of the differential is positive, but its lack of statistical significance

suggests that it might be an equilibrium rate of return (we are using the Belgian financial franc exchange rate rather than the commercial franc rate) and not a sign of barriers (even small ones) to capital inflow as in Germany.

Registering impressively open markets are our three East Asian LDCs. Hong Kong and Singapore show smaller covered interest differentials even than some open industrialized countries like Germany and Switzerland. Malaysia's differential is considerably higher, but still compares favorably with most European countries.[17] Similarly, Australia and New Zealand, both of which have begun to liberalize their financial markets, lie in the middle ground. In the case of Australia there is evidence of the liberalization within the sample period: the frequently large negative covered differential that had been observed up to mid 1983[18] largely vanished thereafter.

Not surprisingly, our remaining LDCs, Mexico, Greece, Bahrain and South Africa, show by far the largest and most variable covered interest differentials. (Bahrain[19] shows a smaller differential than the others, and even than some of the European countries with controls, like Denmark, Norway and Spain.) Again, the results are precisely what one would expect if covered interest differentials are the proper criterion for capital mobility, but precisely the reverse of what the saving-investment criterion shows.

6. Currency Factors, Represented by the Real Forward Discount

Table 4 reports the statistics for the other part of the real interest differential, the real forward discount. In addition to the sta-

Table 4a: Real Forward Discount (ex post)

Forward Discount Less Inflation Differential
Sept. 1982 - Oct. 1986

In Percent p.a.

	# of Obs	Sample Mean (1)	Standard Error Of Mean*	t Prob Mean <> zero	Sample+ Standard Deviation (2)	Root Mean Squared Error (3)	95% Band** (4)
Open Atlantic DCs							
Canada	49	-0.23	0.48	0.36	1.96	1.97	4.03
Germany	50	-2.18	0.69	0.99	2.81	3.57	6.63
Netherlands	49	-1.99	0.80	0.98	3.23	3.81	6.46
Switzerland	50	-3.80	0.83	1.00	3.38	5.11	8.91
United Kingdom	50	-0.15	0.85	0.14	3.46	3.46	5.97
Group	248	-1.67	0.33	1.00	3.00	3.70	
Open Asian LDCs							
Hong Kong	50	-2.88	1.25	0.96	5.11	5.88	12.17
Malaysia	48	2.45	1.27	0.93	5.09	5.66	10.26
Singapore	50	0.28	0.87	0.24	3.56	3.57	7.10
Group	148	-0.09	0.66	0.55	4.61	5.10	
Closed LDCs							
Bahrain	49	5.13	1.21	1.00	4.91	7.13	12.26
Greece	50	0.32	2.35	0.10	9.60	9.61	16.67
Mexico	43	4.10	3.60	0.72	13.62	14.24	24.49
South Africa	50	-2.44	3.02	0.57	12.35	12.59	15.42
Group	192	1.67	1.31	0.90	10.47	11.03	
Other European DCs							
Austria	49	-1.14	0.92	0.77	3.71	3.88	7.75
Belgium	50	-0.24	0.70	0.26	2.85	2.86	5.00
Denmark	50	-0.57	1.12	0.38	4.58	4.62	7.12
France	50	0.88	0.63	0.82	2.57	2.72	3.99
Ireland	48	0.60	1.26	0.36	5.02	5.06	6.93
Italy	48	-1.33	0.89	0.84	3.57	3.81	7.29
Norway	50	0.40	0.72	0.41	2.95	2.98	5.67
Spain	50	2.14	1.33	0.87	5.45	5.86	10.45
Sweden	50	-0.42	1.13	0.28	4.60	4.62	8.14
Group	445	0.04	0.33	0.55	4.00	4.13	
Liberalizing Pacific DCs							
Australia	49	1.16	1.02	0.73	4.13	4.29	6.75
Japan	49	-1.19	0.80	0.84	3.24	3.46	6.24
New Zealand	50	2.04	2.59	0.56	10.56	10.76	15.58
Group	148	0.68	0.97	0.76	6.80	6.96	
All Countries	1181	0.01	0.29	0.51	5.83	6.19	

*See Table 2a for notes.

Table 4b: Real Forward Discount (ex ante)

Forward Discount Less Predicted Relative Inflation
Sept. 1982 - Oct. 1986
Percent p.a.

	Standard Deviation* of Projected Real For. Dis. (8)
Open Atlantic DCs	
Canada	0.59
Germany	1.36
Netherlands	1.90
Switzerland	2.01
United Kingdom	2.18
Group	1.70
Open Asian LDCs	
Hong Kong	1.68
Malaysia	3.01
Singapore	0.62
Group	1.88
Closed LDCs	
Bahrain	2.13
Greece	4.85
Mexico	4.17
South Africa	11.72
Group	6.78
Other European DCs	
Austria	1.45
Belgium	1.57
Denmark	2.48
France	1.60
Ireland	4.37
Italy	1.80
Norway	0.84
Spain	3.62
Sweden	2.78
Group	2.49
Liberalizing Pacific DCs	
Australia	2.21
Japan	1.48
New Zealand	5.35
Group	3.44
All Countries	3.51

*Group standard deviations calculated with deviations around each country's mean.

tistics using ex post inflation rates, the last column reports the variability of the ex ante real forward discount, with the inflation rates projected on the same three variables as in Table 2b.[20] It is clear why some of the countries that have highly open capital markets by the covered interest parity definition — i.e., no barriers to the flow of capital across political boundaries per se — nevertheless exhibit significant deviations from real interest parity. The currency premium is the difference.

Germany, Japan, the Netherlands and Switzerland, for example, all have substantial real forward discounts, $fd - (\pi - \pi^*)$, which constitute approximately the entirety of their real interest differentials, $i - i^* - (\pi - \pi^*)$.[21] These are countries with currencies that have experienced a lot of exchange rate variability, both nominal and real, vis-a-vis the dollar since 1973, and especially since 1980.[22] As a consequence, some combination of exchange risk premiums and expected real depreciation -- factors pertaining to the currency, not to political jurisdiction -- produces the gap in real interest rates. For these four financially-open industrialized countries, and for Hong Kong as well, the currency factors produce a negative real differential even though the covered interest differential is positive: the small controls or frictions that remain are, if anything, working to resist capital inflow into these countries, not outflow as one would mistakenly conclude from the real interest differential criterion. The other countries all have highly variable currency premiums as well. Indeed, the real forward discount (currency premium) is more variable than the covered interest differential (political premium) for all but five of our countries (France, Greece, Italy, Mexico and Norway). The last row of Tables 4a and 2a shows that the average

variability across all 24 countries is higher for the real forward discount than for the covered interest differential.

Thus many of our countries, such as Canada, the United Kingdom and Germany, apparently can borrow abroad if they wish to, without having to pay a substantial country risk premium, contrary to the Darby sentence quoted in section 3. The only qualifications are that (1) they might have to issue the debt in foreign currency to be sure of paying no exchange risk premium, $fd - \Delta s^e$, and (2) the borrowing may force the real interest rate above world levels nevertheless, if it is associated with expected future real depreciation of the currency,

$\Delta s^e - (\pi - \pi^*)$.

7. Further Decomposition into Exchange Risk Premium and Expected Real Depreciation

Our decomposition so far has lumped two terms, the exchange risk premium and expected real depreciation, together into the currency premium:

$$fd - \pi + \pi^* = (fd - \Delta s^e) + (\Delta s^e - \pi + \pi^*) .$$

In this section we attempt to complete the decomposition by separating these two terms. To do so requires a measure or model of expected depreciation Δs^e_t. The usual approach is to use the ex post changes in the spot rate Δs_{t+1} and argue that under rational expectations the expectational error $\varepsilon_{t+1} \equiv \Delta s_{t+1} - \Delta s^e_t$ should be random (uncorrelated with information currently available at time t).

Column (1) of Table 5a reports the mean value of $fd_t - \Delta s_{t+1}$ for each of our countries. Any study of bias in the forward rate that is unfor-

tunate enough to use data from the early 1980s alone would show almost all currencies paying negative exchange risk premiums vis-a-vis the dollar, to a degree that appeared statistically significant even on a few years of data. This is just another way of saying that until 1985 the dollar systematically appreciated against other currencies to an extent not forecast by their forward rates. But our sample now includes data through 1987, including two years of dollar depreciation against the other major currencies. Most of the means are positive, showing that the strong dollar period dominates. (The exceptions, currencies that depreciated at a more rapid rate against the dollar than the forward discount, were the Canadian dollar, Hong Kong dollar, Singapore dollar, Saudi Arabian riyal, South African rand, and Australian dollar.) But the Saudi riyal is the only one that shows a statistically significant mean risk premium of either sign.[22] Furthermore the sign is usually the opposite of the sign of the mean real interest differential during the same period (Table 2a, column (1)), i.e., this measure of the mean return differential does not explain any positive part of the mean real interest differential.

The measures of variability of $fd_t - \Delta s_{t+1}$, which show up very large in columns (2), (3) and (4), are measures of the variability of ex post return differentials, not ex ante. They tell us little about the variability of the exchange risk premium. But the second moments do tell us two things. First, they provide an obvious explanation -- low power -- why the first moments might not be statistically significant. The magnitude of the error term is widely agreed to be much larger than the magnitude of the error term in forecasting inflation, or than the magnitude of the forward discount or exchange risk premium, making it more difficult in

Table 5a: Exchange Risk Premium (ex post)

Forward Discount Less Exchange Depreciation
Sept. 1982 - Dec. 1986

In Percent p.a.

	# of Obs	Sample Mean (1)	Standard Error Of Mean*	t Prob Mean <> zero	Sample+ Standard Deviation (2)	Root Mean Squared Error (3)	95% Band** (4)
Open Atlantic DCs							
Canada	52	-0.56	2.10	0.21	8.74	8.76	16.95
Germany	52	3.93	6.37	0.45	26.53	26.83	44.23
Netherlands	52	3.78	6.52	0.43	27.13	27.39	44.91
Switzerland	52	3.47	6.70	0.39	27.88	28.10	46.77
United Kingdom	52	0.10	6.65	0.01	27.67	27.67	41.59
Group	260	2.15	2.64	0.79	24.54	24.71	
Open Asian LDCs							
Hong Kong	52	-4.11	2.86	0.83	11.92	12.62	25.91
Malaysia	52	0.27	2.56	0.08	10.68	10.68	19.93
Singapore	52	-1.25	2.44	0.38	10.15	10.23	18.76
Group	156	-1.70	1.51	0.87	10.87	11.15	
Closed LDCs							
Greece	52	0.99	6.42	0.12	26.72	26.74	46.22
Mexico	43	6.42	13.34	0.36	50.50	50.92	89.54
Saudi Arabia	52	-1.78	0.74	0.97	3.07	3.56	5.94
South Africa	52	-5.65	11.16	0.38	46.48	46.83	84.13
Group	199	-0.30	4.40	0.53	35.83	36.09	
Other European DCs							
Austria	52	6.69	6.35	0.69	26.44	27.29	49.09
Belgium	52	7.61	5.87	0.79	24.46	25.64	44.75
Denmark	52	7.08	5.94	0.75	24.72	25.73	43.91
France	52	7.41	6.05	0.76	25.20	26.29	42.98
Ireland	52	6.27	6.16	0.68	25.66	26.43	45.23
Italy	52	6.40	5.28	0.76	21.98	22.91	37.05
Norway	52	4.84	5.42	0.62	22.55	23.07	39.30
Spain	52	6.08	5.31	0.73	22.10	22.94	31.71
Sweden	52	5.11	5.07	0.67	21.10	21.72	39.05
Group	468	6.39	1.89	1.00	23.66	24.53	
Liberalizing Pacific DCs							
Australia	52	-2.06	8.40	0.19	34.96	35.02	72.11
Japan	52	10.24	6.06	0.89	25.21	27.25	53.50
New Zealand	52	3.77	9.42	0.31	39.22	39.41	86.97
Group	156	3.98	4.64	0.80	33.43	34.04	
All Countries	1239	3.10	1.30	0.99	26.41	26.90	

*See Table 2a for notes.

Table 5b: Exchange Risk Premium (ex ante)

Forward Discount Less Predicted Exchange Depreciation
Sept. 1982 - Dec. 1986
Percent p.a.

	Regression Coefficients				Standard Deviation* of Projected Exchange RP (8)	F Stat+ (5),(6), (7) = 0	Prob (5),(6), (7)<>0
	Constant	Interest Difference (5)	Forward Discount (6)	1yr Lag Inflation (7)			
Open Atlantic DCs							
Canada	-9.22	3.73	1.45	2.18	6.09	4.42	0.98
Germany	51.06 **	2.48	11.83	-2.23	18.50	9.76	1.00
Netherlands	57.01 **	-35.78	48.66	6.98	21.50	12.75	1.00
Switzerland	50.25	11.91	-1.13	5.73	18.52	5.38	0.99
United Kingdom	-21.61	3.86	4.55	5.75	20.87	9.18	1.00
Group	9.67 **	-5.18	8.91	-5.66	17.86		
Open Asian LDCs							
Hong Kong	1.54	0.14	2.19	-1.79	4.02	1.01	0.58
Malaysia	-2.97	-0.62	1.49	-0.16	3.73	0.85	0.51
Singapore	-14.33	-4.29	1.37	-2.46	2.95	0.67	0.41
Group	-1.92	0.07	0.81	-0.92	3.56		
Closed LDCs							
Greece	-76.22 **	5.79	0.27	3.00	16.13	2.79	0.92
Mexico	-147.73	1.39	-0.79	3.61	27.56	1.53	0.74
Saudi Arabia	-6.84	-0.21	0.83	-0.76	1.29	0.35	0.21
South Africa	-40.60	-1.37	0.21	4.30	14.60	0.52	0.32
Group	-6.03	-0.73	-0.28	1.31	17.02		
Other European DCs							
Austria	34.27 **	7.99 **	5.63	-13.41 **	20.57	14.61	1.00
Belgium	16.35 **	0.73	4.75	-7.60 **	14.89	5.06	0.99
Denmark	36.24 **	8.57	-0.22 **	-4.55 **	15.43	8.51	1.00
France	18.80	12.37	-1.45	-8.42	12.90	2.92	0.93
Ireland	20.90	0.88	0.84	-5.55 **	15.19	3.86	0.97
Italy	1.45	5.70	-0.68	-4.14	10.56	2.29	0.88
Norway	-11.07	-0.86	6.49 **	-2.96	11.17	5.03	0.99
Spain	63.65 **	3.56	-0.43	-11.51 **	11.98	2.12	0.86
Sweden	-24.63	24.82 **	-14.14 **	1.06	16.41	6.79	1.00
Group	15.48	2.56	0.75	-4.91	14.51		
Liberalizing Pacific DCs							
Australia	-24.69	2.85	-1.43	4.39	14.04	1.09	0.61
Japan	40.52	-12.20	20.58	3.43	13.30	1.91	0.83
New Zealand	-29.73	2.89	-1.37	4.02	21.93	3.45	0.95
Group	0.12	1.70	-2.02	2.34	16.77		
All Countries	2.98	0.99	-0.27	-0.33	15.20		

*Group standard deviations calculated with deviations around each country's mean.
**Different from zero with 95% confidence.
+F statistics calculated with non-overlapping observations.

Table 5c: Exchange Risk Premium (ex ante)

Forward Discount Less Forecast Exchange Depreciation
SUR on Groups using Non-Overlapping Data
Sept. 1982 - Dec. 1986
Percent p.a.

	# of Obs	Regression Coefficients: Constant	Interest Difference (5)	Forward Discount (6)	1yr Lag Inflation (7)	Standard* Deviation of Projected Exchange RP (8)	F Stat (5),(6), (7) = 0	Prob (5),(6), (7)<>0
Open Atlantic DCs								
Canada	18	-5.35	-16.01	18.99	1.19	6.12	5.94	1.00
Germany	18	40.55**	-3.05	14.21	-3.92	16.71	10.25	1.00
Netherlands	18	30.82**	2.78	7.29	-3.02	18.11	14.08	1.00
Switzerland	18	36.68**	9.75	-1.36	-0.69	14.90	5.24	1.00
United Kingdom	18	-17.34	50.00	-39.16	4.07	19.90	11.53	1.00
Group	90	+	-7.84	14.07	0.83	15.89	26.41	1.00
Open Asian LDCs								
Hong Kong	18	3.04	-9.89	12.75	-0.53	6.29	6.69	1.00
Malaysia	15	0.80	2.04	-0.03	0.86	3.53	0.96	0.58
Singapore	18	6.94	7.60	-3.88	0.22	3.10	0.70	0.44
Group	51	+	2.50	0.06	-0.43	4.58	6.32	1.00
Closed LDCs								
Greece	18	-83.87	4.98	1.23	2.87	19.70	1.55	0.78
Mexico	15	-96.94	-1.68	-0.22	4.09**	31.67	2.12	0.89
Saudi Arabia	16	-4.62	0.22	-1.32	-0.44	1.31	0.86	0.53
South Africa	17	-17.90	6.31	-4.62	-1.83	9.61	0.19	0.10
Group	33	+	-0.09	0.07	-0.21	18.92	0.05	0.01
Other European DCs								
Austria	18	26.86**	6.69**	1.87	-7.88**	14.12	16.24	1.00
Belgium	18	11.50**	-0.21	4.57	-4.42**	9.59	7.08	1.00
Denmark	18	24.82**	4.70**	1.72	-4.39**	11.51	9.89	1.00
France	18	9.07	5.75	-0.20	-3.41	5.50	2.13	0.90
Ireland	18	0.37	2.99	1.13	-2.52	13.47	7.00	1.00
Italy	18	4.89	2.57	0.26	-2.39	4.32	1.13	0.66
Norway	18	-8.85	-0.29	3.99**	-0.84	7.80	3.20	0.97
Spain	18	27.61	1.83	0.31	-5.40	6.06	1.57	0.80
Sweden	18	-20.80	17.36**	-8.40	0.46	13.87	8.64	1.00
Group	162	+	1.88**	1.05**	-1.13	10.24	12.01	1.00
Liberalizing Pacific DCs								
Australia	18	-24.56	-1.03	2.16	4.19	15.53	0.98	0.58
Japan	18	33.09	-23.84	32.20	-4.96	13.19	1.94	0.86
New Zealand	18	-6.61	6.67	-5.17	1.72	23.15	3.39	0.97
Group	54	+	5.51	-3.63	2.28	17.81	3.49	0.98

*Group standard deviations calculated with deviations around each country's mean.
+Used a separate intercept for each country.

**Different from zero with 95% confidence.

Table 6a: Real Exchange Depreciation (ex post)

Exchange Depreciation Less Inflation
Sept. 1982 - Oct. 1986

In Percent p.a.

	# of Obs	Sample Mean (1)	Standard Error Of Mean*	t Prob Mean <> zero	Sample+ Standard Deviation (2)	Root Mean Squared Error (3)	95% Band** (4)
Open Atlantic DCs							
Canada	49	1.60	1.87	0.59	7.56	7.73	15.16
Germany	50	-5.20	6.30	0.58	25.72	26.25	44.98
Netherlands	49	-3.90	6.29	0.46	25.42	25.72	43.76
Switzerland	50	-6.46	6.57	0.66	26.82	27.61	45.68
United Kingdom	50	1.15	6.57	0.14	26.81	26.83	47.21
Group	248	-2.57	2.59	0.84	23.52	23.89	
Open Asian LDCs							
Hong Kong	50	1.29	2.86	0.34	11.67	11.74	24.40
Malaysia	48	3.49	2.80	0.77	11.22	11.76	22.26
Singapore	50	1.85	2.79	0.48	11.38	11.53	20.78
Group	148	2.19	1.62	0.91	11.35	11.60	
Closed LDCs							
Bahrain	49	7.11	1.57	1.00	6.33	9.58	17.18
Greece	50	0.55	6.20	0.07	25.31	25.32	45.95
Mexico	50	0.17	12.42	0.01	50.72	50.72	88.17
South Africa	50	4.63	12.47	0.28	50.89	51.11	99.29
Group	199	3.10	4.67	0.75	38.02	38.26	
Other European DCs							
Austria	49	-5.98	6.35	0.64	25.65	26.36	42.21
Belgium	50	-6.68	5.71	0.75	23.30	24.31	44.90
Denmark	50	-6.57	5.86	0.72	23.93	24.83	40.66
France	50	-5.74	6.12	0.64	25.00	25.66	42.25
Ireland	48	-3.26	6.12	0.40	24.48	24.71	43.44
Italy	48	-6.30	5.86	0.70	23.43	24.28	41.43
Norway	50	-3.08	5.41	0.42	22.10	22.32	37.93
Spain	50	-3.39	5.65	0.44	23.07	23.32	38.87
Sweden	50	-4.57	4.55	0.67	18.56	19.13	33.19
Group	445	-5.09	1.90	1.00	23.14	23.74	
Liberalizing Pacific DCs							
Australia	49	4.98	8.90	0.42	35.98	36.33	70.91
Japan	49	-10.62	6.36	0.88	25.70	27.85	52.99
New Zealand	50	-0.01	9.82	0.00	40.09	40.09	85.06
Group	148	-1.87	4.88	0.65	34.27	34.93	
All Countries	1188	-1.88	1.35	0.92	26.79	27.23	

*See Table 2a for notes.

Table 6b: Real Exchange Depreciation (ex ante)

Predicted Exchange Depreciation Less Predicted Relative Inflation
Sept. 1982 - Oct. 1986
Percent p.a.

	Regression Coefficients				Standard Deviation* of Projected Real Ex. Dep (8)	F Stat+ (5),(6), (7) = 0	Prob (5),(6), (7)<>0
	Constant	Interest Difference (5)	Forward Discount (6)	1yr Lag Inflation (7)			
Open Atlantic DCs							
Canada	8.85 **	-5.13	0.72	-2.13	4.99	3.98	0.97
Germany	-51.28 **	-2.43	-11.33	2.58	17.07	7.87	1.00
Netherlands	-55.14 **	26.87	-39.23	-6.79	18.88	10.06	1.00
Switzerland	-48.40 **	-13.40	3.60	-5.06	16.47	3.55	0.95
United Kingdom	18.33	-7.87	-0.26	-3.91	18.36	4.94	0.98
Group	-8.70	3.20	-6.10	5.03	15.89		
Open Asian LDCs							
Hong Kong	-2.90	1.51	-2.70	1.34	2.93	0.88	0.52
Malaysia	5.53	0.49	-0.21	0.32	0.61	0.96	0.55
Singapore	15.79	3.21	0.03	2.69	3.28	0.56	0.35
Group	2.04	-1.03	1.06	0.28	2.66		
Closed LDCs							
Bahrain	19.54	0.68	0.28	1.93	2.53	0.84	0.50
Greece	57.02	-6.30	0.38	-2.07	13.43	1.07	0.60
Mexico	131.24	-1.37	1.11	-3.53	28.16	1.72	0.78
South Africa	41.20	0.71	0.79	-5.00	18.41	0.55	0.34
Group	6.32	0.37	0.90	-1.71	17.62		
Other European DCs							
Austria	-31.52 **	-6.84	-5.01 **	14.31 **	19.02	10.75	1.00
Belgium	-14.79	-1.97	-3.20	6.66 **	12.84	3.36	0.94
Denmark	-37.24 **	-7.65	0.54	5.79 **	14.89	8.60	1.00
France	-18.88	-11.83	1.82	8.00 **	12.13	2.17	0.86
Ireland	-18.43	-1.25	0.36	4.45	10.78	2.41	0.88
Italy	0.50	-5.96	1.24	3.63	11.36	1.90	0.82
Norway	12.64	-9.00	1.76	1.66	10.72	2.87	0.92
Spain	-70.01 **	-2.87	0.67	12.09 **	13.75	2.22	0.87
Sweden	21.14	-20.30 **	11.54	-1.33	13.58	5.32	0.99
Group	-15.82	-3.27	0.29	4.75	13.34		
Liberalizing Pacific DCs							
Australia	23.72	-3.12	2.14	-4.40	12.44	0.73	0.45
Japan	-37.88	9.69	-17.33	-2.68	11.92	1.32	0.69
New Zealand	24.16 **	-4.83	2.85	-2.54	18.83	2.65	0.91
Group	-0.44	-2.58	2.89	-1.82	14.67		
All Countries	-2.00	-1.14	0.94	-0.28	14.12		

*Group standard deviations calculated with deviations around each country's mean.
**Different from zero with 95% confidence.
+F statistics calculated with non-overlapping observations.

general to identify statistically significant elements of $fd_t - \Delta s_{t+1}$. Mishkin (1984b, 1353-54) notes how, even though the real interest differential is highly significant statistically, the high variance of ε makes it difficult to separate out the exchange risk premium in a statistically significant way. On the other hand, the existence of large uncertainty regarding the future spot rate suggests, via the theory of optimal portfolio diversification, that a non-zero exchange risk premium must exist, to reward risk-averse investors for holding currencies that are perceived as risky or that are in oversupply.[23]

To estimate ex ante returns, in Table 5b we project $fd_t - \Delta s_{t+1}$ onto the forward discount, the interest differential, and the one-year lagged inflation rate, the same variables as in the earlier regressions. Monetary models of exchange rate determination give us reasons why any one of these three variables, when considered alone, might be a useful predictor of changes in the spot rate. The general principle of efficient foreign exchange markets, jointly with the absence of an exchange risk premium, would imply that no predictable component of spot rate changes should remain beyond the forward discount. But many previous studies of bias in the forward rate have found statistically significant results by conditioning on the forward discount itself. The null hypothesis of unbiasedness is a zero coefficient on the forward discount, but most studies find a coefficient closer to one, which would indicate that the spot rate follows a random walk (the rationally expected rate of depreciation is zero), and all of the forward discount is an exchange risk premium. Some studies even get a coefficient greater than one.

The regressions appear statistically significant by an F test at the 95 percent level for 12 of the 24 countries (though it is usually not a

Table 6c: Real Exchange Depreciation (ex ante)

Forecast Exchange Depreciation Less Forecast Relative Inflation
SUR on Groups using Non-Overlapping Data
Sept. 1982 - Oct. 1986
Percent p.a.

	# of Obs	Regression Coefficients: Constant	Interest Difference (5)	Forward Discount (6)	1yr Lag Inflation (7)	Standard* Deviation of Projected Real Ex. Dep (8)	F Stat (5),(6), (7) = 0	Prob (5),(6), (7)<>0
Open Atlantic DCs								
Canada	18	5.00	9.30	-11.38	-1.13	4.22	4.45	0.99
Germany	18	-40.53 **	1.11	-11.99	4.84	16.43	8.40	1.00
Netherlands	18	-29.22 **	-8.69	-0.81	4.01	16.97	10.52	1.00
Switzerland	18	-35.78 **	-13.58	5.81	0.57	13.46	3.72	0.98
United Kingdom	18	12.42	-63.68	52.27	-0.98	17.89	7.20	1.00
Group	90	+	4.15	-8.20	-0.97	14.68	12.33	1.00
Open Asian LDCs								
Hong Kong	18	-5.00	12.35	-15.51	0.59	7.15	7.94	1.00
Malaysia	15	-0.57	-3.69	3.18	-0.57	3.75	0.52	0.33
Singapore	18	-10.05	-12.67	8.04	-1.07	4.84	1.05	0.61
Group	51	+	-4.91	2.24	0.30	5.52	4.32	0.99
Closed LDCs								
Bahrain	16	18.72 **	0.15	3.45	1.85	4.22	2.02	0.87
Greece	18	48.90	-7.95	-0.37	-0.03	15.86	1.20	0.68
Mexico	15	104.84	1.50	0.40	-4.26 **	32.93	2.35	0.91
South Africa	17	7.83	-10.45	8.47	3.06	15.96	0.57	0.36
Group	66	+	0.45	0.17	-0.40	19.62	0.16	0.08
Other European DCs								
Austria	18	-32.85 **	-8.66	-0.95 **	8.08 **	15.88	16.52	1.00
Belgium	18	-10.04	-4.99	-0.69	4.55 **	9.67	8.56	1.00
Denmark	18	-30.81 **	-5.41 **	-0.72	5.94 **	12.77	14.79	1.00
France	18	-7.64	-10.66	1.40	4.52 **	7.95	6.54	1.00
Ireland	18	-6.93	13.23 **	-15.69 **	2.26 **	60.62	25.61	1.00
Italy	18	7.16	-4.71 **	0.75	1.86	6.80	3.39	0.98
Norway	18	17.06	-3.48	-2.57	0.09	10.93	4.39	0.99
Spain	18	-33.86	-1.67	-0.37	6.78 **	7.34	2.62	0.94
Sweden	18	27.66 **	-14.26 **	6.82	-3.09	11.98	8.38	1.00
Group	162	+	-3.17 **	0.32	1.63 **	22.52	10.97	1.00
Liberalizing Pacific DCs								
Australia	18	20.52	5.46	-5.78	-3.11	14.31	0.75	0.47
Japan	18	-26.74	27.51	-34.88	8.18	12.31	1.52	0.78
New Zealand	18	3.41	-7.71	6.37 **	-1.36	24.89	2.86	0.95
Group	54	+	-6.10	4.51	-2.51	18.04	2.74	0.94

*Group standard deviations calculated with deviations around each country's mean.
+Used a separate intercept for each country.
**Different from zero with 95% confidence.

positive coefficient on the forward discount that gives the explanatory power). This constitutes a rejection of the hypothesis of perfect substitutability (no exchange risk premium), jointly with the rational expectations assumption.[24] We proceed for the moment on the usual assumption that the systematic prediction errors should be interpreted as the exchange risk premium rather than as systematic expectational errors. All the countries that are statistically significant are industrialized countries, confirming the importance of floating exchange rates for exchange risk. In Table 5c we pool observations from the cross section of currencies within each of the five country groups. We use Seemingly Unrelated Regressions to take proper account of the correlation in the error term across currencies. (When, for example, the dollar/Belgian franc rate increases, the dollar/Danish kroner rate often increases at the same time.) We can now reject the joint hypothesis for one additional currency, the Hong Kong dollar, and for all but one of the aggregated country groups.

The standard deviation of the projected exchange risk premium is reported in column (8). It is large, indeed much larger than the standard deviation of the total real interest differential, whether the projections are done country-by-country, in Table 5b, or simultaneously, in Table 5c.

In Table 6 we report the statistics for the other component of the currency premium, expected real depreciation. Given the now widely-accepted failure of purchasing power parity on levels, there is no theoretical reason to expect it necessarily to hold in terms of expected rates of change, a hypothesis sometimes known as ex ante relative purchasing power parity. Nevertheless many previous studies have been unable to reject statistically the hypothesis that the real exchange rate follows a random

walk, which in turn implies, if expectations are rational, that expected real depreciation is zero. Table 6a reports the statistics for unconditional real depreciation. The means in column (1) are negative, indicating real appreciation of the currency against the dollar, for all of the developed countries on the European continent, regardless of financial openness, and for Japan and New Zealand. The LDCs, plus Canada, the United Kingdom and Australia, all depreciated in real terms during our 1982-87 sample period. Most are not statistically significant. But the signs are usually the same as the signs of the mean real interest differentials, suggesting a high correlation of the real interest differential and expected real depreciation across countries. Columns (2)-(4) show very high variability in real depreciation, but again this tells us little about the variation of ex ante expected depreciation, beyond the observation that the high level of variability implies low power in our tests of ex ante relative purchasing power parity.

Table 6b reports the results from conditioning real depreciation on our same three variables. Note that if the nominal exchange rate follows a random walk then the real exchange rate cannot follow a random walk, to the extent that inflation differentials are forecastable. (Of course one can fail statistically to reject both random walk hypotheses due to low power. Indeed this sort of failure is very common.) The regressions appear statistically significant at the 95 percent level in only 8 cases out of 24. The significant countries are all industrialized countries that also showed significant exchange risk premiums: Austria, Canada, Denmark, Germany, Netherlands, Sweden, Switzerland and the United Kingdom.

The specific regression results, if not the finding of some significant countries, may be sensitive to the sample period. The standard

believe that these figures represent the expectations that investors held?

An alternative approach is offered by survey data on the exchange rate expectations of market participants. Three such surveys have been conducted in the 1980s, by American Express, the Economist, and Money Market Services, Inc. The data are analyzed in Frankel and Froot (1985, 1986) and Froot and Frankel (1986).[28] They show that respondents at horizons of 6 and 12 months expect the dollar to regress to PPP (using the 1973-80 average real exchange rate as the base), to a highly significant degree statistically. Table 7 reports results from the Economist data at the six-month horizon. To obtain enough observations, the five exchange rates against the dollar are pooled (mark, yen, pound, French franc and Swiss franc). Rows (1)-(4) show a highly significant expected nominal depreciation in response to gaps from PPP, whether or not we correct for first-order autoregression in the residuals. The expected speed of regression is estimated at .061 to .165 per six-months, or 12-33 percent per annum. This is roughly in the same range as the actual speed of regression to PPP estimated on 116 years of real exchange rate data. Row (5) shows expected real depreciation in response to PPP gaps that is also significant statistically, (though the other Economist six-month data set reported in row (6), from alternate non-overlapping survey dates, is not significant). According to the survey data the expected real depreciation of the dollar in the early 1980s was large enough to explain the entire differential in real interest rates between the United States and its trading partners. This conclusion is consistent with that of the preceding sections, that the large and variable real interest differentials that are still observed among the larger industrialized countries in the 1980s are

deviation of the projected real depreciation (column (8) in table 6 b) is large; as with the projected exchange risk premium, the variability is greater than the variability in the real interest differential.

As noted, many previous studies have failed to reject a random-walk real exchange rate.[25] It has been suggested that this failure reflects the low power of tests based on the short data set available from the floating rate period (fifteen years of data).[26] Frankel (1986) uses 116 years of U.S.-U.K. time series data, and finds a statistically significant tendency of the real exchange rate to regress to purchasing power parity at a rate of 15-30 percent a year. Table 6c musters more data to attack the problem along another dimension, by pooling across countries. Pooling allows a rejection of the null hypothesis in most cases. The significance levels are highest for European countries and remain low for most of the LDCs, suggesting that exchange rate variability makes expected real depreciation an important contributor to real interest differentials for countries on floating exchange rates in particular. This finding supports the claim of McKinnon (1987) that the variability of real exchange rates under the floating-rate regime leads to variability in real interest differentials. He concludes that a more stable exchange rate regime would be more efficient economically.

One possibility is that the entire approach of trying to infer expectations from ex post exchange rate changes has been overdone. From 1981 to 1984 the rate of return on dollar assets was 12 to 18 percent higher than on other major currencies, because the interest differential favored the dollar and yet the dollar persistently appreciated rather than depreciated. The difference was statistically significant.[27] Do we really

not in most cases due to imperfect integration of financial markets across national boundaries.

8. Conclusions Regarding Alternative Measures of Capital Mobility

Measures of capital mobility that are based on rates of return are superior to saving-investment correlations in that they require no assumption about the exogeneity of national saving or of chosen instrumental variables, nor about other parameters such as the sensitivity of investment to the real interest rate. But we saw in section 4 that the real interest differential criterion gives some of the same counterintuitive results as the saving-investment test: it appears to show that, even in the 1980s and even among industrialized countries, capital mobility remains low.

We conclude the paper by seeing what role each of the components of the real interest differential has in explaining the variance of the total. Chart 1 plots the standard deviation of the real interest differential against the standard deviation of the covered interest differential, which we have identified as the political premium. While the political premium does have some explanatory power, the fit is not extremely close (R^2 = .48) and would be even weaker if one were to exclude Mexico, where political risk has increased drastically since August 1982 due to the international debt crisis.

Chart 2 puts the real forward discount, which we have identified as the currency premium, on the horizontal axis. Here the relationship is stronger (R^2 = .76).[29] (The only country that is an outlier is South Africa, another case where it is plausible that political factors should outweigh currency factors.) The currency premium appears to be a more

Table 7: Expected Regression to PPP

Expected Depreciation Δs^e at Six-month Horizon Measured by Economist Survey
(Ordinary Least Squares)

Dependent variable	Dates	Coefficient θ on real overvaluation $(\bar{s}_t - s_t)$	Standard error	t-test for $\theta=0$	D.W.	d.f.	R^2
Δs^e	(1) 6/23/81-3/19/85	.113	(.032)	3.53**	2.55	29	.89
	(2) 9/15/81-12/14/84	.165	(.033)	4.92**	2.56	24	.94
	(3) 6/23/81-11/26/85	.060	(.016)	3.77**	1.32	184	.61
	(4) Same, with AR(1) correction	.078	(.022)	3.54**		179	.58
$\Delta s^e - (\pi - \pi^*)$	(5) 6/23/81-3/19/85	.061	(.025)	2.50**	1.30	22	.91
(Expected inflation from DRI forecasts)	(6) 9/15/81-12/14/84	.038	(.026)	1.46	1.54	18	.06

**Significant at the 99 percent confidence level

Source: Rows (1), (2), (5), (6)--Frankel and Froot (1985). Rows (3), (4)--Frankel and Froot (1987)

Separate dummy variables were estimated for each currency. All estimates of constant terms and dummy variables are omitted to save space. But they, and dates of sample observations, are reported in the earlier working papers. R^2 corresponds to an F test on all non-intercept parameters. DW statistic is the average of the equation-by-equation OLS Durbin-Watson statistic for each of the five currencies.

of integration, especially for Canada, Germany, the Netherlands, Switzerland, the United Kingdom, Belgium, Sweden, Japan, Hong Kong and Singapore. For these countries, currency factors, not political factors, explain virtually the entire real interest differential. In this line, it is highly suggestive that real interest differentials appear to have become more variable after 1973 despite the reduction in political barriers. It is possible that the increase in the saving-investment coefficient after 1973, evident in Table 1 and in earlier studies, is due to this increase in real interest differential variability, which may in turn be due to the change in exchange rate regime as McKinnon (1987) claims.

Even for most of the countries that show significant political premiums, the currency factors dominate. Of the two currency factors, expected real depreciation is as large and variable as the exchange risk premium and appears to be the more important determinant of the real interest differential. To this extent, imperfect integration of goods markets, rather than imperfect integration of financial markets, may be responsible for the failure of real interest rates to be equalized. But this is no reason to change the conclusion that a shortfall of national saving can drive the real interest rate above foreign levels and thereby crowd out investment in the same country.

important determinant of the real interest differential than is the political premium, even though it is the latter variable that measures financial integration across national boundaries.

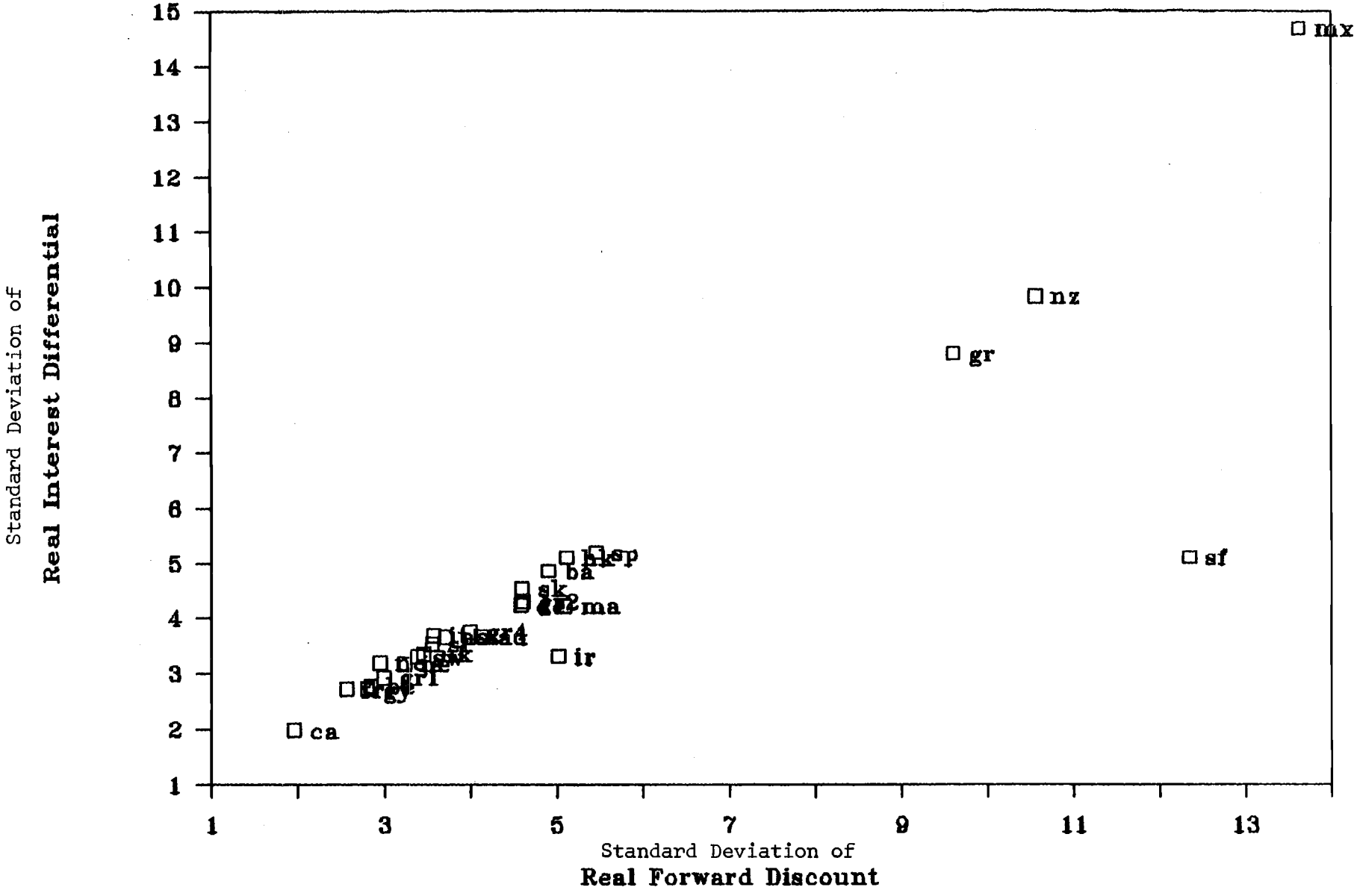
The remaining question is whether the explanatory power of the real forward discount comes from the exchange risk premium or expected real depreciation. Charts 3 and 4 show the measures based on variability of these two (ex ante) differentials, respectively. The question of this decomposition is harder to answer because of the unobservability of exchange rate expectations. But the evidence seems to suggest that expected real depreciation is somewhat more closely related to the real forward discount, and in turn to the real interest differential, than is the exchange risk premium. This is particularly true for the first moments shown in Charts 7 and 8: there is, if anything, a negative relationship between the mean exchange risk premium and the mean real interest differential (both ex post) across countries. But the standard deviations also show a stronger fit for projected real depreciation ($R^2 = .35$) than for the projected exchange risk premium ($R^2 = .03$). Our findings constitute a rejection of the identification by Korajczyk (1985) of the exchange risk premium with the real interest differential; this has also been pointed out by Longworth (1986, p. 16), who reports findings on the importance of expected real depreciation similar to ours.

To repeat our conclusions, the covered interest differential is a better measure of capital mobility -- in the sense of the degree of financial market integration across national boundaries -- not only than saving-investment correlations, but also than real interest differentials. The covered interest differential criterion shows a generally high degree

Chart 2:

Real Interest Differential vs.

Real Forward Discount

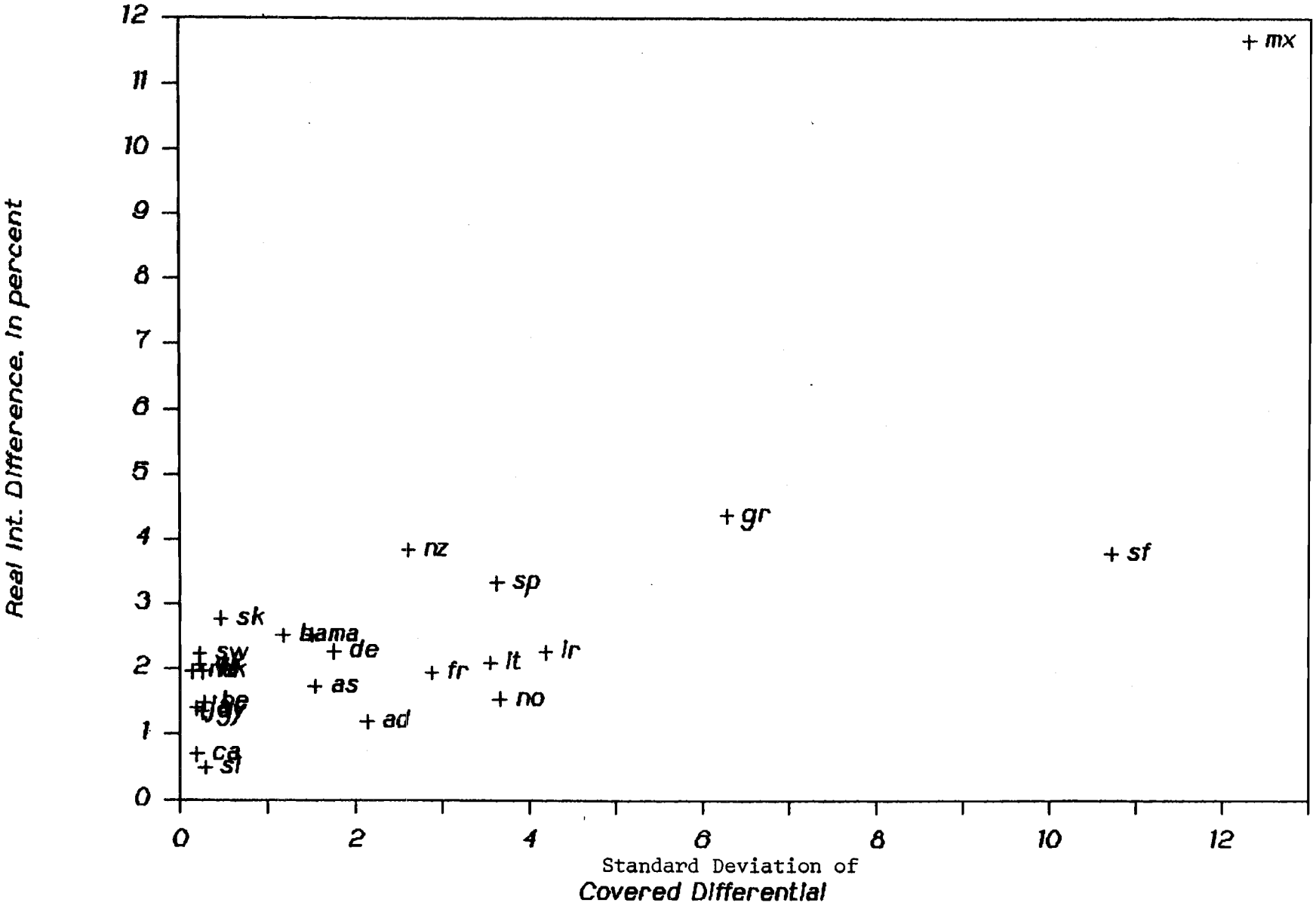


See Table 8 for a key to the country abbreviations.

Chart 1a:

Ex Ante Real Interest Differential vs.

Covered Interest Differential

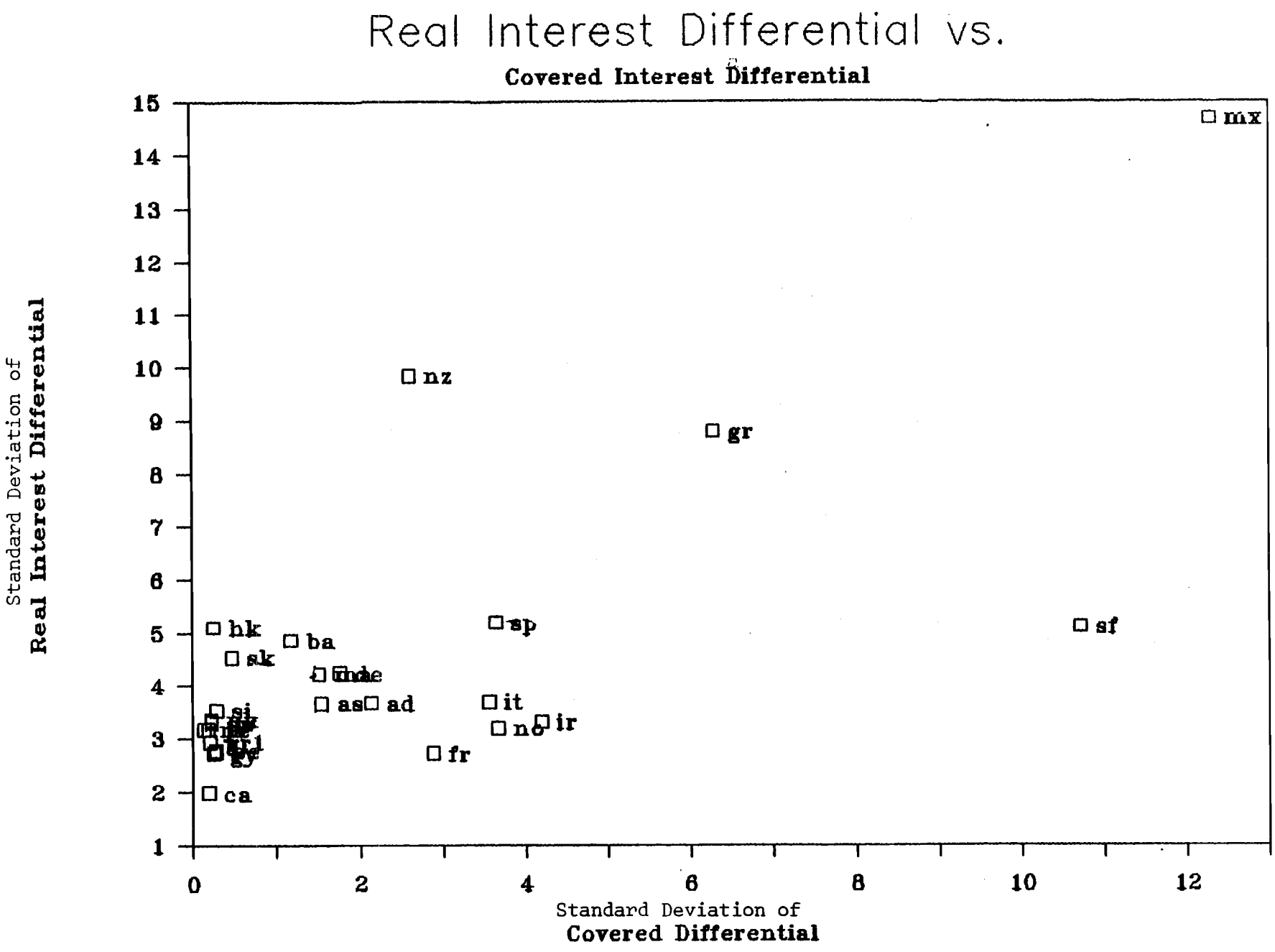


See Table 8 for a key to the country abbreviations.

Table 8: Abbreviations Used On Charts

AD	Australia
AS	Austria
BA	Bahrain
BE	Belgium
CA	Canada
DE	Denmark
FR	France
GY	Germany
GR	Greece
HK	Hong Kong
IR	Ireland
IT	Italy
JA	Japan
MA	Malaysia
MX	Mexico
NE	Netherlands
NZ	New Zealand
NO	Norway
SI	Singapore
SF	South Africa
SP	Spain
SK	Sweden
SW	Switzerland
UK	United Kingdom

Chart 1:

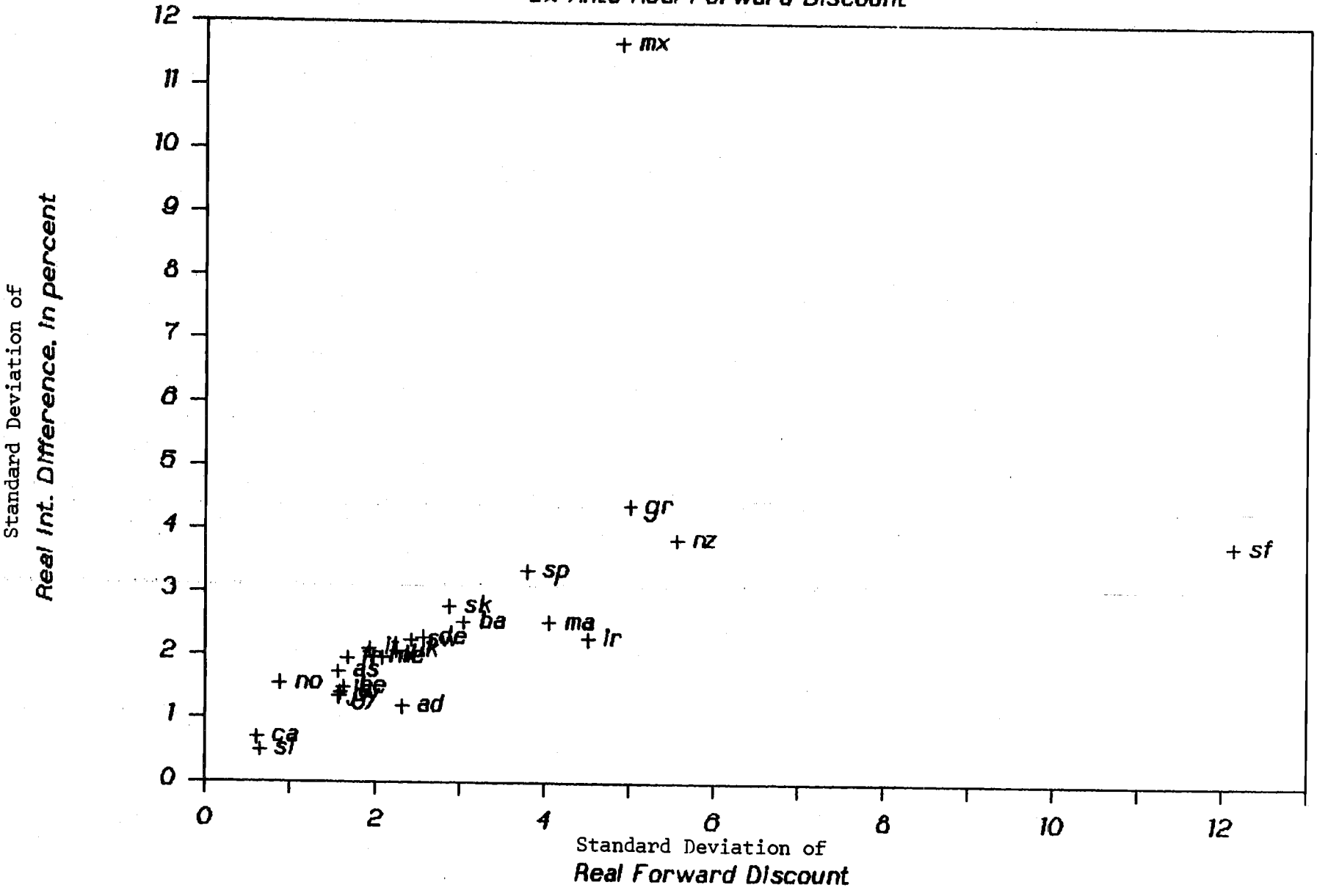


See Table 8 for a key to the country abbreviations.

Chart 2a:

Ex Ante Real Interest Differential vs.

Ex Ante Real Forward Discount

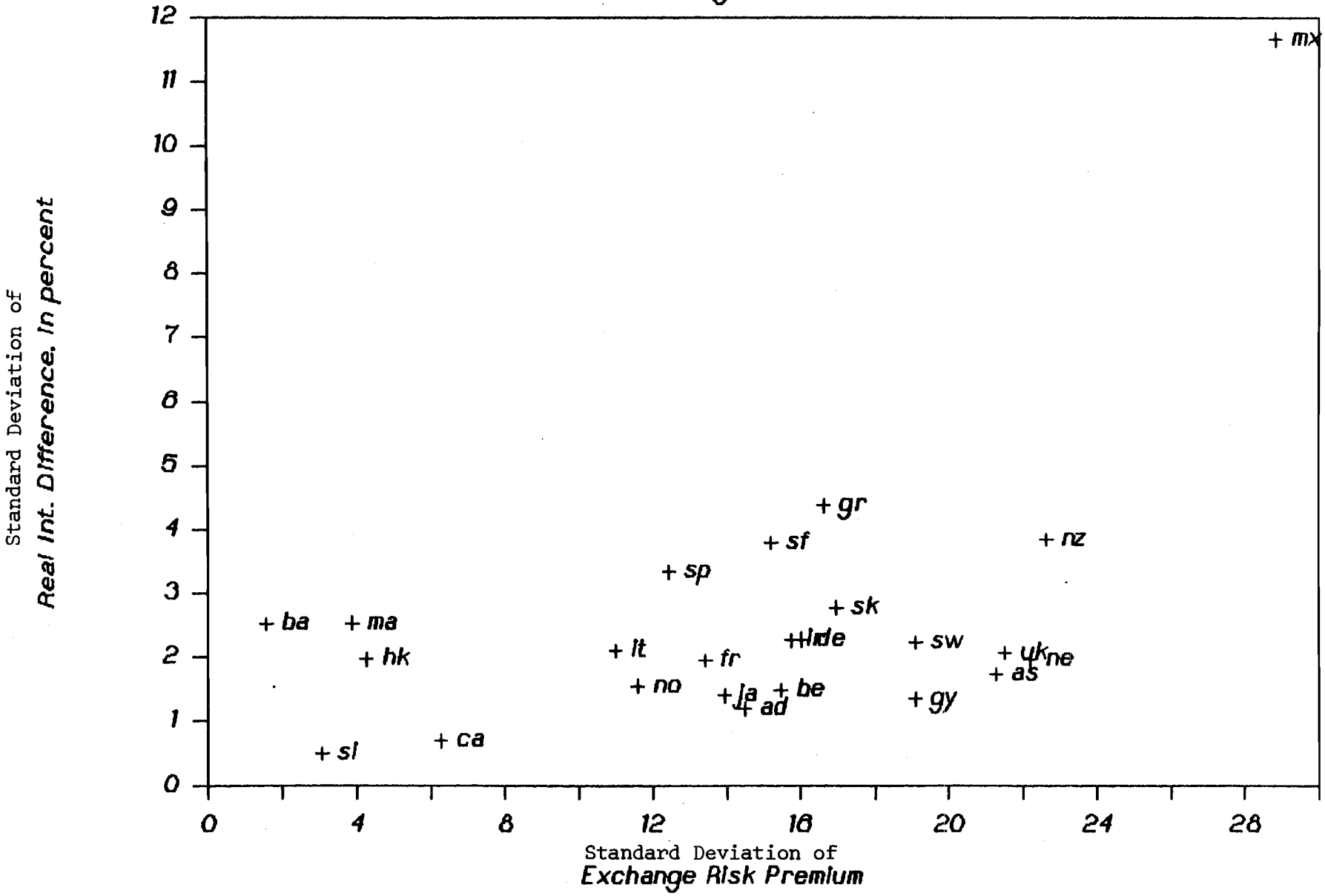


See Table 8 for a key to the country abbreviations.

Chart 3:

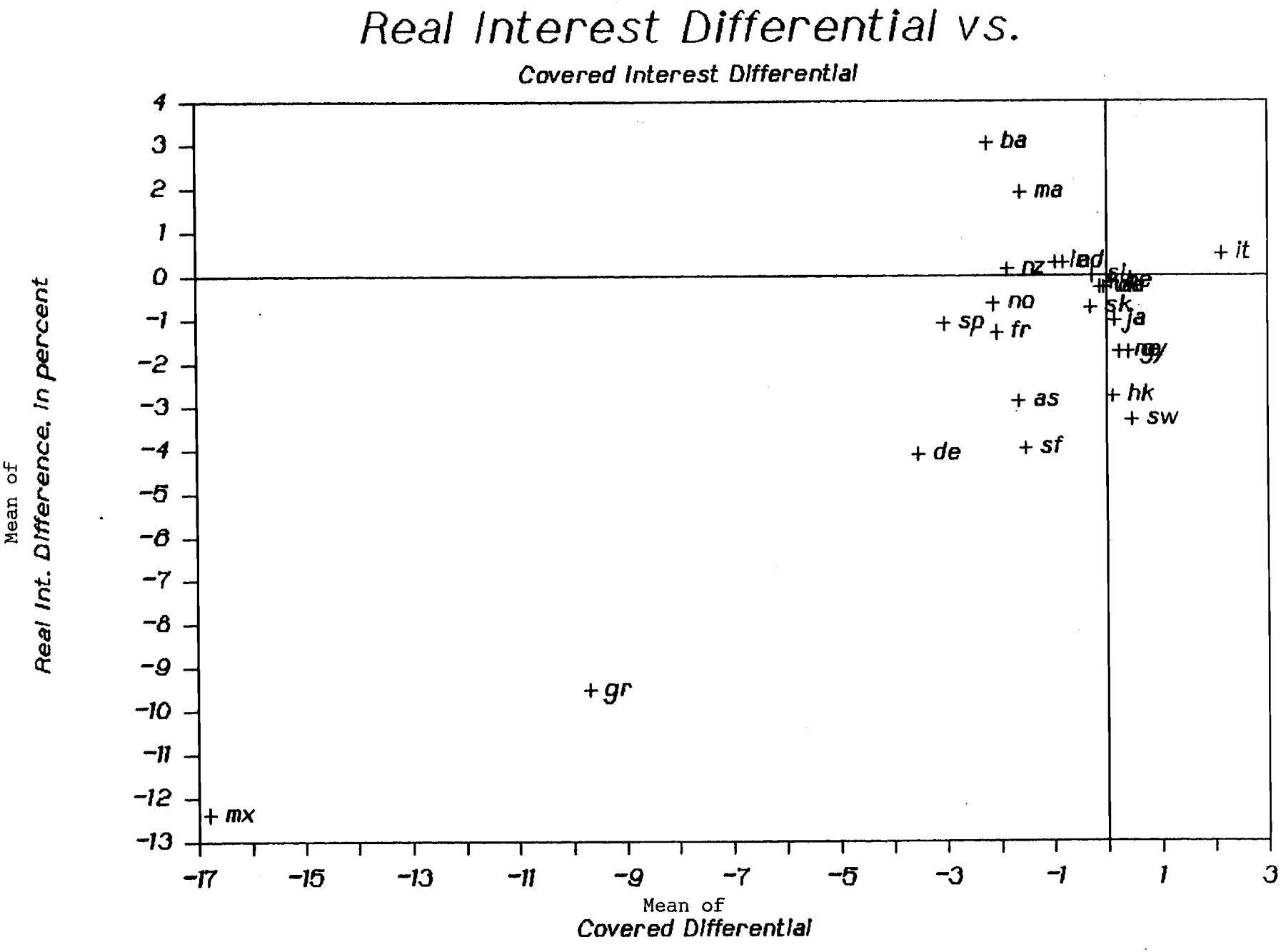
Ex Ante Real Interest Differential vs.

Ex Ante Exchange Risk Premium



See Table 8 for a key to the country abbreviations.

Chart 5:

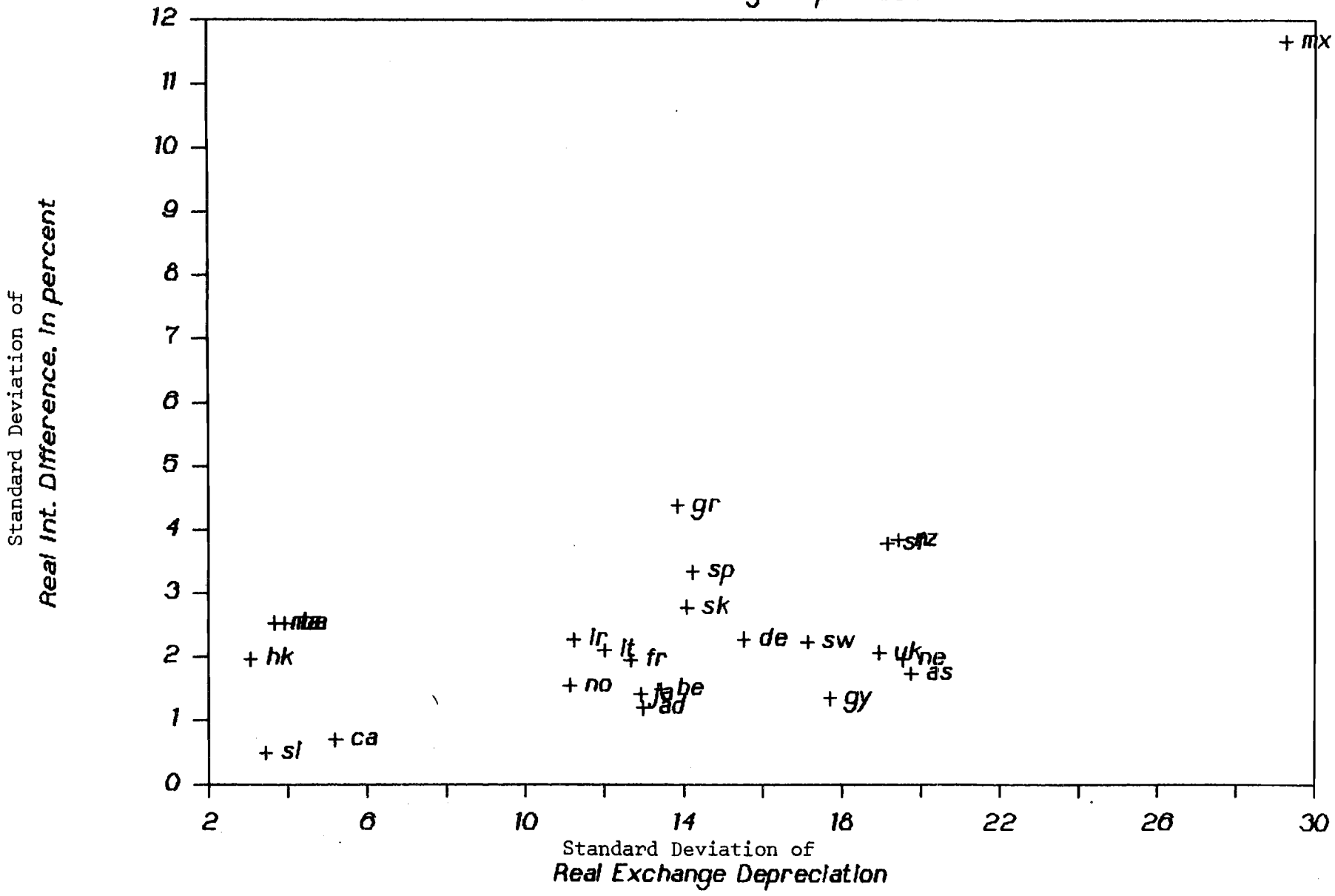


See Table 8 for a key to the country abbreviations.

Chart 4:

Ex Ante Real Interest Differential vs.

Ex Ante Real Exchange Depreciation

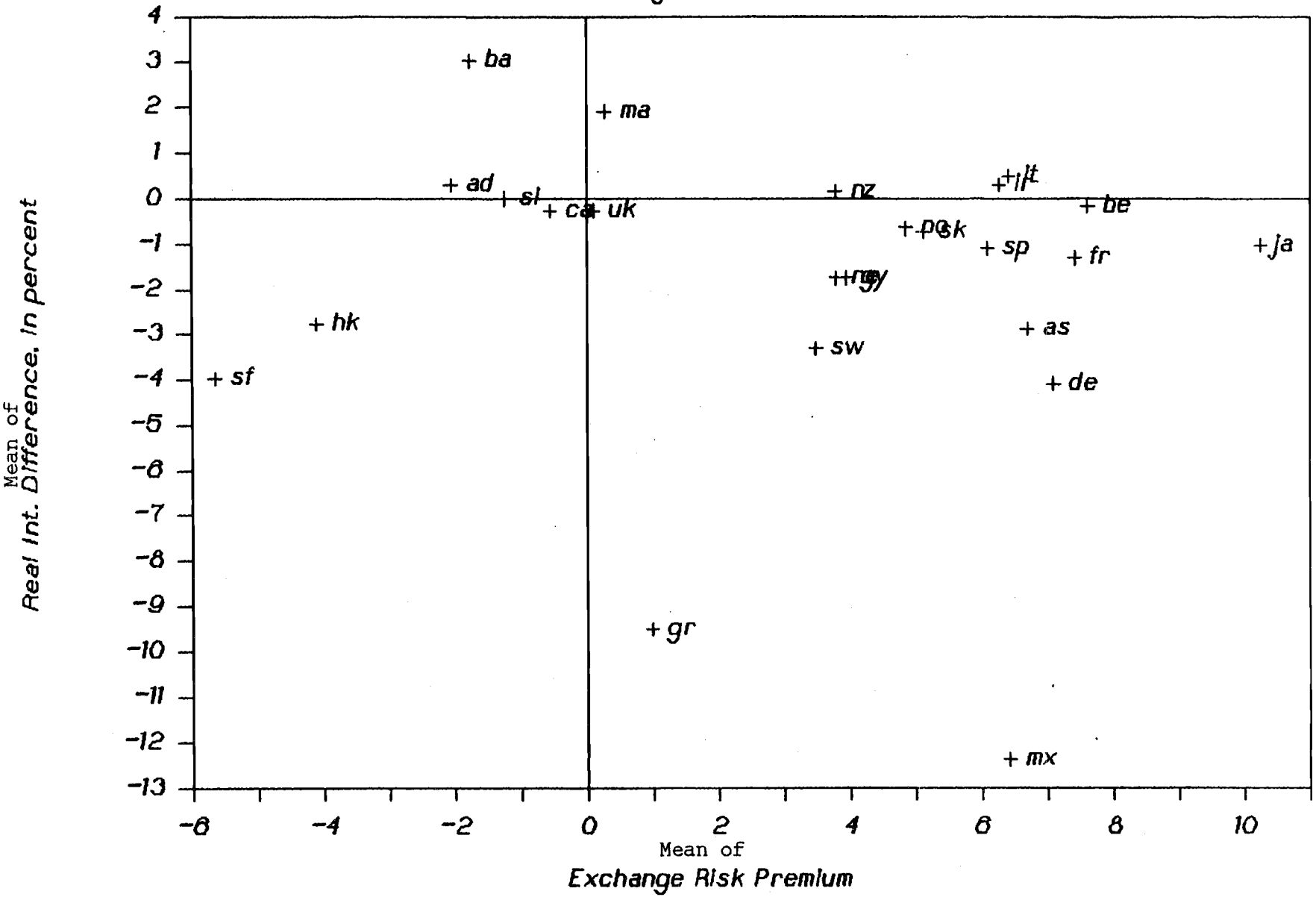


See Table 8 for a key to the country abbreviations.

Chart 7:

Real Interest Differential vs.

Exchange Risk Premium

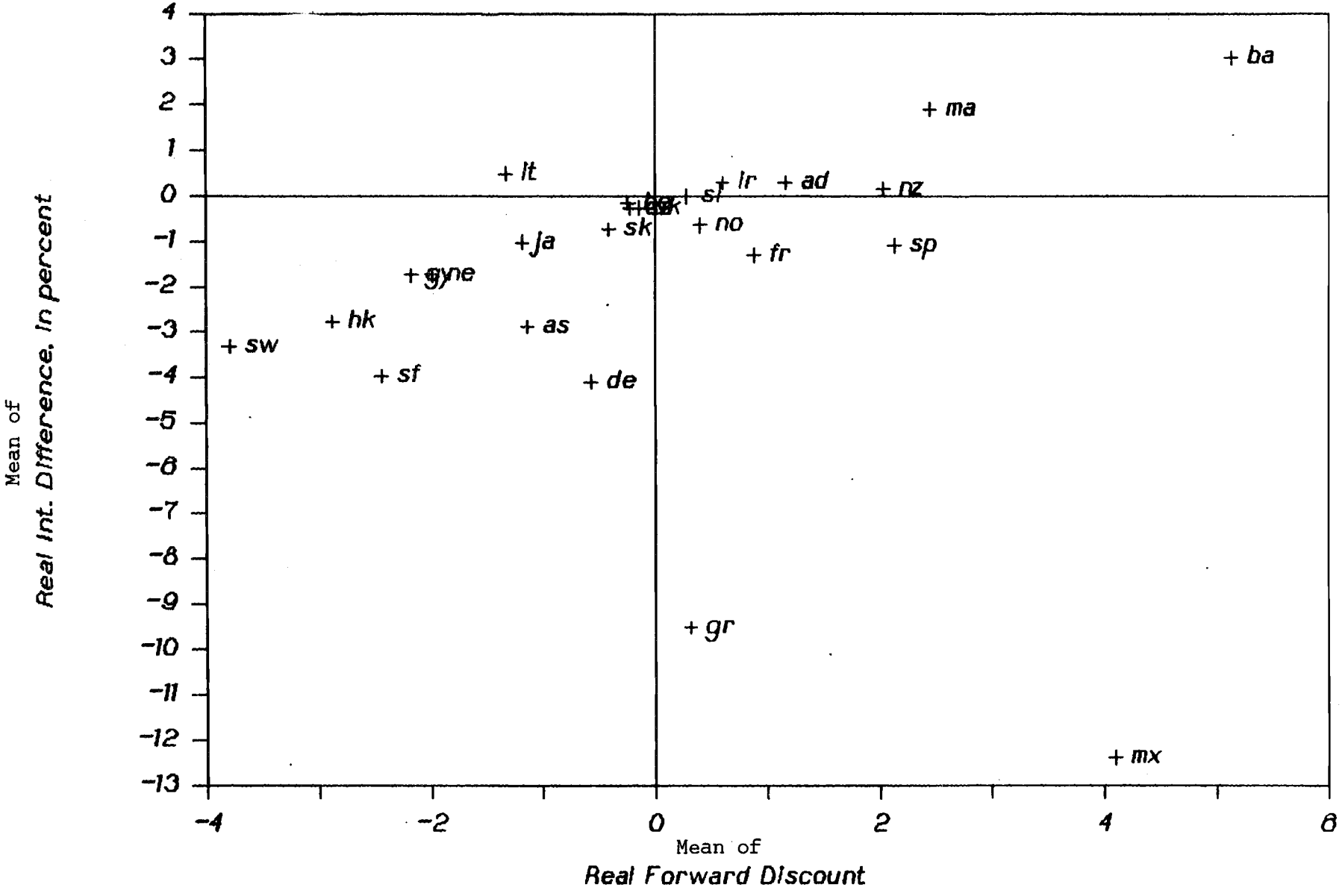


See Table 8 for a key to the country abbreviations.

Chart 6:

Real Interest Differential vs.

Real Forward Discount



See Table 8 for a key to the country abbreviations.

DATA APPENDIX

1. Forward and Spot Exchange Rates

Spot and three month forward exchange rates for 23 countries are collected by Barclay's Bank and stored on DRIFACS daily for the period September, 1982 to the present. Exchange rates for the 24th country in our sample, Belgium, were also stored on DRIFACS, but were compiled by the Bank of America. In the cases of South Africa and Belgium which have dual exchange rate systems, the forward and spot rates are for the financial Rand and Franc. We used the last observation for each month from September, 1982 through March, 1987, yielding a total possible sample of 55 data points. Data were available for all countries during the entire period except for Mexico; forward rate data have not been reported for Mexico since March, 1986. All exchange rates are against the dollar.

The forward discount is calculated as four times the log difference in contemporaneous forward and spot exchange rates. Exchange depreciation over the period is formed similarly, substituting the realized spot rate three months later for the forward rate.

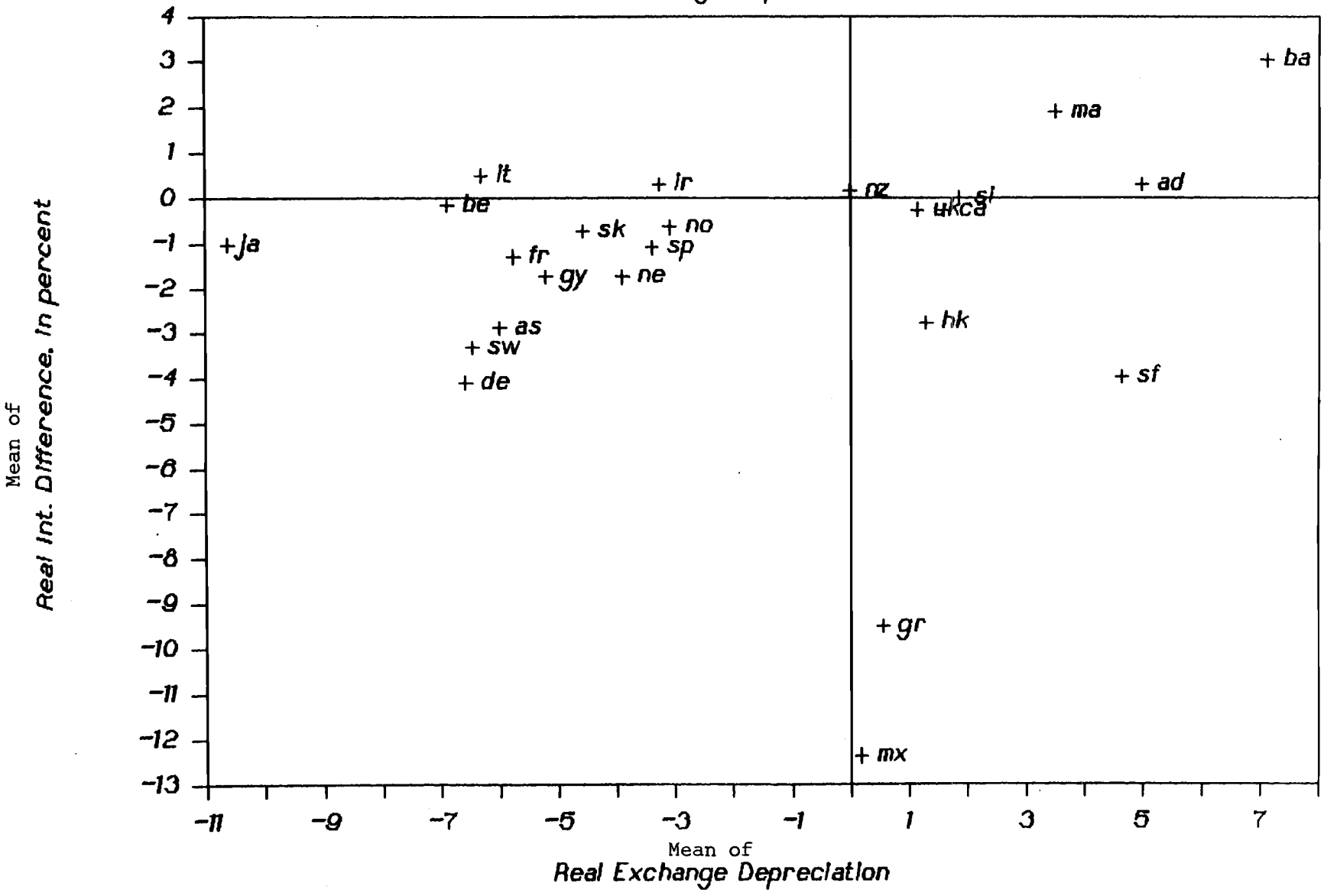
2. Interest Rates

Interest rates were chosen to match as closely as possible the three-month term of the forward exchange rates and the market-determined characteristics of the eurodollar deposit rate to which they are compared. The cleanest measure of a covered

Chart 8:

Real Interest Differential vs.

Real Exchange Depreciation



See Table 8 for a key to the country abbreviations.

September, 1982.

For this paper we use interest differentials, calculated as $\ln(1+i) - \ln(1+i^*)$, where i refers to the local interest rate and i^* to the eurodollar rate.

3. Inflation Rates

All inflation rates are calculated from the consumer price indices as published by the IMF in International Financial Statistics. In all cases but four the indices are available monthly; for Australia, Bahrain, Ireland and New Zealand quarterly data were interpolated to form monthly series. Inflation rate differentials (local vs. U.S. inflation) over the life of the three month contracts are calculated as $4[\ln(1+\pi_{+3}) - \ln(1+\pi_{+3}^*)]$ where π_{+3} and π_{+3}^* refer to local and U.S. three month inflation rates, calculated with:

$$\pi_{+3} = \ln(P_{t+3}) - \ln(P_t).$$

The one year lagged inflation differential used in projecting exchange and inflation rates are calculated in a similar manner:

$$\ln(1+\pi_{-12}) - \ln(1+\pi_{-12}^*).$$

interest differential comes from exchange rates and interest rates observed at the same instant. This is not possible for such a large sample of countries, but for most of the countries interest rates are observed on the same day, or very close to it. A table of the rates, their sources and definitions appears below. The sources are: WFM -- World Financial Markets, published by Morgan Guaranty Bank, DRI -- Data Resources' DRIFACS databank, and IFS -- International Financial Statistics, by the IMF.

Country	Source	Interest Rate
Australia	WFM	3 Month Finance Co. Paper
Austria	WFM	3 Month Time Deposits
Bahrain	IFS	3 Month Time Deposits
Belgium	DRI	3 Month CDs
Canada	WFM	3 Month Prime Finance Co. Paper
Denmark	WFM	3 Month Time Deposits
France	DRI	3 Month Interbank Deposits
Germany	DRI	3 Month Interbank Deposits
Greece	IFS	3 Month Time Deposits
Hong Kong	WFM	3 Month Interbank Deposits
Ireland	WFM	3 Month Interbank Deposits
Italy	DRI	3 Month Interbank Deposits
Japan	WFM	3 Month Gensaki Rate
Malaysia	WFM	3 Month Interbank Deposits
Mexico	WFM	3 Month Time Deposits to Businesses
Netherlands	DRI	3 Month Interbank Deposits
New Zealand	WFM	90 Day Commercial Bills
Norway	WFM	3 Month Time Deposits
Singapore	WFM	3 Month Bank Acceptances
South Africa	WFM	90 Day Bank Acceptances
Spain	WFM	3 Month CDs, Bank of Spain
Sweden	WFM	6 Month Deposits
Switzerland	WFM	3 Month Interbank Deposits
United Kingdom	DRI	3 Month Interbank Deposits
Eurodollar	DRI	3 Month Eurodollar Deposits

Interest rates are quoted on an annual basis and are mostly available for all countries during the entire period. For the case of Malaysia data begin in September, 1983, rather than

[11]We here depart from the usual practice of not reporting the coefficients in the projection and thus sweeping under the rug the question of their sensibility. The usual argument is that as long as the variables are predetermined, the projection will be reliable asymptotically. Mishkin (1984a,b), for example, projects the real interest rate on i, lagged money growth, lagged inflation, time, time^2, time ^{3} and time^4. It is easy to forget that instrumental variables will only give good answers if they are, not only exogenous, but also correlated with the righthand-side variable.

[12]The last 29 observations for Italy, and a few observations for Austria, show forward rates that are very close to the contemporaneous spot rates, giving forward discounts that are close to zero. While Barclay's purports to trade at these rates, they seem suspect. The reader may want to disregard the numbers for Italy and Austria in Table 3 (also Tables 4 and 5).

[13]For example, Frankel and Froot (1986), Table 2a; Frenkel and Levich (1975, 1977).

[14]For example, Otani (1983) and Frankel (1984).

[15]Clausen and Wyplosz (1982), Frankel (1982), and Giavazzi and Pagano (1985, pp. 27-28), among others.

[16]Political risk premiums on long-term bonds are not limited to LDC debtors. In 1980-82 the U.S. government had to pay a higher interest rate on U.S. bonds than European governments had to pay on Eurobonds denominated in dollars. The same U.S.-Euromarket differential held for corporate bonds. Both differentials fell sharply in mid-1982, presumably as investors reacted to the international debt crisis by fleeing to the safe haven of the United States. Interestingly, the short-term differential (U.S. interbank rate minus Eurodollar) behaved precisely the opposite: it was negative until it fell sharply after August 1982, suggesting perhaps a completion of the liberalization process (begun 10 years earlier) relevant only in the money markets. (Frankel, 1987b, Figures 1 and 2).

[17]Thailand had a similar negative covered interest differential during most of this period, according to a forward rate quoted by a Bangkok bank; it went positive in April 1986. (Frankel, 1987a)

[18]Argy (1987, pp. 132-36).

[19]It should be noted that the forward rate quoted by Barclay's applies to the Saudi riyal. We match it up with the Bahraini interest rate because no local interest rate is available for Saudi Arabia and the two countries are said to be closely tied financially. The riyal is classified by the IMF under the same exchange rate arrangement as Bahrain's currency, the dinar, "Flexibility limited in terms of a single currency [the dollar]," which would suggest that the same forward rate could be applied to both. But the riyal exchange rate does in fact vary somewhat, so that our measured covered interest differential is not entirely legitimate.

Footnotes

[1]A large literature tests and rejects the unbiasedness of the discount in the forward exchange market. Given covered interest parity, this is equivalent to the tests of unbiasedness in the interest differential. The forward market literature is comprehensively surveyed by Hodrick (1987).

[2]Obstfeld (1986b) in 1967-84 time series finds the highest saving-investment correlation for the United States, followed by Canada, Germany, Japan, Italy and Austria, and then -- with less significant coefficients -- France, the United Kingdom, Mexico and Australia.

[3]Feldstein and Horioka used instrumental variables to correct for endogeneity of saving. Defense expenditures and the retirement-age proportion of the adult population are used as instrumental variables in Frankel (1986, p. 41) for a U.S. time series context, and in Dooley, Frankel and Mathieson (1986, p. 15) for a cross-section context. The two papers also discuss the "big country" argument and other alleged econometric problems. The finding of a high dependence of investment on saving appears to be robust.

[4]Harberger (1983) and Murphy (1984) argue that one would expect a priori capital mobility (by the Feldstein-Horioka definition) to appear higher for small political units than for large ones. Dooley, Frankel and Mathieson (1986, pp. 24-7) takes exception to their argument.

[5]Obstfeld (1986a) finds that the coefficient fell after 1973, in time series correlations for most of his countries, but Obstfeld (1986b) finds that it has risen over time (1967-84 vs. 1956-66).

[6]For example, Frenkel and Levich (1977, 1981).

[7]Frankel (1986) elaborates on this point. For similar treatments of alternative criteria of capital mobility, see also Boothe, et al (1985), and Obstfeld (1986).

[8]E.g., Lanyi and Saracoglu (1983, Table 1) and Khatkhate (1985, Table 7). On the other hand, Blejer and Gil Diaz (1985) provides an example of a country, Uruguay, that liberalized financial markets and, as a consequence, had a real interest rate that followed the foreign rate very closely, turning sharply positive in 1980. Our three East Asian LDCs are of this type.

[9]The standard errors for individual country means are usable, indeed conservative, despite the use of overlapping observations, because they are calculated as if there were T/3 observations rather than the actual T observations used.

[10]We classify Japan with Australia and New Zealand, rather than with the large (G-11) open industrialized countries, both because of geography and because all three Pacific countries have only pursued financial market liberalization in the 1980s.

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[20]The regression coefficients from the projection are not reported, because they could be precisely recovered from those reported in Table 2b.

[21]The means do not add up precisely, because a few more observations are available for the covered interest differential than for the real interest differential, which required ex post observations on inflation rates.

[22]The mean exchange risk premium for the nine smaller European countries aggregated, or for all 24 countries aggregated, appears statistically significant. But dollar exchange rate changes are highly correlated across currencies, and standard errors that ignore this correlation are seriously biased downward. Seemingly Unrelated Regressions, which properly take into account this correlation across currencies, are used in Table 5c.

[23]Conventional estimates of the coefficient of relative risk-aversion turn out to imply that, if the variances are constant over time, exchange risk premiums should be very small in magnitude and variability. But many recent studies suggest that variances change substantially over time, in which case the exchange risk premium should too. Frankel (1987c) reviews this literature.

[24]By the "rational expectations assumption" we mean, not just that investors are rational, but also that their expectational errors can be treated as white noise in small samples. The assumption could fail, for example, because investors have to learn about a model that is changing over time.

[25]For example, Roll (1979), Frenkel (1981, p. 699), Solnik (1982), Adler and Lehman (1983), Mishkin (1984, pp. 1351-53). However Cumby and Obstfeld (1984), Huizinga (1986) and Longworth (1986) do manage to reject a random walk. Longworth finds stronger rejections in the 1980s than in the 1970s.

[26]Hakkio (1984) or Frankel (1986).

[27]Frankel and Froot (1985, Table 3) and Borensztein (1986). The sample period was chosen on exogenous grounds.

[28]The latter paper uses the survey data to analyze the exchange risk premium; it finds that, contrary to the existing literature, the exchange risk premium explains no positive amount of the forward discount or interest differential. It would follow that the systematic component of the forward discount prediction errors found in Table 5b is not, after all, an exchange risk premium.

[29]If one uses the standard deviations of the projected differentials instead of the ex post differentials, the R^2 is .62 on the covered interest differential and .23 on the real forward discount. The coefficients and their t-ratios give the same rankings as the R^2's; but they are not reported because no hypothesis is being formally tested.

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