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The Comparative Performance of Fixed and Flexible Exchange Rate Regimes: Interwar Evidence

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But with domestic currency convertible into gold and specie imports and exports unrestricted, arbitrage in the international gold market constrained the fluctuation of bilateral rates. Exchange rates could rise or fall only to the gold points (given by the costs of shipping, insurance and short-term credit), at which it became profitable to engage in gold market arbitrage. This limited bilateral rates to narrow bands.

The fixed rate regime of the 1920s operated only for a couple of years before doubts began to surface about its sustainability. Large, persistent payments imbalances threatened to exhaust the reserves of deficit countries. The reason for these difficulties remains a subject of debate.2/ Some observers emphasized the tendency of central banks to impede the balance-of-payments adjustment mechanism by sterilizing reserve flows. Others argued that the adjustment mechanism was in fact permitted to operate but, given the limited flexibility of wages and prices, proved insufficiently powerful to counteract the massive shock of the Great Depression.

In 1929 the fixed rate system began to crumble around the edges. Argentina and Uruguay suspended gold payments in December. Canada introduced new monetary restrictions tantamount to devaluation. Brazil, Chile, Paraguay, Peru, Venezuela, Australia and New Zealand, without officially suspending gold convertibility, permitted their currencies to slip below par. Exchange rates in the industrial center also came under pressure but were successfully maintained.

In the spring and summer of 1931, Germany and Austria, faced with domestic banking panics and runs on central bank reserves, suspended gold convertibility and imposed exchange controls. Next to experience a run was the Bank of England. The devaluation of sterling in September 1931 induced two dozen other countries to follow suit. These events are conventionally taken to mark the demise of the fixed rate system. In fact fixed rates lingered, though on a diminished and steadily shrinking scale. The U.S. floated the dollar in

1933. Czechoslovakia devalued in 1934, Belgium in 1935, France, the Netherlands and Switzerland in 1936. Like the transition from flexible to fixed rates, the transition back is difficult to date with precision.

A distinguishing feature of this episode was pervasive government intervention in the foreign exchange market. In contrast to the first half of the 1920s, governments intervened systematically to influence the fluctuation of exchange rates. They established special Treasury or central bank accounts (known as exchange equalization funds) to limit exchange-rate fluctuations. Historians debate whether these funds intervened symmetrically, buying foreign exchange when the domestic currency rose and selling it when the domestic currency fell, or intervened asymmetrically, only purchasing foreign exchange when the currency rose. A related debate is whether or not the impact on the money supply was sterilized.3/ Whatever the answer, observers agree that, compared to the early 'twenties, intervention in the foreign exchange market was systematic and sustained.

Some countries employed intervention to peg to their trading partners. By 1932, the outlines of a group of sterling area countries could be discerned. Countries which traded heavily with Britain, such as Portugal, Sweden and the rest of Scandinavia, joined the British Commonwealth in pegging to the pound. A second group of countries, centered on Germany, adopted exchange controls, which permitted them to pursue more expansionary policies and allowed a black market discount on their currencies to emerge. A third group, including the U.S., France, Belgium, the Netherlands, Switzerland, Czechoslovakia and Poland, continued to peg to gold and therefore to maintain stable rates vis-a-vis one another.

The next round of devaluations occurred in 1933, when Roosevelt chose to take the U.S. off gold. Over the succeeding nine months, the dollar depreciated by nearly 70 per cent against the French franc and other gold currencies. Cuba, Guatemala, Panama and the Philippines followed the U.S. off gold. Many South American countries depreciated further

to maintain their competitiveness in the U.S. market, creating an informal dollar area. But this quasi dollar area never achieved the cohesiveness of its sterling counterpart. With France, Belgium, Switzerland, the Netherlands, Czechoslovakia and Poland still maintaining gold convertility and the Sterling Area countries tightening their pegs, the world was increasingly splintered into distinct currency areas.

France's devaluation in September 1936 marked another change in regime. The devaluation was accompanied by a Tripartite Agreement issued simultaneously by France, Britain and the United States, which they affirmed their desire to cooperate in minimizing the fluctuation of exchange rates. Switzerland and Holland devalued immediately thereafter, and other countries endorsed the principles of the Tripartite Pact.4/

3. Data and Conventions

To analyze exchange rate behavior under these regimes, I assembled weekly data on exchange rates and ancillary variables. For the years 1921-36, Einzig (1937) provides continuous end-of-week observations on spot and forward foreign exchange rates for eight industrial countries. For other countries, spot rates were drawn from the Monthly Statistical Bulletins of the League of Nations. Einzig also provides 30 day market rates of discount on an monthly average basis. These can be combined with the exchange rate data by generating appropriately-weighted averages of the weekly observations of the latter.

Partitioning the period into regimes is inevitably arbitrary. The three periods I distinguish are January 1922 - August 1926 (free floating), January 1927 - August 1931 (fixed rates) and January 1932 - August 1936 (managed floating). Although continuous forward exchange rate quotations become available in January 1921, consistent series for several other variables start only in 1922. It is convenient, therefore, to begin the analysis with January 1922. Few of my conclusions hinge on this starting date. I choose January

1927 to mark the start of the fixed exchange rate period, since the French franc was stabilized in December 1926. Most of the other currencies considered were stabilized at earlier dates. The choice of January 1927 should therefore highlight the distinguishing features of the fixed rate period.

Britain floated the pound on September 19, 1931, with Sweden, Norway and Denmark following at the end of September, Finland in October, and Japan in December. But policies designed to manage the fluctuation of these exchange rates were widely adopted only in 1932. For this reason (and for symmetry with January 1921 and January 1927), I choose January 1932 to mark the start of managed floating. I end the analysis in August 1936, the month before France, the Netherlands and Switzerland devalued and the international monetary system was again transformed. The two periods of transition (September - December 1926 and September - December 1931), being difficult to assign to a particular period, are omitted.

I follow Einzig by using the pound sterling as the reference currency. It is possible to use other reference currencies, computing the relevant bilateral rates from triangular arbitrage. But direct market quotations are likely to be cleaner than those computed assuming triangular arbitrage, or for that matter than calculations of effective exchange rates. The choice of reference currency in fact makes little difference for most of the conclusions that follow.5/ It only matters for rankings of exchange rate stability across countries within periods. Countries which pegged to sterling obviously appear to have enjoyed the greatest exchange rate stability when sterling is used as the reference currency, while countries which pegged to the dollar appear to have enjoyed the greatest stability when the dollar is used. But the average volatility of exchange rates under free floating compared to managed floating is unaffected by the choice. And it is with the comparative performance of the

successive regimes, rather than the comparative performance of countries, that this paper is concerned.

Here even more than in other periods, conclusions are heavily influenced by outliers. The extreme behavior of exchange rates, interest rates and prices during the German hyperinflation dominates the international averages even when a relatively large cross section of countries is considered. I consequently calculate most summary statistics omitting German data.

4. Exchange Rate Variability

A standard indictment of flexible exchange rates is that they give rise to costly variability. The assertion can be broken into two parts: that there is an association between flexibility and variability, and that variability is costly. I focus here on the first of these propositions.

Tables 1 and 2 display measures of the nominal exchange rate changes at weekly and monthly intervals. The exchange rate is defined as the foreign-currency price of the domestic currency, an increase signifying appreciation. The predominance of negative means for 1922-26 indicate that the reference currency, the pound sterling, was appreciating on average. The preponderance of positive values for 1932-36 indicates that sterling was weakening relative to the currencies of the gold bloc, while the negative values for the U.S. and Belgium remind us that some countries opted for large depreciations against sterling.

The standard deviations of exchange rate changes are considerably larger during the period of freely floating exchange rates at the beginning of the 'twenties than under managed floating in the 'thirties or under pegged rates from 1927 through 1931.6/ On average, the standard deviation of weekly changes is about four times as large under free floating (excluding Germany) as under managed floating. For monthly changes, the standard

Table 1
Weekly Holding Period Returns

$(e - e_{-1})/e_{-1}$ where e = £/foreign currency
(Mean and Standard Deviation are in per cent)

Period	Country	# of Obs	Mean	Standard Deviation	Kurtosis	Skewness
Free Floating	U.S.	243	-0.0582	0.5659	4.41263	-0.50525
1922.01-1926.08	France	243	-0.4056	3.7334	26.61692	3.20364
	Belgium	243	-0.4246	3.3176	6.95342	0.83557
	Netherlands	243	-0.0225	0.3305	2.85755	0.00995
	Italy	243	-0.1008	2.1120	10.03896	1.06194
	Switzerland	243	-0.0588	0.5632	8.68960	-1.27418
	Germany	243	-5.8580	19.2724	7.69773	-1.24616
	Group w/Ger.	1701	-0.9898	4.2707	N/A	N/A
1/22 - 6/23	Germany	79	-7.1176	18.1959	5.19578	1.33889
12/23 - 8/26	Germany	143	-0.0845	2.0930	18.26350	-1.32898
	Group w/o German hyperinfl.	1680	-0.4967	4.5059	N/A	N/A
Fixed Rates	U.S.	245	-0.0006	0.0634	4.95476	0.79697
1927.01-1931.08	France	245	-0.0041	0.0791	18.09449	0.54552
	Belgium	245	-0.0007	0.0532	0.98735	-0.20406
	Netherlands	245	0.0031	0.0750	3.69021	0.62432
	Italy	245	0.0637	0.8240	42.12113	4.09295
	Switzerland	245	0.0031	8.4500	8.54001	0.30155
	Germany	245	-0.0045	0.0995	9.85131	0.01692
	Group	1715	0.0087	0.3199	N/A	N/A
Managed Floating	U.S.[a]	242	-0.1512	1.3941	13.55535	-2.49615
1932.01-1936.08	France	244	0.0557	0.9118	3.34139	0.34173
	Belgium	244	-0.0672	1.6159	62.90761	-6.28143
	Netherlands	244	0.0065	0.5973	11.90388	0.12467
	Italy[b]	239	0.0288	0.9863	4.31911	0.92046
	Switzerland[c]	242	0.0698	1.1178	10.93090	0.47981
	Germany	244	0.0603	1.0507	5.75554	0.02627
	Group	1689	0.0004	1.1417	N/A	N/A

Table 1 (Cont.)

Notes: [a] Missing 3/4/33 and 3/11/33.
[b] Missing 11/30/35 and 12/21/35.
[c] Missing 12/3/32 and 12/10/32.

Source: See text.

Kurtosis is calculated as $K = \frac{\sum_{i=1}^{N} \left(\frac{x_i - \bar{x}}{S} \right)^4}{N} - 3$ where

$$S = \left[\sum_{i=1}^{N} (x_i - \bar{x})^2 / (N-1) \right]^{1/2}$$

Skewness is calculated as $SK = \frac{\sum_{i=1}^{N} \left(\frac{x_i - \bar{x}}{S} \right)^3}{N}$.

Table 2
Monthly Holding Period Returns

$(e - e_{-1})/e_{-1}$ where e = £/foreign currency
(Mean and Standard Deviation are in per cent)

Period	Country	# of Obs	Mean	Standard Deviation	Kurtosis	Skewness
Free Floating	U.S.	56	-0.2398	1.2788	3.45619	-0.82206
1922.01-1926.08	France	56	-1.8976	6.5612	10.26536	2.44108
	Belgium	56	-1.8640	7.1690	8.80784	2.00190
	Netherlands	56	-0.0880	0.6199	0.28450	-0.62054
	Italy	56	-0.4794	4.1122	1.05382	0.92705
	Switzerland	56	-0.2534	1.1138	1.94649	0.34462
	Group w/o Ger	336	-0.8046	3.4758	N/A	N/A
1/22 to 6/23	Germany	18	-30.0477	26.7688	-1.19338	0.12987
12/23 to 8/26	Germany	33	-0.1523	1.6409	2.65800	0.80723
	Group w/Ger	387	-2.1091	4.4028	N/A	N/A
Fixed Rates	U.S.	56	0.1055	0.8202	44.35583	6.57578
1927.01-1931.08	France	56	0.0917	0.8435	46.15152	6.75524
	Belgium	56	0.1138	0.8373	47.75379	6.94352
	Netherlands	56	0.0132	0.1246	-0.28132	0.04062
	Italy	56	0.4322	2.1429	11.79899	3.33032
	Switzerland	56	0.1311	0.8682	45.35807	6.69467
	Germany	56	0.0945	0.7553	46.00722	6.75890
	Group	392	0.1403	0.9127	N/A	N/A
Managed Floating	U.S.	56	-0.6474	2.6895	4.22938	-1.90477
1932.01-1936.08	France	56	0.2502	1.6847	4.20390	0.18375
	Belgium	56	-0.2559	3.7077	30.15620	-4.93156
	Netherlands	56	0.2617	1.6931	0.94489	0.06340
	Italy[a]	54	0.1580	1.8646	0.19169	0.12881
	Switzerland	56	0.2246	1.7293	1.06710	0.39773
	Germany	56	0.2742	1.8559	0.51436	0.42678
	Group	390	0.0402	2.1943	N/A	N/A

Note: [a] Missing 1935.11 and 1935.12.

Source: See text.

deviation is fifty per cent larger under free floating (again excluding Germany) than under managed floating. Clearly, exchange-rate variability was positively associated with the freedom of the float.

The behavior of exchange rates in the gold standard period (1927-31) was of course very different. The standard deviations of average percentage changes at both weekly and monthly intervals are small compared to either floating-rate period. The anomalous behavior of the Italian lira reinforces the point: the lira was stabilized only midway through 1927 and shows exceptional volatility due to its movement over the first part of that year.

Tables 1 and 2 also report the kurtosis and skewness of the distribution of exchange rate changes. Kurtosis measures the "fatness" of the tails of the exchange-rate distribution, indicating whether an unusual proportion of changes was relatively large. Positive values of the statistic computed signify a disproportionate share of observations in the tails relative to the normal distribution. Studies of the post-1973 period have suggested that kurtosis is a common feature of floating rates. Tables 1 and 2 indicate that this is also a feature of interwar experience. Kurtosis is often large for those currencies for which the mean percentage change is large (France and Italy in the first half of the 1920s, Italy in the second half). Although there are cases where average percentage changes are very large but kurtosis is not so pronounced (Germany from 1922 to 1926), the dominant association of large movements with kurtosis suggests that exchange rate variability was episodic, a conclusion consistent with studies of recent decades.

Interestingly, kurtosis is common to all three interwar regimes; it is not obvious that it increases with the degree of exchange rate variability.7/

Skewness measures the symmetry of distribution of exchange rate changes. Negative values for the U.S. and Belgium in the 1930s confirm that dollar and franc movements were skewed by discrete devaluations (by the U.S. in 1933 and Belgium in 1935). A large

positive value for Italy in 1927-31 (Table 1) confirms that the distribution of lira movements was skewed by the series of unusually large weekly appreciations preceding Italy's stabilization.8/ Finally, the distribution of French franc movements in the first half of the 1920s is positively skewed, especially the weekly data, by a small number of unusually large appreciations in a period when the franc was depreciating on average. This points to the "bear squeeze" of early 1924, when the authorities engineered a sudden appreciation of the franc, rather than the "runs" on the franc in 1923, 1925 and 1926 as the unusual period. The monthly data in Table 2 suggest the same behavior by the Belgian franc, which followed its French counterpart for much of the floating period.

Table 3 displays comparable statistics for holding period returns. The percentage change in the exchange rate is adjusted for the differential between domestic and foreign interest rates. This statistic provides another measure of the implications for international investors of exchange rate variability. Holding period returns show much the same pattern as nominal exchange rate changes. On average, holding period returns were larger and more variable under free floating than under managed floating and under managed floating than under fixed rates. Interest rate differentials did not render investors indifferent to exchange rate changes.

5. Exchange Rate Predictability

Exchange rate variability is different from exchange rate uncertainty. Table 4 therefore reports a measure of the magnitude of the residuals from a standard exchange rate forecasting equation. The log spot rate is regressed on a constant term and its own lagged value, a slight generalization of the assumption of a random walk with no drift in previous studies.9/ The forecasting equations are reported in Table A1. The standard deviation of the forecast errors is shown in the top panel of Table 4. Monthly data are used to facilitate

Table 3

Monthly Holding Period Returns, Interest-Rate Adjusted

(Mean and Standard Deviation are in per cent)

$i^* - i + (e - e_{-1})/e_{-1}$ where e = £/foreign currency

Period	Country	# of Obs	Mean	Standard Deviation	Kurtosis	Skewness
Free Floating	U.S.	56	-0.1907	1.8164	1.78684	-0.50992
1922.01-1926.08	France	56	-0.3655	6.6760	10.46026	2.46421
	Belgium	56	0.1135	7.1185	9.18542	2.11209
	Netherlands	56	-0.0250	1.3673	-1.14055	0.05452
	Italy	56	2.4348	4.1428	1.36201	1.07691
	Switzerland	56	-1.1690	1.5148	0.07059	0.80897
	Group	336	0.1330	3.7726	N/A	N/A
1/22 - 6/23	Germany	18	-23.0243	26.7536	0.08716	0.72006
2/24 - 8/26	Germany	31	8.2150	11.2455	3.23597	1.95435
	Group w/ Ger.	385	-0.2989	5.4488	N/A	N/A
Fixed Rates	U.S.	55	-0.4095	0.6597	-0.68482	-0.03105
1927.01-1931.07	France	55	-1.1742	0.7410	-0.77282	-0.03148
	Belgium	55	-0.2397	0.5865	-0.45596	-0.11543
	Netherlands	55	-0.4392	0.6006	-0.46389	0.06922
	Italy	55	2.8321	2.6597	9.47487	2.93389
	Switzerland	55	-1.0791	0.6712	-0.39798	-0.10824
	Germany	54	1.8514	0.8162	-0.12928	-0.39212
	Group	384	0.1873	1.1885	N/A	N/A
Managed Floating	U.S.	56	-1.0587	2.5961	3.67211	-1.70672
1932.01-1936.08	France	56	1.6707	2.4830	3.15543	-1.36501
	Belgium	56	1.0988	3.8725	23.19736	-4.16349
	Netherlands	56	0.7501	2.4673	1.65155	-0.77240
	Italy[b]	54	3.4895	2.1208	0.59755	-0.10645
	Switzerland[c]	55	1.0557	2.2713	5.58014	-1.76080
	Germany	56	3.1415	2.1132	0.71507	0.39411
	Group	389	1.4402	2.6248	N/A	N/A

Notes: [a] To 1931.06.
[b] Missing 1935.11 and 1935.12.
[c] To 1936.07.

Source: See text.

comparisons with the behavior of real exchange rates (Section 6 below). Since no forward data are used, it is possible to expand the sample of countries.

Though the standard deviations of the residuals from the exchange rate forecasts are larger under the managed float of the 'thirties than the free float of the 'twenties for five of the 11 countries, on average (excluding Germany) this measure of exchange rate unpredictability falls by about 15 per cent when moving from the free to the managed float. This is smaller than the concurrent fall in the variability of spot rates. An interpretation is that government policy succeeded in damping fluctuations in spot exchange rates on average but was subject to changes that were difficult to predict.

To explore whether these results are robust to alternative forecasting equations, I fit a simple ARMA model of the exchange rate (the results of which are reported in Table A2). In each case (except for Denmark in the fixed rate period, when the ARMA model did not solve), one autoregressive and one moving average term were the preferred time-series representation of the data. The corresponding standard errors of the residuals are shown in the bottom panel of Table 4. The results are essentially identical to the AR(1) forecasts described above.

6. Real Exchange Rates

Table 5 summarizes the variability of real exchange rates under the three regimes. The real exchange rate is computed as the ratio of domestic to foreign wholesale price indices, converted to foreign currency using the nominal exchange rate. The standard deviation of the first difference in the log real rate is on average 15 per cent larger in the period of free floating than under managed floating.10/ The cross-country correlation of the standard deviation of the first differences of (log) nominal and real rates exceeds 0.8 for both the early 'twenties and the early 'thirties. This suggests that nominal exchange rate variability in

Table 4
Nominal Exchange Rate Predictability
(Standard Deviation of residuals from exchange rate forecasts)

	Period 1 1922-26	Period 2 1927-31	Period 3 1932-36
		AR(1) Forecasts	
Denmark	.03264	.00151	.03070
Finland	.02621	.00168	.02985
Norway	.03252	.00311	.02808
Sweden	.01061	.00178	.02995
Switzerland	.00994	.00157	.01729
U.S.	.01050	.00168	.02781
France	.06329	.00088	.01689
Netherlands	.00626	.00120	.01694
Belgium	.06998	.00093	.04190
Italy[e]	.03654	.01361	.01953
Germany[a]	.35800	.00129	.01851
Germany[b]	.01460		
Average excluding Germany	.02985	.00280	.02590
		ARMA(1,1) Forecasts	
Denmark	.02785	na	.03070
Finland	.02607	.00167	.02969
Norway	.03170	.00299	.02783
Sweden	.01020	.00158	.02862
Switzerland	.00991	.00139	.01624
U.S.	.01013	.00167	.02716
France	.06301	.00082	.01516
Netherlands	.00572	.00108	.01554
Belgium	.06930	.00091	.04109
Italy[e]	.00390	.00855	.01839
Germany	.33438[c]	.00117	.01756
Germany	.01434[d]		
Average excluding Germany	.02578	.00230	.02782

Notes: Monthly data are used. Precise definitions of periods are described in Section 3.

[a] 1922.01 - 1923.07 and 1923.12 - 1926.08.
[b] 1922.01 - 1922.05 and 1924.01 - 1926.08.
[c] 1922.01 - 1923.07 and 1924.01 - 1926.08.
[d] 1924.02 - 1926.08.
[e] 1935.12 - 1936.02 omitted due to missing data.
na not available.

Source: See text.

Table 5
Standard Deviations of Real Exchange Rates: Monthly Rates
(£ as reference currency)

Real Exchange Rate: $\log R_t - \log R_{t-1}$

	Period 1 1922-26	Period 2 1927-31	Period 3 1932-36
Belgium	.0480	.0105	.0330
Germany	.1380*	.0077	.0212
Netherlands	.0148	.0109	.0231
Italy	.0371	.0156	.0204
U.S.	.0153	.0102	.0358
France	.0395	.0129	.0194
Switzerland	.0173	.0113	.0205
mean w/o Germany	.0292	.0121	.0254
mean w/Germany	.0584	.0114	.0248

Notes: Monthly data are used. Precise definitions of periods are described in Section 3.

* Missing 1923.09 - 1923.12 due to break in wholesale price index.

Source: See text.

periods of relatively free floating translated into a comparable, if not proportionate, increase in the variability of relative prices.

Table 6 reports the standard deviation of real exchange rate forecast errors analogous to those for the nominal exchange rate in Table 4. In the top panel, the unweighted average of this measure of the forecast error is nearly 10 per cent larger under managed floating in the 'thirties than under free floating in the 'twenties (again excluding Germany). The notable exceptions are the high inflation countries: France, Belgium and Italy (and of course Germany) in the early 'twenties. There is a positive relationship between the predictability of nominal exchange rates and the predictability of real exchange rates in both periods of floating.11/ That relationship is in fact stronger under free floating: the correlation coefficient for the real and nominal exchange rate forecast errors is 0.89 under free floating (10 countries, excluding Germany) and 0.74 under managed floating.

The bottom panel of Table 6 confirms that more general forecasting equations do not alter the implications of the analysis.

Table 4 confirmed that the greater stability of spot rates in the gold-exchange standard period enhanced the predictability of the spot rate. According to Table 6, it also enhanced the predictability of the real rate. For all but two countries, the real rate was easier to predict in the fixed rate period than in either period of floating rates. This is especially impressive given the major terms of trade shocks to which the world economy was subjected between 1929 and 1931.

7. International Capital Movements

A common criticism of flexible exchange rates is that the risks to which they give rise interfere with international capital mobility (McKinnon, 1987). Exchange rate uncertainty discourages investors from arbitraging international interest-rate differentials, preventing real-

Table 6
Real Exchange Rate Predictability
(Standard Deviation of residuals from real exchange rate forecasts)

	Period 1 1922-26	Period 2 1927-31	Period 3 1932-36
		AR(1) Forecasts	
Denmark	.02090	.01055	.02956
Finland	.01819[e]	.01193	.0309
Norway	.02938	.01226	.0323
Sweden	.01384	.00930	.0303
Switzerland	.01553	.01084	.01863
U.S.	.01333	.01019	.02633
France	.03661	.01323	.01614
Netherlands	.01456	.01078	.02203
Belgium	.03589	.01007	.02685
Italy	.03655	.01361	.01953[d]
Germany	.10836[a]	.00755	.0207
Germany	.01760[b]		
Average excluding Germany	.02348	.01128	.02526
		ARMA(1,1) Forecasts	
Denmark	.02090	.01054	.02890
Finland	.01815	.01186	.03040
Norway	.02930	.01220	.03170
Sweden	.01350	.00926	.02930
Switzerland	.01553	.01072	.01861
U.S.	.01318	.00945	.02534
France	.03598	.01323	.01593
Netherlands	.01416	.01070	.02120
Belgium	.03518	.01007	.02676
Italy	.03391	.00855	.01839[d]
Germany	na	.00750	.02040
Germany	.01716[c]		
Average excluding Germany	.02298	.01066	.02465

Notes: Monthly data are used. Precise definitions of periods are described in Section 3.

[a] 1922.01 - 1923.07 and 1923.12 - 1926.08.
[b] 1922.01 - 1922.05 and 1924.01 - 1926.08.
[c] 1924.02 - 1926.08.
[d] 1932.02 - 1935.10 only.
[e] 1923.01 - 1926.08.

Source: See text.

interest rate convergence across countries and limiting the integration of national financial markets. Frankel and MacArthur (1988) present evidence for the period since 1960 consistent with the hypothesis. They report an increase in the variability of international real interest rate differentials since 1973, which, in light of the concurrent decline in political barriers to international capital movements, they attribute to currency risk.

Interwar experience provides another opportunity to consider this question. Table 7 displays the volume of international capital flows. These estimates, calculated by the United Nations as the inverse of the balance of trade in goods, services and gold (the current account plus net gold flows), vary in reliability and coverage.12/ They imply that capital movements were most extensive during the fixed-rate period. But there is no direct correspondence between the degree of exchange rate flexibility and the volume of capital flows. Capital movements were larger in the early 1920s, when exchange rates floated freely and were most variable, than in the early 1930s, when managed floating gave rise to somewhat less nominal variability. Of course, other factors besides exchange rate variability surely influenced the volume of capital flows. The debt defaults of the 'thirties may have depressed the volume of capital flows by discouraging long-term foreign lending. That capital flows to the debtors fall with the shift from free to managed floating, whereas capital flows among the creditors do not, suggests that an association between the freedom of the float and the volume of capital movements may re-emerge if one controls for the risk of default.

Differences among periods become more evident if capital movements are scaled by national income.13/ Figures 1 and 2 contrast these measures of the magnitude of capital flows under the three international monetary regimes for all countries for which the requisite data are available. Figure 1 contrasts the 1922-26 and 1927-31 periods, Figure 2 the 1927-31 and 1932-36 periods. The figures reinforce the implications of Table 7, but render

Table 7
International Capital Movements Under Three
Exchange Rate Regimes, 1922 - 1936

(sum of absolute value of balances on capital account)
Millions of U.S.$

	Freely Floating Rates (1922-26)	Fixed Rates (1927-31)	Managed Floating (1932-36)
Eight Creditor Countries	6,967	8,722	9,525
14 Developed or Semi-developed Debtor Countries	4,853	6,695	2,223
12 Underdeveloped Debtor Countries	1,312	2,035	1,138
Total	13,132	17,452	12,886

Source: Computed from United Nations (1949).

the extent of capital movements in the first half of the 'twenties even more impressive. The standard deviation of the capital flows/national income ratio is larger in the free floating period 1922-26 than in the fixed rate period 1927-31 that followed. (For the data underlying Figure 1, the standard deviations are 0.025 for 1922-26 and 0.019 for 1927-31.) The standard deviation for 1932-36 is considerably smaller (0.016) despite the presence of the Finnish outlier. These measures indicate no obvious association between the flexibility of nominal exchange rates and the magnitude of international capital movements.

8. Real Interest Differentials

The problem with basing inferences about the extent of international capital mobility on direct measures of capital flows is that the magnitude of capital movements depends not only on the integration of international capital markets but also on national economic conditions. One can visualize a situation in which capital is highly mobile but, because economic policies minimize the savings-investment gap in each country, few if any capital movements are observed.

These problems have led authors to consider the question using data on asset returns, notably real interest rate differentials, rather than asset flows.14/ Table 8 reports real interest differentials (the nominal differential less the inflation differential, in per cent per annum) for the three interwar exchange rate regimes. Given the extremity of German experience in the early 1920s, I again compute averages for free floating period both including and excluding Germany.

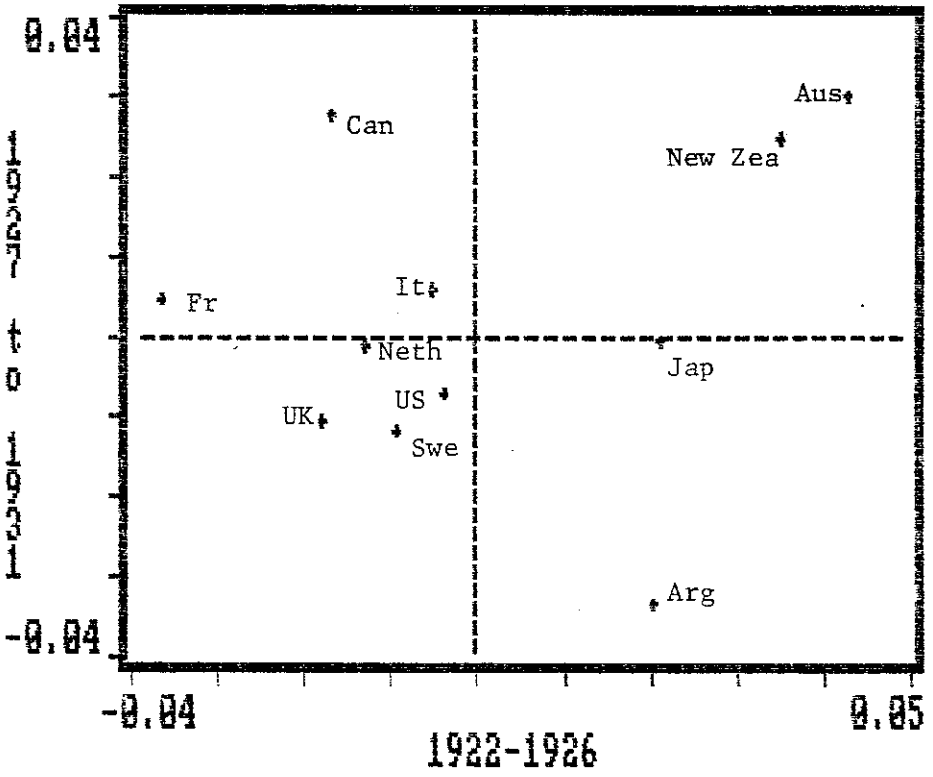
The real interest differentials (and other statistics calculated below) are constructed as the British rate minus the rate for other countries.15/ Positive sample means for the U.S. and France in the early 1920s show that real interest rates for these countries were 25 basis points lower than British rates. Positive U.K.-U.S. differentials reflect tight British monetary

Table 8
Real Interest Differential
(Interest differential less inflation differential, in per cent)

Period	Country	# of Obs	Sample Mean	S.E. of Mean	Sample Stand Dev	Root MSE	95% Band
Free Floating	U.S.	56	0.2536	0.4305	0.01860	0.01843	0.0338
1922.01-1926.08	France	56	0.2605	0.8764	0.03786	0.03752	0.0911
	Belgium	56	-0.3066	0.9130	0.03944	0.03909	0.0764
	Netherlands	56	-0.1872	0.4459	0.01926	0.01909	0.0337
	Italy	56	-2.3994	0.4884	0.02110	0.02091	0.0498
	Switzerland	56	0.7722	0.4121	0.01780	0.01764	0.0332
	Group w/o Ger.	336	-0.303	0.2579	0.02729	0.02704	0.0551
1922.01-1923.10	Germany	22	-70.2884	136.8874	3.70693	3.62170	-10.3358
1924.02-1926.08	Germany	31	-8.0963	3.3788	0.10862	0.10685	0.2837
	Group w/Ger.	389	-4.8821	7.7496	0.88246	0.86218	0.2800
Fixed Rates	U.S.	56	0.5702	0.2638	0.01140	0.01129	0.0221
1927.01-1931.08	France	56	1.1687	0.3218	0.01390	0.01378	0.0311
	Germany	56	-1.7795	0.2663	0.01150	0.01482	0.0384
	Belgium	56	0.2796	0.2703	0.01168	0.01157	0.0250
	Netherlands	56	0.3167	0.2606	0.01126	0.01115	0.0219
	Italy	56	-2.8919	0.5088	0.02198	0.02178	0.0679
	Switzerland	56	1.2052	0.2819	0.01218	0.01207	0.0280
	Group	392	0.6614	0.1215	0.01389	0.01422	0.0380
Managed Floating	U.S.	56	0.6254	0.3092	0.01336	0.01324	0.0225
1932.01-1936.08	France	56	-1.5809	0.5461	0.02359	0.03006	0.0573
	Germany	56	-2.9204	0.2663	0.01150	0.01140	0.0471
	Belgium	56	-1.3697	0.4768	0.02060	0.02042	0.0329
	Netherlands	56	-0.8568	0.4903	0.02118	0.02099	0.0418
	Italy	56	-3.4499	0.3709	0.01603	0.01588	0.0536
	Switzerland	56	-1.0151	0.3566	0.01541	0.01527	0.0345
	Group	392	-1.5096	0.1593	0.01821	0.01909	0.0480

Source: See text.

Fig. 1. Capital Flows as Percent of GNP



Note: Countries included are France, the Netherlands, Sweden, UK, US, Argentina, Australia, Canada, Italy, Japan and New Zealand.

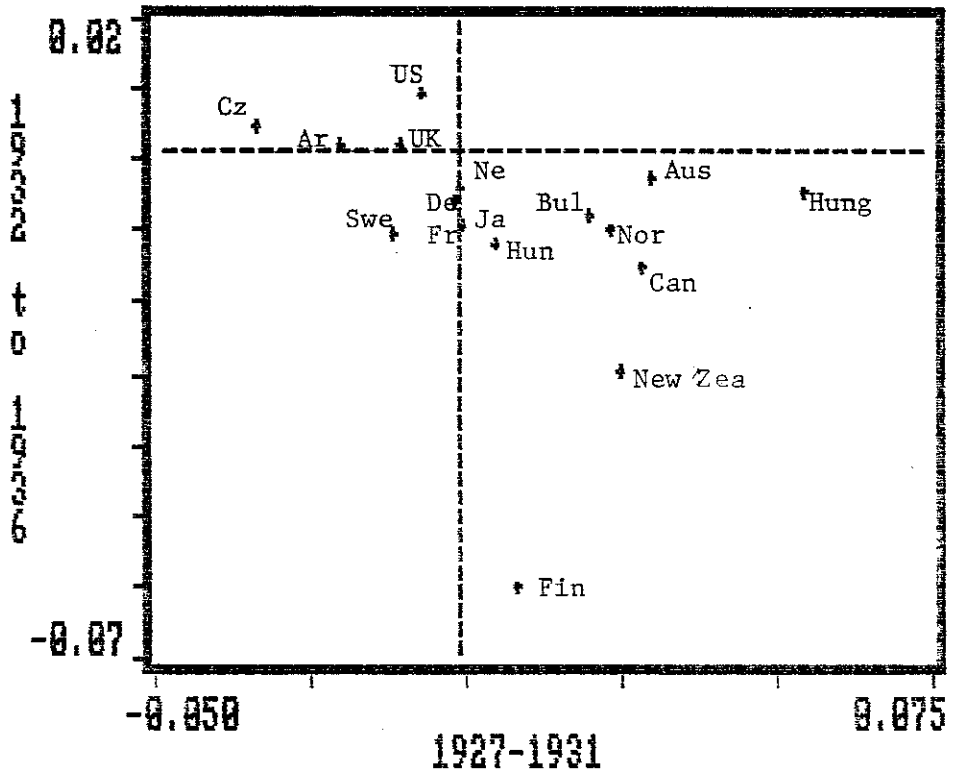
Source: See text.

policy designed to induce the deflation required for a return to the prewar sterling parity. Positive U.K.-French differentials reflect the loose monetary policy associated with French inflation and depreciation of the franc. Similar stories can be told for the other periods. For example, in the 1930s the preponderance of negative sample means indicates that, except in comparison with the United States, the Bank of England's policy of cheap money succeeded in lowering real interest rates relative to those of other countries.

The group averages indicate that real interest differentials were larger in the two floating periods than under fixed rates (1927-31). Again, however, there is no direct correspondence between the degree of exchange rate variability and the magnitude of the differential. Real interest differentials were on average five times as large under managed floating as under free floating. Here for once we have a case where direct evidence on capital flows and indirect evidence from asset returns point to the same conclusion. Note that the contrast between periods is not due to a subgroup of countries: for every country in the sample (but Germany) the differentials were larger under managed than under free floating. As in the estimates of real and nominal exchange rate predictability above, the decline in nominal exchange rate variability with the move from free to managed floating did not deliver a comparable reduction in real interest differentials.16/

The story must be modified slightly when one considers the level of the differentials rather than their variability. The sample standard errors of the real interest differentials are consistent with the hypothesis that the extent of financial market integration (as measured by the variability of the real interest differential) is directly correlated with the degree of exchange rate stability. Real interest differentials were half again as variable under free floating as under managed floating, and half again as variable under managed floating as under fixed rates. (I refer to results for 1922-26 excluding Germany.) The root mean squared error, an alternative measure of variability, provides the same picture. If the

Fig. 2. Capital Flows as Percent of GNP



Note: Countries included are France, Netherlands, Sweden, UK, US, Argentina, Australia, Czechoslovakia, Canada, Denmark, Finland, Japan, New Zealand, Norway, Bulgaria and Hungary.

Source: See text.

average level of the real interest differential was larger in the early 1930s than in the early 1920s, its variability was larger under the 'twenties float than the 'thirties float. This suggests, plausibly, that political factors such as capital controls, actual or anticipated, may have been responsible for the larger average differentials in the 1930s, while exchange rate volatility may have been responsible for their greater variability in the 1920s.

Variations across countries within each period are consistent with the interpretation. Under the early 1920s float, countries with relatively stable exchange rates (the U.S., whose currency was pegged to gold and relatively stable against sterling, along with the Netherlands and Switzerland) have small sample standard deviations compared to countries with more volatile exchange rates (France, Belgium and Italy). Within this group of volatile exchange-rate countries, there is a direct correspondence between the degree of nominal exchange rate variability and the variability of the real interest differential (with Belgium and France exhibiting larger differentials than Italy). The very large variability of the Anglo-German real interest differential drives home the point.

Under fixed rates (1927-31) there is relatively little difference across countries in the average level or variability of the real interest differential. Since this was the period not only with least exchange rate variability but also with least risk of capital controls and fewest political impediments to capital mobility, it is difficult to determine whether the degree of exchange rate flexibility or other factors were responsible for the contrast.

For managed floating (1932-36), real interest differentials against London were both larger and more variable for gold bloc countries such as France, Belgium and the Netherlands than for countries such as Germany and Italy which suspended at least some provisions of the gold standard and imposed exchange controls of varying degrees of severity. One would think that exchange controls would be inconsistent with international financial market integration and real interest convergence, but 1930s experience is not clearly

consistent with this view. The relatively low average level and variability of the U.S. and Swiss real interest rate differentials are difficult to reconcile with any explanation that would contrast gold bloc and exchange control countries. One would think that Switzerland in particular should be grouped with the gold bloc, where in fact the variability of its real interest differential more closely resembles those of Germany and Italy.

9. Decomposing Real Interest Differentials

Shedding light on these patterns requires digging deeper into the composition of the differentials. I follow Frankel and MacArthur (1988) in decomposing the real interest differential into three components. Defining the real differential 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 rate of inflation and asterisks denote foreign variables, we can add and subtract the forward discount f_d and the expected rate of depreciation of the domestic currency Δs^e:

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

The first term is the covered interest differential. In the absence of transactions costs, information costs, capital controls, risk of future capital controls and default risk, the mean and variability of this component of the real interest differential should be negligible. If capital controls and like factors were significant impediments to real interest rate convergence, they should be picked up by this term. Following Aliber (1973) and Frankel and MacArthur (1988), I refer to $i-i^*-f_d$ as the "political risk" premium to highlight the political dimension of adoption of capital controls.

The second term is the exchange risk premium. The forward discount on foreign exchange need not equal the expected rate of depreciation of the foreign currency if investors demand compensation for the risks of exchange rate changes. A large literature documents the existence of an exchange risk premium for the 1980s. The question is how its magnitude compares in the 1920s and 1930s, and the extent to which it contributes to real interest differentials.

The third term is expected real depreciation. Only if the expected rate of depreciation of the nominal exchange rate equals the expected inflation differential will purchasing power parity hold in an expectational sense. But if, for example, the rate of depreciation of the domestic currency is expected to exceed the difference between domestic and foreign inflation rates, the real exchange rate of the home country is expected to depreciate. The purchasing power of domestic goods over foreign goods is expected to decline; to induce investors to hold assets that yield a return denominated in domestic goods, they must be compensated by a higher real interest rate.

Table 9 displays the first component of the real interest differential, the political risk premium. The results reveal the greater magnitude of political risk in the early 1930s than in the early 1920s, and in the early 1920s than in the gold-exchange standard period 1927-31. (Unless stated to the contrary, I refer to the results excluding Germany in the early 'twenties.) This is quantitative confirmation of the prevalence of exchange controls in the 1930s.

Controls were also utilized in the 1920s by countries to combat inflation and exchange rate depreciation, as well as by some countries seeking to strengthen their currencies and return to par. A priori, it is not obvious that they represented a more serious impediment to international capital mobility in the 1920s or the 1930s. Actual controls may have been more prevalent in the 'thirties, but investors might hesitate to transfer capital across national

Table 9

Covered Interest Differential

(Interest differential less forward discount, in per cent)

Period	Country	# of Obs	Sample Mean	S.E. of Mean	Sample Stand Dev	Root MSE	95% Band
Free Floating	U.S.	56	-0.1733	0.308	0.01331	0.01319	0.0230
1922.01-1926.08	France	56	-2.4928	0.4414	0.01907	0.01890	0.0427
	Belgium	56	-2.2103	0.2491	0.01076	0.01066	0.0369
	Netherlands	56	-0.2050	0.3404	0.01471	0.01458	0.0239
	Italy	56	-3.2402	0.4740	0.02048	0.02029	0.0829
	Switzerland	56	0.9022	0.2644	0.01142	0.01132	0.0246
	Group w/o Ger	336	-0.9032	0.1455	0.01540	0.01526	0.0372
1922.01-1923.01	Germany	13	-9.3530	4.6581	0.09697	0.09316	0.1364
1924.12-1926.08	Germany	21	-2.9399	0.8131	0.02151	0.02100	0.0450
	Group w/Ger.	370	-1.3157	0.2153	0.02392	0.02327	0.0460
Fixed Rates	U.S.	56	0.4805	0.1911	0.00825	0.00818	0.0134
1927.01-1931.08	France	56	1.2056	0.2427	0.01048	0.01039	0.0275
	Germany	55	-2.2164	0.2497	0.01069	0.01059	0.0318
	Belgium	56	0.2620	0.1503	0.00649	0.00643	0.0131
	Netherlands	56	0.5146	0.1777	0.00768	0.00761	0.0157
	Italy	56	-2.7894	0.3066	0.01324	0.01312	0.0503
	Switzerland	56	1.0024	0.3165	0.01367	0.01355	0.0226
	Group	391	-0.2150	0.0910	0.01039	0.01035	0.0360
Managed Floating	U.S.	56	0.1933	0.2221	0.00960	0.00970	0.0220
1932.01-1936.08	France	56	-2.4627	0.7529	0.03253	0.03224	0.0864
	Germany	N/A	N/A	N/A	N/A	N/A	N/A
	Belgium	56	-1.6589	0.3331	0.01439	0.01426	0.0327
	Netherlands	56	-1.1805	0.572	0.02471	0.02449	0.0594
	Italy	47	-5.2501	0.5416	0.02340	0.02315	0.1007
	Switzerland	56	-1.4404	0.5911	0.01946	0.01929	0.0453
	Group	327	-1.8762	0.2100	0.02192	0.02173	0.0640

Source: See text.

borders because of a perceived danger of future controls as well as because of their actual presence. Table 9 suggests that political risk was a more serious impediment in the 1930s. The sample mean of our measure of political risk is twice as large in the 1930s as in the 1920s. The contrast between the 1930s and early 1920s is all the more striking in view of the fact that data limitations prevent the inclusion of Germany in the 1930s.

The contrast between the two periods of floating on the one hand and the fixed rate years on the other is even more striking. Political risk is four times as large in the early 1920s as in 1927-31, nine times as large in the early 1930s as in 1927-31. The same ranking emerges when one considers the variability of the covered interest differential (as measured by either the sample standard deviation or the root mean squared error) rather than its average level.

Which countries account for the rise in political risk? The rise is quite general: the sample mean rises in absolute value for all countries except Belgium. The largest increase is that of Italy, presumably reflecting a combination of capital controls and default risk due to political developments.

Alternative measures of the variability of the covered interest differential tell a consistent story. Judged by the standard deviations, political risk under the managed float of the 1930s was greater than under the free float of the 1920s, and greater under the free float than under fixed rates. Interestingly, however, the United States is an exception to the rule that political risk was greater in the 'thirties than in the early 'twenties. Both the sample standard deviation and the root mean squared error are larger in 1922-26 than in 1932-36. This difference could be due to an unusually high perceived risk of exchange control in the 1920s, or an unusually low risk in the 1930s. The second explanation is more plausible than the first. It is hard to imagine why fears of the imposition of capital controls by the United States in the early 1920s would have been greater or more variable than comparable fears in

the 1930s. And neither the root mean squared error nor the sample standard deviation for the U.S. in 1922-26 are much different than the comparable statistics for other countries such as the Netherlands and Switzerland, where fears of exchange control were minimal. For the 1930s, the U.S. covered interest differential behaves very differently than those of these other countries. It remains an open question why investors in dollars should have been so sanguine about political risk in a period when the Roosevelt Administration felt free to experiment with the exchange rate and to make radical changes in other economic arrangements.

This evidence of political risk under floating rates is difficult to reconcile with the argument of Stockman (1988) and Giovannini (1989) that capital controls tend to be associated with fixed exchange rates. According to this argument, policymakers habitually adopt nominal exchange rate targets that are incompatible with domestic policies. They turn to controls to alleviate the conflict. As Giovannini points out, capital controls were a prominent feature of the European Monetary System throughout its first decade of operation. They were used to reconcile the relatively inflationary policies pursued by the weak currency countries with sustained periods of nominal exchange rate stability. Under the Bretton Woods System, exchange controls were prevalent as late as 1958, at which time the external convertibility of the European currencies was finally restored. There were also subsequent instances, such as the U.S. Exchange Equalization Tax of the 1960s, when countries with fixed exchange rates sought to tax and control capital movements.

But in the interwar period, capital controls were more prevalent under floating than under fixed rates. The interwar system of fixed rates provides a counterexample to the general proposition.

Was political risk solely responsible for deviations from covered interest parity in the 1930s, or did other factors play a role? Table 10 displays the sum of the other two

components of the real interest differential: exchange risk plus expected real depreciation. Estimating these components separately requires an assumption about how investors formed expectations of depreciation. Given the difficulty of constructing such forecasts and the controversial nature of any empirical proxy, I first circumvent the problem entirely, considering the two components together, which eliminates the expected depreciation term. The sum of the two components $(f_d-\pi+\pi^*)$ is denoted the real forward discount or "currency risk," since it encompasses both the exchange risk premium and expected real depreciation due to divergent movements anticipated in the exchange rate and the international inflation differential.

Table 10 shows that currency risk was greatest in the early 1920s, not in the early 1930s when real interest differentials were largest. The sample mean of the real forward discount is nearly 150 per cent as large under the free float as under the managed float. Equally striking is the contrast between the currency risk in the two floating periods and the fixed exchange rate years. By this measure, currency risk was four times as great under managed floating as under fixed rates, and six times as great under free floating as under fixed rates.

Alternative measures (standard deviations, root mean squared errors) yield the same ranking. Currency risk was greater under free than managed floating, and greater under managed floating than fixed rates. But by these alternative measures, which focus on the variability of the real forward discount rather than its level, the contrast between the two floating-rate regimes is less impressive.

The differences across regimes in currency risk are quite general. They apply to all countries in the sample. The mean real forward discount, for example, is smaller for every country under fixed rates than under either floating-rate regime.

Table 10

Real Forward Discount

(Forward discount less inflation differential, in per cent)

Period	Country	# of Obs	Sample Mean	S.E. of Mean	Sample Stand Dev	Root MSE	95% Band
Free Floating	U.S.	56	0.4269	0.3045	0.01315	0.01304	0.0294
1922.01-1926.08	France	56	2.7533	0.7185	0.03104	0.03076	0.0780
	Belgium	56	1.9037	0.9511	0.04109	0.04072	0.0903
	Netherlands	56	0.0178	0.3178	0.01373	0.01361	0.0284
	Italy	56	0.8407	0.6171	0.02666	0.02642	0.0511
	Switzerland	56	-0.1300	0.3212	0.01388	0.01375	0.0268
	Group w/o Ger.	336	0.9687	0.7375	0.02555	0.02532	0.0625
1922.01-1023.01	Germany	13	44.5546	14.7277	0.30658	0.29455	0.8061
	Germany	21	0.6561	0.4676	0.01237	0.01208	0.0199
	Group w/Ger.	380	2.4170	0.5478	0.06165	0.05952	0.0830
Fixed Rates	U.S.	56	0.0897	0.2285	0.00987	0.01268	0.0176
1927.01-1931.07	France	56	-0.0370	0.3966	0.01713	0.01698	0.0415
	Germany	55	0.5572	0.1645	0.00704	0.00698	0.0174
	Belgium	56	0.0176	0.2576	0.01113	0.01103	0.0209
	Netherlands	56	-0.1978	0.2717	0.01174	0.01163	0.0191
	Italy	56	-0.1184	0.3216	0.01389	0.01355	0.0264
	Switzerland	56	0.0325	0.2576	0.01113	0.01103	0.0180
	Group	392	0.1644	0.1055	0.01206	0.01230	0.0216
Managed Floating	U.S.	56	0.4321	0.3425	0.01480	0.01466	0.0252
1932.01-1936.08	France	56	0.8818	0.5989	0.02587	0.02564	0.0598
	Germany	N/A	N/A	N/A	N/A	N/A	N/A
	Belgium	56	0.2892	0.6153	0.02658	0.02634	0.0247
	Netherlands	56	0.3238	0.3620	0.01564	0.01550	0.0260
	Italy	47	1.9678	0.7350	0.02909	0.02878	0.0836
	Switzerland	56	0.4252	0.3965	0.01713	0.01697	0.0417
	Group	327	0.6856	0.2114	0.02207	0.02186	0.0485

Source: See text.

In contrast, within each exchange-rate regime there are dramatic differences across countries in the magnitude of currency risk. Under the free float of the 1920s, currency risk was by far the grestest for France and Belgium, followed at a distance by Italy. France and Belgium are the high inflation countries in the sample, while Italy experienced moderate inflation.

Under the managed float of the 1930s, cross-country variations in currency risk were moderate in size. Under fixed rates, in contrast, cross-country variations were small. Currency risk was greatest for Germany and Italy, the two countries for whom convertibility was most in doubt.

Tables 11 and 12 decompose currency risk into the exchange risk premium (the forward discount less expected nominal depreciation) and expected real depreciation (expected nominal depreciation net of the expected inflation differential). Actual depreciation of the currency over the period is used as a proxy for expected depreciation, actual inflation as a proxy for expected inflation.17/ Both components contribute to the greater magnitude of the currency risk premium under free than managed floating. The mean exchange risk premium was nearly four times as large under free floating as under managed floating; in turn, mean exchange risk was nearly four times as great under managed floating as under fixed rates. Apparently, investors demanded more compensation for the risks associated with uncertain exchange-rate fluctuations under freely floating rates than under managed floating, and under managed floating than under fixed rates. The same pattern is evident in the sample standard deviation: it is nearly twice as large in 1922-26 as in 1932-36, and nearly twice as large in 1932-36 as in 1927-31.

Cross-country variations in the exchange risk premium support the notion that investors required a premium to hold highly variable currencies. In the early 1920s the largest and most variable risk premia are, in descending order, those of Germany, Belgium, France and

Italy, corresponding to their ranking in order of exchange rate volatility (as measured by standard deviations of holding period returns in Table 2). Smaller risk premia were demanded of countries with relatively stable currencies such the U.S., Switzerland and the Netherlands.

It is not clear why the United States, whose currency was pegged to gold throughout the 'twenties, should have had a larger risk premium than Switzerland and Holland. But while the dollar was pegged vis a vis gold, it was not pegged against other currencies, such as sterling. Table 2 shows that the sterling-dollar rate was more volatile between 1922 and 1926 than either the British-Swiss or British-Dutch exchange rates. The premium on dollars is thus consistent with the hypothesis linking exchange-rate variability, via uncertainty, to the exchange risk premium.

For the managed float, cross-country differences are more difficult to interpret. The largest exchange risk premia were demanded of Italy, France and the U.S., in descending order. But the sample standard deviation and the root mean squared error indicate that the exchange risk premium was most variable in Belgium and the United States. Belgium and the U.S. are the two countries in the sample which moved from the pegging their exchange rates to gold to managed floating midway through the period. Apparently, the exchange risk premium rose significantly when countries departed from the gold standard.

For the fixed-rate regime, there is little systematic cross-country variation in exchange risk premia. One suggestive fact is that the means and sample standard deviations are larger for Germany and Italy than for the other countries. Germany and Italy were the two countries in the sample whose gold standard parities were in most serious doubt, which may explain the relatively large risk premia attached to their currencies.

Expected real depreciation, the final component of the real interest differential, was also greater under free than managed floating.18/ Average real depreciation was 3.5 per cent per

month between 1922 and 1926, but only 0.3 per cent per month between 1932 and 1936. Similarly, the sample standard deviation of the rate of real depreciation was almost twice as large under free as under managed floating. Not all countries conform to the pattern: for Switzerland, the Netherlands and the U.S., the average rate of real depreciation is larger in the early 'thirties than in the early 'twenties. The correlation dominates where the variability of the nominal rate was especially pronounced: in France, Belgium and Italy in the 1920s. This suggests that even if there existed a positive association between the freedom of the float and the variability of the expected change in the real exchange rate, where the correlation was weak it could be overwhelmed by other influences.

The importance of other factors in determining expected real depreciation is underscored by the fact that the variability of expected real depreciation was actually greater under fixed rates between 1927 and 1931 than under the subsequent managed-floating regime. The fixed-rate period coincided with the Great Depression and the collapse of commodity prices, which wreaked havoc with real exchange rates.19/ This points up the inability of fixed nominal rates to guarantee real exchange rate stability.

To summarize, currency risk was greater under free floating in the 'twenties than under managed floating in the 'thirties, because both the exchange risk premium and the variability of the real exchange rate were greater. The variability of freely floating rates appears to have rendered financial assets denominated in different currencies increasingly poor substitutes. In conjunction with imperfectly flexible domestic-currency prices, the variability of nominal rates under free floating led to large real exchange rate changes, limiting the integration of international commodity markets. Yet despite the greater magnitude of currency risk in the 'thirties, real interest differentials were smaller in the early 'twenties because capital controls and other forms of government intervention in international financial markets were more extensive under managed floating.

The evidence from asset returns suggests that capital mobility was lower in the 'thirties than the 'twenties due to the fact and threat of capital controls. Exchange risk premia and real exchange rate variability were in fact greater in the early 'twenties, but these were insufficient to swamp the effect of controls. Only if one wishes to argue that the capital controls of the 'thirties were a legacy of dissatisfaction with the "hot money" flows experienced under free floating in the 'twenties is it possible to assert that the degree of exchange rate flexibility bears a direct relationship to the degree of international financial market integration.

10. The Credibility of Fixed Exchange Rates

The preceding analysis reveals the most interest rate convergence and international financial market integration under fixed rates. This section considers whether the decision to peg the exchange rate delivered those benefits immediately or only after a period of transition.

Pegging nominal rates did not equalize real interest rates across countries. But as Tables 7-11 show, insofar as real interest differentials remained, they were attributable to terms of trade shocks creating expectations of real exchange rate changes. If exchange rates were credibly fixed, however, these terms of trade shocks should not have produced nominal interest rate differentials. Equation (2) above, reproduced here for clarity,

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

can be rewritten (bringing the inflation terms to the left-hand side) as:

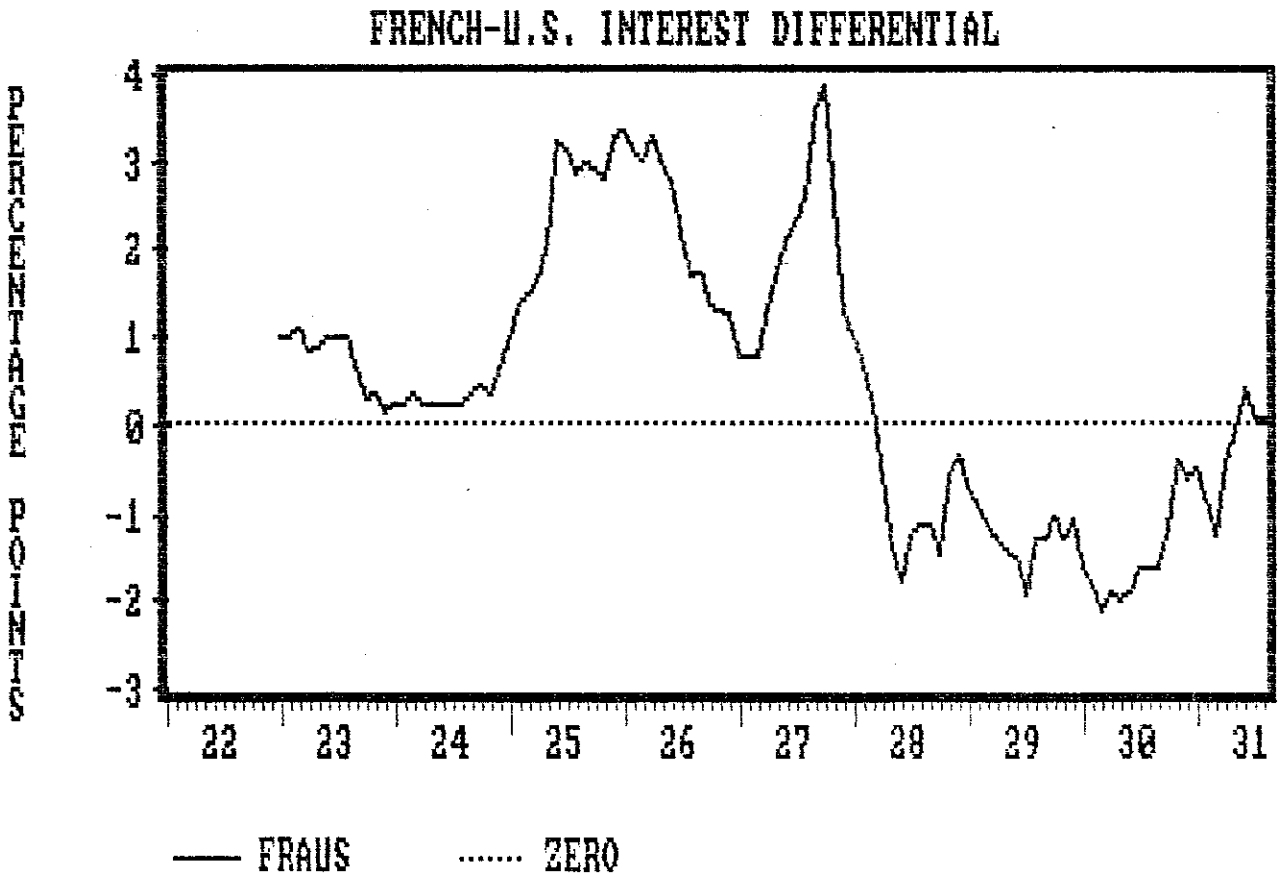
$$i - i^* = (i-i^*-f_d) + (f_d-\Delta s^e) + (\Delta s^e) \qquad (3)$$

The nominal interest differential will be negligible under fixed rates if (i) deviations from covered interest parity are negligible, (ii) risk premia are negligible, and (iii) expectations of nominal exchange rate changes are zero. Figures 3-5 show the nominal interest differential against the United States for France, Belgium and Italy, three of the last industrial countries to stabilize. The interest rates are 90 day market discount rates. The figures suggest that fixed nominal rates did not instantaneously deliver nominal interest rate convergence and financial market integration.

Figure 3 for France shows that fully a year following the franc's de facto stabilization was required before even short-term interest rates fell to U.S. levels. Nominal rates declined over the second half of 1926, following Poincaré's accession to power in the summer. The fall in nominal rates reflects rapid deflation associated with the recovery of the exchange rate. But once the exchange rate and prices were stabilized in December 1926, the nominal interest differential rose, presumably reflecting continued doubts about the government's commitment to peg the nominal rate.

Interpretation of French experience is complicated by the 18 month lag between de facto and de jure stabilization. The nominal interest differential is consistent with instantaneous credibility if one believes that the government's commitment to fixed rates was only complete following de jure stabilization. But Figure 4 for Belgium buttresses the view that credibility was not acquired instantaneously. Legal stabilization in Belgium took place abruptly in October 1926. In contrast to Poincaré, Franqui moved immediately from de facto to de jure stabilization. Yet Figure 4 shows that, as in France, a year passed before the credibility of this commitment to a fixed nominal rate was accepted by the market. There had been a previous attempt to stabilize the Belgian franc (the Janssen Plan of October 1925 - March 1926). On that previous occasion, like the current one, de facto stabilization had been accompanied by tax increases sufficient to balance the budget and

FIGURE 3


FRENCH-U.S. INTEREST DIFFERENTIAL
PERCENTAGE POINTS
4
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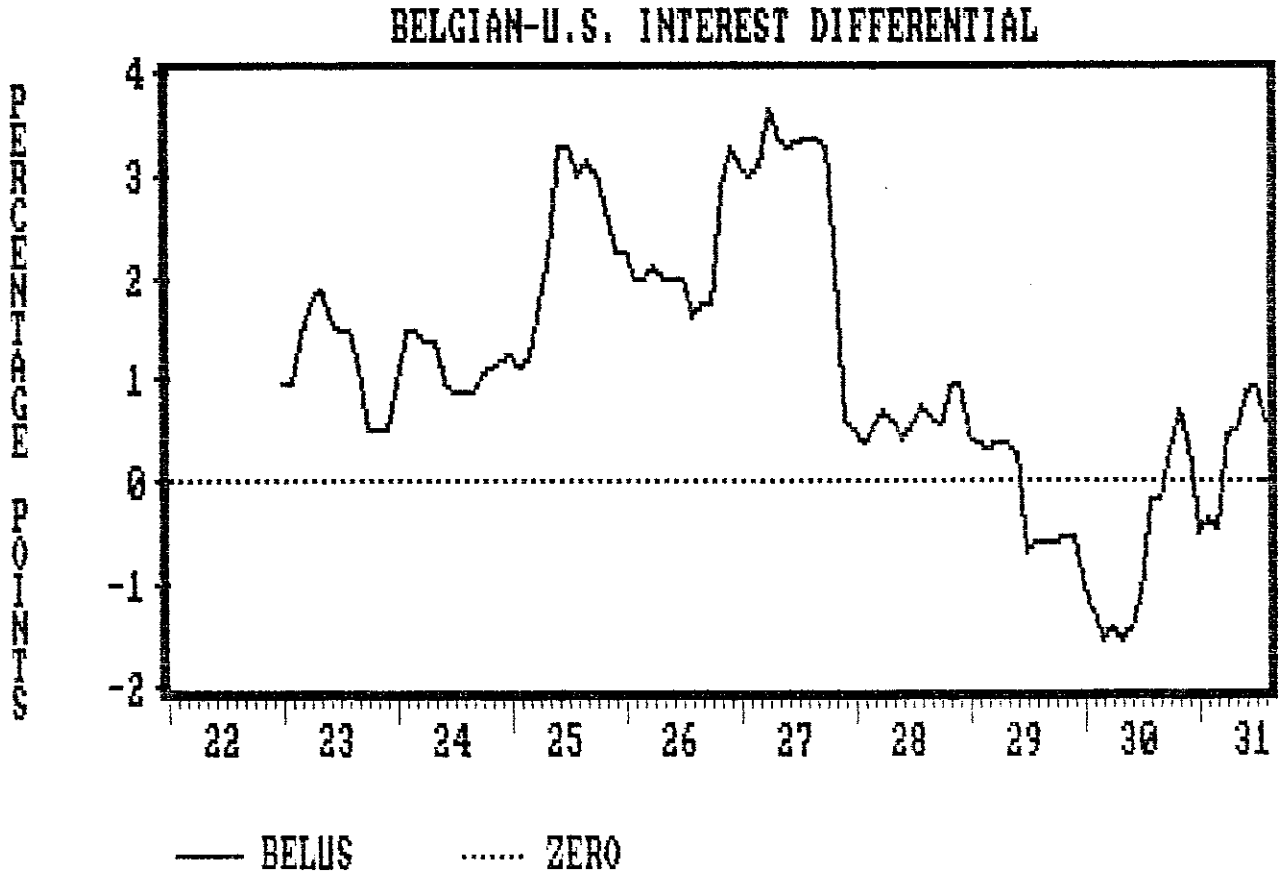
FRAUS
ZERO

FIGURE 4


BELGIAN-U.S. INTEREST DIFFERENTIAL
PERCENTAGE POINTS
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-1
-2
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23
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26
27
28
29
30
31
BELUS
ZERO

foreign loan negotiations.20/ Yet the Janssen stabilization had failed. This helps us understand why the market remained skeptical of the Franqui stabilization for much of 1927.

The same pattern is evident in Figure 5 for Italy. Stabilization took place in 1927, yet a significant interest differential vis-a-vis the United States remained until 1929.

Figures 6 and 7, which show French and Belgian interest differentials against Switzerland, make two further points. First, our conclusions about the gradual nature of the transition to credibly fixed exchange rates are not affected by choice of reference currency. Second, the credibility of the commitment to a fixed rate appears to have depended more on individual national policies than on the gold standard system as a whole. There was little question about the stability of the Swiss franc, at least until the second half of 1935. The Belgian-Swiss nominal interest differential remains roughly constant throughout 1931-34, even after Britain and the U.S. have devalued. There is only the slightest indication of a larger nominal interest differential in the early 'thirties than in the late 'twenties. The same is true of France. Until the election that brought the Popular Front to power in the spring of 1936, there is little sign of growing skepticism about the credibility of the official commitment to maintain the nominal peg.

11. Summary

This paper has reported evidence on the characteristics of fixed and flexible exchange rate regimes. Using interwar evidence, it has uncovered important differences across regimes, encompassing both nominal and real variables and both policy inputs and performance outputs.

The variability of the nominal exchange rate was found to be positively associated with the freedom of the float. Nominal rates were considerably more variable under free than managed floating. The kurtosis in the distribution of exchange rate changes suggests that

FIGURE 5

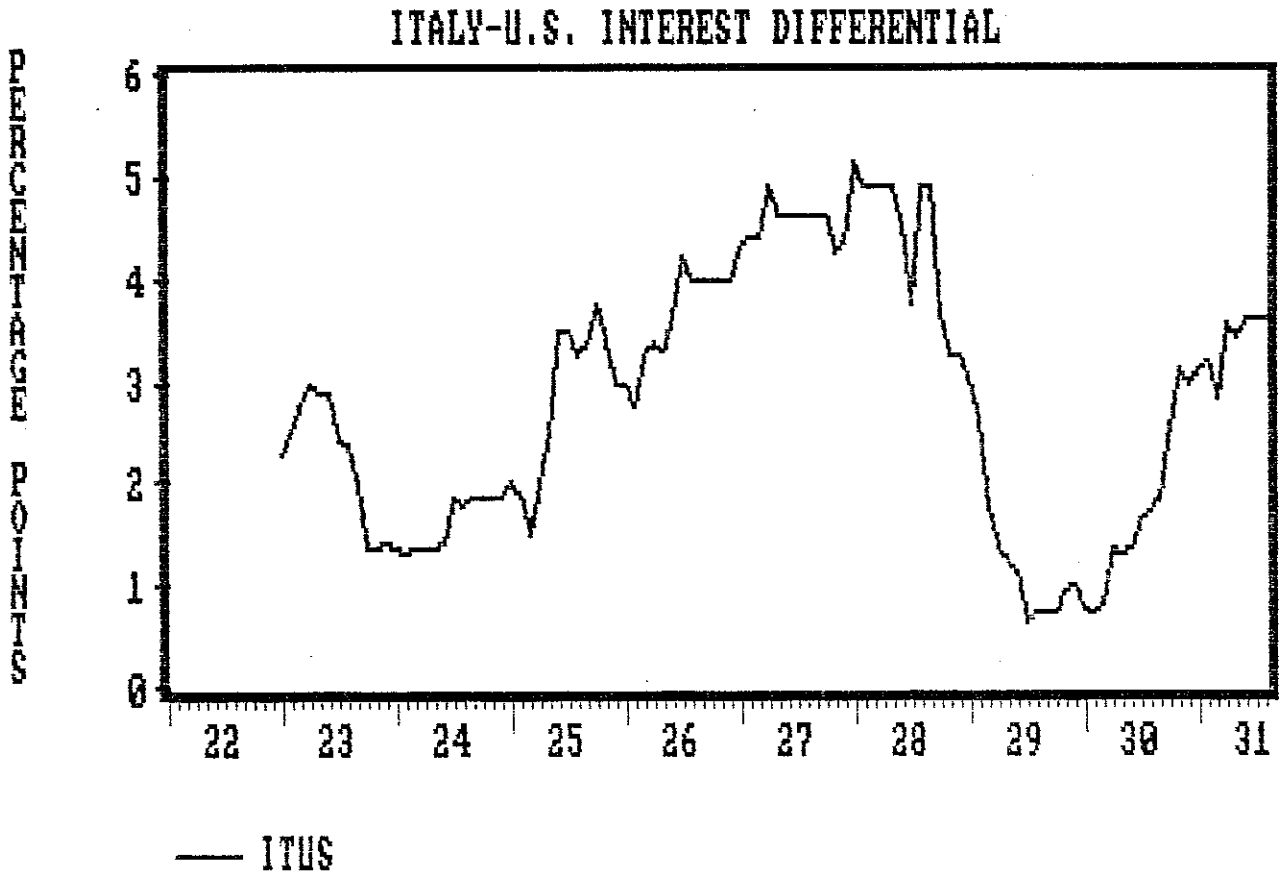
ITALY-U.S. INTEREST DIFFERENTIAL
PERCENTAGE POINTS
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FIGURE 6

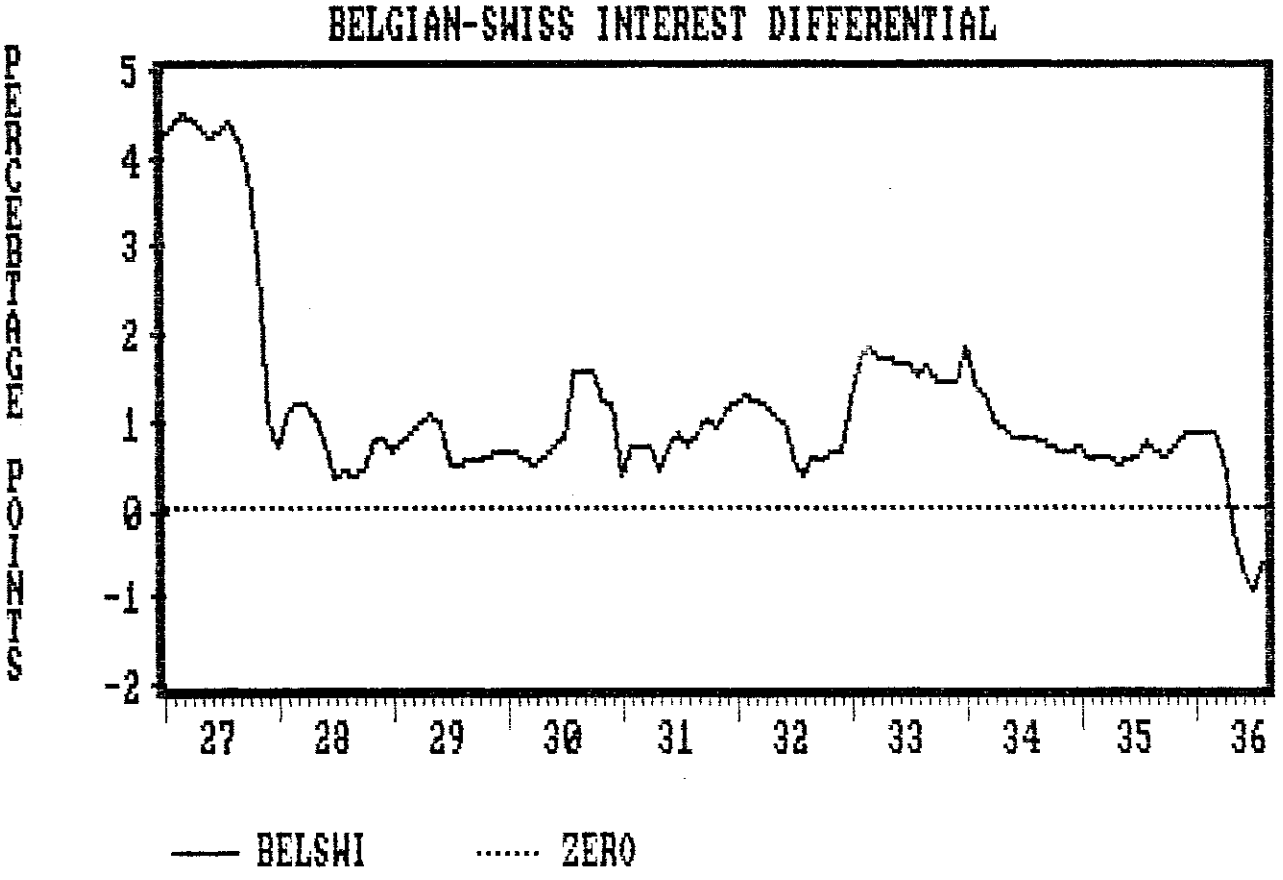
BELGIAN-SWISS INTEREST DIFFERENTIAL
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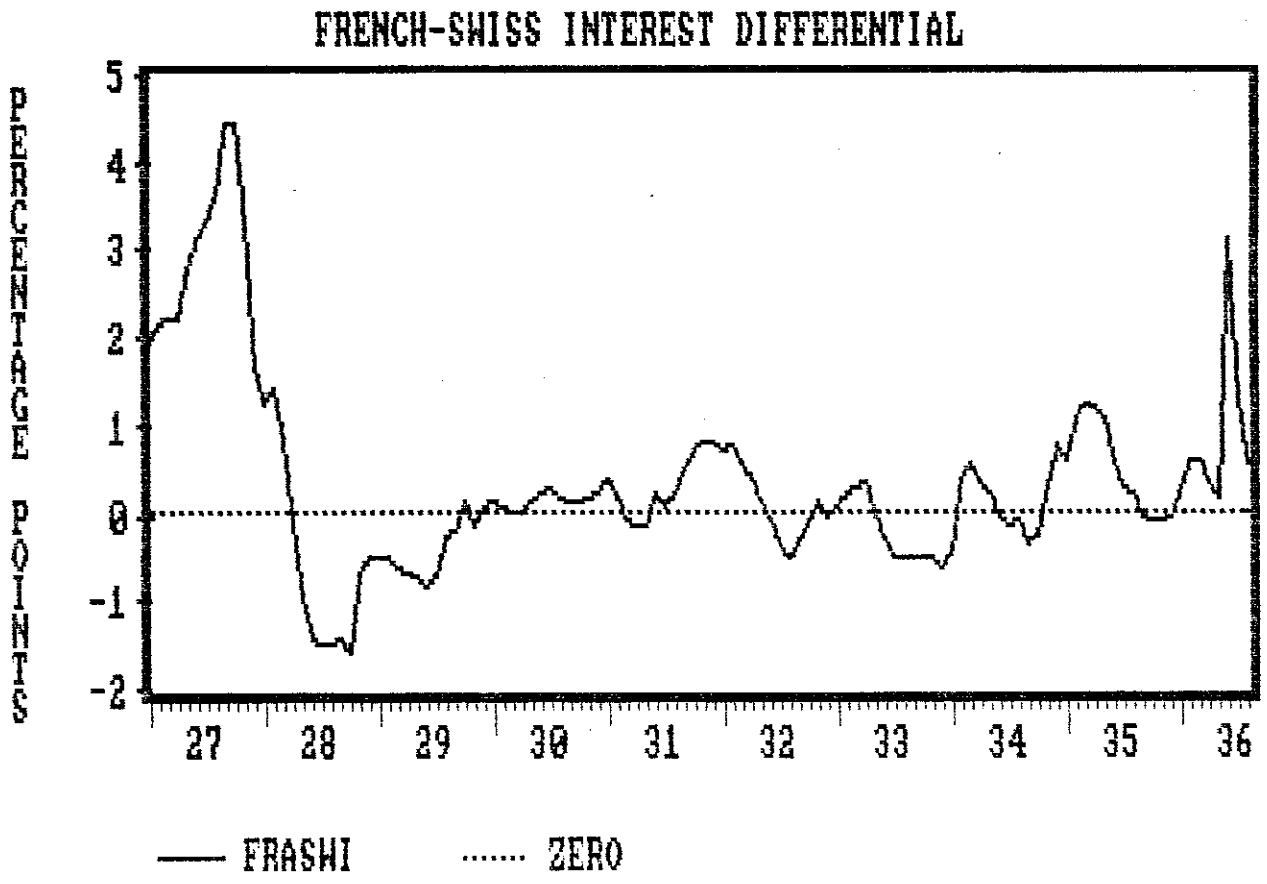
FIGURE 7


FRENCH-SWISS INTEREST DIFFERENTIAL
PERCENTAGE POINTS
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36
FRASWI
ZERO

such variability was episodic: that free floating rates were highly variable mainly because of a few periods of exceptional volatility.

Yet the reduction in nominal exchange rate variability achieved with the move from free to managed floating was not accompanied by a commensurate fall in exchange rate uncertainty. Alternative forecasting equations suggest that the spot rate was almost as difficult to predict in the early 'thirties as in the early 'twenties. While government policy succeeded in damping spot rate fluctuations, it seems to have been subject to periodic shifts that heightened risk. If this interpretation is correct, then the decline in exchange rate variability between the early 'twenties and early 'thirties did not necessarily imply an improvement in welfare.

This point is reinforced by the observation that there was a strong association between nominal exchange rate predictability and real exchange rate predictability in both periods of floating. It appears that intervention to stabilize nominal exchange rates did not guarantee a commensurate reduction in either real or nominal exchange rate uncertainty.

Policies which stabilized exchange rates might, in principle, have encouraged international capital mobility. But there is no direct correspondence between the degree of exchange rate stability and the volume of capital flows, because there is no direct correspondence between exchange rate stability and exchange rate risk, or between exchange rate stability and the real interest rate differentials in response to which capital movements take place. For many countries, real interest differentials were larger under the managed float of the 1930s than under the free float of the 1920s. This is because capital controls which posed a barrier to international capital mobility were more pervasive in the 1930s. On the question is whether exchange controls are a necessary concomitant of attempts to limit exchange rate flexibility, evidence from 1927-31 suggests a negative answer. That fixed rate regime operated without the presence or prospect of significant exchange controls.

It delivered reductions in nominal exchange rate uncertainty, real exchange rate uncertainty and real interest differentials.

This suggests that whether a reduction in exchange rate variability confers economic benefits depends on how that reduction is achieved. In the 1930s, exchange rate flexibility was limited through government intervention in the markets, using instruments including but not restricted to exchange control. There was only limited international policy coordination to minimize exchange rate swings. Conflicts therefore arose between domestic policies and exchange rate stability, causing intervention to be subject to changes whose timing was difficult to predict. In the second half of the 1920s, nominal exchange rates were fixed instead through the systematic adaptation of monetary and fiscal policies. This permitted fixed nominal rates to deliver many of the benefits anticipated by their advocates.

Table A1
Alternative Forecasting Equations for Nominal Exchange Rates

	AR(1) Equations		ARMA(1,1) Equations		
	α	β	α	β	MA(1)
Floating Rates					
Denmark	2.6771	.9940	2.7740	.9903	.6117
Finland	5.1989	.9038	5.2014	.8913	.1166
Norway	3.0515	.9883	3.0780	.9839	.2249
Sweden	2.8902	.9592	2.8777	.9382	.2880
Switzerland	3.2204	.8865	3.2200	.8809	.0790
U.S.	1.5878	.9674	1.5708	.9540	.2790
France	7.3377	.9923	7.2800	.9922	.1035
Netherlands	2.4924	.9719	2.4787	.9415	.4551
Belgium	5.5270	.9787	5.5178	.9780	.1467
Italy	7.1783	.9963	7.1582	.9962	.4016
Germany (1)	20.7137	.9697	21.8430	.9720	.1295
Germany (2)	30.6420	.9280	30.6370	.9022	.2015
Fixed Rates					
Denmark	2.9003	.3709		na	
Finland	5.2634	.7220	5.2630	.7572	-.0858
Norway	2.9004	.8865	2.8991	.9116	-.2965
Sweden	2.8975	.4464	2.8975	.5974	-.1946
Switzerland	3.2148	.9810	3.2179	.9637	.5609
U.S.	1.5813	.7241	1.5813	.7399	-.0338
France	4.8205	.7229	4.8204	.5730	.4581
Netherlands	2.4924	.7750	2.4926	.5643	.6003
Belgium	3.5523	.7976	3.5523	.7021	.2509
Italy	4.5221	.6203	4.5234	.3410	.9910
Germany	30.6473	.8404	30.6470	.6806	.5390
Managed Floating					
Denmark	3.8186	.9669	3.8321	.9675	.0403
Finland	6.1390	.9751	6.1330	.9743	.1053
Norway	3.6474	.9654	3.6464	.9646	.1317
Sweden	3.6172	.9649	3.6125	.9637	.1478
Switzerland	2.7155	.9644	2.7339	.9475	.3706
U.S.	1.6827	.9642	1.6619	.9591	.2203
France	4.3103	.9650	4.3248	.9480	.4855
Netherlands	1.9786	.9648	1.9927	.9492	.4375
Belgium	3.2988	.9601	3.2738	.9380	.2112
Italy	4.0926	.9500	4.1014	.9251	.3688
Germany	30.1390	.9620	30.1468	.9497	.3387

Source: See text.

Table A2

Alternative Forecasting Equations for Real Exchange Rates

	AR(1) Equations		ARMA(1,1) Equations		
	α	β	α	β	MA(1)
Floating Rates					
Denmark	2.8799	.8986	2.8789	.9074	-.0396
Finland[a]	5.6648	.8873	5.6670	.9009	-.0723
Norway	2.9240	.9192	2.9227	.9103	.0689
Sweden	2.8789	.9299	2.8777	.9213	.2293
Switzerland	3.2270	.9586	3.2340	.9619	-.0272
U.S.	1.9811	.9143	1.9828	.8913	.1613
France	3.3702	.9698	3.4001	.9318	-.2220
Netherlands	2.5296	.9313	2.5234	.9048	.2551
Belgium	3.3599	.8418	3.3811	.9012	-.2365
Italy	7.1780	.9963	7.1582	.9963	.4016
Germany (1)	8.1914	.1575	na	na	na
Germany (2)	30.7520	.7373	30.753	.6303	.2883
Fixed Rates					
Denmark	2.8149	.3950	2.8149	.3240	.0843
Finland	5.1060	.9947	5.1041	.9947	.1108
Norway	2.7560	.9584	2.7580	.9473	.1054
Sweden	2.8424	.9320	2.8407	.9375	-.0263
Switzerland	3.1766	.8575	3.1718	.9148	-.1815
U.S.	1.9238	.9245	1.9275	.8830	.4401
France	3.3087	.8083	3.3087	.8086	-.0023
Netherlands	7.5370	.9997	7.5855	.9997	.1193
Belgium	1.7363	.8680	1.7359	.8769	-.0390
Italy	4.5221	.6203	4.5234	.3410	.9910
Germany	30.4990	.9799	30.4946	.9800	.1253
Managed Floating					
Denmark	3.5708	.9691	3.5664	.9675	.2149
Finland	6.4406	.9791	6.4230	.9779	.1876
Norway	3.4890	.9683	3.4707	.9658	.1987
Sweden	3.5627	.9677	3.5426	.9648	.2623
Switzerland	2.9196	.8629	2.9196	.8485	.0572
U.S.	1.9415	.9474	1.9343	.9352	.2859
France	3.1006	.6647	3.1006	.5307	.2416
Netherlands	2.3933	.9117	2.3907	.8627	.3020
Belgium	1.6938	.9533	1.6901	.9467	.0863
Italy[b]	4.0926	.9500	4.1013	.9251	.3688
Germany	30.2056	.9651	30.2105	.9579	.1854

Notes: [a] 1923.01 - 1926.08.

[b] 1932.02 - 1935.10 only.

Source: See text.

FOOTNOTES

1. This statement is too sweeping to be entirely accurate. The pound sterling remained officially convertible into gold throughout the war, although bureaucratic impediments and the special difficulties of gold export permitted substantial depreciation. The U.S. dollar remained officially convertible into gold throughout the war, although moral suasion discouraged citizens from attempting to acquire gold from the authorities. In the interest of brevity, I omit such qualifications for the rest of this section. A more detailed summary of interwar exchange rate experience is in Eichengreen (1989).

2. Notable contributions to this literature include Viner (1932), Gayer (1939), Brown (1940), Nurkse (1944), and Kindleberger (1973).

3. On these debates see Nurkse (1944, chapter VI), Hall (1935) and Howson (1980).

4. Whether meaningful action accompanied these words remains a matter for debate. Three references to this literature are Beyen (1949), Clarke (1977) and Eichengreen (1985).

5. The problem with conducting tests of market efficiency using effective rates is the results depend on choice of weights. In fact, however, very similar conclusions emerge from an analysis of effective rates, as I will show in a forthcoming paper.

6. Mean changes are also reported but are more difficult to interpret than global measures of variability, since they reflect mainly the movement of the reference currency.

7. The average value of the statistic is larger for the early 'thirties than for the early 'twenties, although the difference is due entirely to the experience of one country, Belgium. Belgium floated against sterling throughout the period, but pegged against the gold bloc until the spring of 1935. At that point Belgium devalued and repegged to France at a lower level, which accounts for the kurtosis.

8. This episode was limited to a sufficiently short period that there is little evidence of it in the monthly data used to construct Table 2.

9. See for example Artis (1987).

10. Here I report only a select few summary statistics on the behavior of real rates. Below I provide more information on the distribution of real rate changes. The analysis here differs from that in Eichengreen (1988) by analyzing the log real rate in first difference form.

11. In Eichengreen (1988) I documented the strong positive correlation between the variability of real and nominal exchange rates within both periods. The present result, for the correlation between the variability of real and nominal exchange rate forecasts within both periods, is suggestive of stronger welfare implications.

12. They are especially incomplete at the beginning of the 1920s, when newly-established governments had not yet set up reliable recording systems, and in the second half of the 1930s, when various governments are suspected, for political reasons, of having window dressed their accounts. To the extent that this leads to underreporting of the volume of

capital flows during the two floating-rate periods, comparisons should be treated with caution.

13. Data on GNP and GDP for this period are fragile and must be treated gingerly. To prevent any one annual estimate from dominating the analysis, in the text I generally rely on five year averages. Sources of national income estimates are as in Eichengreen and Portes (1986).

14. A recent survey is Hodrick (1987).

15. Since I use monthly observations of 90 day forward exchange rates and, where possible, interest rates, the standard deviations of these means are calculated assuming N/3 independent observations, where N is the number of months.

16. International real interest differentials reached such high levels during the German hyperinflation that their inclusion is sufficient to raise the average interest differential for 1922-26 to some three times that for 1932-36.

17. In future work I plan to construct alternative measures of expected exchange rate changes by projecting actual changes on variables proxying for currently available information. Since here I use actual depreciation as a proxy for expected depreciation, for the remainder of this section I do not distinguish the two.

18. Two accounts which emphasize the impact of the Depression on real exchange rates are Lewis (1949) and Diaz-Alejandro (1983).

19. This is a result that may be driven by the use of actual depreciation as a proxy for expected depreciation. In the future work described in footnote 17, I plan to reconsider this question.

20. An account of the failed Janssen stabilization is Shepherd (1936).

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