Some new stylized facts of floating exchange rates

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Abstract

This paper re-examines real exchange rate behavior of OECD currencies under the current float using the more extensive dataset that an additional decade's worth of experience has made available. What emerges is a new set of stylized facts, which suggest that the problems of the current float were not, as commonly believed, generic to that system but in fact rather specific, being largely confined to one sub-period — the early and mid-1980s — and one currency — the US dollar. This dollar behavior ranks as one of the important puzzles of the past 25 years. © 1998 Elsevier Science Ltd. All rights reserved.

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Regarded as a key to solving the world's monetary ills at their inception, floating exchange rates came to be viewed as a major part of the problem a scant decade later. Underlying this dissatisfaction with the float were a number of important features of exchange rate behavior that appeared substantially at variance with economic theory. In this paper I re-examine that behavior using the more extensive data set that an additional decade's worth of experience has made available.[1] What emerges is a new set of stylized facts, which suggest that the problems of the current float were not, as commonly believed, generic to that system but in fact rather specific, being largely confined to one time period — the early and mid-1980s — and one currency — the US dollar.

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[1] The papers in this issue by Koedijk et al. (1998) and by Papell and Theodoridis (1998) speak further of the importance of these additional data for inferences about real exchange rates under the float.

1. Earlier studies

The system of floating exchange rates that began with the breakdown of the Bretton Woods system in 1971 quickly became an object of empirical scrutiny. Because of the dominant position of the United States in the world economy, dollar exchange rates quite naturally were the major focus. By the mid-1980s, the verdict was in. The float was not working. Exchange-rate behavior under the new regime appeared too far removed from what had seemed reasonable to expect on the basis of theory. The end result was that the theory itself increasingly was called into question.

The first and seemingly most telling bit of evidence was the substantial volatility of exchange rates observed during this period, not only nominal exchange rates, but more importantly real (Frankel and Meese, 1987). The second was the strong correlation between quarter-to-quarter and year-to-year changes in nominal and real exchange rates documented by Mussa (1986). The third was a series of findings that suggested that this correlation did not dissipate over time, and hence that nominal exchange rates did not eventually revert to stable equilibrium values, even to a first approximation. One bit of evidence that gave rise to this belief was the widely reported finding that real exchange rates could be characterized statistically as random walks. Another was the subsequent failure of many researchers to reject the hypothesis of a unit-root for real exchange rates and of non-cointegration of nominal exchange rates and relative price levels.

The problem in all of this was not simply that nominal exchange rates had fluctuated. It had long been recognized that floating exchange rates did not necessarily imply a high degree of stability in an absolute sense. The issue was one of stability in an economic sense. The fluctuations in nominal exchange rates appeared highly excessive relative to fluctuations in fundamentals and the divergences between nominal exchange rates and one particularly important set of fundamentals, relative price levels, appeared to be permanent in nature. The inferences that were made were that purchasing power parity, if it had ever been a useful guide, was no longer so and that models of exchange rates in which PPP served as a building block were no longer reliable (Meese and Rogoff, 1983). While sentiment has altered somewhat with regard to the question of mean reversion, principally as a result of the substantial body of new studies published during the 1990s, no one to my knowledge has gone back and systematically re-evaluated the data for the float from a descriptive standpoint to see if the other empirical regularities had stood the test of time.[2] That is the object of this research.

2. Data and empirical evidence

The sample that I use in this investigation contains data for the United States

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[2] These recent studies of purchasing power parity include Frankel and Rose (1996), Jorion and Sweeney (1996), Lothian (1997), Lothian and Taylor (1996), Mark (1995), and Oh (1996). See Rogoff (1996) and Edison et al. (1996) for reviews of this literature.
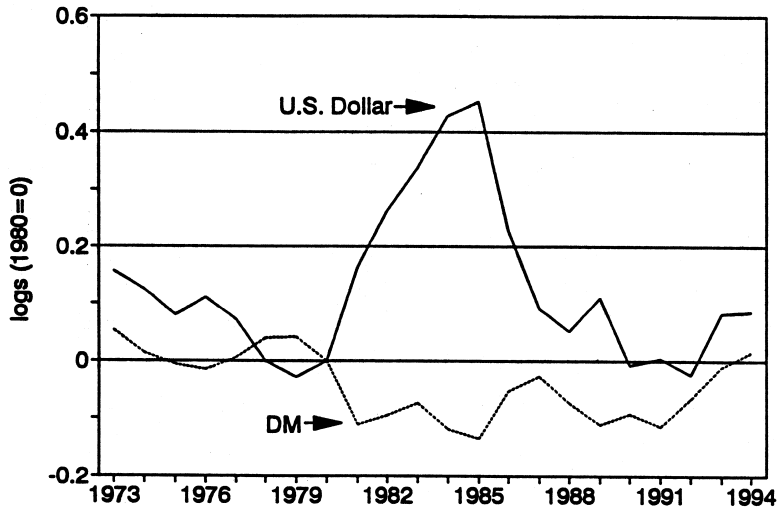
Fig. 1.   Real exchange rate indexes: 22-country averages.

and 22 other OECD countries over the period 1973 through 1994. Exchange rates are denominated alternately in US dollars and in DM; the price level is measured by the consumer price index, or cost-of-living index, depending upon the country.[3]

2.1. Volatility

The principal empirical results with regard to real exchange rate volatility are summarized in Fig. 1 and Table 1. Shown in Fig. 1 are 22-country averages of annual log US dollar and log DM real exchange rates for the period 1973 to 1994. Reported in Table 1 are means and standard deviations of both series and their first differences for the full period 1974–1994 and for the subperiods 1974–1980, 1981–1987, and 1988–1994.

The plot of the averages is striking. The bulk of the variation in the dollar series is clearly confined to two rather protracted sets of movements in the middle of the sample period — the substantial real appreciation of the dollar between 1980 and early 1985 and the subsequent and nearly offsetting real depreciation from then until 1987. In the periods both before and after this episode, the variations while not totally inconsequential were far more muted. Just as important the average levels of these cross-country average real dollar exchange rates before and after this episode appear to differ very little from one another. The figures in Table 1 confirm these visual impressions — standard deviations of the average log real

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[3]The exchange rates are yearly averages as listed in either line rf or line rh of the International Financial Statistics (International Monetary Fund]); the figures for the cost-of-living indexes are yearly averages as listed in line 64 of that publication.

Table 1
Summary statistics for 22-country average real exchange rates

	log(US$)	log(DM)	Dlog(US$)	Dlog(DM)
1974−1994				
Mean	0.123	−0.047	−0.003	−0.002
S.D.	0.138	0.057	0.087	0.044
1974−1980				
Mean	0.046	0.011	−0.021	−0.008
S.D.	0.056	0.022	0.037	0.028
1981−1987				
Mean	0.276	−0.088	0.014	−0.004
S.D.	0.129	0.039	0.136	0.062
1988−1994				
Mean	0.047	−0.065	−0.001	0.006
S.D.	0.050	0.050	0.069	0.042

The second and third columns show figures for averages of log levels; the last two columns for changes in the average log levels. Underlying data are indexes with 1980 as the base year.

dollar exchange rates of 0.056, 0.129 and 0.050 for the subperiods 1974−1980, 1980−1987 and 1988−1994, respectively; means of 0.046 and 0.047 for the first and the last of these three subperiods.

The average DM real rate in contrast appears much more stable over the full sample period and exhibits only a slight increase in volatility during the 1980s. The full-period standard deviation of the log DM rate is less than half that of the dollar rate (0.057 versus 0.138); the 1981−1987 standard deviation is less than a fourth that of the dollar rate (0.039 versus 0.129). There is however variability between subperiods, as we can see by comparing the subperiod means, but this too is much less than for the dollar.

What is true for these average real exchange rates in the main also holds for the individual-country rates. Figures 2 and 3 summarize this analysis. Shown in Fig. 2 are frequency distributions of the standard deviations of the log real dollar and DM exchange rates for the individual countries for the full sample period. As was the case for the average rates, we see consistently higher variability of the dollar real rates. Shown in the two panels of Fig. 3 are plots of the cumulative percentage changes in the two real exchange rates [the dollar in Fig. 3(a) and the DM in Fig. 3(b)] for the periods 1980−1985 and 1985−1987 for each country individually. With the notable exception of Canada with its close economic and policy links to the United States, and capital markets, and the partial exception of Turkey, the individual-country real dollar rates again behave very similarly to the average rate, showing substantial increases over the years 1980−1985 and substantial and nearly offsetting decreases over the two following years. For the DM real rates, in contrast, the individual-country data exhibit much less volatility over these periods
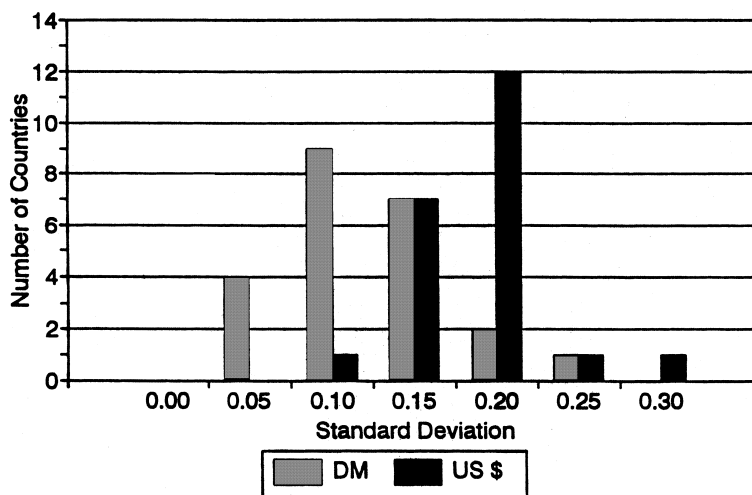
Fig. 2.   Distribution of standard deviations of real exchange rates.

in virtually every instance. The two glaring exceptions — exceptions which in fact prove the rule — are Canada and the United States.

2.2. The relation between nominal and real exchange rates

The second stylized fact of the float — a positive and substantial relationship between real and nominal exchange rates — can be seen in these data when we examine year-to-year changes. It weakens substantially, however, as the frequency of data observation is shortened and in the end actually seems to disappear. We can see this in the scatter plots for the pooled dollar and DM data shown in Figs. 4 and 5 and in Table 2 which reports the corresponding regression results. For the yearly data plotted in Figs. 4(a) and 5(a) there is a noticeable positive relation between the logarithmic changes in the nominal and real rates in both instances. In the 3-year averages shown in Figs. 4(b) and 5(b) the relations between the two are noticeably weaker, more so in the case of the DM. In the 7-year averages and full-period averages plotted in Fig. 4 (c,d), Fig. 5 (c,d) they are virtually non-existent. Hence, while movements in nominal exchange rates give rise to movements in real exchange rates over the short run, such influences do not persist to any great extent over the long run.

2.3. Mean reversion

In studies using long historical data sets, the finding of real-exchange-rate mean reversion has now become quite common.[4] More recently, studies that focus on the

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[4] See Lothian and Taylor (1996) and the studies cited therein, and the review of this literature in Rogoff (1996).
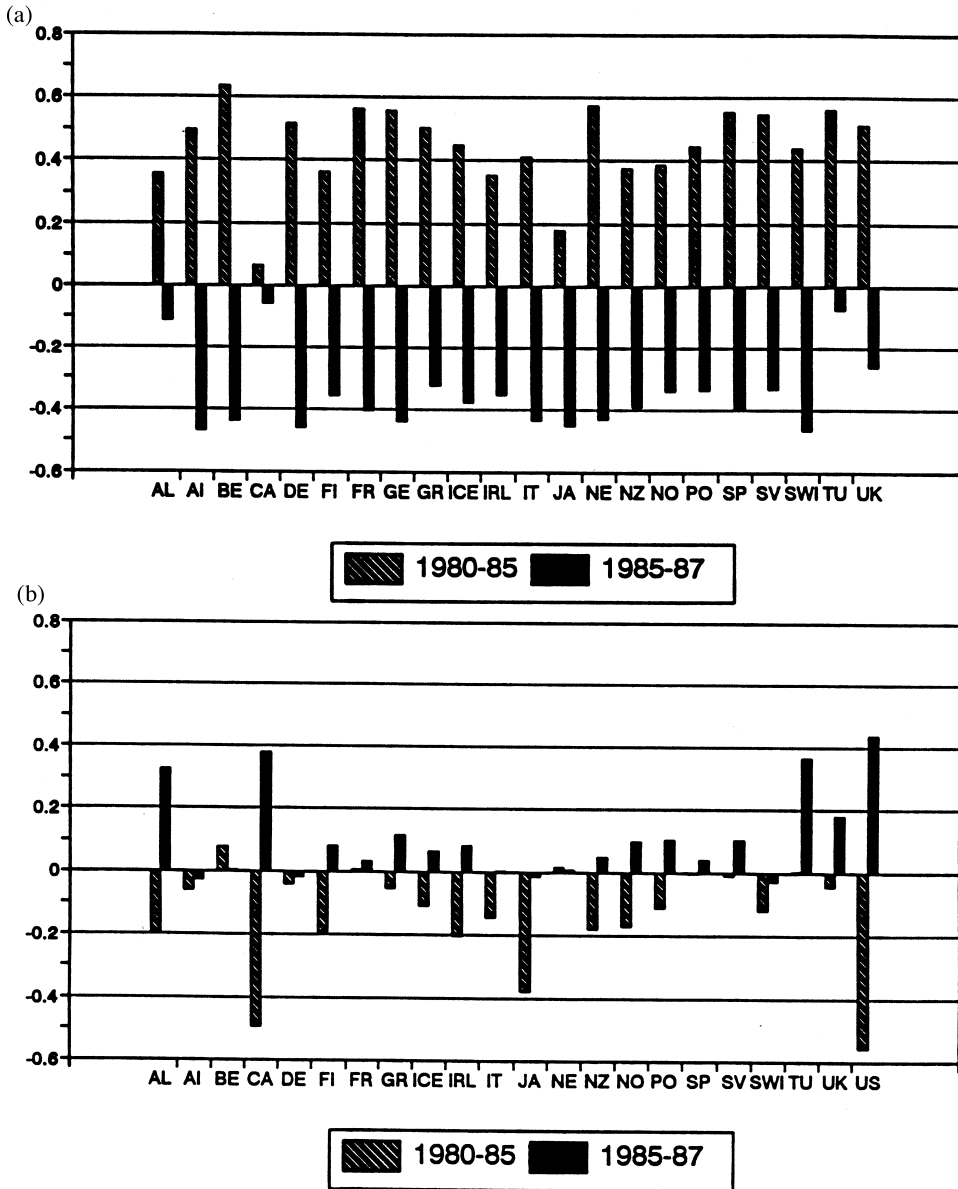
(a)

(b)

Fig. 3.   (a) Changes in real US$ exchange rate: 1980−5 versus 1985−87; (b) Changes in real DM exchange rates: 1980−85 versus 1985−7.

float alone have begun to report much the same thing.[5] These studies suggest that during the floating rate period (a) real exchange rates have not behaved any differently over the longer run than in earlier periods; (b) they have in fact

Table 2
Regressions of the change in the log real exchange rate $(\mathrm{d}q)$ on the change in the log nominal exchange rate $(\mathrm{d}e)$ $\mathrm{d}q = \alpha + \beta \mathrm{d}e + \epsilon$

Data	α	β	R^2/SEE	Data	α	β	R^2/SEE
DM				US dollar			
Yearly	−0.026	0.377	0.396	Yearly	−0.024	0.510	0.548
	0.003	0.022	0.060		0.003	0.022	0.070
	−8.427	17.38			−7.067	23.60	
3-year average	−0.015	0.203	0.208	3-year average	−0.020	0.403	0.450
	0.004	0.032	0.043		0.005	0.036	0.057
	−3.735	6.324			−4.040	11.16	
7-year average	−0.006	0.059	0.095	7-year average	−0.007	0.089	0.159
	0.003	0.023	0.018		0.003	0.026	0.020
	-2.139	2.587			−2.588	3.479	
Period average	−0.007	0.075	0.365	Period average	−0.006	0.074	0.360
	0.002	0.022	0.009		0.002	0.022	0.009
	−2.770	3.394			−2.681	3.357	

Data are for all 22 countries pooled.

contained economically important mean-reverting components; and hence that (c) purchasing power parity has therefore remained a useful first approximation for many, though certainly not all, purposes. The evidence reviewed above buttresses those conclusions. At the same time, however, it points to a major difficulty surrounding the investigation of PPP under the float. This has to do with the data themselves.

Given the long-lived nature of the movements in real exchange rates, most noticeably the two large swings in dollar rates in the 1980s, separating the transitory (mean-reverting) components of real exchange rates from the permanent components has necessarily been very difficult. One episode does not a large sample make. Adding to the problem until quite recently was the paucity of observations at the end of that episode. The analogue that comes to mind is the problem that would arise using the early NBER method of business-cycle analysis if only a scant cycle worth of data were available and there was no clear sign that the cycle had run its full course. Identification of the trend, and thus separation of the long-term and short-term movements in the series would be extraordinarily difficult; generalizations about cyclical behavior on the basis of this one observa-

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[5] These studies include Frankel and Rose (1996), Jorion and Sweeney (1996), Koedijk et al. (1996), Mark (1995), Oh (1996), Lothian and Taylor (1996) and Lothian (1997). See O'Connell (1997) and Papell (1997) for criticisms of and qualifications to these results.
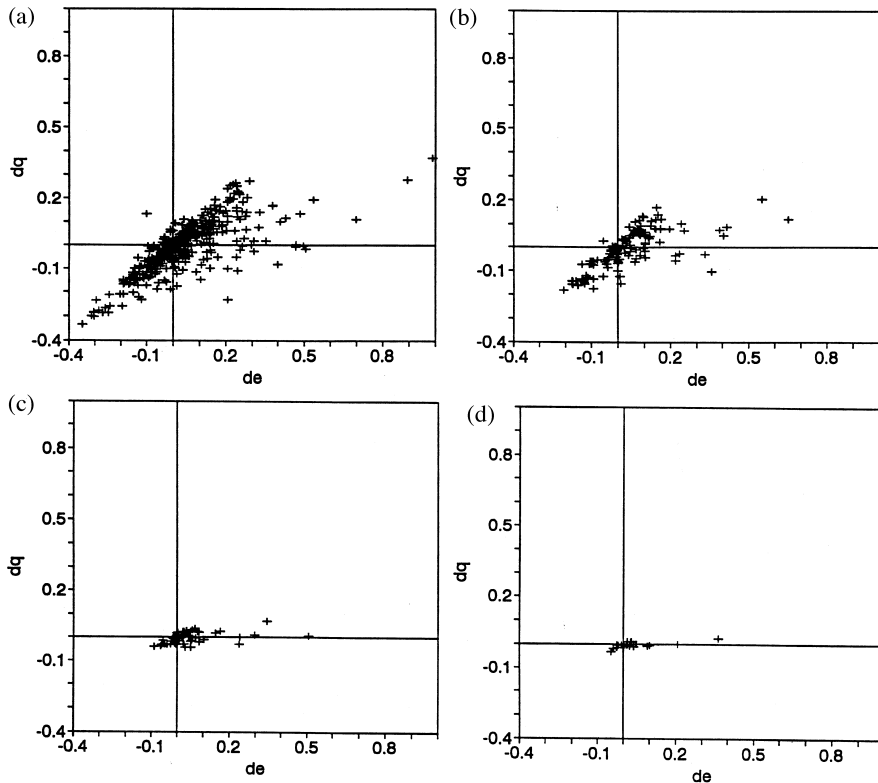
Fig. 4.   (a) Growth of nominal and real dollar exchange rates, yearly data; (b) Grown of nominal and real dollar exchange rates, 3 year averages; (c) Growth of nominal and real dollar exchange rates, 7 year averages; (d) Growth of nominal and real dollar exchange rates, period averages.

tion would be impossible. Econometrics has become much more sophisticated since the heyday of the NBER method of analysis, but underlying deficiencies in data still pose much the same problem.

3. Concluding remarks

After swinging from one intellectual extreme to the other, professional thinking on the subject of real exchange rates and PPP has now started to come back close to where it was in the 1960s.

Real exchange rates are tolerably stable over the long run. That message has come through loud and clear from the research of the 1990s. They are not the will-o'-the-wisps many thought a scant decade ago. Shifts in their long-run equilibrium values may occur but these generally appear to be small in absolute terms and
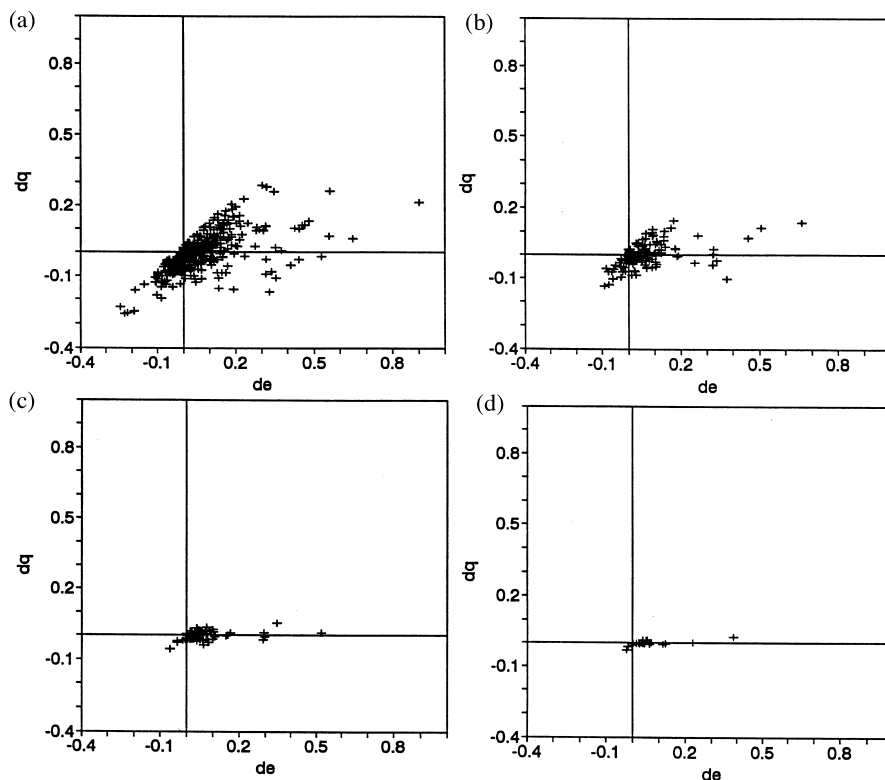
Fig. 5. (a) Growth of nominal and real DM exchange rates, yearly data; (b) Growth of nominal and real DM exchange rates, 3 year averages; (c) Growth of nominal and real DM exchange rates, 7 year averages; (d) Growth of nominal and real DM exchange rates, period averages.

very much smaller still when compared with long-run changes in nominal exchange rates and price levels.[6] Real exchange rates are, however, subject to a good deal of variation over shorter, though nevertheless still quite lengthy periods. They cannot be treated as approximately constant over all time horizons as some proponents of the monetary approach to exchange rates in the 1970s seemed wont to do. That is equally clear.

The important questions for research going forward therefore lie in the rather broad middle ground between these two extremes. The first task for researchers is to come up with more complete statistical characterizations of real exchange rate behavior, ones that distinguish more accurately the transitory and permanent components of real exchange rates and that as a result can prove helpful in

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[6] Lothian (1997), Papell (1997), Taylor (1996) and Koedijk et al. (1998) contain evidence of variations in long-term equilibrium real exchange rates for various currencies.

discriminating among alternative possible model structures.[7] The second is to model that behavior empirically and thus develop better explanations for real exchange rate movements at both higher and lower frequencies. The third, which is related to the first two, is to provide a more intellectually satisfying explanation for the dollar's behavior in the 1980s. Given the importance of that episode and the apparent links between it and several other still not well understood economic developments of that period, dollar behavior to my mind ranks as one of the important unsolved puzzles of the past 25 years.

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[7]Evans and Lothian (1993) and Engel and Kim (1996) are two studies that have attempted to do this. The former uses data for five major countries relative to the dollar under the float, while the latter uses long time series data for the real dollar-sterling rate.

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