Open Economy Macroeconomics

Unit 4

Purchasing Power Parity

The **PPP** is based on the “law of one price”

Law of one price: Arbitrage forces will lead to the equalization of goods prices internationally when the price of goods are measured in the same currency

The idea is that, in the long run, exchange rates should equalise prices across countries

For this to happen, three assumptions need to be fulfilled:

- No barriers to trade
- No transport costs
- Perfect competition

-The law of one price applies not only to individual goods but also to identical bundles of goods. Thus, the PPP is the generalisation of the law of one price to a basket of identical goods between two countries.

Absolute version

$$S = \frac{P}{P^*}$$

Relative version

$$\%\Delta S = \%\Delta P - \%\Delta P^*$$

Generalized version

$$P_T = S\,P_{T^*}$$

$$P_I = \alpha P_N + (1-\alpha)P_T \qquad P_{I^*} = \beta P_{N^*} + (1-\beta)P_{T^*}$$

$$\frac{P_I}{P_{I^*}} = \frac{\alpha P_N + (1-\alpha)P_T}{\beta P_{N^*} + (1-\beta)P_{T^*}}$$

$$\frac{P_I}{P_I{}^*} = S \times \left[\frac{\alpha(P_N/P_T) + (1-\alpha)}{\beta(P_{N^*}/P_{T^*}) + (1-\beta)} \right]$$

$$S = \frac{P_I}{P_{I^*}} \times \left[\frac{\beta(P_{N^*}/P_{T^*}) + (1-\beta)}{\alpha(P_N/P_T) + (1-\alpha)} \right]$$

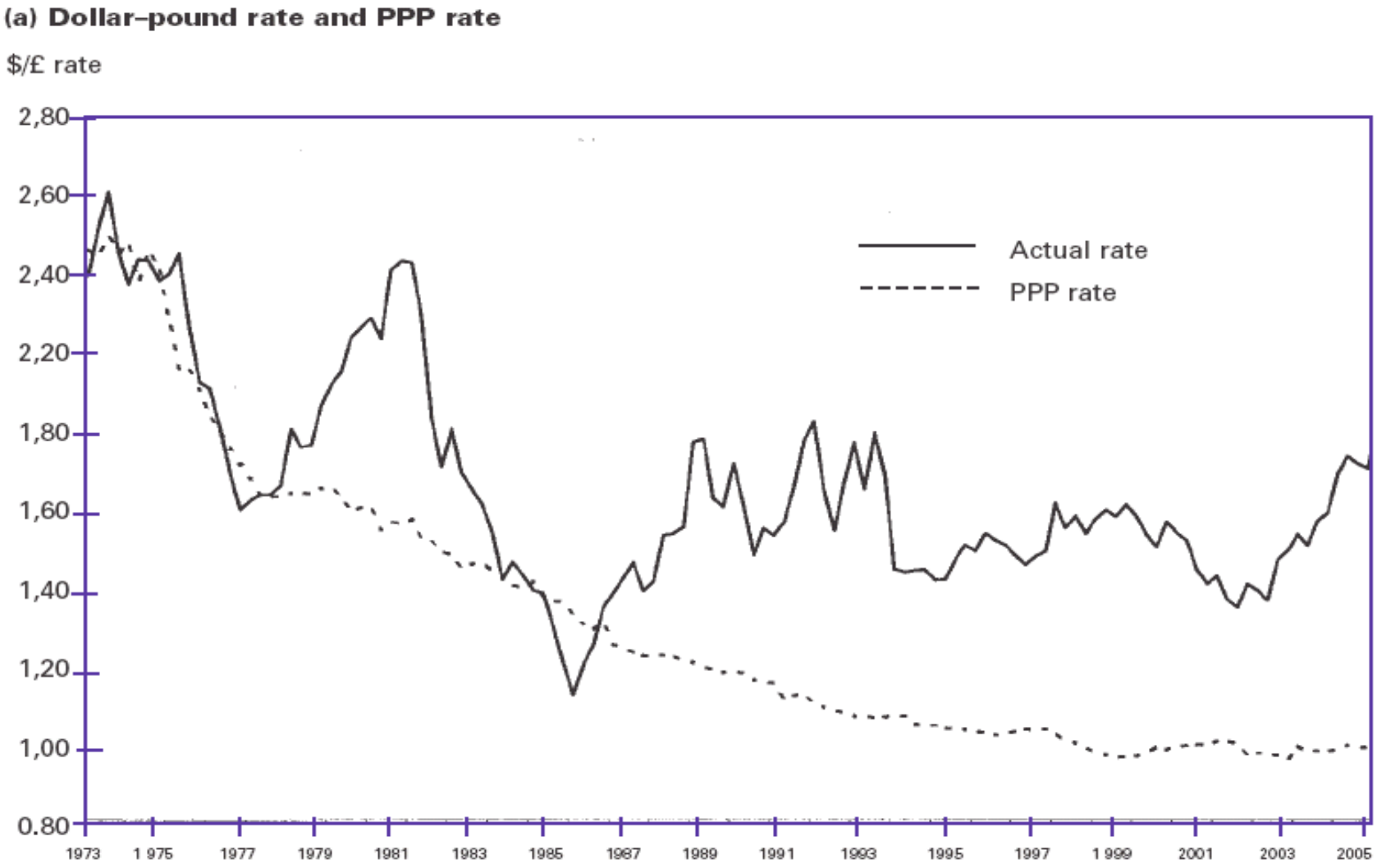
Testing the PPP theory

1. Big Max Index

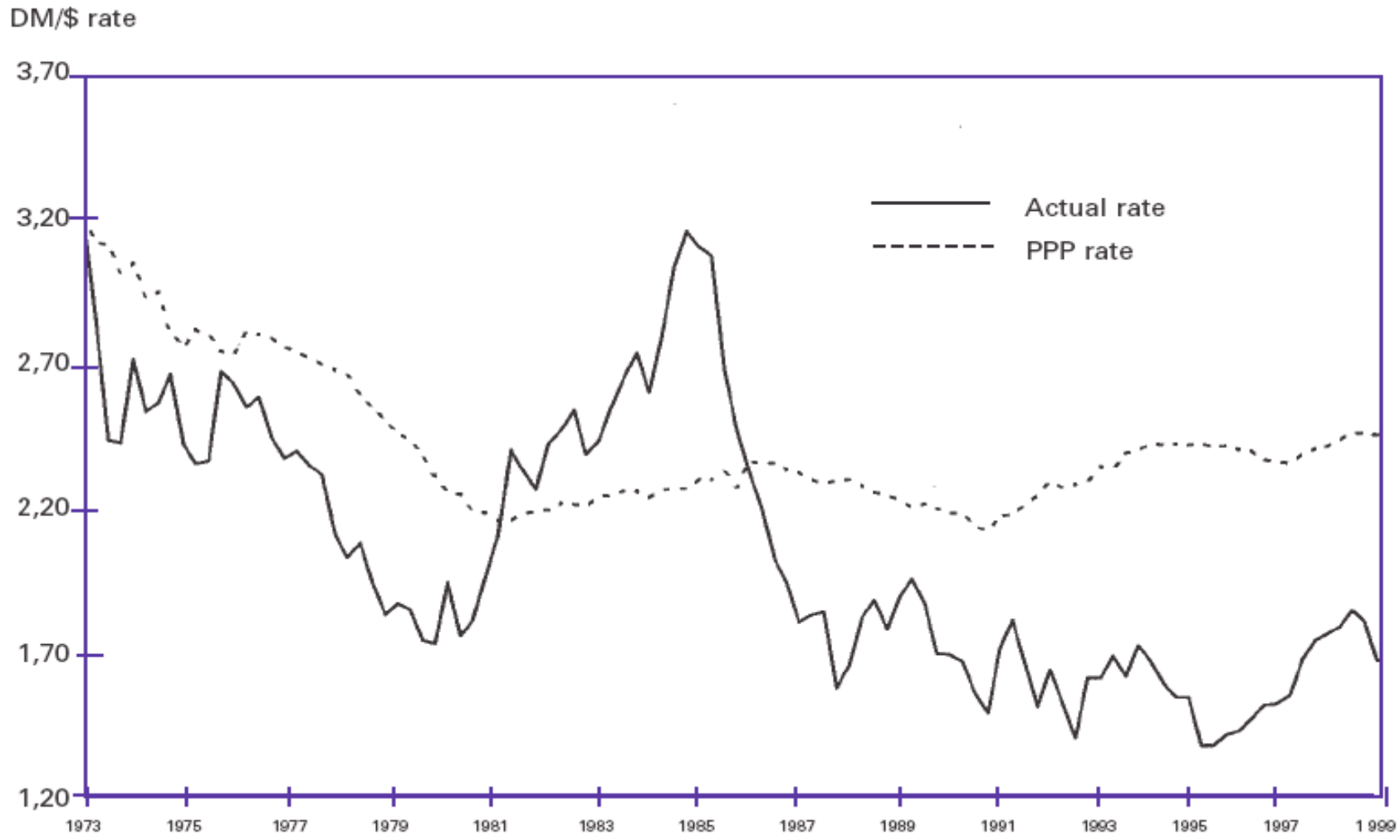
Country	Big Mac prices		Implied PPP of the dollar*	Actual $ exchange rate	Local currency under(–)/over(+) valuation (%)
	in local currency	in dollars			
USA	$2.90	$2.90	–	–	–
Argentina (peso)	4.35	1.48	1.50	2.96	–49
Australia (A$)	3.25	2.27	1.12	1.43	–22
Brazil (real)	5.40	1.70	1.86	3.18	–41
Britain (£)	1.88	3.37	1.54**	1.79	+16
Canada (C$)	3.20	2.33	1.10	1.37	–20
Chile (peso)	1400	2.18	483	642	–25
China (yuan)	10.40	1.26	3.59	8.25	–56
Czech Re (CKr)	56.55	2.13	19.50	26.55	–27
Denmark (DKr)	27.75	4.46	9.57	6.22	+54
Egypt	10.00	1.62	3.45	6.17	–44
Euro Area (€)	2.74	3.28	1.06***	1.20	+13
HongKong (HK$)	12.00	1.54	4.14	7.79	–47
Hungary (forint)	531	2.52	183	210	–13
Indonesia (rupiah)	16,100	1.77	5,552	9,096	–39
Japan (yen)	262	2.33	90.3	112.4	–20
Malaysia (M$)	5.05	1.33	1.74	3.79	–54
Mexico (peso)	24.00	2.08	8.28	11.54	–28
New Zealand (NZ$)	4.35	2.65	1.50	1.64	–9
Peru	9.00	2.57	3.10	3.50	–11
Philippines	69.00	1.23	23.8	56.1	–58
Poland (zloty)	6.29	1.63	2.17	3.86	–44
Russia (rouble)	42.05	1.45	14.5	29.0	–50
Singapore (S$)	3.30	1.92	1.14	1.72	–34
South Africa (rand)	12.40	1.86	4.28	6.67	–36
S.Korea (won)	3,200	2.72	1,103	1,176	–6
Sweden (SKr)	29.90	3.94	10.3	7.59	+36
Switzerland (SFr)	6.30	4.90	2.17	1.29	+68
Taiwan (NT$)	75.10	2.24	25.9	33.5	–23
Thailand (baht)	58.90	1.45	20.3	40.6	–50
Venezuela	4,400	1.48	1,517	2,973	–49

Local currency prices and actual exchange rates are inferred by the author from data presented in *The Economist*. 'Euro Area' is a weighted average price based on the price in the 12 Eurozone countries. * PPP is the local price divided by the price in the United States, ** dollars per pound, *** dollars per euro.
Source: *The Economist*, 27 May 2004.

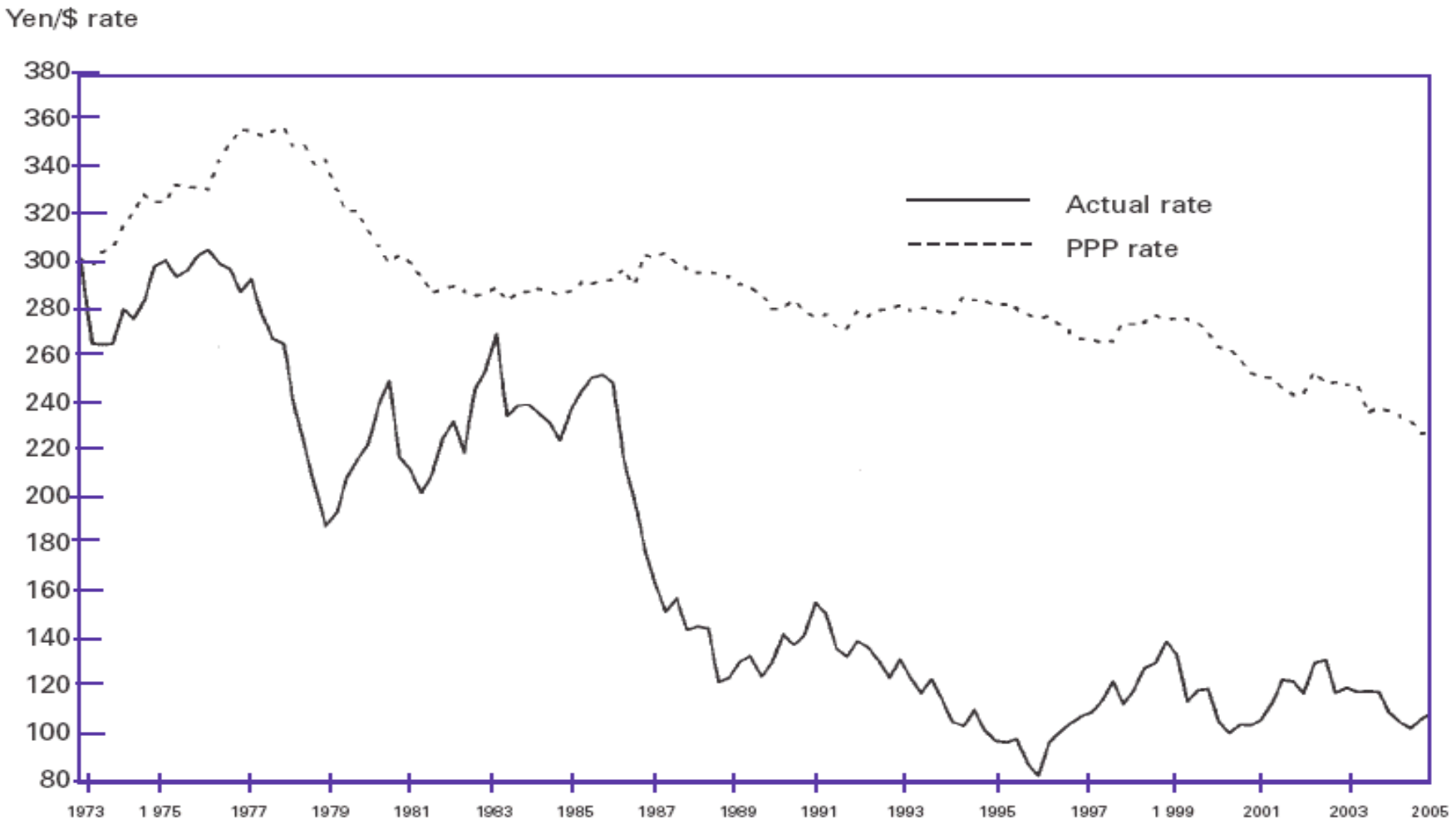
2. Plots: The actual exchange rate and the PPP exchange rate for different currency pairs



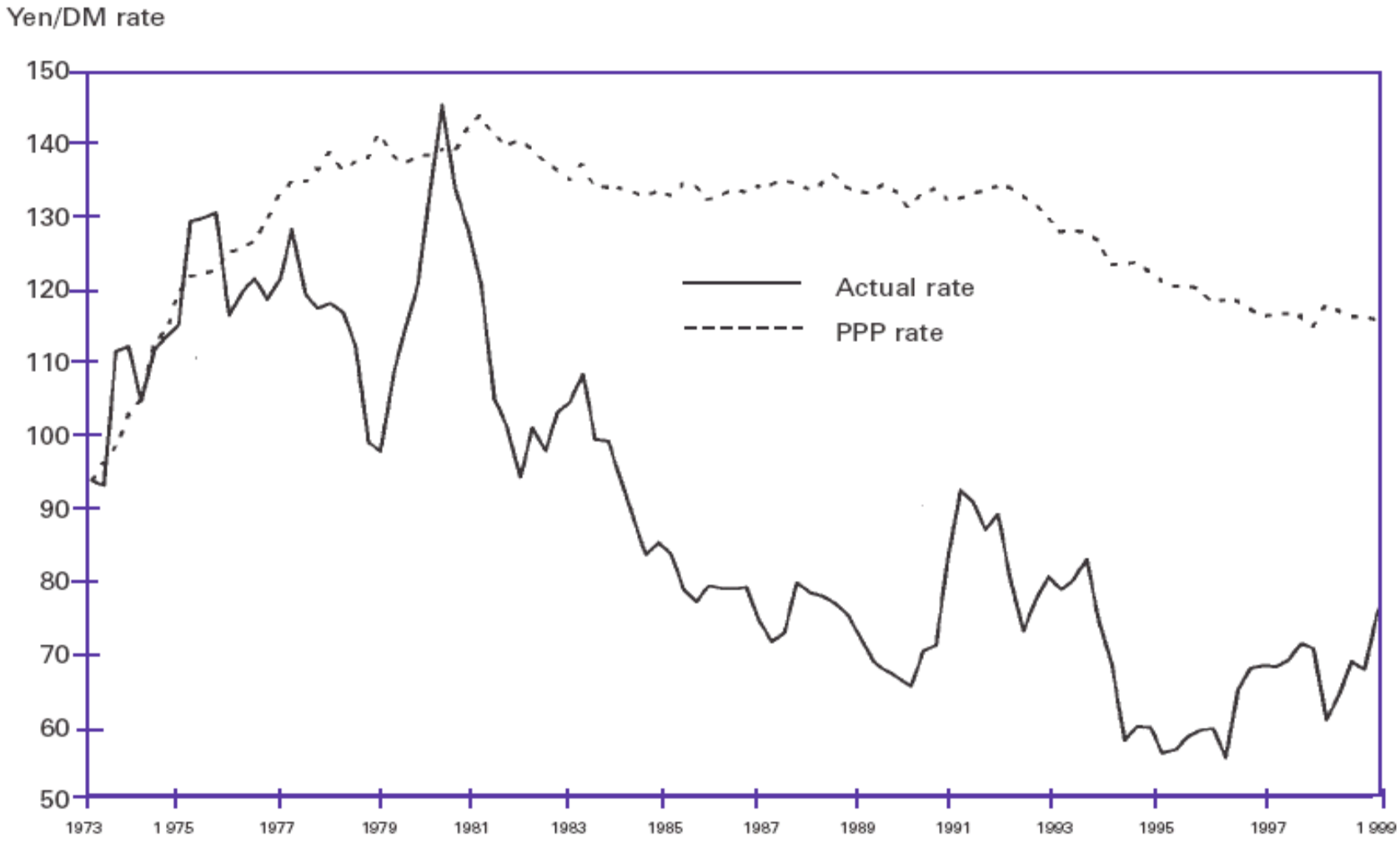
(b) Deutschmark–dollar rate and PPP rate



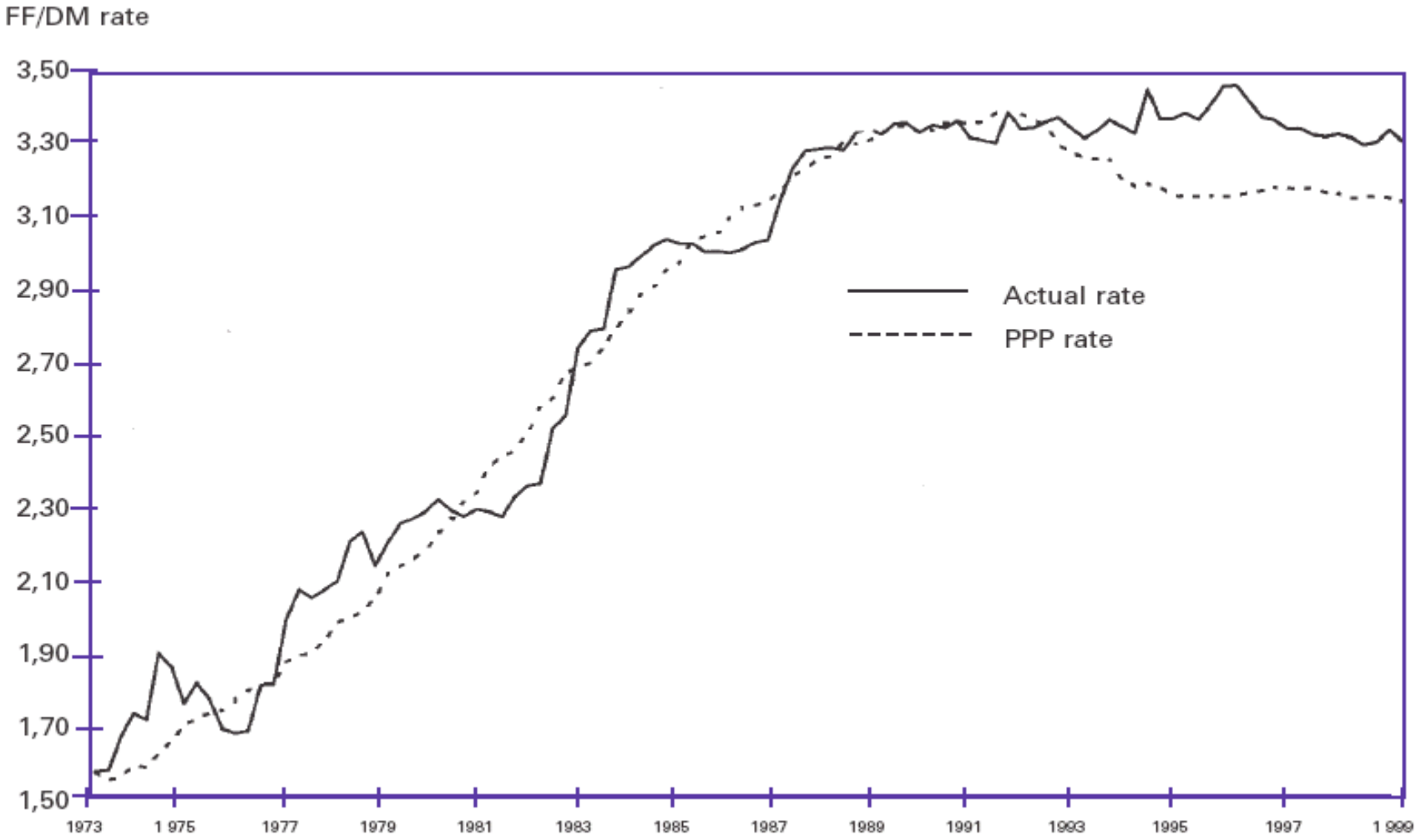
(c) Yen–dollar rate and PPP rate



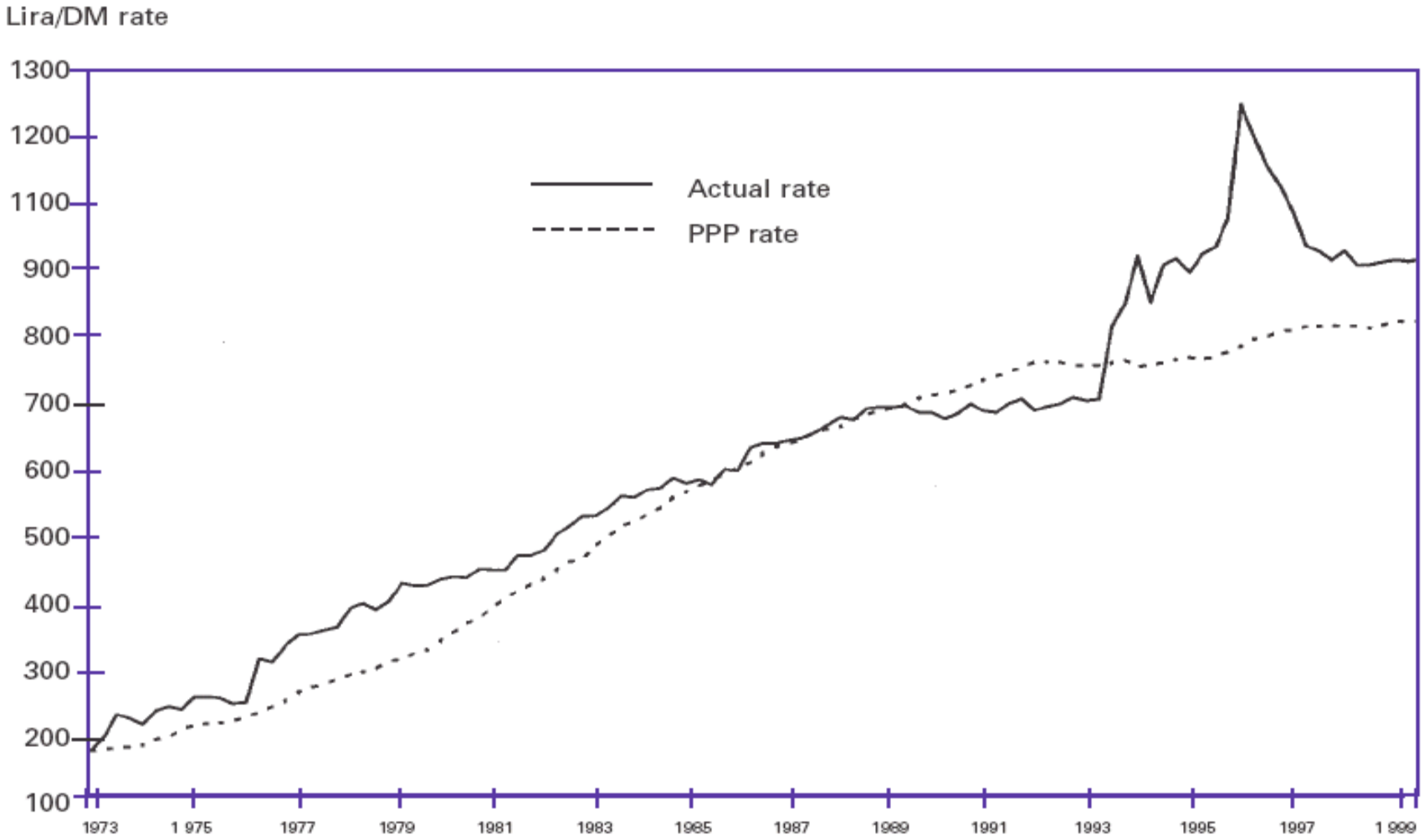
(d) Yen–deutschmark rate and PPP rate



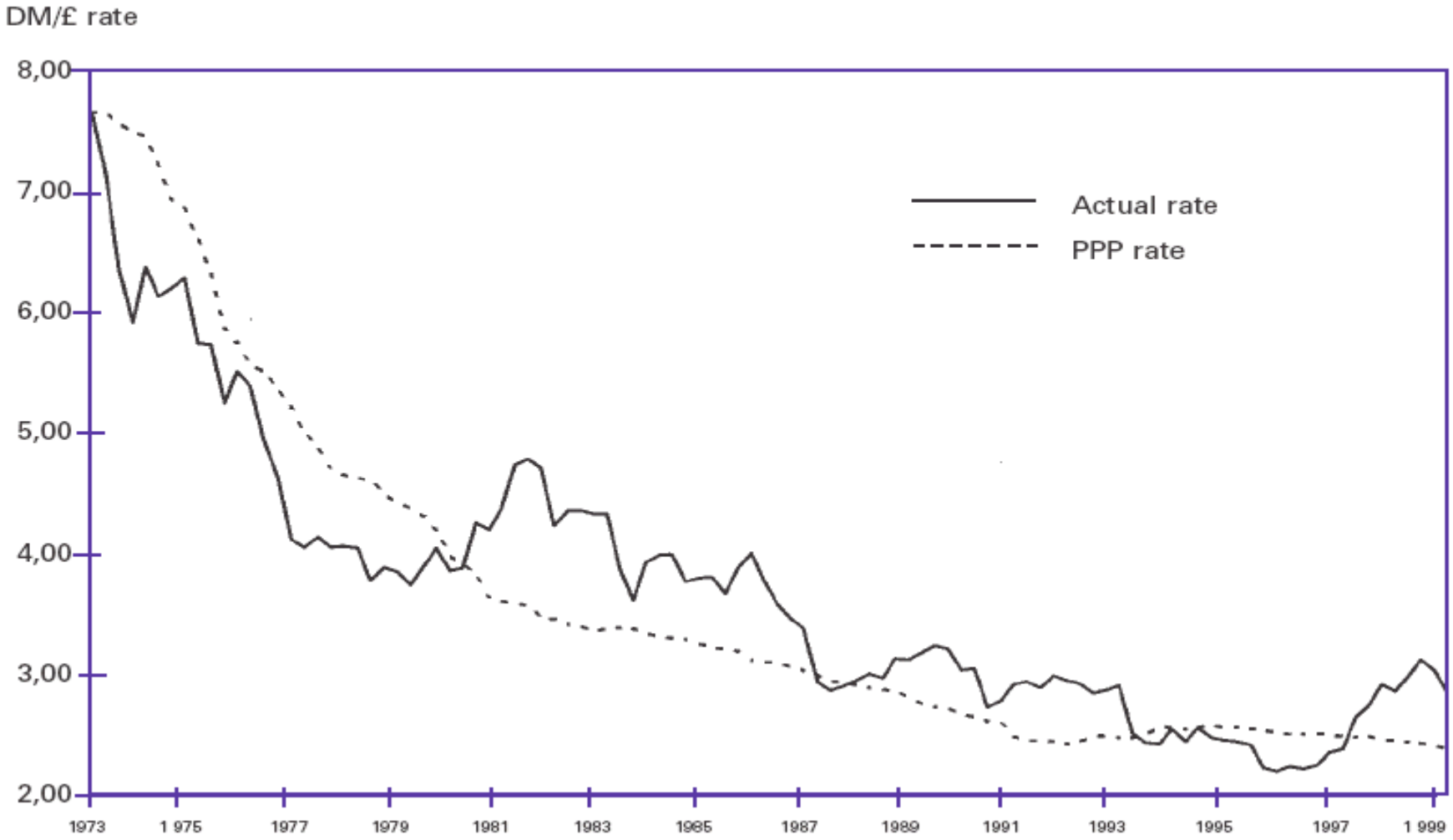
(e) French franc–deutschmark rate and PPP rate



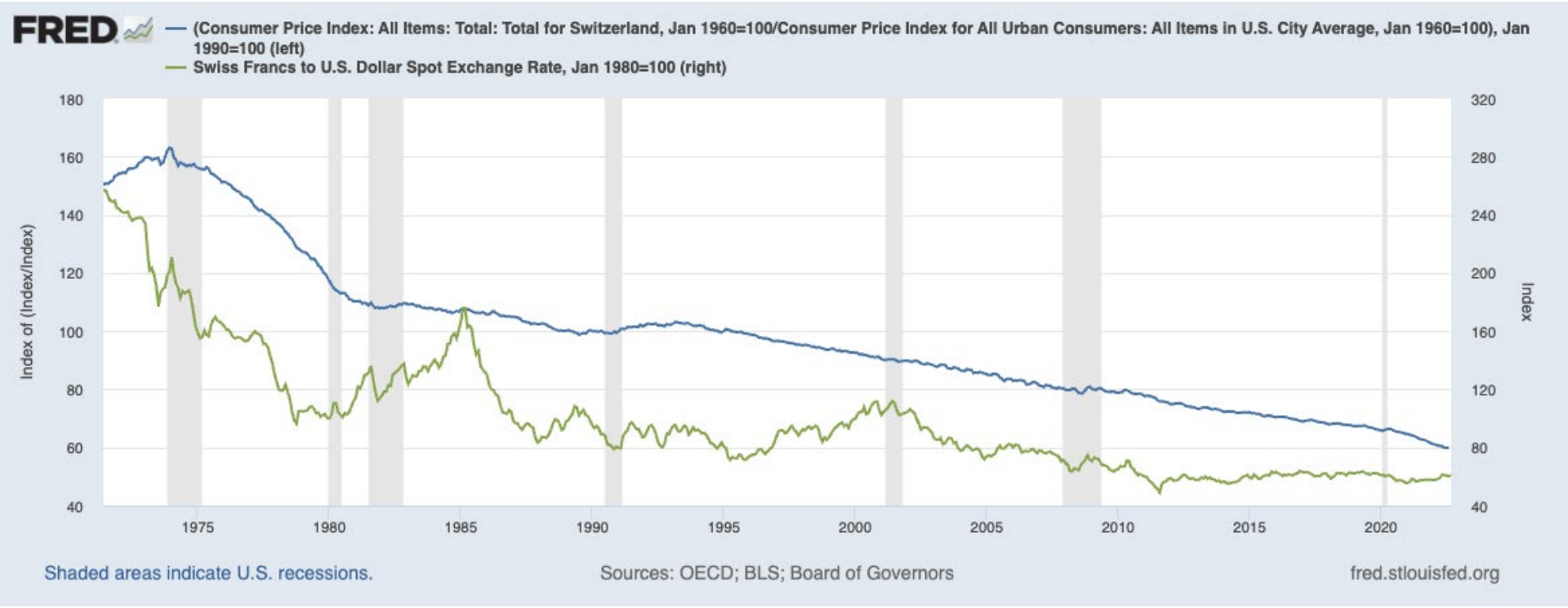
(f) Lira–deutschmark and PPP rate



(g) Deutschmark–pound rate and PPP rate



A more recent study (Source: Vicente Esteve blog)



Source: Vicente Esteve, "¿Se cumple la teoría de la Paridad del Poder Adquisitivo entre dos monedas?: el caso del dólar norteamericano y del franco suizo, 1971-2022", Universidad de Valencia, Blog Viaje al Fondo de las Finanzas Internacionales, 21/10/2022

Evolution of the market exchange rate of the dollar to the Swiss franc (green line, Swiss francs per 1 dollar) and of relative prices between the two countries (blue line) for the period 1971 (May)-2022 (September).

Conclusions:

PPP is one of the fundamental propositions when determining the exchange rate. Monetary models of exchange rate determination rest on this proposition and hence the importance of adhering to it. When prices have had time to adjust there seems to be a consensus that the nominal exchange rate and relative prices move proportionally, so that the real exchange rate reverts to equilibrium.

However, there is also a consensus that this is not true in the short run: the exchange rate is much more volatile than the average price level. In short, there may be deviations from PPP in the short run, but these should be temporary and disappear over time, allowing PPP to be fulfilled in the long run. And why do short-term deviations of market exchange rates from the PPP equilibrium exchange rate occur? There are several reasons for this.

On the one hand, many of the goods and services produced in an economy are not "exportable" and are therefore not exposed to foreign competition. There are also sectors considered strategic that may be protected by national governments.

On the other hand, there are other factors: geopolitical risks (favoring stronger currencies), shocks in the financial or commodity markets, and the reserve management policy of central banks, among others.

In short, the PPP equilibrium exchange rate should be seen as a long-term benchmark for the market rate (not in the short term), which will oscillate around it in cycles that can be very long in time.

3. Econometric approach. Relative PPP tests

Rate	Period	Relative PPP $\Delta \ln S_t = a_1 + a_2(\Delta \ln P_{t^*} - \Delta \ln P_t) + u_t$ a_1	a_2	SE	DW
Pound/dollar	73Q1–81Q4	0.01	–0.17	0.050	1.83
		(0.56)	(–0.46)		
	81Q4–90Q3	0.00	–0.21	0.059	1.85
		(0.03)	(–0.26)		
	73Q1–90Q3	0.00	–0.01	0.054	1.87
		(0.41)	(–0.04)		
Deutschmark/dollar	73Q1–81Q4	0.00	0.53	0.069	1.79
		(–0.25)	(0.89)		
	81Q4–90Q3	–0.01	0.48	0.062	1.96
		(–0.76)	(0.59)		
	73Q1–90Q3	–0.01	0.46	0.064	1.88
		(–0.80)	(1.00)		
Yen/dollar	73Q1–81Q4	0.00	0.82	0.051	1.94
		(–0.43)	(1.82)		
	81Q4–90Q3	0.01	2.79	0.063	2.01
		(0.93)	(3.67)		
	73Q1–90Q3	0.00	1.22*	0.058	1.95
		(–0.26)	(3.15)		
Lira/dollar	73Q1–81Q4	0.01	0.68*	0.053	1.99
		(0.74)	(2.25)		
	81Q4–90Q3	–0.01	0.78*	0.055	1.90
		(–0.70)	(1.07)		
	73Q1–90Q3	0.00	0.73*	0.055	1.98
		(–0.05)	(2.36)		
French franc/deutschmark	73Q1–81Q4	0.00	0.77*	0.034	1.89
		(0.21)	(1.29)		
	81Q4–90Q3	0.00	0.76*	0.021	1.91
		(0.59)	(1.35)		
	73Q1–90Q3	0.00	0.71*	0.027	2.00
		(0.53)	(1.90)		
Lira/deutschmark	73Q1–81Q4	0.01	0.51*	0.054	1.80
		(1.32)	(1.64)		
	81Q4–90Q3	0.00	0.55*	0.017	1.88
		(0.56)	(2.39)		
	73Q1–90Q3	0.00	0.68*	0.040	1.79
		(0.87)	(3.51)		
Pound/deutschmark	73Q1–81Q4	0.01	0.16	0.057	1.95
		(0.91)	(0.39)		
	81Q4–90Q3	–0.01	1.32*	0.045	1.97
		(–0.71)	(2.63)		
	73Q1–90Q3	0.01	0.40	0.051	1.96
		(0.83)	(1.32)		
Yen/deutschmark	73Q1–81Q4	0.00	0.90*	0.061	1.99
		(–0.25)	(1.84)		
	81Q4–90Q3	0.00	1.18*	0.039	1.97
		(0.10)	(2.81)		
	73Q1–90Q3	0.00	0.93*	0.050	1.99
		(–0.15)	(2.78)		

Notes: Hypothesis is $a_2 = 1$. An asterisk by a variable indicates that it is both of the correct sign and statistically equal to its hypothesized value. The *t*-statistics are in parentheses.
Source: Author's own estimates.

The Balassa-Samuelson model

$$P_N = W_N/Q_N \quad \text{and} \quad P_T = W_T/Q_T$$

$$P_{N^*} = W_{N^*}/Q_{N^*} \qquad P_{T^*} = W_{T^*}/Q_{T^*}$$

$$W_N = W_T \quad \text{and} \quad W_{N^*} = W_{T^*}$$

$$Q_{T^*} > Q_T \quad \text{and} \quad Q_{N^*} = Q_N$$

$$S = P_T/P_{T^*}$$

$$\frac{P_N}{P_T} = \pi \qquad \frac{P_{N^*}}{P_{T^*}} = \pi^* \qquad \pi^* > \pi$$

$$\frac{SP_{N^*}}{SP_{T^*}} = \pi^* \qquad SP_{N^*} > P_N$$