Understanding Exchange Rates: Real and Monetary Factors

by

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Some Definitions

$\mathcal{E}_t$: nominal exchange rate (price of foreign currency in terms of domestic currency)

$Q_t \equiv \frac{\mathcal{E}_t P_t^*}{P_t}$: real exchange rate (relative price of foreign consumption basket vs. domestic consumption basket)

$S_t \equiv \frac{\mathcal{E}_t P_{F,t}^*}{P_{H,t}}$: terms of trade (relative price of foreign goods vs. domestic goods)

In logs:

$$q_t = e_t + p_t^* - p_t$$

Some Evidence

- observed fluctuations in real exchange rates mirror nominal exchange rate fluctuations (Fig1. and Table 1 CKM)

- price ratio evolves very smoothly (sticky prices)

- volatility of real exchange rates much larger under flexible exchange rate systems ("Mussa puzzle")

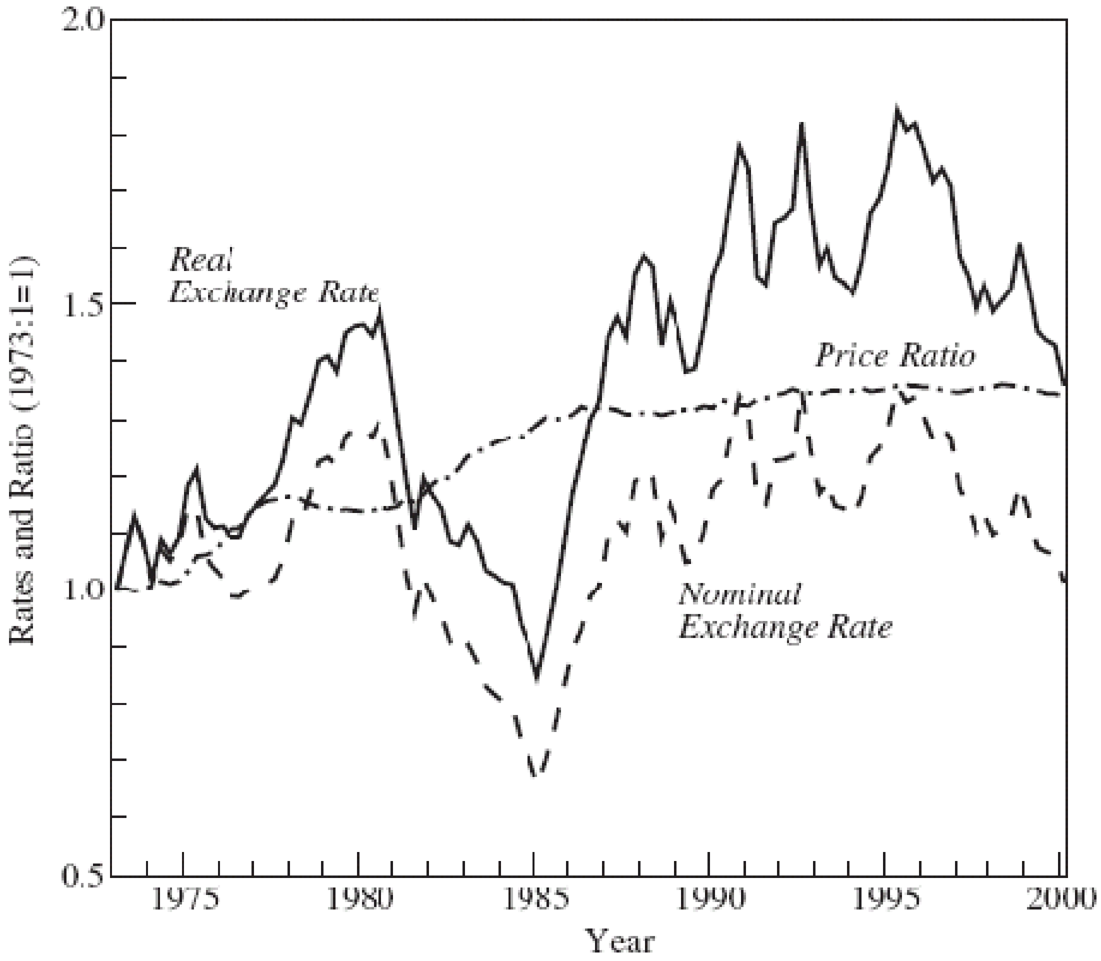


FIGURE 1

Exchange rates and the price ratio between the U.S. and Europe.

Note: the real exchange rate is eP^*/P, where the nominal exchange rate e is the U.S. dollar price of a basket of European currencies, P^* is an aggregate of European CPIs, and P is the U.S. CPI. The price ratio is P^*/P

Source: Chari, Kehoe and McGrattan (2002)

TABLE 1

Properties of exchange rates and CPIs†

Statistic	Austria	Denmark	Finland	France	Germany	Italy	Netherlands	Norway	Spain	Switzerland	U.K.	Europe relative to U.S.
	Country relative to U.S.											
Standard deviations												
Price ratio	1·59	1·23	1·80	1·17	1·42	1·67	1·62	1·80	2·29	1·49	1·74	1·18
Exchange rate												
Nominal	8·19	8·08	8·28	8·52	8·37	8·51	8·30	6·23	8·88	9·08	8·20	7·95
Real	7·93	8·00	7·71	7·95	8·06	7·80	7·99	6·08	8·42	8·83	7·89	7·52
Autocorrelations												
Price ratio	0·89	0·74	0·92	0·92	0·90	0·87	0·93	0·90	0·90	0·90	0·79	0·90
Exchange rate												
Nominal	0·83	0·84	0·85	0·86	0·83	0·85	0·84	0·78	0·87	0·82	0·84	0·85
Real	0·82	0·83	0·83	0·84	0·82	0·83	0·82	0·77	0·86	0·82	0·81	0·83
Cross-correlations												
Real and nominal exchange rates	0·98	0·99	0·98	0·99	0·99	0·98	0·98	0·96	0·97	0·99	0·98	0·99

†The statistics are based on logged and H-P-filtered quarterly data for the period 1973 : 1–2000 : 1. The statistics for Europe are trade-weighted aggregates of countries in the table. (See the text for details on construction of the data for Europe.)

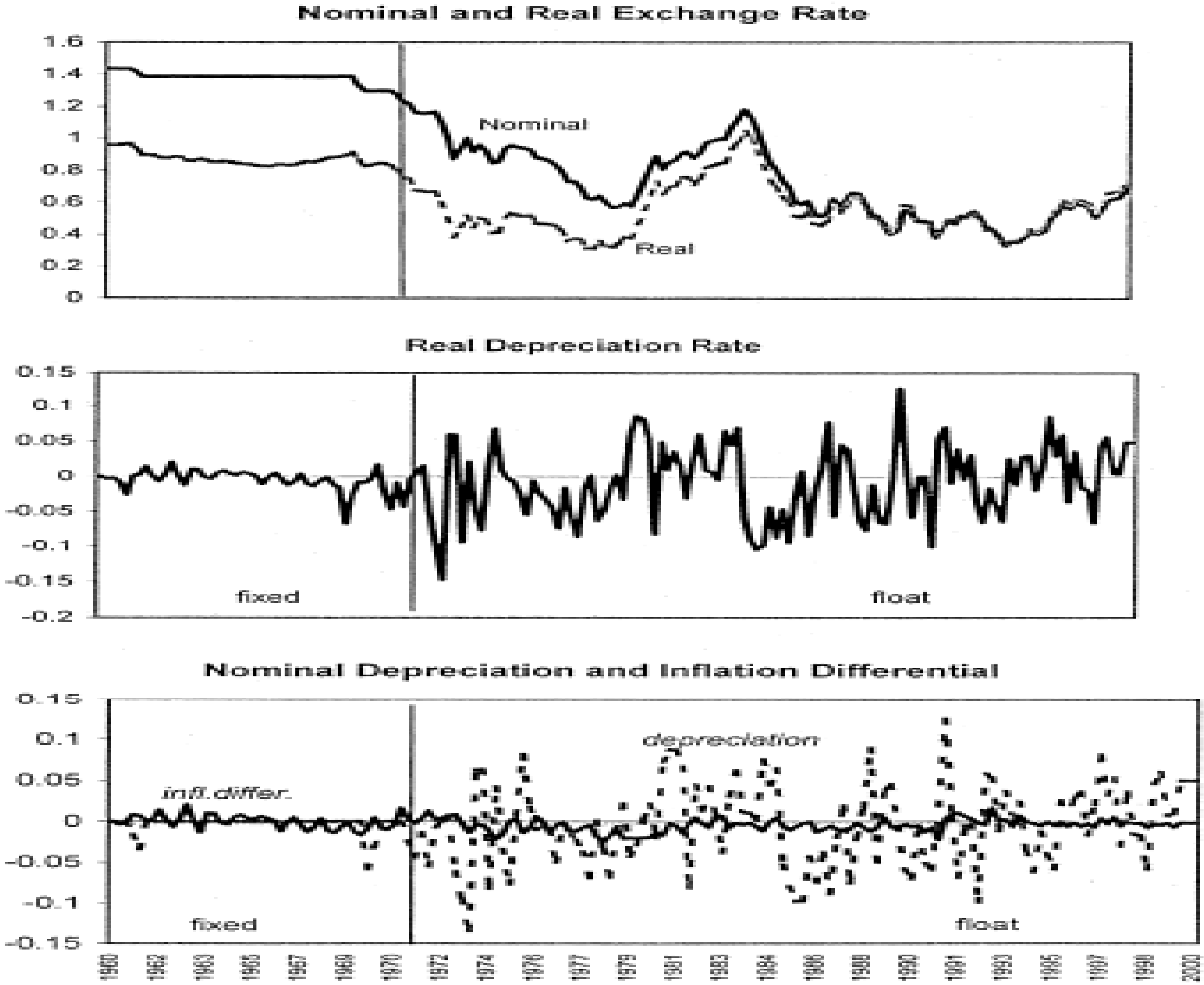


Fig. 1. Germany/U.S. exchange rates.

Source: Monacelli (JIE, 2004)

Table 1
Exchange rates and output statistics

Country	Standard deviation in %						Correlation with nominal depreciation	
	Nominal exchange rate		Real exchange rate			Output	Real depr.	Inflation differential
	60:1–71:1	71:2–00:1	60:1–71:1	71:2–00:1	Ratio float/fixed	Ratio float/fixed		
Austria	0.00	5.00	1.23	5.15	4.20	1.22	0.99	0.09
Belgium	0.00	5.03	0.62	5.17	8.31	1.26	0.99	0.10
Canada	1.06	1.62	1.17	1.73	1.47	1.35	0.94	0.02
France	1.32	4.86	1.36	5.04	3.71	0.62	0.99	0.20
Italy	0.10	4.84	0.89	5.24	5.89	1.15	0.98	0.25
Japan	0.00	5.31	1.10	5.38	4.89	0.91	0.98	−0.05
Netherlands	0.54	4.94	1.45	5.01	3.45	0.64	0.99	0.01
Norway	0.00	4.22	1.07	4.35	4.07	2.29	0.98	0.04
Spain	1.73	4.87	2.44	5.28	2.16	0.91	0.97	0.20
Switzerland	0.00	5.60	0.65	5.77	8.84	1.10	0.99	0.11
United Kingdom	1.71	4.86	1.88	5.02	2.68	1.44	0.97	0.00
West Germany	1.10	5.06	1.37	5.18	3.79	0.80	0.99	0.07
Average	0.63	4.69	1.27	4.86	**4.46**	**1.14**	**0.98**	**0.09**

Note: Data are quarterly HP filtered from OECD and IFS. Ratio refers to the volatility of a variable under floating relative to fixed. The real exchange rate is each country's CPI converted in dollars relative to the U.S. CPI. Output statistics refer to real GDP for all countries except for Austria, Belgium, and Norway for which is measured as the industrial production.

Source: Monacelli (JIE, 2004)

The Role of Non-Tradables

Ignoring time subscripts:

$$\begin{aligned} p &= \omega p_T + (1-\omega) p_N \\ &= p_T + (1-\omega)(p_N - p_T) \end{aligned}$$

Similarly (assuming identical weights):

$$p^* = p_T^* + (1-\omega)(p_N^* - p_T^*)$$

Hence,

$$\begin{aligned} q &= e + p^* - p \\ &= (e + p_T^* - p_T) + (1-\omega)\left[(p_N^* - p_T^*) - (p_N - p_T)\right] \\ &= q_T + (1-\omega)[(p_N^* - p_T^*) - (p_N - p_T)] \end{aligned}$$

The Balassa-Samuelson Model

- law of one price for tradables: $q_T = 0$

- profit maximization: $p_N - p_T = \psi_N - \psi_T = a_T - a_N$

- similarly $p_N^* - p_T^* = \psi_N^* - \psi_T^* = a_T^* - a_N^*$

- assuming $a_N \simeq a_N^*$, it follows that

$$q = a_T^* - a_T$$

- Variations in real exchange rates reflect developments in the relative productivity of tradables
- Convergence $\Rightarrow$ real appreciation of lower income countries' currencies.

Evidence on Balassa-Samuelson (Engle)

Figure 2, Table 2 CKM

- much of the variability in real exchange rates mirrors that of tradables real exchange rates

- nontradables are not an important part of the story

- Possible explanations:
    (i) LOP but different consumption baskets ("home bias")
    (ii) deviations from LOP (tariffs, transportation costs)
    (iii) imperfect substitutability between domestic and foreign goods.

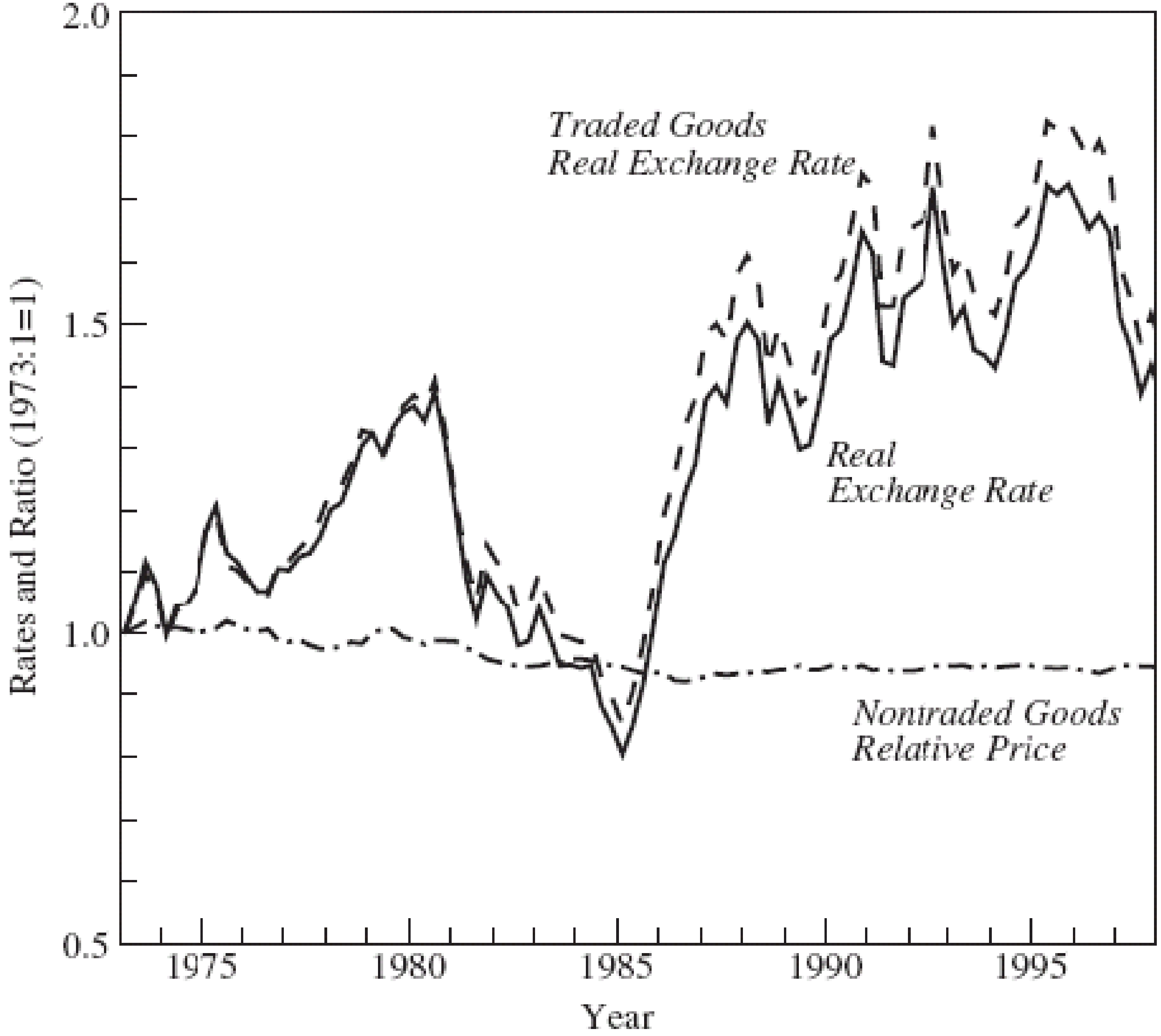


FIGURE 2

A decomposition of real exchange rates. Quarterly, 1973–98.

TABLE 2

Properties of exchange rates and disaggregated CPIs†

Statistic	Country relative to U.S.				Europe
	France	Italy	Netherlands	Norway	relative to U.S.
Standard deviations					
Price ratio					
All goods	1·01	1·57	1·44	1·82	1·24
Traded goods	1·42	2·00	1·97	2·13	1·65
Exchange rate					
Nominal	8·72	8·68	8·50	6·39	8·25
All goods real	8·25	8·10	8·24	6·14	7·78
Traded goods real	8·05	8·12	8·05	6·34	7·76
Autocorrelations					
Price ratio					
All goods	0·90	0·83	0·88	0·91	0·91
Traded goods	0·90	0·85	0·84	0·90	0·89
Exchange rate					
Nominal	0·86	0·86	0·84	0·79	0·85
All goods real	0·84	0·83	0·83	0·76	0·83
Traded goods real	0·84	0·83	0·82	0·79	0·83
Cross-correlations of exchange rates					
Real and nominal					
All goods	0·99	0·98	0·99	0·96	0·99
Traded goods	0·99	0·97	0·97	0·94	0·94
All and traded goods real	1·00	0·99	0·99	0·99	1·00

† The statistics are based on logged and H-P-filtered quarterly data for the period 1973 : 1–1998 : 4. The statistics for Europe are trade-weighted aggregates of countries in the table (see the text for details).

The Role of Monetary Policy

$$i_t = i_t^* + E_t\{\Delta e_{t+1}\}$$

which can be rewritten as:

$$e_t = (i_t^* - i_t) + E_t\{e_{t+1}\}$$

or

$$e_t + p_t^* - p_t = [i_t^* - (E_t\{p_{t+1}^*\} - p_t^*)] - [i_t - (E_t\{p_{t+1}\} - p_t)] + E_t\{e_{t+1} + p_{t+1}^* - p_{t+1}\}$$

or, equivalently,

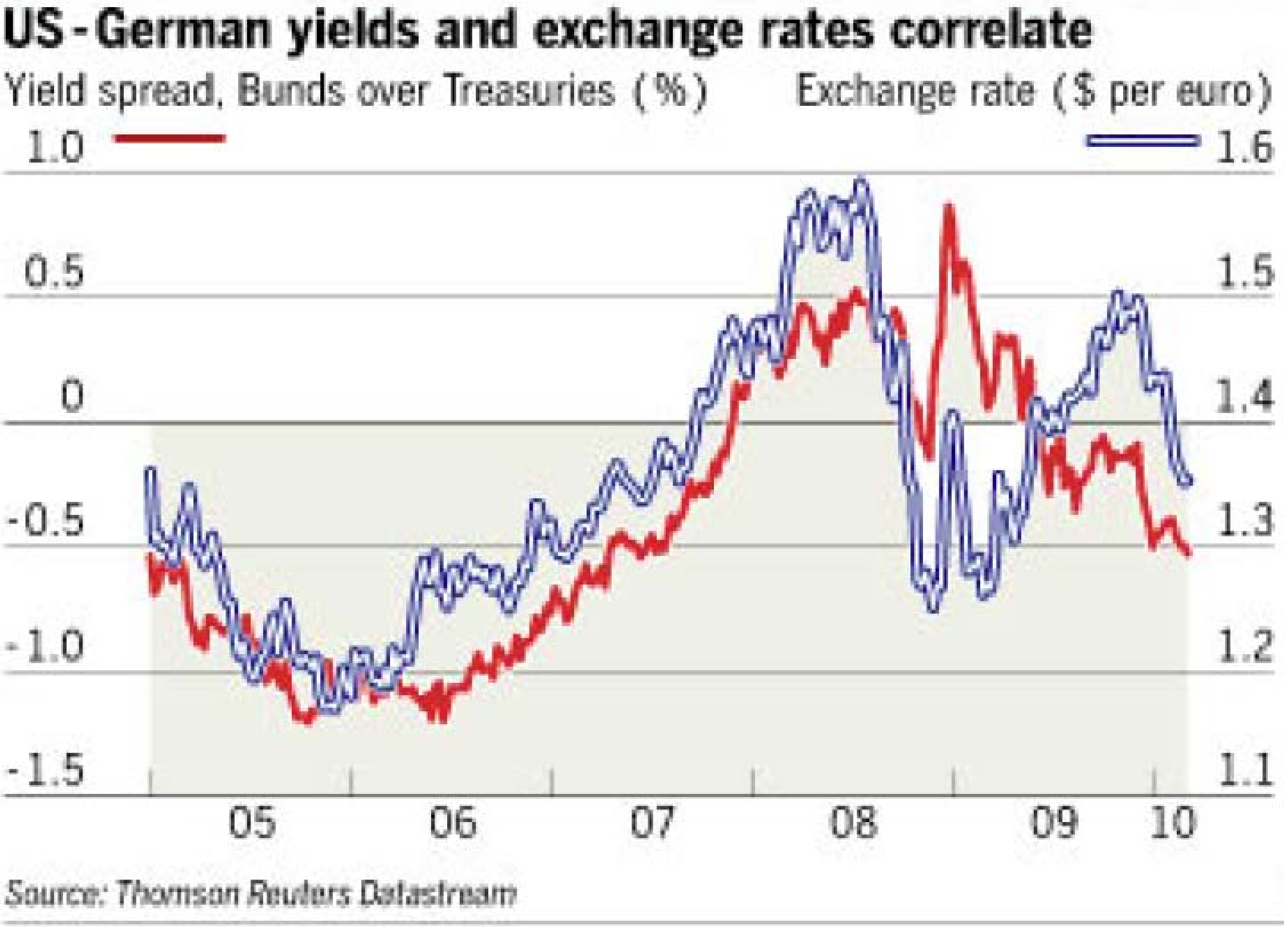
$$q_t = (r_t^* - r_t) + E_t\{q_{t+1}\}$$

Solving forward and letting $\lim_{T\to\infty} E_t\{q_{t+T}\} = q_t^{LR}$ we obtain

$$q_t = q_t^{LR} + \sum_{k=0}^{\infty} (E_t\{r_{t+k}^*\} - E_t\{r_{t+k}\})$$

or

$$e_t = (p_t - p_t^*) + q_t^{LR} + \sum_{k=0}^{\infty} (E_t\{r_{t+k}^*\} - E_t\{r_{t+k}\})$$



Financial Times, 27 February 2010