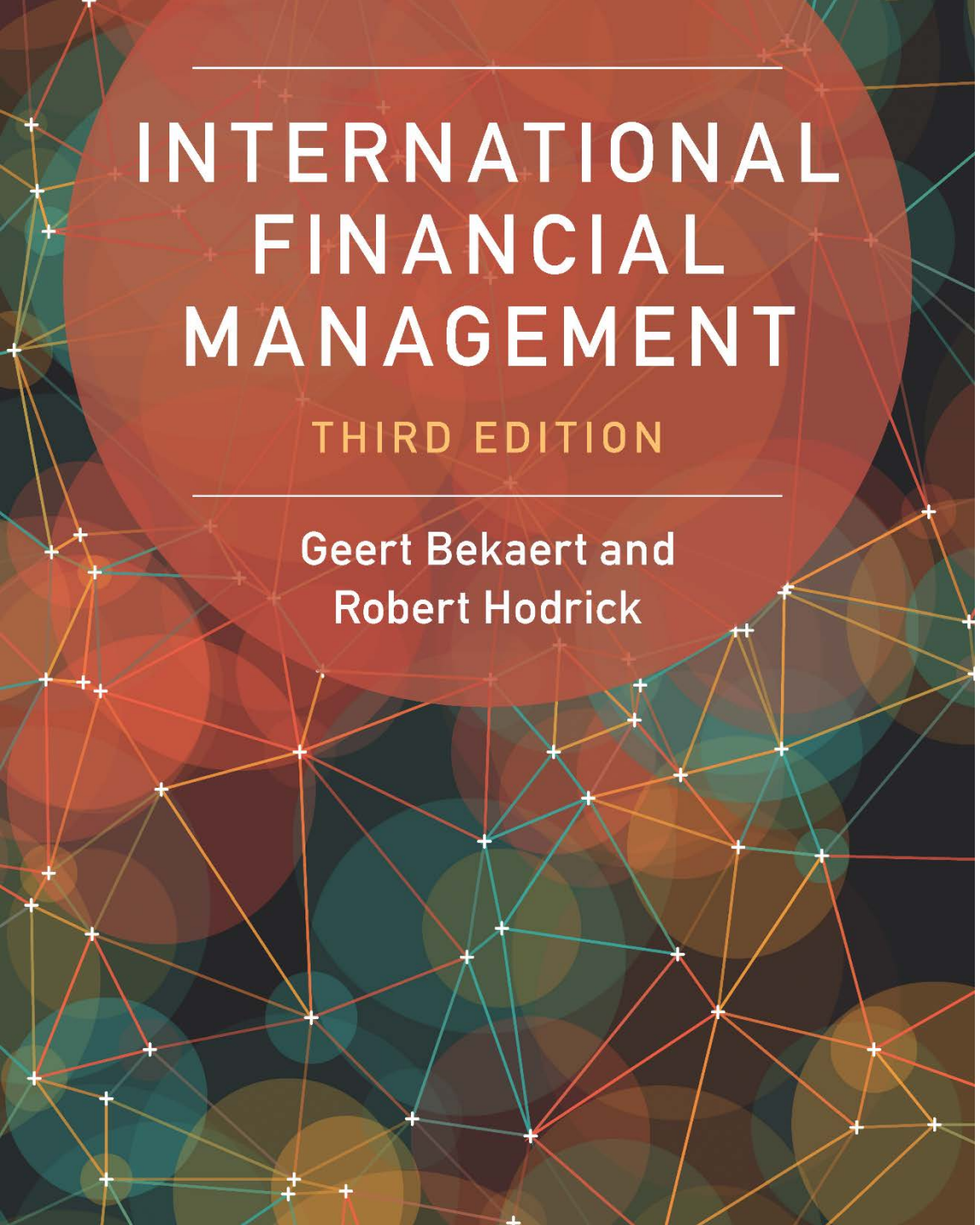


Chapter 8

Purchasing Power Parity and Real Exchange Rates

Purchasing Power Parity

- A model of the determination of exchange rates
  - Baseline forecast for predicting exchange rates
- Plays a fundamental role in corporate decision making and performance
  - Location of plants
  - Pricing products
  - Hedging decisions
- Assessing cost of living decisions (and job opportunities)

8.1 Price Level, Price Indexes, and the Purchasing Power of a Currency

- The general idea of purchasing power
  - Nominal price – the monetary value
  - Price level – the nominal price level of a country's "basket of goods"
    - Weighted average of goods and services (i.e., we spend 1% of our income on shoes)
  - Inflation/deflation
    - Inflation – when price level is rising
    - Deflation – when price level is falling
  - Purchasing power – inverse of price level

8.1 Price Level, Price Indexes, and the Purchasing Power of a Currency

- Calculating the price level – cost of living:
  - $P(t,\$) = \sum_{i=1}^{N} w_i P(t,i,\$)$

- Calculating a price index – ratio of price levels at two different times:
  - $PI(t+k,\$) = \left(\frac{P(t+k,\$)}{P(t,\$)}\right) \times 100 = \frac{\sum_{i=1}^{N} w_i P(t+k,i,\$)}{\sum_{i=1}^{N} w_i P(t,i,\$)} \times 100$

Exhibit 8.1 Price Indexes for the G7 Countries, 1960–2015

Exhibit 8.1 Price indexes for the G7 countries, 1960–2015

Year	United States	Canada	France	Germany	Italy	Japan	United Kingdom
1960	27.6	24.6	17.2	39.4	9.8	21.2	13.2
1970	36.1	32.3	25.2	50.9	14.0	36.9	19.6
1980	76.5	69.7	63.3	82.6	51.0	87.2	70.7
1985	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1990	121.4	124.1	116.3	107.7	131.2	107.0	133.4
1995	141.7	139.2	129.9	126.2	168.6	113.5	158.4
2000	159.0	150.0	138.0	133.9	188.3	115.2	179.9
2005	179.4	167.8	151.8	144.9	212.0	112.4	202.1
2010	199.3	181.1	162.6	155.8	231.3	111.7	228.2
2015	216.4	194.5	171.5	166.2	248.6	114.8	255.1

8.2 Absolute Purchasing Power Parity

- Internal purchasing power
  - The amount of goods and services that can be purchased with $1 in the U.S.
    - If price level is $15,000, what is purchasing power of $1M?
    - $\left(\frac{1}{\$15{,}000}\right) \times \$1M = 66.67\ consumption\ bundles$
- External purchasing power
  - The amount of goods and services that can be purchased with $1 outside the U.S.
    - $(1/S(t, \$/X)) \times 1/P(t, X)$
    - $\frac{£}{\$} \times \frac{UK\ Consumption\ Bundle}{£} = \frac{UK\ Consumption\ Bundle}{\$}$

8.2 Absolute Purchasing Power Parity

- Absolute Purchasing Power Parity
  - States that the exchange rate adjusts to equalize the internal with external purchasing powers of a currency.
    - $\frac{1}{P(t,\$)} = \frac{1}{S^{PPP}(t,\$/X)} \times \frac{1}{P(t,X)}$
  - Arbitrage is possible if the exchange rate does not adjust
    - Buy goods at cheaper price, ship them to where goods are more expensive and sell them
    - However, the price difference would have to be great enough to cover transportation costs

8.2 Absolute Purchasing Power Parity

- Internal purchasing power of $1M based on $15,000 price level
  - $\$1M \times \frac{1}{\$15{,}000} = 66.67\ cons.bundles$
- External purchasing power of $1M based on £10,000 price level
  - $\$1M \times [1/(\$1.4/£)] = £714{,}286$
  - $£714{,}286 \times \frac{1}{£10{,}000} = 71.43\ cons.bundles$
  - Because external PP > internal PP, one can profit from buying UK goods and shipping them to US for resale
  - Sell 71.43 cons. bundles (from UK) in US at $15,000 per bundle and receive:
    - $(71.43 \times \$15{,}000) = \$1{,}071{,}450$

8.3 The Law of One Price

- The perfect market ideal
  - A barrel of oil should cost the same (once you convert money) no matter where you are
- Why violations of the law of one price occur
  - Tariffs and quotas – Malaysia tariffs on cars: 65% to 105%
  - Transaction costs – would you go to Italy to get a haircut?
  - Difficulty in finding buyers for some goods
  - Noncompetitive markets
  - Sticky prices – sometimes there are costs for switching prices (“menu costs”)

8.4 Describing Deviations from PPP

- Overvalued
  - When its external purchasing power exceeds its internal purchasing power
- Undervalued
  - When its external purchasing power is less than its internal purchasing power
- Overvaluation of one currency implies undervaluation of the other currency in the exchange rate
  - Think taller/shorter – these are relative terms
- Predictions
  - Overvaluations – must weaken (depreciate)
  - Undervaluations –must strengthen (appreciate)

8.4 Describing Deviations from PPP

- The MacPPP Standard
  - The Big Mac as a Price Index
  - Advantages to use:
    - Standard product globally
    - Local suppliers used reducing transit costs
  - Surprisingly close to more complicated indexes
  - Implied MacPPP Rates
  - Overvaluations / Undervaluations

Exhibit 8.2 MacPPP in 2015

Exhibit 8.2 MacPPP in 2015

		Big Mac prices		Exchange rates		
		Local currency	Dollars	PPP	Actual	% Under (–)/Over (+) valuation against the dollar
United States*	dollar	4.79	4.79	1.00	1.00	
Australia	dollar	5.30	4.32	1.11	1.23	–10%
Britain†	pound	2.89	4.37	1.66	1.51	–10%
Canada	dollar	5.70	4.64	1.19	1.23	–3%
China	yuan	17.20	2.77	3.59	6.21	–42%
Egypt	pound	16.93	2.30	3.53	7.35	–52%
Euro area‡	euro	3.68	4.26	1.30	1.16	–12%
Hungary	forint	860.00	3.17	179.54	271.39	–34%
Indonesia	rupiah	27,939.00	2.24	5,832.78	12,480.00	–53%
Japan	yen	370.00	3.14	77.24	117.77	–34%
Malaysia	ringgit	7.63	2.11	1.59	3.62	–56%
Mexico	peso	49.00	3.35	10.23	14.63	–30%
Norway	kroner	48.00	6.30	10.02	7.62	31%
Poland	zloty	9.20	2.48	1.92	3.71	–48%
Russia	ruble	89.00	1.36	18.58	65.23	–72%
Saudi Arabia	riyal	11.00	2.93	2.30	3.76	–39%
South Africa	rand	25.50	2.22	5.32	11.48	–54%
South Korea	won	4,100.00	3.78	855.95	1,083.30	–21%
Switzerland	franc	6.50	7.54	1.36	0.86	57%
Taiwan	dollar	79.00	2.51	16.49	31.49	–48%
Thailand	baht	99.00	3.04	20.67	32.61	–37%
Turkey	lire	9.25	3.96	1.93	2.33	–17%
UAE	dirham	13.00	3.54	2.71	3.67	–26%

8.4 Describing Deviations from PPP

- Predicting British Pound movements with the MacPPP
  - Pound set too high by ERM in 1991
  - The Economist suggested that they devalue it or they would be sorry
  - In September 1992, British authorities were forced to withdraw from ERM, but not before they lost $12 billion trying to defend the higher rate
- The econometric evidence
  - Several studies find that although there are deviations, they are temporary
  - A 10% undervalued currency tends to appreciate by 3.5% the next year

8.5 Exchange Rates and Absolute PPPs Using CPI Data

- Interpreting the charts
  - Overvaluations and undervaluations
    - Remember how exchange rates are quoted
      - The pound and euro are quoted directly as the amount of dollars it takes to purchase £1 or €1 whereas the other exchange rates (relative to the $) are quoted indirectly as the amount of that currency it takes to purchase $1
    - Dollar is undervalued when the actual exchange rate is above the PPP prediction
  - Fixing when PPP held – the chart assumes absolute PPP held during the decade of the 1980s
    - Note that the U.N. Comparison Project attempts to compare absolute PPPs

Exhibit 8.3 Actual USD/GBP and PPP Exchange Rates

Exhibit 8.4 Actual USD/EUR and PPP Exchange Rates

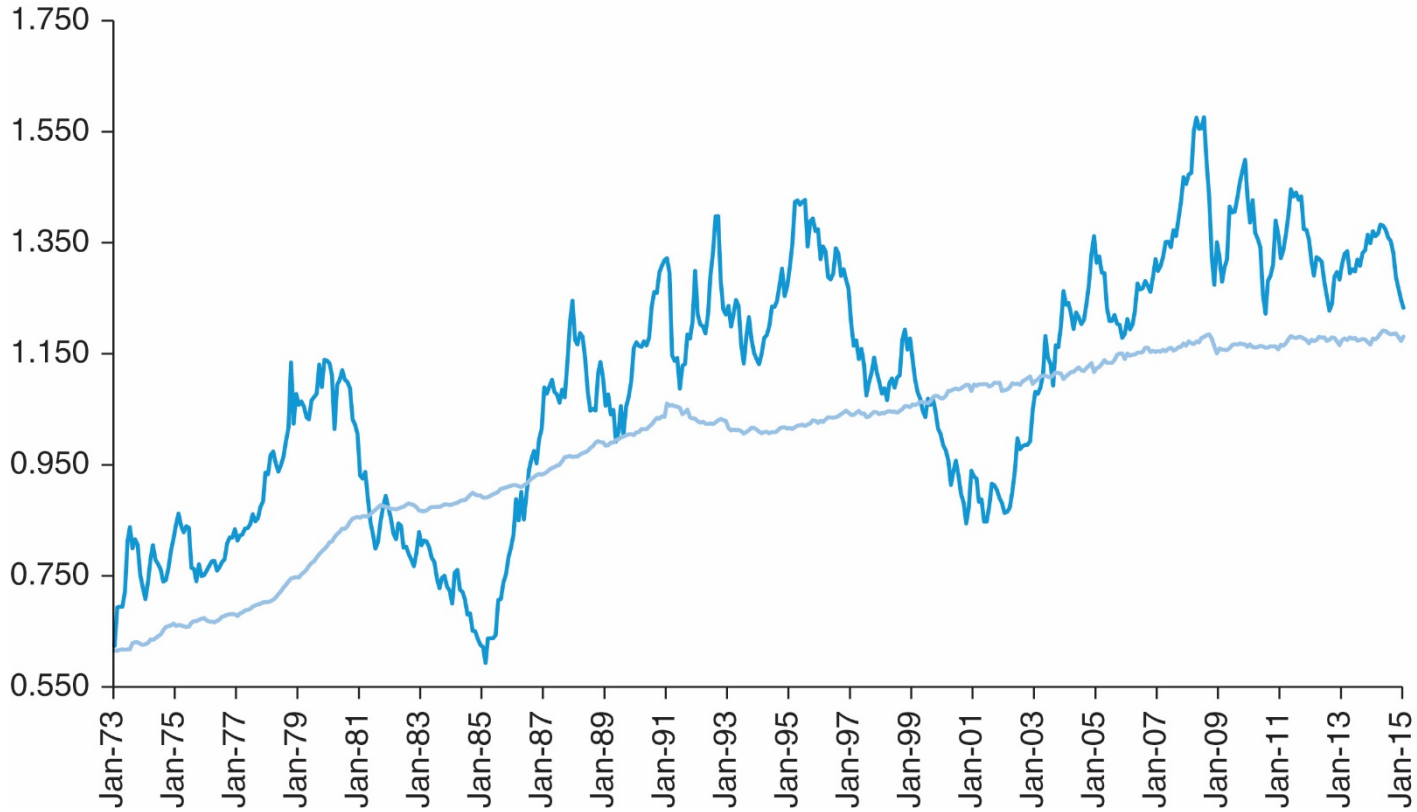


Exhibit 8.5 Actual JPY/USD and PPP Exchange Rates

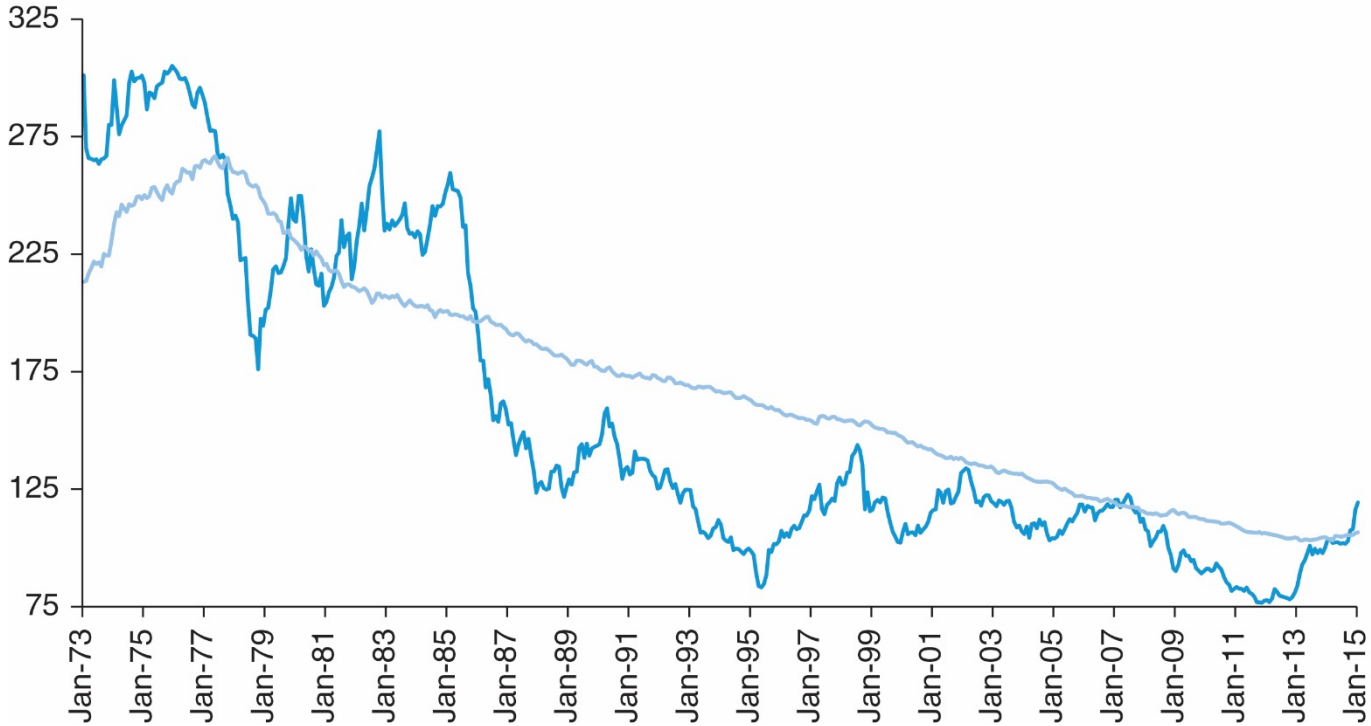


Exhibit 8.6 Actual CAD/USD and PPP Exchange Rates

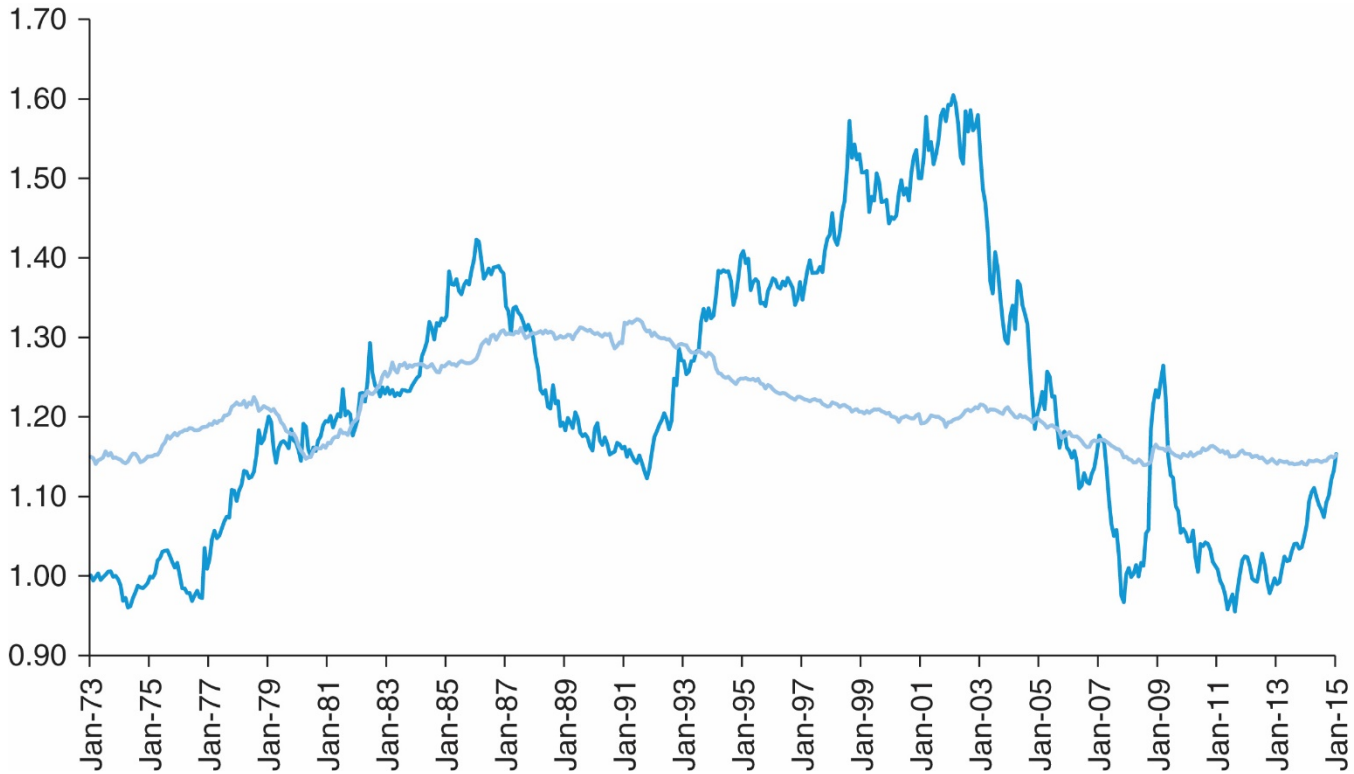
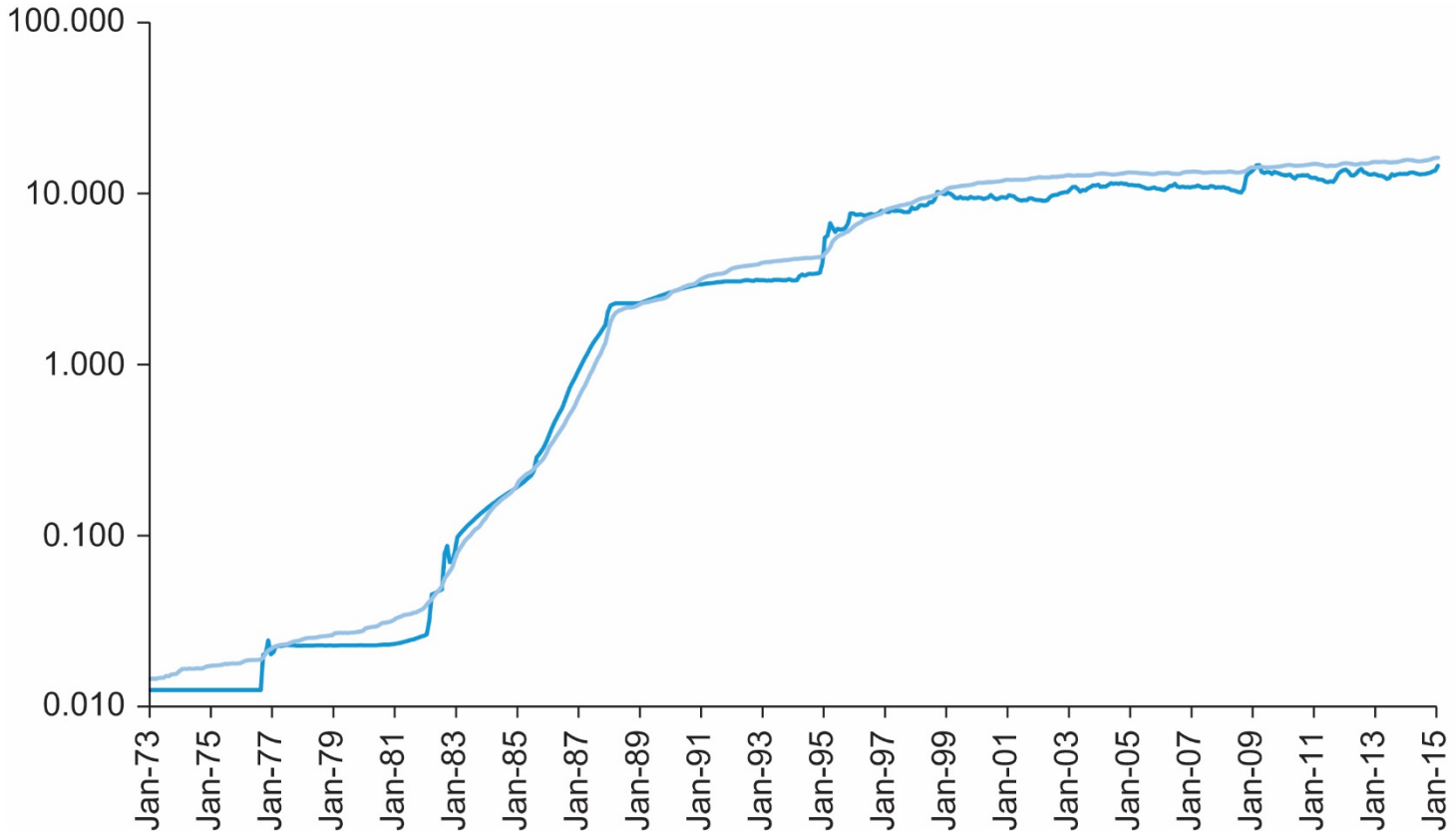


Exhibit 8.7 Actual MXN/USD and PPP Exchange Rates



8.6 Explaining the Failure of Absolute PPP

- Changes in relative prices – what if Japanese spend more on sushi than Americans do?
  - Different weights
- Non-traded goods
  - Houses
  - Technology / productivity improvements
- PPP deviations and the Balance of Payments
  - When a currency is overvalued (relative to that implied by the PPP), its external purchasing power increases
  - Consumers buy more foreign goods, thereby pulling the value of the domestic currency back down

Exhibit 8.8 GDP per Capita for OECD Countries in 2014 using Exchange Rates and PPP Values

Exhibit 8.8 GDP per capita for OECD countries in 2014 using exchange rates and PPP values

OECD country	In US dollars, based on Market exchange rates	In US dollars, based on PPP exchange rates
Australia	62,190	46,017
Austria	51,111	45,598
Belgium	47,819	42,853
Canada	50,321	44,319
Chile	14,462	22,421
Czech Republic	19,539	29,970
Denmark	60,527	44,631
Estonia	19,681	26,893
Finland	49,537	40,185
France	42,921	38,163
Germany	46,734	44,190
Greece	21,606	26,226
Hungary	13,900	24,855
Iceland	52,448	44,638
Ireland	53,286	48,911
Israel	37,145	33,462
Italy	35,254	35,276
Japan	36,305	36,905
Korea	27,969	34,547
Luxembourg	113,234	94,138
Mexico	10,683	17,252
Netherlands	51,542	47,155
New Zealand	45,851	37,610
Norway	97,329	67,123
Poland	14,209	24,761
Portugal	22,081	28,461
Slovak Republic	18,410	27,595
Slovenia	23,959	30,114
Spain	30,213	33,985
Sweden	58,746	45,814
Switzerland	86,931	58,439
Turkey	10,433	19,363
United Kingdom	45,658	39,562
United States	54,566	54,566

8.8 Relative Purchasing Power Parity

- Relative Purchasing Power Parity
  - Takes market imperfections into account
  - Exchange rates adjust in response to differences in inflation across countries
  - General expression for relative PPP

$$\frac{S_{t+1}}{S_t} = \frac{1+\pi_{t+1}}{1+\pi^*_{t+1}}$$

  - Logic is that inflation lowers the purchasing power of money, so a change in the nominal exchange rate to compensate for different levels of inflation should occur

8.9 The Real Exchange Rate

- The real exchange rate
  - Adjusted for inflation:
    - $RS(t, \$/€) = \frac{S(t,\$/€) \times P(t,€)}{P(t,\$)}$
- Real appreciations and real depreciations
  - Three basic movements:
    - An increase in the nominal exchange rate ($/£), holding $ prices and £ prices constant
    - An increase in the £ prices of goods holding the $ prices of goods constant
    - An increase in the $ prices of goods holding the £ prices of goods constant
- Trade-weighted real exchange rates
  - Useful when looking at how forex changes will affect trade balance