What Determines Exchange Rates?

In the Short Run
In the Long Run
Selected Exchange Rates

Indian rupees per $  
Thai baht per $  
South Korean won per $  
Argentine pesos per $  
Colombian pesos per $  
Ecuadorean sucres per $  

Dollarization completed by end of 2000
Determinants of the Exchange Rate in the Short Run

- In the short run, movements of currency respond to short run differences in interest rates so that short run rates of return are equalized across borders.
Determinants of the Exchange Rate in the Short Run

<table>
<thead>
<tr>
<th>Change in Variable</th>
<th>Direction of International Financial Repositioning</th>
<th>Implications for the Current Spot Exchange Rate ($e = \text{Domestic currency}/\text{Foreign currency}$)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Domestic Interest Rate ($i$)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Increases</td>
<td>Toward domestic-currency assets</td>
<td>$e$ decreases (domestic currency appreciates)</td>
</tr>
<tr>
<td>Decreases</td>
<td>Toward foreign-currency assets</td>
<td>$e$ increases (domestic currency depreciates)</td>
</tr>
<tr>
<td><strong>Foreign Interest Rate ($i_f$)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Increases</td>
<td>Toward foreign-currency assets</td>
<td>$e$ increases (domestic currency depreciates)</td>
</tr>
<tr>
<td>Decreases</td>
<td>Toward domestic-currency assets</td>
<td>$e$ decreases (domestic currency appreciates)</td>
</tr>
<tr>
<td><strong>Expected Future Spot Exchange Rate ($e^{ex}$)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Increases</td>
<td>Toward foreign-currency assets</td>
<td>$e$ increases (domestic currency depreciates)</td>
</tr>
<tr>
<td>Decreases</td>
<td>Toward domestic-currency assets</td>
<td>$e$ decreases (domestic currency appreciates)</td>
</tr>
</tbody>
</table>

The analysis for each change in one of the variables assumes that the other two variables are unchanged.
Determinants of the Exchange Rate in the Long Run

- In the long run, currency moves in response to price differences so that long run prices for the same goods are the same across borders.
Long Run Exchange Rates
Law of One Price (LOOP)

LOOP states that if

• There is free trade (no tariffs, quotas, etc)
• Transportation costs are low relative to the value of the product (diamonds, oil, wheat, but not Big Macs)
• Competition

Then identical products sold in different locations will sell for the same price (when expressed in a common currency)
Law of One Price (LOOP)

If a diamond of high quality sells for

• 1000 € in Amsterdam
• $4000 in New York
• The exchange rate is $1.50/€

Then trader could buy the diamond for $1500 in Amsterdam and sell it for $4000 in New York. Traders would continue doing this, driving up the price in Amsterdam, and driving down the price in New York until the price is (for example) 2000€ in Amsterdam and $3000 in New York.
The Big Mac Index is a (partly tongue in cheek) applications of LOOP. The Big Mac Index has been published for over 20 years by the Economist as an indicator of short term under or over valuations of currencies.

Link to July/08 Big Mac Index
By LOOP, when expressed in a common currency (say US$) the price of a Big Mac should be the same every

In Beijing: Big Mac Price = 12.5 RMB
In New York: Big Mac Price = $3.57
In Zurich: Big Mac Price = 6.50SF
Exchange Rates (Oct. 08): 6.84RMB/$ and 1SF/$

So the Beijing Big Mac is cheap .....12.5/6.83=$1.83.
The Zurich Big Mac is pricey .......6.50/1.02= $6.37
By LOOP, when expressed in a common currency (say US$) the price of an Ipod should be the same every location. The Ipod may be a better product to use for this than the Big Mac because Ipods are traded internationally (Big Macs typically don’t get imported or exported).
## Law of One Price (LOOP)  
**Ipod Index (2gb)**

<table>
<thead>
<tr>
<th>Country</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brazil</td>
<td>$327.71</td>
</tr>
<tr>
<td>India</td>
<td>$222.27</td>
</tr>
<tr>
<td>France</td>
<td>$205.80</td>
</tr>
<tr>
<td>UK</td>
<td>$195.04</td>
</tr>
<tr>
<td>Italy</td>
<td>$192.86</td>
</tr>
<tr>
<td>China</td>
<td>$179.84</td>
</tr>
<tr>
<td>Korea</td>
<td>$176.17</td>
</tr>
<tr>
<td>Switzerland</td>
<td>$175.59</td>
</tr>
<tr>
<td>Taiwan</td>
<td>$164.88</td>
</tr>
<tr>
<td>Mexico</td>
<td>$154.46</td>
</tr>
<tr>
<td>USA</td>
<td>$149.00</td>
</tr>
<tr>
<td>Japan</td>
<td>$147.63</td>
</tr>
<tr>
<td>Canada</td>
<td>$144.20</td>
</tr>
</tbody>
</table>
Purchasing Power Parity (PPP)

Purchasing Power Parity is the macroeconomic equivalent of the Law of One Price. Rather than looking at one good (LOOP), purchasing power parity examines a representative market basket of goods.

Link to OECD PPPs
Absolute Purchasing Power Parity

With Absolute Purchasing Power Parity any market basket of goods will have the same price when expressed in a common currency.

Let $Q$ be a representative market basket

$P_{US} = \text{Prices of market basket goods in the US}$

$P_{E} = \text{Price of market basket goods in Europe}$

$P_{US} \times Q = \text{cost of market basket in US}$

$P_{E} \times Q = \text{cost of market basket in Europe}$

With Absolute PPP:

Exchange Rate ($/€) = \frac{P_{US} \times Q}{P_{E} \times Q}$
Absolute Purchasing Power Parity

In the unhealthy case where the “representative market basket” just included the Big Mac

With Absolute PPP the exchange rate between the Chinese RMB and the US $ would simply be the ratio of Big Mac prices (Beijing/New York)

Exchange Rate (RMB/$) = 11RMB/$3.41 = 3.22RMB
Absolute Purchasing Power Parity

While New Yorkers are not likely to Fed Ex cheap Big Macs from Beijing, the violation of purchasing power parity does suggest that the same product may be less expensive in the PRC than in the US (at the current exchange rate). The US will find it attractive to import Chinese goods, and over time we should observe some combination of

- Upward pressure on the prices of PRC exports
- Downward pressure on the price of US substitutes
- Appreciation of the RMB
Chapter 12 uses Relative PPP

Relative PPP

- Changes in Exchange rates are related to differences in the level of prices between two countries
  - Changes in relative national price levels determine changes in exchange rates over the long run
- Given in symbols as: \[ S_1 = S_0 \frac{P_{US_1}/P_{US_0}}{P_{S_1}/P_{S_0}} \]
- Application of the concept (Table 12.4)
Relative Purchasing Power Parity

Application of the concept (Table 12.4)

<table>
<thead>
<tr>
<th>Year</th>
<th>U.S. Consumer Price Index</th>
<th>Mexican Consumer Price Index</th>
<th>Actual Exchange Rate: Dollars/Peso</th>
<th>Forecasted Exchange Rate: Dollars/Peso</th>
</tr>
</thead>
<tbody>
<tr>
<td>1985</td>
<td>100.0</td>
<td>100.0</td>
<td>0.0039</td>
<td>—</td>
</tr>
<tr>
<td>1987</td>
<td>105.7</td>
<td>431.7</td>
<td>0.0007</td>
<td>0.0010</td>
</tr>
<tr>
<td>1989</td>
<td>115.2</td>
<td>1,109.6</td>
<td>0.0004</td>
<td>0.0004</td>
</tr>
</tbody>
</table>


Between 1985 and 1987 prices rose by about 400% in Mexico while US prices only rose by 5%. So it makes sense that since the prices of the same Mexican goods rose by a factor of 4, their currency (compared to the US$) would be worth about ¼ of what it was worth in 1985.
Key Implications of Relative PPP

- A country with a relatively high inflation rate will have a depreciating currency (a declining nominal-exchange-rate-value value of its currency).
- A country with a relatively low inflation rate will have an appreciating currency (an increasing nominal-exchange-rate-value value of its currency).
- The rate of appreciation or depreciation will be approximately equal to the percentage-point difference in the inflation rates.
Relative Purchasing Power Parity: Inflation Rate Differences and Exchange Rate Changes, 1975-2004

A. 16 Industrialized Countries
Average Annual Rate of Change of the Exchange Rate
(U.S. Dollars per Unit of the Country's Currency)

1. Australia
2. Austria
3. Canada
4. Denmark
5. Finland
6. France
7. Germany
8. Greece
9. Ireland
10. Japan
11. Netherlands
12. New Zealand
13. Spain
14. Sweden
15. Switzerland
16. United Kingdom

B. 27 Developing Countries
Average Annual Rate of Change of the Exchange Rate
(U.S. Dollars per Unit of the Country's Currency)

1. Brazil
2. Central African Republic
3. Chile
4. Colombia
5. Costa Rica
6. Cyprus
7. Egypt
8. El Salvador
9. Hungary
10. India
11. Indonesia
12. Iran
13. Israel
14. Jordan
15. Korea
16. Kuwait
17. Mexico
18. Morocco
19. Pakistan
20. Poland
21. Singapore
22. South Africa
23. Sri Lanka
24. Thailand
25. Tunisia
26. Uruguay
27. Venezuela
Figure 19.4 – Actual Exchange Rates and Exchange Rates Consistent with PPP, Monthly, 1975-2005
### International Income Comparisons and PPP

<table>
<thead>
<tr>
<th>Country</th>
<th>Using the Exchange Rate</th>
<th>Using Common Prices</th>
<th>Domestic Price Level (This Country/U.S.) as a Percentage of the Level Predicted by PPP</th>
</tr>
</thead>
<tbody>
<tr>
<td>United States</td>
<td>100</td>
<td>100</td>
<td>100%</td>
</tr>
<tr>
<td>Norway</td>
<td>126</td>
<td>97</td>
<td>129</td>
</tr>
<tr>
<td>Switzerland</td>
<td>116</td>
<td>89</td>
<td>131</td>
</tr>
<tr>
<td>Britain</td>
<td>82</td>
<td>79</td>
<td>103</td>
</tr>
<tr>
<td>Canada</td>
<td>69</td>
<td>77</td>
<td>89</td>
</tr>
<tr>
<td>Japan</td>
<td>90</td>
<td>76</td>
<td>119</td>
</tr>
<tr>
<td>Sweden</td>
<td>86</td>
<td>75</td>
<td>115</td>
</tr>
<tr>
<td>France</td>
<td>73</td>
<td>74</td>
<td>98</td>
</tr>
<tr>
<td>Australia</td>
<td>65</td>
<td>74</td>
<td>88</td>
</tr>
<tr>
<td>Germany</td>
<td>73</td>
<td>70</td>
<td>103</td>
</tr>
<tr>
<td>Italy</td>
<td>63</td>
<td>70</td>
<td>90</td>
</tr>
<tr>
<td>Singapore</td>
<td>59</td>
<td>67</td>
<td>87</td>
</tr>
<tr>
<td>Israel</td>
<td>42</td>
<td>59</td>
<td>71</td>
</tr>
<tr>
<td>South Korea</td>
<td>34</td>
<td>51</td>
<td>66</td>
</tr>
<tr>
<td>Czech Republic</td>
<td>22</td>
<td>46</td>
<td>48</td>
</tr>
<tr>
<td>Saudi Arabia</td>
<td>25</td>
<td>35</td>
<td>71</td>
</tr>
<tr>
<td>Poland</td>
<td>15</td>
<td>32</td>
<td>46</td>
</tr>
<tr>
<td>South Africa</td>
<td>9</td>
<td>28</td>
<td>32</td>
</tr>
<tr>
<td>Chile</td>
<td>12</td>
<td>26</td>
<td>45</td>
</tr>
<tr>
<td>Russia</td>
<td>8</td>
<td>24</td>
<td>34</td>
</tr>
<tr>
<td>Mexico</td>
<td>16</td>
<td>24</td>
<td>68</td>
</tr>
<tr>
<td>Brazil</td>
<td>7</td>
<td>20</td>
<td>37</td>
</tr>
<tr>
<td>Thailand</td>
<td>6</td>
<td>20</td>
<td>30</td>
</tr>
<tr>
<td>Turkey</td>
<td>9</td>
<td>19</td>
<td>47</td>
</tr>
<tr>
<td>China</td>
<td>3</td>
<td>14</td>
<td>22</td>
</tr>
<tr>
<td>Egypt</td>
<td>3</td>
<td>10</td>
<td>30</td>
</tr>
<tr>
<td>Indonesia</td>
<td>3</td>
<td>9</td>
<td>32</td>
</tr>
<tr>
<td>India</td>
<td>1</td>
<td>8</td>
<td>19</td>
</tr>
<tr>
<td>Ghana</td>
<td>1</td>
<td>6</td>
<td>16</td>
</tr>
<tr>
<td>Pakistan</td>
<td>1</td>
<td>5</td>
<td>27</td>
</tr>
<tr>
<td>Tajikistan</td>
<td>1</td>
<td>3</td>
<td>23</td>
</tr>
<tr>
<td>Nigeria</td>
<td>1</td>
<td>2</td>
<td>40</td>
</tr>
</tbody>
</table>

The Ups and Downs of the Dollar: 1970 to 2008

- The 1980s
  - Path of appreciation and then depreciation
  - Peaked in 1985; 50% above 1979 levels
  - Depreciation in latter half of 1980s
    - Fluctuations significantly caused by policy changes – Monetary expansion at US Fed

- The 1990s
  - Economic weakness; recession in 1991
  - Rapid growth in the mid-1990s
The Ups and Downs of the Dollar: 1970 to 2008

Trade Weighted Exchange Index: Major Currencies (DTWEXM)
Source: Board of Governors of the Federal Reserve System

Shaded areas indicate US recessions as determined by the NBER.
2008 Federal Reserve Bank of St. Louis: research.stlouisfed.org
The Ups and Downs of the Dollar: 2000 to 2008

○ The 2001
  ● A rising dollar and the large flow of investment into the U.S. that pushes the currency higher than could not be sustained
    ○ Weakening of the demand for dollar-denominated assets on the part of foreign investors.
  ● 2008: US $ appreciates as world owners of assets look for a safe haven
Too Much Volatility?
Exchange-Rate Overshooting

- Short-run response to a change in market fundamentals greater than long-run response
  - Helps explain sharp movements
  - Tendency of elasticities to be smaller in the short run than in the long run (Figure 12.5)
  - Exchange rates tend to be more flexible than many other prices
In 1980 the US$ was 1.2 Canadian, by 1985 it was back to 1.2, then rose to 1.6 in 2000, only to fall back to 1.2 in 2005, and fall to less than 1.00 in 2007, only to come back to 1.2 today. Did all this variation reflect changes in the two economies?
Forecasting Foreign-Exchange Rates

- Most forecasting methods use:
  - Accepted economic relationships to formulate a model that is then refined through statistical analysis of past data
  - Exchange-rate forecasting organizations and their methodologies (Table 12.7)
<table>
<thead>
<tr>
<th>Forecasting Organization</th>
<th>Methodology</th>
<th>Horizon</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chase Econometrics</td>
<td>Econometric</td>
<td>8 quarters</td>
</tr>
<tr>
<td>Chase Manhattan Bank</td>
<td>Judgmental</td>
<td>Under 12 months</td>
</tr>
<tr>
<td>Data Resources</td>
<td>Econometric</td>
<td>6 quarters</td>
</tr>
<tr>
<td>Exchange Rate Outlook</td>
<td>Judgmental</td>
<td>12 months ahead</td>
</tr>
<tr>
<td>Goldman Sachs</td>
<td>Technical</td>
<td>Under 12 months</td>
</tr>
<tr>
<td></td>
<td>Econometric</td>
<td>Over 12 months</td>
</tr>
<tr>
<td>Phillips &amp; Drew</td>
<td>Judgmental, econometric</td>
<td>6, 12 months ahead</td>
</tr>
<tr>
<td>Predex Forecast</td>
<td>Econometric</td>
<td>7 quarters</td>
</tr>
<tr>
<td>Predex Short-Term Forecast</td>
<td>Technical</td>
<td>1–3 months ahead</td>
</tr>
<tr>
<td>Wharton Econometric Forecasting Associates</td>
<td>Econometric</td>
<td>24 months ahead</td>
</tr>
</tbody>
</table>

*Source: Euromoney, various issues.*
Forecasting Foreign-Exchange Rates

- Judgmental forecasts
  - Subjective or common sense models
  - Projections based on a thorough examination of individual nations
    - Use of economic indicators; political factors; technical factors; and psychological factors

- Technical forecasts
  - Involves the use of historical exchange-rate data to estimate future values (Figure 12.6)
  - Useful in explaining short-term movements
When forecasting exchange rates, technical analysts watch for new highs and lows, broken trendlines, and patterns that are thought to predict price targets and movement.
Forecasting Foreign-Exchange Rates

- **Fundamental analysis**
  - Involves consideration of economic variables that are likely to affect a currency’s value
  - Uses computer-based econometric models
  - Best suited for forecasting long-run trends
Forecast Performance of Advisory Services

- Better information about future exchange rates than is available to the market
- Evaluating the performance of forecasters
  - Predict spot rates better than what is implied by the forward rate
Figure 19.5 – A Case of Exchange Rate Overshooting

- $e$, the exchange rate value of foreign currency
- $t_0$: Domestic money supply unexpectedly rises 10%
- $e$ 10% higher