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International Economics

VIII. Currency Markets and Exchange Rates

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VIII. Currency Markets and Exchange Rates

1. Introduction – A World of Many Currencies
2. The Basics of Currency Markets
3. Changes in Exchange Rates and Trade
4. What Determines Exchange Rates?
5. Conclusion
6. References

Pugel, *International Economics*, pp. 390-404, 434-464



1. A World of Many Currencies

Recap: Capital Flows in a World of one Global Money

- Capital flows finance trade and investment
- Such flows are managed in the market for foreign exchange – the market for claims on each country
- If there is high demand for such claims, the rate of exchange appreciates and it becomes cheaper to send the base money instead

Interlocal Exchange Rates

- Fluctuate within a narrow range set by the costs of transporting money



The Classical Gold Standard

- C. 1870-1914 all of the industrialized world used the same money: gold
- Denominated in national units (francs, pounds, marks etc.)
- Gold regularly flowed between nations

The End of the Gold Standard

- In 1914 all the warring countries suspended convertibility of their currencies
- In 1922 at the Genoa conference, a sort of gold standard was established
 - The *gold-exchange standard*: gold or gold-backed currencies the reserve
- Central banks began holding the central currencies – dollars and pounds – instead of gold.
- The equilibrating flows of gold were suspended



Failure of the Gold-Exchange Standard

- First Britain (1931), then the US (1933) abandoned gold redemption, France gave up in 1936

The Bretton Woods System

- A new international system agreed after WW2
- At conference in Bretton Woods, hence its name
- Only the US dollar convertible into gold, only foreign central banks could redeem dollars
- Why? most of the world's gold reserves had been centralized in the US before and during the war



Problems of Bretton Woods

- US in position of money producer: export dollars to finance trade, investment, government
- Inflationary policies in the US meant that dollars kept flowing out
- Especially from the late 1950s on, this led to an outflow of gold from the US as European governments redeemed dollars

The End of Bretton Woods

- In 1968 the private market for gold was “decoupled” from the “official” market
- 15 August 1971 the US finally gave up and broke its promise to redeem dollars for gold



Fiat Currencies Since 1971

- In the modern world, all currencies are *fiat* currencies
- A fiat money has no relation to any commodity like gold
- The production of fiat money is controlled by the central bank / monetary authority
- They can produce more money at will – by *fiat*

Currency Markets

- All fiat currencies are traded on the open market against each other
- Fiat currencies are distinct economic goods, each with a price in terms of other currencies
 - A fixed exchange rate today is very different than under the gold standard
 - It's effectively a kind of price control
- There are some exceptions to this: dollarization, currency boards, currency pegs...

Key question: how is the value of each currency determined?



2. The Basics of Currency Markets

Foreign Exchange

- The act of trading different nations' moneys
- By extension, we also call the holdings of foreign currencies foreign exchange

The Exchange Rate

- The price of one money in terms of another money
- The spot exchange rate is the price for immediate exchange
- The forward exchange rate is the price in the present for an exchange that will take place sometime in the future – standard terms are 30, 90, and 180 days

Foreign exchange is almost always the exchange of bank deposits



The Exchange Rate

- We can state the price in two ways: the price of money A in terms of money B and the price of money B in terms of money A
- The prices are the reciprocals of each other
 - If the price of British pounds in terms of dollars is 1.3569
 - Then the price of US dollars in terms of British pounds is 0.7370, or $1/1.3569$
- As with other prices, the good that is being priced is in the denominator
 - E.g., $\$1.3569/£$ or $£0.7370/\$$

Vehicle Currency

- Most foreign exchange involves exchanging US dollars for other currencies
- To exchange currency A for currency B, you/your bank exchange currency A for dollars and dollars for currency B
- There are thin markets for direct exchange, hence the use of an intermediary
- Some currencies, e.g., euros, have thick markets, so no use for intermediary (usually)



Currency Prices

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Country/Currency	In US\$	Per US\$	Country/Currency	In US\$	Per US\$
Argentina peso	0.04577	21.850	Norway krone	0.1241	8.0565
Australia dollar	0.7520	1.3297	Pakistan rupee	0.008653	115.57
Bahrain dinar	2.6518	0.3771	Peru nuevo sol	0.3049	3.2797
Bolivia boliviano	0.1447	6.9100	Philippines peso	0.01928	51.875
Brazil real	0.2820	3.5466	Poland zloty	0.2796	3.5765
Canada dollar	0.7775	1.2861	Romania leu	0.2558	3.9094
Chile peso	0.001591	628.50	Russia ruble	0.01594	62.723
China yuan	0.1571	6.3649	Saudi Arabia riyal	0.2666	3.7503
Colombia peso	0.0003536	2828.3	Singapore dollar	0.7482	1.3366
Costa Rica colon	0.001767	565.92	South Africa rand	0.07949	12.581
Czech Rep. koruna	0.04668	21.425	South Korea won	0.0009283	1077.3
Denmark krone	0.1599	6.2530	Sweden krona	0.1133	8.8300
Egypt pound	0.05647	17.707	Switzerland franc	0.9967	1.0033
Hong Kong dollar	0.1274	7.8498	Taiwan dollar	0.03359	29.771
Hungary forint	0.003788	263.99	Thailand baht	0.03140	31.850
India rupee	0.01489	67.171	Tunisia dinar	0.4046	2.4717
Indonesia rupiah	0.00007143	14000	Turkey lira	0.2342	4.2699
Israel shekel	0.2767	3.6139	UAE dirham	0.2722	3.6732
Japan yen	0.009152	109.26	United Kingdom pound	1.3569	0.7370
1-mo forward	0.009153	109.25	1-mo forward	1.3571	0.7369
3-mo forward	0.009153	109.25	3-mo forward	1.3575	0.7366
1-yr forward	0.009153	109.25	1-yr forward	1.3594	0.7356
Kenya shilling	0.009974	100.26	Venezuela bolivar fuerte	0.00001451	68915
Kuwait dinar	3.3179	0.3014	Vietnam dong	0.00004392	22769
Malaysia ringgit	0.2535	3.9445	Euro Area euro	1.1915	0.8393
Mexico peso	0.05149	19.421	1-mo forward	1.1912	0.8395
New Zealand dollar	0.7020	1.4246	3-mo forward	1.1906	0.8399
Nigeria naira	0.002774	360.50	1-yr forward	1.1877	0.8420

Source: The values shown for country currencies per U.S. dollar are from *Financial Times*, "Currency," May 8, 2018.



Retail Market

- Banks deal with customers who want to buy or sell foreign exchange
- Customers are mostly companies, financial institutions and others who make large international payments

Interbank Market

- Interbank trading constitute about 40 percent of the market
- Banks can quickly buy and sell currencies, to service customers
- Speculation in the market for foreign exchange, taking advantage of small changes in exchange rates, is also a huge part of the market
- Volume in the market is enormous: estimated at \$5 trillion per day



Supply and Demand

- Supply and demand the immediate determinants of exchange rates
- Exchange rates rise and fall in response to changes in supply and demand

Supply of Currency

- Imports of goods, services, and financial assets constitute *exchange supply* of the currency
- Production of new units of currency constitute an extra supply

Demand for Currency

- Exports of goods, services, and financial assets generate *exchange demand* for a currency
- Demand to hold a given quantity constitutes *reservation demand* for a currency



German manufacturers export to Great Britain

- Euro-denominated goods sold in Great Britain
- This creates a demand for euros in terms of pounds
 - The British want to pay in pounds, but the Germans want to be paid in euros
 - Somewhere in the process, pounds are exchanged for euros
 - It does not matter where in the process the exchange is made
- The British now supply more pounds into the foreign exchange market
- The demand for euros in terms of pounds go up
- The supply of pounds in terms of euro go up
- Result: the exchange rate for euros in terms of pounds rises



Changes in Reservation Demand

- Changes in reservation demand can compensate currency rate
- If the Germans want to hold more pounds, or if the British had a stock of euros they could draw on
- Then no action takes place in the market for foreign exchange
- This process is completely analogous to changes in the individual's reservation demand
- Changes in reservation demand can alone lead to changes in exchange rates



Appreciation

- An increase in *exports* increases the exchange demand for a currency → appreciation in terms of other currencies
- An increase in *capital imports* also increases the demand for a currency → appreciation
 - Appreciation makes the exchange rate go down
 - If euros appreciate in terms of dollars, the rate of euros per dollar decreases (and the rate of dollars per euro increases)
- An increase in the reservation demand for a currency → appreciation

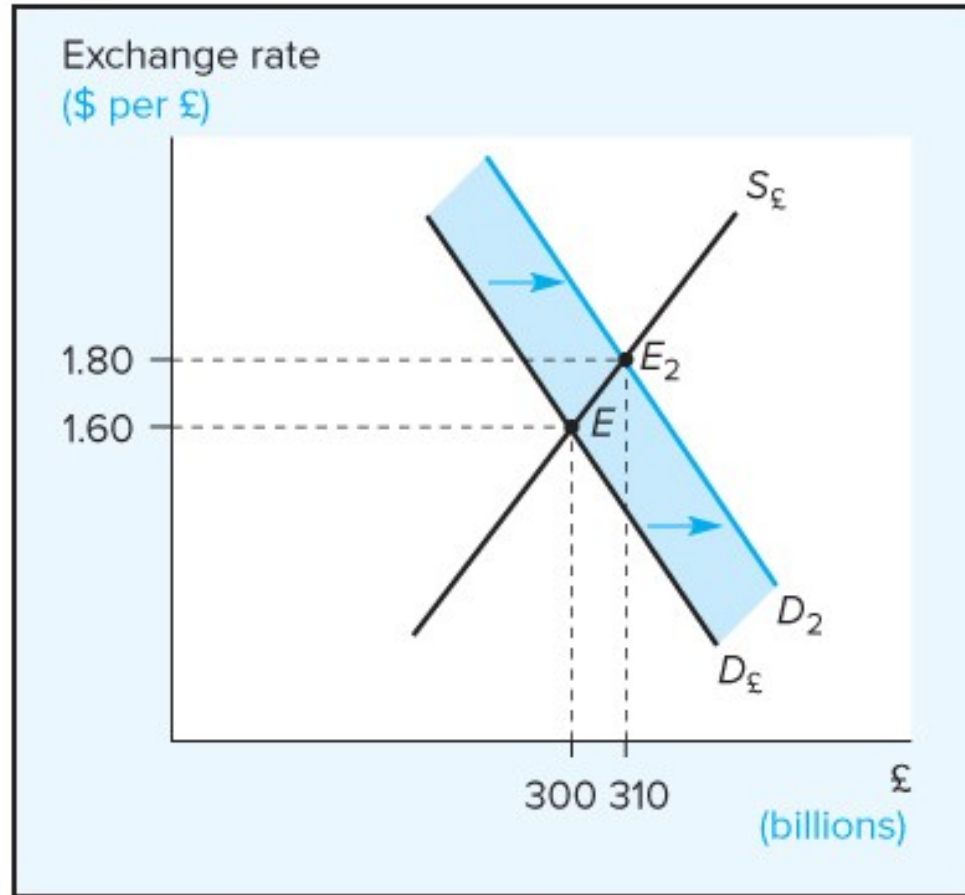
Depreciation

- A fall in the demand for a currency leads to depreciation: it loses value compared to other currency
 - Depreciation makes the exchange rate go up



An Increase in Demand

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Depreciation

- An increase of imports will put downward pressure on a currency as exchange supply increases → depreciation in terms of other currencies
- Capital exports (imports of financial assets) is also a fall in demand for the national currency → depreciation

Equilibration

- Supply and demand of all currencies will tend to equilibrate international trade
- Value of imports and exports match
- International supply of and demand for capital match
- Appreciation and depreciation take the place of gold flows
- In practice, however, it's more complicated: monetary policy play a huge role



Arbitrage

- The practice of discerning price discrepancies and profiting from them
- Foreign exchange arbitrage make sure that exchange rates are essentially the same in different locations – there is not one rate of exchange in London and another in Hamburg
- *Triangular arbitrage* takes place through three exchange rates and makes sure that the rates are internally consistent

Speculation

- Here as in other markets derivative of fundamental changes in supply and demand
- Speculation is not an independent determinant of exchange rates
- It helps speed up the adjustment process of prices after the data of the market has changed



3. Changes in Exchange Rates and Trade

Appreciation

- If a country's currency is appreciating, its exports become more expensive
 - Example: if the euro appreciates from €1/\$ to €0.9/\$
 - Americans now need \$111 to buy in Europe what they before could buy with \$100
- At the same time, appreciation means imports become cheaper

Depreciation

- If a country's currency is depreciating, then its exports become less expensive
 - Example: the exchange rate changes from €1/\$ to €1.1/\$
 - Now \$91 buys in Europe what \$100 bought before. European exports to the US increases
- At the same time, depreciation means imports become more expensive



Beggar Thy Neighbour

- Countries wanting to increase exports have seized on exchange rate manipulation as a short-cut
 - One country devaluates its currency in order to boost exports,
 - Is then quickly imitated by other countries who don't want to lose market shares
 - The result is a series of competitive devaluation
- This is known as beggar-thy-neighbour policy and was very disruptive in the 1930s
- Post-war international monetary cooperation was an attempt to avoid a repeat of this pattern
- It is a variation of mercantilism: exports good, imports bad!



Equilibrium

- Imports equal exports and capital transfers
- Changes in exchange rates are equilibrating

Appreciation

- Imports become cheaper, exports more expensive
- Current account surplus disappears
- Indicator of accumulated purchasing power
- Prices adjust domestically and internationally

Depreciation

- Imports become more expensive and exports less expensive
- It is necessary to export more to maintain the same level of imports
- A current account deficit disappears

Appreciating currency *can* be taken as an indicator of economic development in a country

- Increased productivity → increased exports → increased demand for currency → appreciation



4. What Determines Exchange Rates?

Purchasing Power of Money

- Money is demanded for its purchasing power: the amount of goods and services it can be exchanged for
- Purchasing power of money is determined by the demand and the supply of money

Exchange Rates and PPM

- The PPM of each currency determines its value
- Exchange rates between currencies ultimately tend to be set by PPMs
- The ratio of one currency to another will tend toward the ratio of their respective PPMs



The Purchasing Power of Money

Definition

- The purchasing power of money (PPM) is the *inverse of the array of prices of other goods* exchanged against money
- E.g., €0.1/egg, €1/liter of milk, €4/ per pound of bacon yields the reciprocals of 10 eggs/€, 1 liter of milk/€, and 0.25 pound of bacon/€
- There is thus not one single market for money and a single price of money: money is exchanged across all markets
- A statistical index of the “price level” is a poor approximation of this reality

Demand for Money

- How much each person wants to hold depends on the PPM
- This is true of both reservation demand for money
- And exchange demand for money (the supply of goods and services)



Increase in PPM

- If more goods and services are produced and exchanged against money
 - The exchange demand for money rises
 - Prices fall → PPM rises
- If people increase their demand for money to hold, PPM rises
- If the supply of money decreases, prices fall and PPM rises (rare)

Decrease in PPM

- If the supply of money increases, prices rise and PPM falls
- If the reservation demand for money falls, prices rise and PPM falls
- If the supply of goods and services falls, the exchange demand for money declines, prices rise and PPM falls



- The value of each national currency is determined by its PPM. *Therefore, the ratio of PPMs of different currencies determine their exchange rates*

Example

- Dollar prices are: \$0.2/egg, \$2/liter of milk, \$8/pound of bacon
- Euro prices are: €0.1/egg, €1/liter of milk, €4/pound of bacon
- The PPM of the dollar is 5 eggs/\$, 0.5 liters of milk/\$, 0.125 pounds of bacon/\$
- The PPM of the euro is 10 eggs/€, 1 liter of milk/€, 0.25 pounds of bacon/€
- At this array of prices, 2 dollars buy exactly the same as 1 euro. The exchange rate will therefore be \$2/€ or €0.5/\$

This is the purchasing power parity theory of exchange rates, first formulated by von Mises (1912) and Cassel (1921)



- There can be discrepancies, deviations from PPP

Natural Discrepancies

- Such deviations simply reveal beneficial trades – and the comparative advantage of different countries
- They really reveal *interlocal* differences in prices
- E.g., if eggs are \$0.3/egg, this means that exports of eggs from Europe a beneficial trade

Monetary Policy

- Deviations can also be induced by monetary policy
- Either intentionally – e.g., beggar-thy-neighbour
- Or unintentionally – e.g., the result of domestic inflation



The Law of One Price

- Units of the same identical good will trade in all markets at the same price
- Identical does not mean simply physically similar but *economically* identical
 - A house in London is not the same good as a house in Leipzig – “living in London” is not the same service as “living in Leipzig”
 - Similarly, services consumed in different parts of the world are distinct goods
 - E.g., barbers and hairdressers may be more or less expensive depending on where they live and ply their trade
- For locally fixed goods, their price in terms of local and foreign currency will still tend toward being the same



Possibility for Arbitrage

- If currencies are not priced according to PPP
- There are clear profit opportunities from bringing exchange rates into line with PPP

Example

- The dollar price of gold (an internationally traded asset) is \$1,500/oz., and the euro price of gold is €1,000/oz. The exchange rate is \$1.25/€. What will happen?
- Clear profit opportunity: buy gold with euros and sell it against dollars
- By buying gold for €1,000 and selling the gold for \$1,500, you can then sell your dollars for €1,200 – a 20 percent profit
- As a result, prices will tend to adjust, euro prices for gold will rise, dollar prices for gold will fall, and the euro will appreciate in terms of dollars
 - The equilibrium position might be \$1430/oz., €1100/oz., and an exchange rate of \$1.3/€
- This is the same process as in the case of triangular arbitrage



Factors Already Mentioned

- An increase in the money supply → lower PPM → depreciation of the currency on the foreign exchange market
- An increase in productivity → higher PPM → appreciation of the currency on the foreign exchange market
- An increase in reservation demand → higher PPM → appreciation of the currency
- And the inverse: lower supply etc.

Other Factors

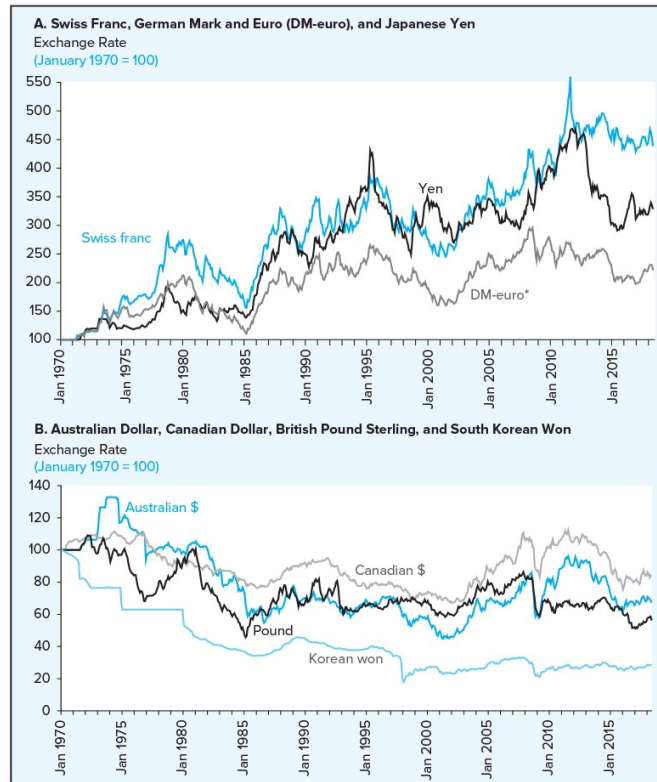
- Political risks
- Speculation on changes in the economic fortunes and monetary policies
- These factors always work through the channels of supply and demand for currencies

The ratio of PPMs is the long-term determinant of exchange rates; they may vary in the short term



Selected Exchange Rates 1970-2018

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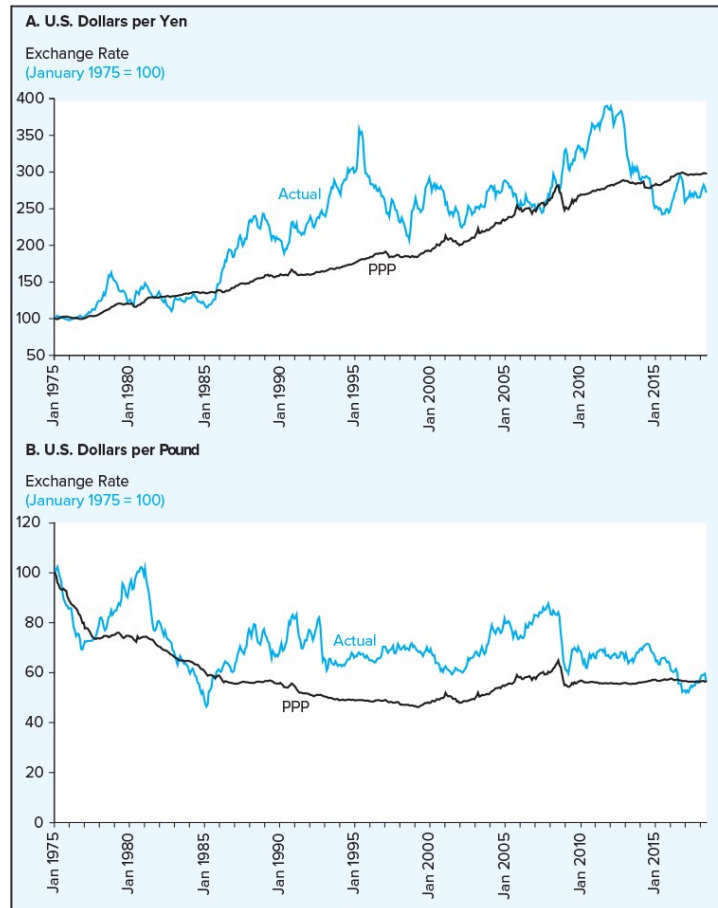
*At the beginning of 1999, the German mark was fixed to the euro, and in 2002 the euro replaced the DM.
For each currency, the dollar price of that currency (e.g., \$/£) is shown, with units adjusted so that its January 1970 value is 100. For any currency, an increase in the value shown from one time to another indicates that the currency increased in exchange-rate value (appreciated) relative to the U.S. dollar during that time period; a decrease in the value shown indicates that the currency depreciated relative to the U.S. dollar. For the currencies shown, the Japanese yen, Swiss franc, and German mark appreciated over the entire 48-year period, while the Australian dollar, British pound sterling, Canadian dollar, and South Korean won depreciated.

Source: International Monetary Fund, *International Financial Statistics*.



Actual Exchange Rates and PPP

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Source: International Monetary Fund, *International Financial Statistics*.



- This exposition combines the monetary and PPP approach to exchange rates. Note that the simple use of PPP is different!

Absolute PPP

- Compares the price level, a statistical aggregate in each country (CPI or PPI)
- This does not take account of the nuances explained above, e.g., the differences in goods depending on their location
 - P is the domestic price level, P_f is the foreign price level, and e is the exchange rate
 - Then $P = e \times P_f$
 - And $e = P / P_f$

Relative PPP

- Differences in changes in price levels over time will be off-set by changes in exchange rates
 - $e_t / e_0 = (P_t / P_0) / (P_{f,t} / P_{f,0})$
- Relative PPP tracks reality better than absolute
- These are only attempts to measure national PPP and their relations to the price level
- Such measurement are necessarily less precise than reality



5. Conclusion

1. We now live in a world of many currencies, the result of a century of government intervention
2. Currencies are traded in currency markets. The supply of and demand for different currencies are integrated with the flows of trade and capital
3. Beggar-thy-neighbour policies are attempts to boost exports through devaluation of domestic money. Usually leads to competitive devaluations and confusion, reduction in international trade
4. Exchange rates are fundamentally determined by the purchasing power of each currency. Correctly understood, they tend to follow the ratio of purchasing power, known as purchasing power parity



6. References

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Mises, Ludwig von, 1912. *The Theory of Money and Credit* (originally: *Theorie des Geldes und der Umlaufsmittel*). Leipzig.