[Prices and Exchange rates]

One obvious reason why the exchange rates change over time is that as the price level changes internationally, the exchange rates also should change in order to keep the prices measured in a common currency equal across countries. So, the exchange rates should adjust to offset the difference in inflation rates between two countries.

Purchasing Power Parity (PPP) shows the relationship between the prices of goods and exchange rates, and it is important to understand the roles of goods market in international finance. The most typical example of the PPP theory is Big Mac Index

1. Law of One Price

Under perfect arbitrage in the goods market the price of domestic goods will equal the price of foreign goods times the nominal exchange rate. Then

$$P^* = SP,$$

where P and P^* are the general price indexes for domestic and foreign country, not the price of individual products and S is the spot exchange rate expressed in terms of foreign currency per domestic currency.

This relationship is often expected to hold especially in terms of a basket of homogeneous goods (Big Mac) that are tradable between countries.

For example, if the price of a Big Mac costs HK$10 in the HK and the spot exchange rate, S = 0.13 = US$/HK$, then
Cost of the same X in US = (Cost of market basket in HK)(Exchange Rate in US$/HK$)

$$P^* = HK\$(10)(0.13) = US\$1.3$$

Now suppose the HK has a doubling of its price level in the next decade, while US prices remain constant. That is the HK has quite a severe inflation, while US avoids any inflation. Then the price of the goods in the HK will be HK$20 or US$ 2.6, while in US the price of the same product remains at US$1.3. Arbitrager will make profit by buying the commodity in US market where it is cheap and selling it in HK market. So, the demand for HK$ rises and the dollar would depreciate to S = 0.065 = US$/HK$. Hence,

$$P^* = (20)*S = US\$1.3$$

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If the exchange rate adjusts in this way, it preserves the Law of One Price, or Purchasing Power Parity and eliminate the arbitrage opportunity.

If PPP held exactly then the differences in the inflation rates between countries would completely account for all the movements in exchange rates.

In practice there are some cases in which the Law of One Price might not hold at any one point of time especially for the case of differentiated goods or some products which are not traded internationally.

3. Absolute Purchasing Power Parity

From the law of one price, the absolute PPP can be written as,

$$S = P^*/P,$$

The absolute PPP indicates that the exchange rate between two countries is equal to the ratio of the general price indexes, not the price of individual products. Thus, if domestic HK prices increase, then S will decrease, implying there will be less HK dollars per unit of foreign currency, so that again the HK dollar will depreciate.

For example, suppose that the price of a basket of an apple in HK is HK$75 and the price of the same basket in the US is US$10. Then according to the absolute PPP, the exchange rate is 10/75 = 0.133.
But, if the HK price increases to HK$80, the exchange rate would be 10/80 = 0.125. So, as the price level of HK increase, the exchange rate decreases.

3. Real Exchange Rates

The real exchange rate is the nominal exchange rate adjusted for difference in prices or inflation. It is a measure of the purchasing power parity. T**he real exchange rate** can be,

$$\mathbf{S(P/P^*)}$$

where S is expresses in terms of foreign currency per domestic currency.

Example: Suppose PPP held in 1984; when the HK CPI was 100, the US CPI was 100 and the nominal exchange rate was US$/HK$ = 0.13. Then,

$P = 100$, $P^* = 100$ and $S = 0.13$.

This means that the implied real exchange rate of $P^*/P = 1$ would have to be multiplied by a constant of 0.13 if we want to impose the condition that the PPP holds in 1984.

Now suppose that ten years later in 1994, the HK had experienced a 50% inflation and US a 12.5% inflation, so that $P = 150$, $P^* = 112.5$. The ratio of the two price levels is $P^*/P = 112.5/150 = 0.75$. While the real exchange rate in 1994 would be:

Real Exchange Rate = [(112.5)/150](0.13) = 0.098

Now suppose that the market spot exchange rate is S = 0.08. The market rate has less US$ to the HK$ than implied by price changes, so that the HK$ is undervalued by the market to the extent of:

$$100(\text{Real} - S)/\text{Real} = 100(0.098 - 0.08)/0.098 = 18\%$$

Overvaluation and undervaluation

If the foreign price level (P^*) increases faster than domestic price level (P), the foreign exchange rate S (the domestic currency of the foreign currency) is expected to fall. But, when the exchange rate does not decrease by the amount of P/P^* so that the actual market exchange rate is greater than the real exchange rate, the domestic currency is said to be underevaluated and the foreign currency is overvalued.

Clearly, if PPP holds continuously, then the Real Exchange Rate should be a constant. However, since PPP does not hold very well for any pair of countries, most major currencies since 1973 have experienced real exchange rates that have varied considerably over time and have been successively undervalued, then overvalued. The nominal exchange rate has varied considerably around the real rate.

4. Relative PPP

$$\Delta S = \Delta P^*/\Delta P$$

where $\Delta S = \Delta S_t - \Delta S_{t-1}$. Sometimes the relationship is expressed in terms of percentage changes as,

$$(S_t - S_{t-1})/S_{t-1} = [(P^*_t - P^*_{t-1})/P^*_{t1}] - [(P_t - P_{t-1})/P_{t-1}]$$

The relative PPP implies that the percentage change in the exchange rate is equal to the percentage change in the price level (the inflation differential) between the domestic and foreign country.

For example, during a particular period, HK inflation rate was 10% and US inflation was 6%. Assuming that relative PPP held precisely, what would have happened to exchange rate if the initial level was 7.8?

→ According to the relative PPP, $\Delta S = 6 - 10 = -4\%$. So, the new exchange rate would be below the initial level by 4%. HK$ have depreciated against US$ by 4% during the time period. So, 7.8 + 0.312 = 8.112.

5. Relationship between absolute PPP and relative PPP

If the absolute PPP holds, the relative PPP will also hold. But, if the absolute PPP does not hold, the relative PPP may hold because the level of exchange rate my not be always equal to the ratio of the level of the prices, but the percentage change in exchange rate could still be equal to the inflation differential.

6. Deviation form PPP

In the era after World War I in 1918, Purchasing Power Parity (PPP) theory was thought to hold continuously at all points of time. Economists found that PPP was not exactly an identity. It failed to hold at most points of time.

Reasons Why PPP May not Hold in the Long Run

(a) The CPIs include non-traded goods as well as traded goods. Many goods included in the CPI, such as housing, land, services, haircuts, tennis lessons are not traded across borders.

(b) Goods are not identical across countries; is a Honda Accord really the equivalent of a Ford Taurus?

(c) In international trade, tariffs and transportation costs like freight charges make the prices different and prevent goods market arbitrage.

Reasons Why PPP may not Hold in the Short Run

(a) CPIs may change due to relative price changes rather than because of inflation.

(b) In the short run factors such as fiscal deficits, oil supply changes, productivity growth, also affect the equilibrium exchange rate.

(c) Exchange rates are extremely sensitive to changes in asset markets, while price changes are more "sticky".

7. Why PPP is useful in international finance?

PPP provides theories of exchange rate movement based only on the international exchange of goods and services without considering financial capital flows and money stocks.

PPP provides information about the relative purchasing power of currencies, the degree of overvaluation and undervaluation of the currencies. This information is very useful especially for economic policy makers and FX dealers.

For economic policy makers, this information is important especially when the apparent over, or undervaluation is persistent for some time because it can has significant macroeconomic consequences. So, the information from PPP can serve as a basis for economic policy decision.

For private dealers, the information from PPP can be used as a trading rule in the foreign exchange market. A currency is bought when it is undervalued and sold when it is overvalued.