Purchasing Power Parity

- We can expect the arbitrage that we discussed in the previous lecture, be present in any market where similar goods are traded in different locations. For instance, we can expect to see the price of a Big Mac be the same or at least approximately be the same across different cities in Michigan and or states across United States. Similarly, one would expect to observe the price of big mac be similar across different countries when we convert them to the same currency unit.

- The tendency of similar goods to sell for similar prices provides a link between prices and exchange rates. One reason why exchange rates change over time is that possibly the prices of goods are changing over time internationally and hence exchange rates need to change to keep the prices measured in a common currency equal across countries.

- The relation between goods and services prices and exchange rates is known as purchasing power parity (PPP).

- PPP is a theory that the nominal exchange rate is given by the ratio of two national price levels. That is,

\[ S = \frac{P}{P^*} \]  

where \( S \) is the domestic price (say US dollar price) of foreign currency (say Euro), \( P \) is the home (U.S.) price level, and \( P^* \) is the foreign (European) price level. The idea is simple. \( S \) is the relative price of two national currencies and should in equilibrium be equal to their relative values. The value of a dollar is \((1/P)\) whereas the value of a euro is \((1/P^*)\).

- By price level we usually mean an index of prices which on average indicates the level of the prices of several goods. For instance, consumer price index, (CPI).

- The PPP given in 1 is also known as absolute PPP, as it indicates that the exchange rate between two currencies is equal to the ratio of price levels in two
countries. The exchange rate defined by 1 is a *nominal* value in the sense that it is expressed as the ratio of current price levels.

- If the changes in the prices were only nominal, then we would expect PPP to hold if we had true price indexes. In this sense, the equation given in 1 is also is the condition that states that when expressed in the same currency goods prices need to be the same in different countries. To see this re-write equation (1) as;

\[ P = SP^* \]  

(2)

This equation says that the domestic price level is equal to the domestic currency price of foreign currency times the foreign price level. The equation (2) is called the **law of one price** and it indicates that goods sell for the same price worldwide.

- *Example:* If \$/Lexchange rate is \$2.0 per pound, and a CD is selling \$15 in the U.S. and \L7.5 in the U.K., then \[ P = SP^* = 2 \times 7.5 = 15 \]. Thus the price of CD in the U.K. is the same as the U.S. price once we convert the pound price into dollars using the exchange rate between dollar and pound.

- In an ideal world with no transaction costs, transportation and shipping costs, and all goods are traded internationally, then the law of one price will hold for each good individually. If this is true for each good, then the law of one price will hold for all goods included in the price level too (i.e. in all good that are included in the price index for instance). Under these conditions we get equation (1).

- The equation 2 gives the nominal price of foreign goods in terms of US dollars and says that they need to be the same when expressed in the same currency-US dollars in this case. The relative price of foreign goods in terms of US dollars is given by the ratio of foreign price level expressed in terms of US dollars to the
US price level. That is;

\[ Q = \frac{S P^*}{P} \]

We call \( Q \) the real exchange rate. That is, the nominal exchange rate is deflated by price level differences gives the real exchange rate between domestic-US dollar- and the foreign-say Euro- exchange rates.

- If PPP holds then the real exchange rate need to be constant reflecting the differences in measurement of price level across countries.

- **Why PPP may not hold in the short run?**
  
  - Different countries may have different tastes and consumption behavior. Use of price indexes to compare the price level in two countries in a given time period may not be appropriate as different country price indexes will potentially contain some how different goods in the index. Hence, we may not expect to see prices behave on average the same at least in the short run.
  
  - Use of price indexes may not be appropriate as the movements of individual prices in the index may be different from one another. When price level changes the individual prices changes as well. But the relative price changes may be different from the general price level change. In other words, as the inflation results in an increase in all the prices, relative price changes indicate that not all prices move in the same proportion. Some prices rise faster than others and some prices fall relative to others. In the short run, the changes in the exchange rates may be due to solely by the changes in relative prices rather than the price level changes. Hence, if we look at equation in (1) over time short intervals of time we may see that it does not hold at all.
  
  - Exchange rate can change due to real economic events, even with average price levels constant. Since the PPP is discussed in terms of price indices,
real events, such as the relative price changes brought about by a poor harvest, will cause deviations from PPP as the exchange rate changes, even if the price indices remain constant.

- **Relative PPP**

  - Relative PPP is given by:

    \[ \Delta S_t = \Delta P_t - \Delta P_t^* \]  

    where \( \Delta X_t = 100(X_t - X_{t-1}) \), that is the percentage change in the underlying variable.

  - The relative PPP says that the percentage change in (nominal) exchange rate is equal to the percentage change in the domestic price level minus the percentage change in foreign price level. Alternatively, it says that percentage change in exchange rate is equal to the inflation differential between the home and the foreign country.

  - **Example:** If inflation rate in UK is 10 percent over the last year and it is 5 percent in the US, then inflation differential between UK and US is, 10%-5%=5%. Therefore, we would expect that US dollar to appreciate by 5 percent in order for relative PPP hold true. (Or pound to depreciate by 5 percent).

  - In the above example, if US dollar appreciates less than 5 percent than we say that dollar is undervalued compared to PPP exchange rate. On the other hand, if dollar appreciates more than 5 percent, then dollar is said to be overvalued compared to its PPP value. Overvaluation of a currency hurs the exporters as the prices becomes relatively expensive in that country.

  - Some studies have found that PPP holds better for high inflation countries. This is due to the fact that in high inflation countries, huge magnitudes of inflation overwhelms the relative price effects, while in moderate or low
inflation countries, the movement of individual prices (i.e. relative price effects) dominate exchange rate movements.

• Why PPP may not hold in the long run?

  – The PPP condition assumes that there are no transactions costs. In the presence of transactions costs, PPP will not hold exactly. Instead the transaction cost will create a band within which the deviation from PPP, that is real exchange rates, can fluctuate without setting into motion international arbitrage of commodities. This because, in the presence of transactions costs, arbitrage activity will not take place for those goods for which profits from arbitrage is lower than the transaction cost.

  – The PPP condition assumes that all goods are traded internationally. But we know that many are not traded internationally. For instance, medical services, housing, etc. are not traded internationally. As the prices of nontraded goods change, the price indices change as well. But the exchange rates may not vary, since changing prices of nontraded goods would not give rise to international trade flows as a result, exchange rates will not change as we expect under PPP.

  – Richer countries have higher price levels than poor countries. Rich cities or states in the U.S. have higher price levels than poor cities-states in the U.S. The reason is that the price of nontraded goods is higher in wealthy nations. For instance, medical examination is higher in U.S. then in Turkey.

  – Since the price of nontraded goods enter into the price indices and hence into the real exchange rate-deviation from PPP- this means that the deviation from PPP may not be constant at all.

  – The two main determinants of the relative price of non traded goods are income and technology.
* High income implies a high demand for nontraded goods and therefore a high relative price of nontraded goods.

* Technology has advanced and improved faster for production of traded goods (mainly for manufactured goods) than it has for nontraded goods. Improvements in technology means high factor productivity and attractive returns to labor and technology in the traded goods sector. As resources move into that sector, the relative supply of nontraded goods declines. This also contributes to high relative prices of nontraded goods.

* So countries that experience rapid technological improvements and rising incomes should also experience a real appreciation of their currency over time.

* Above hypothesis that links productivity differentials to deviations from PPP is also known as Balasa-Samuelson effect. For details see your textbook, pages 375-378.