1. Law of One Price (LOOP) and PPP

An unsophisticated way of thinking about the way the exchange rate is determined to think about what must be true about prices. Consider about two identical blocks of steel, one in Japan, one in the US. From an American's perspective s/he can sell it in the US for let's say $100, or in Japan. Suppose the exchange rate is 0.01 $/¥ (i.e., 100 ¥/$, which is about right). Then the American could ship it to Japan, and (assuming no transportation costs, tariffs, etc.) sell it for

$$P_1^{US}/E \Rightarrow 100 \text{ \$/block} / 0.01 \text{ \$/¥} = 10,000 \text{ \¥/block}$$

Now consider the Japanese block of steel. If it's selling for more than ¥ 10,000 (let's say ¥ 12,000), then the Japanese producer will be undercut by the US producer, who could sell it for ¥ 11,999, and make a hefty profit relative to what s/he could in the US. Consequently the Japanese producer will be forced to drop his/her price. (If the Japanese price is less than the US, then the reverse would occur.) Now consider if there are many blocks of steel in each country. Then the US producer would start shipping lots to Japan, driving down Japanese prices, and driving up US prices (as the supply of blocks of steel in the US declines). This process is called arbitrage. Eventually prices (after adjustment by the exchange rate) would equalize. This suggests the following equality:

$$P_1^{US}/E = P_1^{JP}$$

Suppose (1) this is true for all goods, and (2) the basket of goods in the US is the same as the basket of goods in Japan. This then implies the following:

$$E = P_1^{US}/P_1^{JP}$$

2. Why PPP May Not Hold

One can think about a lot of reasons why this process might not happen completely, or very fast. First, transportation is costly for a lot of bulky things. Second, there are tariffs and other import restrictions. Third, laws, regulations, and standards (health, safety, consumer protection) differ a lot between countries, so that you might not be able to move that block of steel so easily. Also, firms don't like changing prices all the time. This will lead to some "stickiness" in prices, so that one shouldn't expect this equality to hold every instant.

3. What's the Evidence?

In general, we don't have too much information on prices on individuals goods. Rather, we have general price indices, like the Consumer Price Index (CPI), which measures the prices of lots of things (including things that can't be easily traded between countries, like haircuts and...
rent on apartments). Let's ignore this complication for the moment, and look at the evidence. Looking at the figures, one sees that exchange rates move roughly in the right direction with prices, but that they also move a lot more. This suggests that maybe this criterion is useful for thinking about matters in the long run, but it's not terribly useful for day to day, or even year to year, variations in the exchange rate.

Notice also for Japan, relative prices don't seem to explain the exchange rate even in the right direction. We'll return to this issue later on when we discuss the long run factors.