AcF305 International Financial and Risk Management

Additional Explanations on International Parity Relations

Absolute Purchasing Power Parity (PPP)

The price of a bundle of goods in domestic country and the price of an identical bundle of goods sold in a foreign country will be equal, when converted by the exchange rate into a common currency of measurement.

$$P_t = S_t P_t^* \tag{3.2}$$

where

S_t: the exchange rate
P_t: the price of a bundle of goods expressed in the domestic currency
P_t^*: the price of an identical bundle of goods expressed in foreign currency

Real Exchange Rate

Suppose that absolute PPP is violated so that equation (3.2) holds only if another parameter is introduced into the equation, so that

$$P_t = K\left(S_t P_t^*\right) \qquad (3.3)$$

$\left(KS_t\right)$ is the Real Exchange Rate and is equal to $\dfrac{P_t}{P_t^*}$

---If K>1, FC is undervalued and foreign country has a competitive advantage

---If K<1, FC is overvalued and home country has a competitive advantage

Example of Real Exchange Rate

A Big Mac in USA and France

P=FFr15, P*=$2.5 , S=5FFr/$

Real S=15/2.5=6 and K=6/5=1.2

$ is undervalued and FFr is overvalued

Relative PPP

The relative PPP states that the exchange rate will adjust exactly by the amount of the inflation differential between the domestic and foreign countries. That is

(3.4) $$\frac{S_T}{S_t} = \frac{1+p}{1+p^*} \qquad\qquad S_T = S_t \frac{1+p}{1+p^*}$$

where

P: the rate of inflation at home (i.e. $1+p=\frac{P_T}{P_t}$)

P*: the rate of inflation abroad (i.e. $1+p^* = \frac{P_T^*}{P_t^*}$)

If absolute PPP is violated but the magnitude of violation does not change over time, then relative PPP will still hold.

At time t, $P_t = K\left(S_t P_t^*\right)$

At time T, $P_T = K\left(S_T P_T^*\right)$

Taking the ratio and rearranging terms:

(3.5) $$\frac{S_T}{S_t} = \frac{P_T / P_t}{P_T^* / P_t^*} = \frac{1+p}{1+p^*}$$

The first-order approximation can be expressed as

(3.6) $$\%\Delta S = \frac{S_T - S_t}{S_t} \approx p - p^*$$

If P>P*, then $S_T > S_t$ i.e. HC depreciates

If P<P*, then $S_T < S_t$ i.e. FC depreciates

The relative PPP can be easily converted into an *ex ante* framework. That is, the expected change in the exchange rate is equal to the differential of the expected rates of inflation between two countries.

Mathematically

(3.7) $$E(\%\Delta S) = \frac{E(S_T) - S_t}{S_t} \approx E(p) - E(p^*)$$

$$E(s_T) - s_t \approx E(p) - E(p^*)$$

where s_t is the natural logarithm of S_t.

Empirical Evidence of PPP

- In the short run, deviations from PPP are so frequent as to be more or less the norm
- There is not even much sign of a tendency towards PPP in the long run. Although PPP holds better in long run than in short run
- Exchange rates have been much more volatile than the corresponding national price levels
- The currencies of countries that have very high inflation rates relative to their trading partners experienced rapid depreciation of their currencies

Interest Rate Parity

Interest Rate Parity (IRP) establishes the linkage between spot and forward exchange rates simultaneously with domestic and foreign money markets

It states that on free money markets the differential between the forward and spot exchange rates must equal the interest rate differential between two currencies. That is,

$$\frac{F_{t,T}}{S_t} = \frac{1+i}{1+i^*}$$

Proof of IRP

Strategy one:

Invest 1HC in the money market, and the end-of-period wealth is

$$1+i$$

Strategy two:

Convert into foreign currency (now): $\frac{1}{S_t}$

Invest in foreign money market: $\frac{1}{S_t}\left(1+i^*\right)$

Sell FC forward (now): $\left[\frac{1}{S_t}(1+i^*)\right]F_{t,T}$

As both investments start with 1HC and have identical risk (no risk), they should have identical end-of-period wealth:

(3.9) $$1+i=\frac{1}{S_t}(1+i^*)F_{t,T}$$

Rearranging term, we have

$$\frac{F_{t,T}}{S_t}=\frac{1+i}{1+i^*}$$

Or with first-order linear approximation:

$$\frac{F_{t,T}-S_t}{S_t}=\frac{i-i^*}{1+i^*}\approx i-i^*$$

Forward Premium/Discount = Interest Differential

Example of IRP

$$S_t = 1.65\$/£, \quad F_{t,T} = 1.68\$/£, \quad i_\$ = 5\%, \quad i_£ = 7\%$$

$ = HC, £ = FC, start with 1$

<u>Strategy one</u>

Invest in US money market, 1.05$

Strategy two

Convert into £, £ $\frac{1}{1.65}$

Invest in UK money market, £ $\frac{1}{1.65}\times 1.07$

Sell £ forward, $\frac{1}{1.65}\times 1.07\times 1.68$ =\$1.09

$\boxed{\textbf{Arbitrage Opportunity!!}}$

Arbitrage $\Rightarrow$ $S_t \uparrow$ and $F_{t,T} \downarrow \Rightarrow$ IRP holds