Lecture 4 - International Parity Conditions II – PPP and RIP

Price Level, Price Indexes, and the Purchasing Power of a Currency - terms

- *Nominal price* – the monetary value
- *Price level* – the nominal price level of a country's "basket of goods" (consumption bundle)
    - Weighted average of goods and services (i.e., we spend 1% of our income on shoes)
    - Calculating the price level – cost of living

$$P(t, \$) = \sum_{i=1}^{N} w_i P(t, i, \$)$$

    - Calculating a price index – ratio of price levels at two different times, from t=k to t=t

$$PI(t + k, \$) = \left(\frac{P(t + k, \$)}{P(t, \$)}\right) * 100 = \frac{\sum_{i=1}^{N} w_i P(t + k, i, \$)}{\sum_{i=1}^{N} w_i P(t, i, \$)} * 100$$

- *Inflation* – when price level is rising -> lowers the purchasing power of a country's currency
    - Calculating **annual** inflation

$$\frac{PI(t+1)}{PI(t)} = \frac{P(t+1)}{P(t)} = [1 + \pi(t + 1)], \text{ where } \pi=\text{inflation}, \pi(t + 1) = \frac{P(t+1)-P(t)}{P(t)}$$

    - Calculating **cumulative** inflation

$$(\frac{PI(t+N)}{PI(t)})^{\frac{1}{N}}, \text{ where t = base year}$$

- *Deflation* – when price level is falling -> increases the purchasing power of a country's currency
- *Purchasing power* – inverse of price level

Purchasing Power Parity

- What is PPP?
    - A simple model of the determination of exchange rates
    - Baseline forecast for predicting exchange rate
    - However plays a more important role in corporate decision making for:-
        - Location of plants, factories, etc.
        - Pricing products
        - Hedging decisions
    - Assessing cost of living decisions (or job opportunities) globally
- *Internal purchasing power* – the amount of goods and services that can be purchased with $1 in the U.S.
    - If price level is $15,000, what is purchasing power of $1 mil?
    - ($1M/$15,000) * $1 mil = 66.67 consumption bundles
    - 1/P($)
- *External purchasing power* - the amount of goods and services that can be purchased with $1 outside the U.S.
    - First, it is necessary to purchase some amount of pounds with the dollar
    - Second, it is necessary to examine the purchasing power of those pounds in UK
        - 1/S($/£) * 1/P(£)
    - If price level is £10,000 and current exchange rate is S($/£)=1.4

- o **% change in spot rates $\approx$ % change in price levels (inflation rate)**
- o Using π represents the rate of price changes (inflation), by approximation:

$$1 + \Delta S\left(\frac{USD}{AUD}\right) = \frac{1 + \pi_{US}}{1 + \pi_{AUS}} \ \ or \ \ \Delta S\left(\frac{USD}{AUD}\right) = \pi_{US} - \pi_{AUS}$$

- ▪ Actual % appreciation in exchange rate = US-AUS inflation differential
- Relative PPP stipulates that:
  - o If $\pi_{US} > \pi_{AUS} \Rightarrow \Delta S(USD/AUD) > 0$ i.e. appreciation of AUD
  - o If $\pi_{US} < \pi_{AUS} \Rightarrow \Delta S(USD/AUD) < 0$ i.e. depreciation of AUD
  - A country experiencing a higher inflation level will expect its currency to depreciate
- Example:

	US	UK
Price level(t)	$15,000	£10,000
Inflation	3%	10%
Price level(t+1)	$15,450	£11,000

Since inflation rate in UK is much higher, its change in price level from t=0 to t=1 is much greater.

› Actual exchange rate S$_t$($/£)=$1.40/£
› According to the Absolute PPP, the pound is undervalued:
  S$^{PPP}_{t+1}$($/£)=$1.50/£
› The pound should strengthen by 7.14% (=1.5/1.4-1).

➔ When looked from the perspective of **absolute** PPP

› The absolute PPP implied exchange rate for the next year
  S$^{PPP}_{t+1}$($/£)=$1.4045/£

➔ When looked from the perspective of **relative** PPP, incorporating price level changes at different times, i.e. next year.

› For the pound remains 7.14% undervalued
  S$^{RPPP}_{t+1}$($/£)=S$^{PPP}_{t+1}$($/£)/1.0714=$1.3109/£

› The pound is expected to depreciate by 6.36%.
  1.3109/1.40-1=-6.36%

Result is different – expected to increase in APPP, but decrease in RPPP.

The Real Exchange Rate

- The definition of the real exchange rate – the exchange rate adjusted for inflation (nominal rate adjusted for price) - measures the price of foreign goods relative to the price of domestic goods
  - o **Real exchange rate indicates the deviation from APPP, and changes in the real exchange rate indicates deviations from RPPP.**

$$RS\left(t, \frac{\$}{£}\right) = \frac{S\left(t, \frac{\$}{£}\right) * P(t, £)}{P(t, \$)} \ \ or \ RS\left(\frac{\$}{£}\right) = S\left(\frac{\$}{£}\right)\left(\frac{P_£}{P_\$}\right)$$

- Real appreciations and real depreciations – changes in FX rate adjusted for inflation
  - o An increase in the nominal forex rate ($/€), holding $ prices and € prices constant
  - o An increase in the € prices of goods holding the $ prices of goods constant
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- *When APPP holds, real exchange rate should be 1*
  - o According to APPP, $S^{PPP}\left(\frac{\$}{£}\right) = \frac{P_£}{P_\$}$
- *If RPPP holds, real exchange rate is constant (over-time)*
- Essentially, the real exchange rate describes deviations

- o Method used to end the obligation underlying an existing futures contract; go long if you have a short position in a futures; go short if you have a long position in a futures.
- o E.g. An investor who has purchased two June 2006 Australian dollar futures contracts (gone long 2 contracts) can unwind or close-out their obligations by selling two June 2006 Australian dollar contracts (go short 2 contracts) before June 2006. Clearinghouse recognises this and accordingly cancels out the two positions.

<u>Daily Marking-to-Market & Settlement</u>

- Marking-to-market $\Rightarrow$ market participants realise their profit or suffer their losses on their futures contract positions, on a day-to-day basis.
- Depending on how futures prices move from one day to the next, customers' margin accounts are either credited or debited.
  - o **Decreased**, if futures prices move such that the position would show loss if liquidated
  - o **Increased**, if futures prices move such that the position would show profit if liquidated.
- Margining requirements that are in place on organised exchanges thus ensure that every open futures contract: -
  - o Is always covered by a minimum deposit (maintenance margin)
  - o All profits and losses are received and paid as soon as they occur.
- Margining requirements and daily marking-to-market provisions thus effectively minimise the chance of default on a futures contract.
- <u>Example</u> - Consider a long position in the CME US/Euro contract (You are buying Euro in the future).
  - o It is written on €125,000 and quoted in $ per €.
  - o The strike price is $1.30 per € the maturity is 3 months.
  - o At initiation of the contract, the long posts an initial margin of $6,500. The maintenance margin is $4,000.
  - o Each day's losses are subtracted from the investor's account.
  - o Each day's gains are added to the account.
  - o If this investor loses more than $2,500, he has a decision to make; he can maintain his long position only by adding more funds, and if he fails to do so his position will be closed out with an offsetting short position.
  - o Over the first 3 days, the euro strengthens then depreciates in dollar terms:

Settle	Gain/Loss	Account Balance
$1.31	**$1,250**	$6,500 + $1,250 = $7,750
$1.30	**-$1,250**	$6,500
$1.27	**-$3,750**	$2,750 + $3,750 = $6,500

  - o On day three suppose our investor keeps his long position open by posting an additional $3,750.
  - o Over the next 2 days, the long keeps losing money and closes out his position at the end of day five.

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$1.26	-$1,250	$6,500 - $1,250 = $5,250
$1.24	-$2,500	$2,750