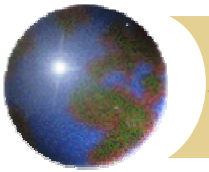


# *Exchange Rates, Interest Rates, & Interest Rate Parity*

**Interest Rate Parity**

**Exchange Rates, Interest Rates, & Inflation**

**Exchange Rates & The Term Structure of Interest Rates**



## *Interest Rate Parity*

✚ An investor has ¥1

✚ invest in Japan

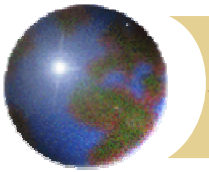
✚ have  $(1+i_{ja})$  yen at maturity

✚ invest in U.S.

1. buy \$ and receive  $1/E$  dollars per yen where  $E$  is ¥/\$

2. buy \$ bond worth  $(1+i_{us})(1/E)$  dollars at maturity

3. sell \$ proceeds forward so dollar proceeds at maturity equal  $(1+i_{us})(F/E)$



## *Derivation of IRP*

- ✦ If dollar and yen investments are alike in every way except currency of denomination, then covered interest arbitrage will yield the interest rate parity (IRP) condition:

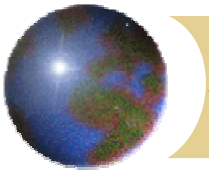
- ✦  $(1+i_{ja}) = (1+i_{us})(F/E)$

or

- ✦  $(1+i_{ja})/(1+i_{us}) = F/E$

or

- ✦  $(i_{ja}-i_{us})/(1+i_{us}) = (F-E)/E$



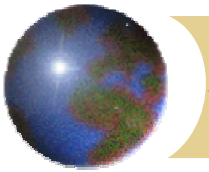
## *Example of IRP*

✚ Suppose 1 year Eurodollar gives  $i_{us}=.05$ , 1 year Euroyen gives  $i_{ja}=.04$ ,  $E=100$ , what is  $F$  you quote?

✚  $F = ((.04-.05)/(1.05))100 + 100 = 99.0476$

✚ interest differential =  $-.0095$

✚ forward premium =  $-.0095$



## *Annualization and IRP*

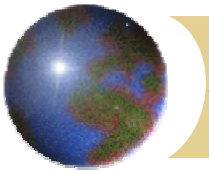
- ✦ Suppose these were not 1 year interest rates but 3 month interest rates?

- ✦  $[(i_{ja} - i_{us})/4]/[1 + (i_{us}/4)] = ((F - E)/E)$

- ✦ Now what is forward rate you would quote?

- ✦  $[(.04 - .05)/4]/[1 + (.05/4)] * 100 + 100 = F = 99.7531$

- ✦ Must adjust forward premium for fraction of year



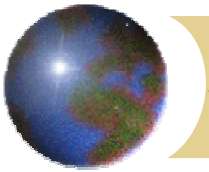
## *Deviations from IRP*

### ✦ Why might actual deviations from IRP occur?

- ✦ transactions costs
- ✦ capital controls
- ✦ political risk

### ✦ Spurious deviations from IRP could be due to:

- ✦ taxes
- ✦ timing
- ✦ noncomparable assets



## *Exchange Rates, Interest Rates, & Inflation*

✚  $i = r + \pi$

✚  $i$  = nominal interest rate

✚  $r$  = real interest rate

✚  $\pi$  = expected inflation rate

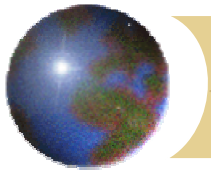
✚ Let's use the approximate IRP formula:

✚  $i_{ja} - i_{us} = (F - E)/E$

✚ If real interest rates are equal, then

✚  $i_{ja} - i_{us} = \pi_{ja} - \pi_{us} = (F - E)/E$

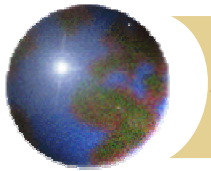
✚ interest rates, inflation expectations, and forward premiums or discounts are all jointly determined



## *The Term Structure of Interest Rates*

- ✦ **Expectations**
- ✦ **Liquidity premium**
- ✦ **Preferred habitat**





## *Expectations & the Term Structure*

- ✦ Since  $i_{ja} - i_{us} = (F - E)/E$ , then differences between interest rates over term structure will reflect expected exchange rates
  
- ✦ \*without a forward market, can infer expected change in exchange rate
  
- ✦ Uncovered IRP:
  - ✦  $i_{ja} - i_{us} = (E^* - E)/E$