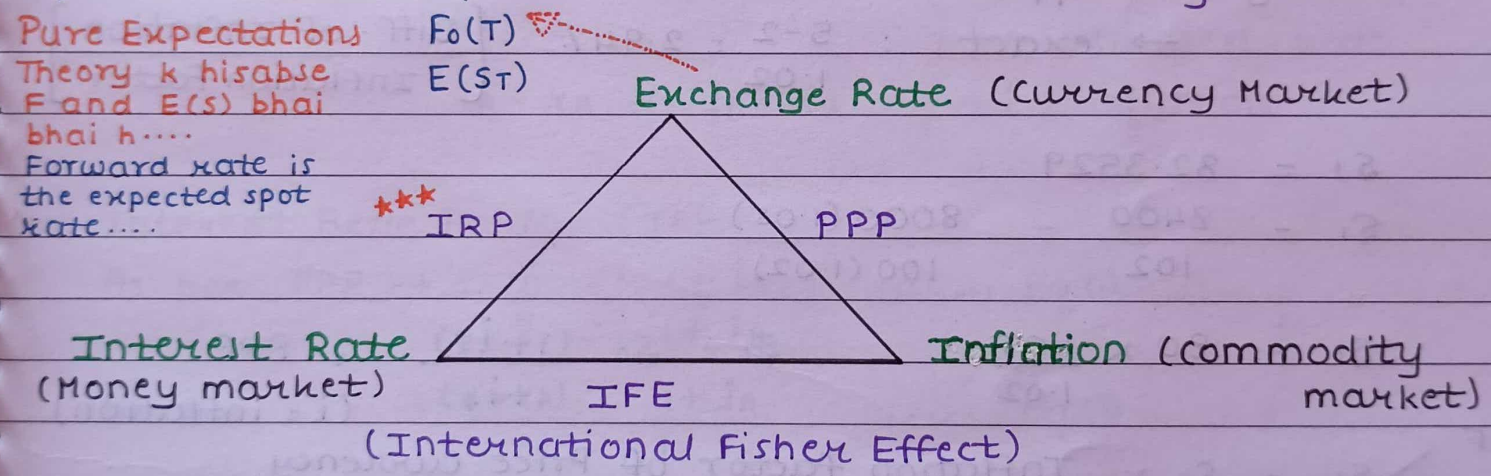
* Part 4 :- Exchange Rate Determination

Exchange rate depends on demand & supply factors. Demand & supply factors depend upon macro-eco factors

Marco Economic Factors
- 1) Interest rate : Interest Rate Parity (IRP)
- 2) Inflation : Purchasing Power Parity (PPP)



This entire discussion assumes frictionless markets i.e. no taxes, no trade barriers, no capital controls, no transaction costs....

Money Market → short term.
Capital Market → long term.

Eg: India S_0 = ₹80/$ US

$\therefore P_0 = 100 \times 80$ $P_0 = \$100$

$= 8000$ ₹

If $P_0 \neq 8000$ → Mispricing → Arbitrage

Law of one price (Prevention of commodity arbitrage)

Price of commodity throughout the world should be same.

⇒ Purchasing Power Parity (PPP) -

Eg: India $S_0 = ₹80/\$$ US

$\therefore P_0 = ₹8000$ $P_0 = \$100$

5% ← Inflation → 2%

$\therefore P_1 = ₹8400$ $P_1 = 102\$$

So, for the law of 1 price to hold good, exchange rate should be $\frac{₹8400}{\$102} = ₹82.3529/\$$

Jis currency ka inflation kam h wo currency appreciate hoga.

$ has appreciated

% appreciation $= \frac{1.05 - 1.02}{1.02} = 2.94\%$.

or $\frac{82.3529 - 80}{80} = 2.94\%$.

change → approx : $5 - 2 = 3\%$.

→ exact : $\frac{5-2}{1.02} = 2.94\%$ $\left[\frac{\text{Diff. of Inflation}}{\text{Inflation factor}}\right]$

$S_1 = 82.3529$

$S_1 = \frac{8400}{102} = \frac{8000(1.05)}{100(1.02)}$

$S_1 = 80 \times \frac{1.05}{1.02}$ $S_1 = S_0 \frac{(1+i_₹)}{(1+i_\$)}$ → PPP (i = inflation)

F

$E(S_1) > S_1 = S_0 \times \frac{\text{Inflation factor of Price Currency}}{\text{Inflation factor of Base Currency}}$

$\frac{F}{S}$ = Inflation factor ka ratio.

⇒ International Fischer Effect (IFE) -

RFreal = 3% (across the globe → ₹, $, £, ¥, etc.)

India US

5% ← expected inflation → 2%

RFnominal $= (1.05 \times 1.03) - 1$ RFnominal $= (1.02 \times 1.03) - 1$

$= 8.15\%$. $= 5.06\%$.

$$\frac{\text{Interest rate factor of ₹}}{\text{Interest rate factor of \$}} = \frac{1.0815}{1.0506} = 1.0294$$

This is equal to ratio of inflation $= \frac{1.05}{1.02} = 1.0294$

Why are both the same?

RFreal same for both the countries

Inflation rate only played the part here.

In real life RFreal won't be same all over the world.

IFE → RFreal is equal in all currencies.

∴ Nominal interest rates differ b/w currencies on account of inflation only.

Equation : $\frac{1.0815}{1.0506} = \frac{1.05}{1.02}$

$$\frac{1+r_A}{1+r_B} = \frac{1+i_A}{1+i_B} \longrightarrow \text{IFE}$$

r = interest rate

i = inflation

$$r_A - r_B \cong i_A - i_B$$

⇒ Interest Rate Parity (IRP)-

As per PPP → $\frac{F}{S} = \frac{1+i_A}{1+i_B}$ ..... Eq ①

As per IFE → $\frac{1+r_A}{1+r_B} = \frac{1+i_A}{1+i_B}$ ..... Eq ②

From eq ① & ②;

As per IRP → $\frac{F}{S} = \frac{1+r_A}{1+r_B}$

- PPP should hold good to prevent commodity arbitrage
- IRP should hold good to prevent covered interest arbitrage.

$$\frac{F}{S} = \frac{1+r_A}{1+r_B} \longrightarrow \text{IRP}$$

★ Interest Rate Parity :-

which interest rate ? RF nominal

Parity ? Equality of RF nominal on a covered basis.

↓

Don't just look at the money market .... also look at the currency market .... whatever is the difference b/w interest rate in the money market, it is exactly offset by the forward premium or discount in the currency market.

Means → $r_₹ = 8.15\%$ $r_\$ = 5.06\%$

($r_\$$ is less than $r_₹$ by 2.94%.)

look they aren't equal

$S = ₹80/\$$ $F = ₹82.3529/\$$

$ is at forward premium of 2.94% apprx

Jis country me interest rate kam h, us country ka currency Forward premium pe hoga .... kitna ? Interest rate ka diff.

$ is @ forward premium of -

- Difference b/w interest rate
  $= 8.15 - 5.06 = 3.09\%$ (approx)
- $\frac{\text{Difference b/w interest rate}}{\text{Interest rate factor}} = \frac{8.15 - 5.06}{1.0506} = 2.94\%$ (exact)

IRP Formula : $\frac{F}{S} = \frac{\text{Interest rate factor of A}}{\text{Interest rate factor of B}}$

Eg : $r_\$ = 3.9\%$

$r_£ = 2.1\%$

$S_0 = \$1.0254/£$

$F = ?$

Soln :- $F = S_0 \times \frac{1+r_\$}{1+r_£} = 1.0254 \times \frac{1.039}{1.021} = \$1.0435$

Eg: Time value of Month

6m interest rate = 10% p.a.

$1.05	$(1.1)^{6/12}$	$e^{0.1 \times 6/12} = e^{0.05}$
SAR	EAR	CAR
10% p.a. compounded semi-annually.	10% p.a. compd annually.	10% p.a. compounded continuously
Tone = $1 + rt$	Tone = $(1+r)^t$	Tone = e^{rt}
$= 1 + 0.1 \times 6/12$	$= (1.1)^{6/12}$	$= e^{0.1 \times 6/12}$
$= 1.05$	$= (1.1)^{1/2}$	$= e^{0.05}$

Eg: 3m interest rate (p.a. compounded annually)

$r_\$ = 4\%$, $r_₹ = 9\%$

$S_0 = ₹84.2510/\$$, $F = ?$

Soln:- $$\frac{F}{S} = \left(\frac{1+r_₹}{1+r_\$}\right)^t$$

$$\frac{F}{84.2510} = \left[\frac{1.09}{1.04}\right]^{3/12}$$

$$3m\ F = 84.2510 \times \left[\frac{1.09}{1.04}\right]^{1/4}$$

$$3m\ F = ₹85.2459/\$$$