Direct Quote → 85 ₹/$ — ₹ → Pricing Currency; $ → Base Currency.

or, → 0.0117 USD/INR

Indirect Quote

	85 ₹/$ → 82 ₹/$	85 ₹/$ → 87 ₹/$
₹	↑	↓
$	↓	↑
	$ D: $\frac{82-85}{85} = -3.5\%$	$ A: $\frac{87-85}{85} = 2.35\%$
	₹ A: $\frac{\frac{1}{82}-\frac{1}{85}}{1/85} = 3.65\%$ ↑	₹ D: $\frac{\frac{1}{87}-\frac{1}{85}}{1/85} = -2.29\%$

Appreciation always ↑↑ than Depreciation.

∵ Base is lower in case of appr.

BID/ASK

85.50 | 85.70

DEALER: 85.50 (Bid → sell) | 85.70 (Ask → Buy) → SPREAD

↳ 0.20 = Dealer earns this in a one-round transaction.

85.60 = MID QUOTE

INTEREST – RATE PARITY

$$F = S_{A/B} = \left[\frac{1+i_A}{1+i_B}\right]^T$$

compounding int. / discounting benefit → since data in %

0 ———— T

S_0 → Spot

ex: 85 ₹/$

$i_₹ = 8\%$

$i_\$ = 5\%$

T = 1 year.

$$F = S_{A/B}\left[\frac{1+i_A}{1+i_B}\right]^T$$

$= 85 \left(\frac{1.08}{1.05}\right)^1$

$= 87.428$

US

1 \$ ————→ (T=1) 1.05 \$

↓

85 ₹ ————→ 85×1.08 = 91.80

$$F_{0,T} = S_0 \times \left(\frac{1+i_A}{1+i_B}\right)^T$$

$E(S_T)$ → expectation about → S_T = Actual Spot rate

F S_T → PAYOFF → calculated.

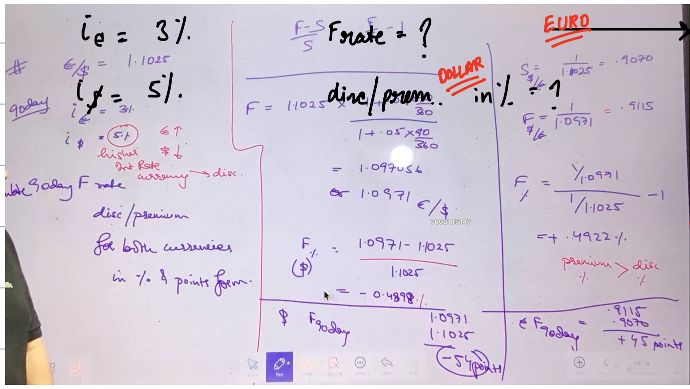
$F^{+}_{\$}$ ∴ interest rate parity $= 1.05\,\$$ || A → ₹, B → \$

$$F = Spot + Int + Storage - Benefit.$$

$$F_{A/B} = S_{A/B} \cdot \left[\frac{1+\left(i_A \times \frac{60}{360}\right)}{1+\left(i_B \times \frac{60}{360}\right)}\right] \checkmark$$

$$S_{A/B}\left(\frac{1+i_A}{1+i_B}\right)^{60/365} \times$$

\# Euro/\$ = 1.1025 / 95 = 1.1025 / 1.1095



$$1.1025 \times \frac{1+0.03 \times \frac{90}{360}}{1+0.05 \times \frac{90}{360}}$$

$$= 1.0971 \; €/\$$$

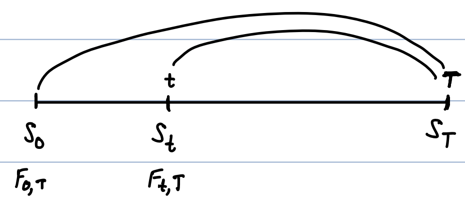
∴ \$↓ €↑

$$F_{\%} = \frac{1.0971 - 1.1025}{1.1025} = -0.4898\%$$

SPREAD ↑
- Maturity – H
- Liquidity ↓
- int. rate. risk ↑
- Credit Risk ↑

CURRENCY

86 ₹/\$ → Pricing, → Base



BID/ASK → 70 PIPs spread → 0.0070

144.5995 / 65 JPY/USD

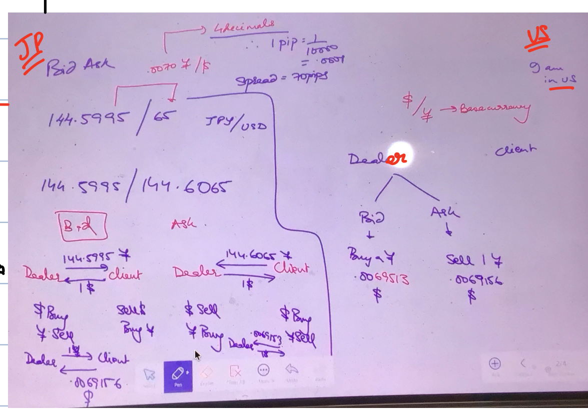
↓

144.5995 / 144.6065 → NOT ADDITION, it is way of quoting.

Bid Ask.

Dealer Spread

- Spread in Interbank Market.
  - Currency Pair: liquid, illiquid
  - Time of the day: overlap, LONDON, NY
  - Market Volatility: H, L
- Transaction Size
- Dealer Client Relationship



CROSS-RATES.

$$\boxed{\frac{A}{B} \times \frac{B}{C} = \frac{A}{C}}$$

$Bid_{A/B}$ / $Ask_{A/B}$

$\times$

$Bid_{B/C}$ / $Ask_{B/C}$

$\parallel$

$Bid_{A/C}$ / $Ask_{A/C}$

$Bid_{A/B}$ / $Ask_{A/B}$

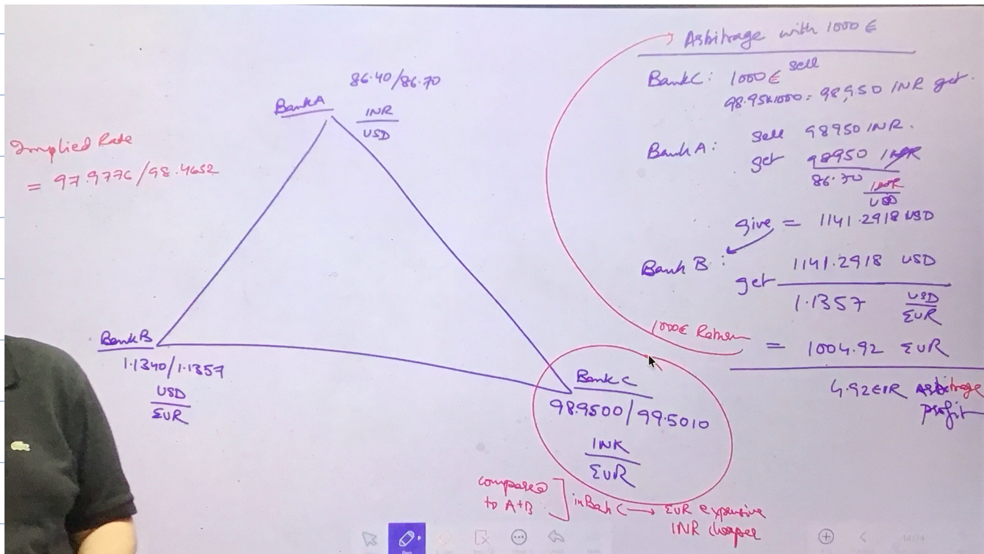
$Bid_{C/B}$ / $Ask_{C/B}$

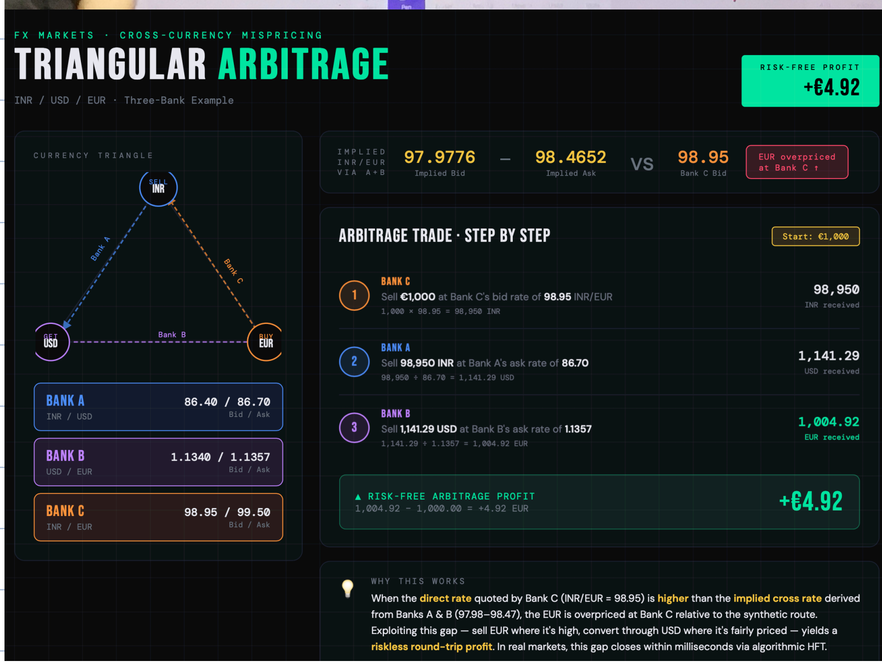
$Bid_{A/C}$ / $Ask_{A/C}$

$Bid_{C/B}$ / $Ask_{C/B}$

$\frac{1}{Ask}$ / $\frac{1}{Bid}$

$Bid_{B/C}$ / $Ask_{B/C}$





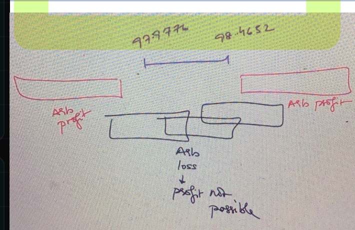
Overlapping Bid/Ask

ALWAYS LOSS

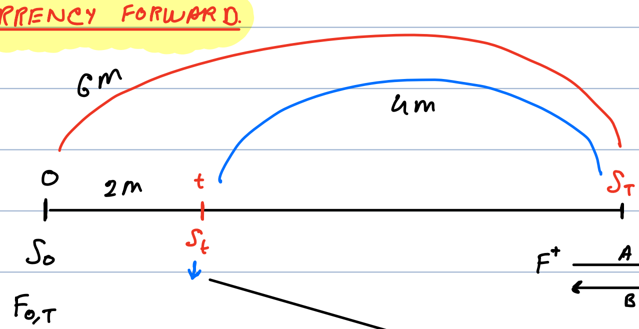
↓

else

ARBITRAGE PROFIT



CURRENCY FORWARD



$F^+ \xrightarrow{A} F^-$

$F^+ \xleftarrow{B} F^-$

$F_{price} = \text{Spot} + \text{Int} + \text{Storage} - \text{Benefit}.$

$$= S_0 \left[\frac{1 + (i_A \times m/360)}{1 + (i_B \times m/360)} \right]$$

$F_{t,4} = Y_{A/B}$

$F^- \xrightarrow{Y} F^+$

$F^- \xleftarrow{B} F^+$

$V_F = 0$ at initiation.

[No arb. price]

$\therefore$ Value of Forward Contract to F^+ on B

$$= \frac{FP_t - FP_0^{A/B}}{1 + \left(i_A \times \frac{T-t}{360}\right)}$$

lock in the rate for 1\$ [B]

→ A = INR, B = USD.

↪ discounted using INR rate

\# $S_0 = 86.5$ ₹/\$

180 day $i_₹ = 7\%$

$i_\$ = 4.5\%$

$$\Rightarrow F_{0,180} = S_0 \times \left(\frac{1 + (0.07 \times \frac{1}{2})}{1 + (0.045 \times \frac{1}{2})} \right) = 87.5574 \text{ ₹/\$}$$

0 — 60 — 180

$S_0 = 86.5$

5m \$ F^+

$X^+ \xleftarrow{5m\ USD}$

$X^+ \rightarrow$ $87.5574 \times 5m$ INR

$S_t = 87.34$

$F_{60,180} = 87.9137 \rightarrow X^-$

$X^- \xrightarrow{5m\ USD}$

$\leftarrow 87.9137 \times 5m$ INR

diff in coming

$$\Rightarrow \frac{1.7815}{1 + \left(0.065 \times \frac{120}{360}\right)} = 1{,}74{,}3719 \text{ ₹}$$

→ disc. using INR rate.

S_T days	$i_₹$	$i_\$$
60	6%	4%
120	6.5%	4.5%
180	7.2%	4.8%

$$F_{60,180} = 87.34 \left[\frac{1 + 0.065 \times \frac{120}{360}}{1 + 0.045 \times \frac{120}{360}} \right]$$

$= 87.9137$

$$F = S\left(\frac{1+i_A}{1+i_B}\right)^T$$

$$\Rightarrow \frac{F}{S} = \left(\frac{1+i_A}{1+i_B}\right)$$

$$\Rightarrow \frac{F-S}{S} = \frac{1+i_A - (1+i_B)}{1+i_B}$$

$$\Rightarrow F\% \simeq i_A - i_B$$

interest rate differential.

Interest Rate Parity

Key Assumption ↳ RISK NEUTRAL

Covered — position covered using forward

$$F_{A/B} = S_{A/B}\left[\frac{1+i_A}{1+i_B}\right]^T$$

Uncovered.

$$E(S_{A/B}) = S_{A/B}\left[\frac{1+i_A}{1+i_B}\right]^T$$

0 — T

S_0 — S_T

$F_{0,T}$

known today

If UIRP holds,

$$F_{0,T} = S\left(\frac{1+i_A}{1+i_B}\right)^T = E(S_T) = S\left(\frac{1+i_A}{1+i_B}\right)^T$$

$$\Rightarrow \boxed{F_{0,T} = E(S_T)}$$ → FORWARD RATE PARITY. } → UNBIASED ESTIMATOR.

PPP → Purchasing Power Parity

$1\$ = 86₹$

- $\boxed{\text{Law of one price}}$

ABSOLUTE PPP

→ Basket of Goods

→ $S_{A/B} = \frac{CPI_A}{CPI_B}$

CONS

- diff consumption pattern
- basket different

RELATIVE PPP

- $\Delta S\% = \text{inflation}_A - \text{inflation}_B$

$$\frac{S_1 - S_0}{S_0}$$

$$\Rightarrow \frac{S_1}{S_0} - 1$$

$$= \frac{\cancel{S}\left(\frac{1+r_A}{1+r_B}\right)}{\cancel{S}} - 1$$

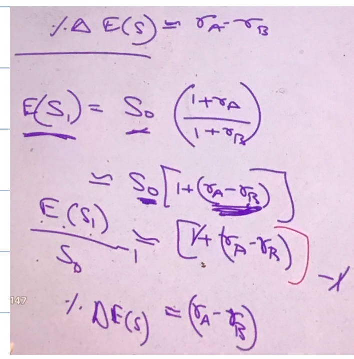
$$= \frac{r_A - r_B}{1+r_B}$$

$$\simeq r_A - r_B$$

Ex-Ante PPP

expected. Anticipation.

$$\%\Delta E(S) = E[\text{Inflation}_A - \text{Inflation}_B]$$



$$\%\Delta E(S) \simeq r_A - r_B$$

$$E(S_1) = S_0\left(\frac{1+r_A}{1+r_B}\right)$$

$$\simeq S_0[1 + (r_A - r_B)]$$

$$\frac{E(S_1)}{S_0} - 1 \simeq [\cancel{1} + (r_A - r_B)] - 1$$

$$\%\Delta E(S) \simeq (r_A - r_B)$$

FISHER'S EQUATION

DOMESTIC

$$(1+\text{nominal}) = (1+\text{real})(1+\text{inflation})$$

delayed consumption — loss of purchasing power.

$$\text{nominal} \simeq \text{real} + \text{inflation}.$$

INTERNATIONAL

$$\text{REAL}_A = \text{REAL}_B$$

$$\text{nominal}_A - \text{inflation}_A \simeq \text{nom}_B - \text{infl}_B.$$

$\Rightarrow$ real $\cong$ nominal $-$ inflation

$$= \frac{1+\text{nominal}}{1+\text{inflation}} - 1$$

$$\cong \underset{(i)}{\text{nominal}} - \underset{(\pi)}{\text{inflation}}$$

Nominal (A−B) $\cong$ inflation A−B

Interest Rate Differential   Inflation Differential.

$\Downarrow$

$$\frac{1+\text{nom}_A}{1+\text{nom}_B} = \frac{1+\text{infl}_A}{1+\text{infl}_B}$$

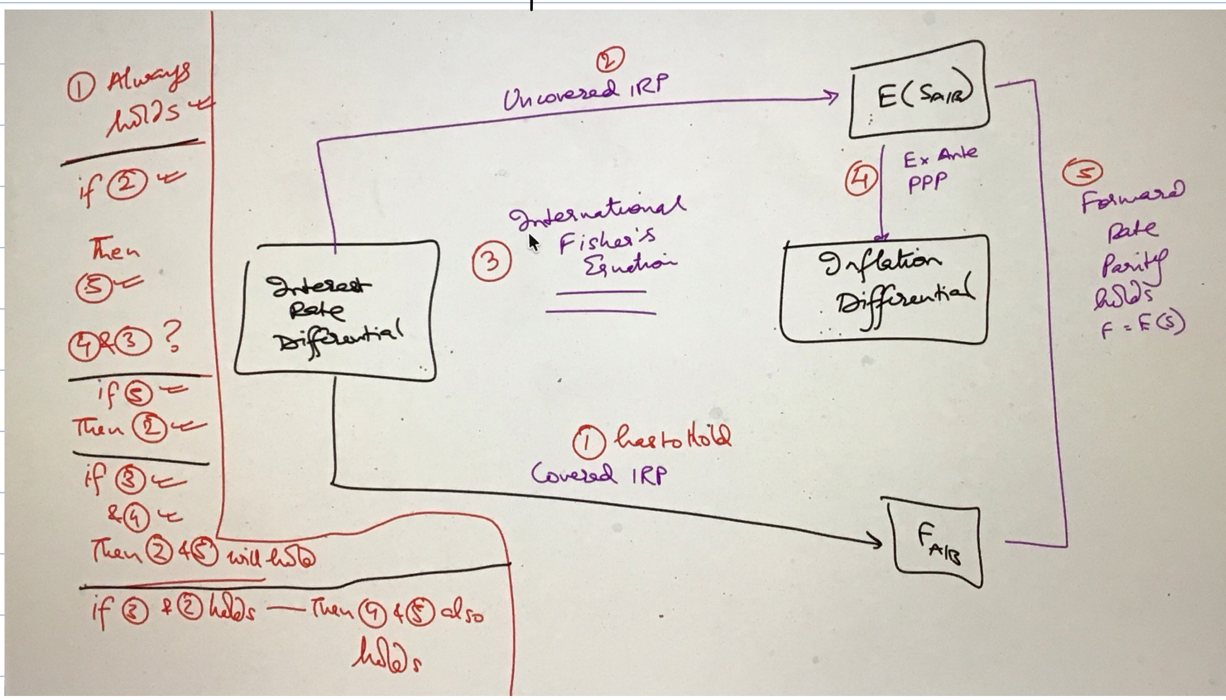
ASSUMPTION

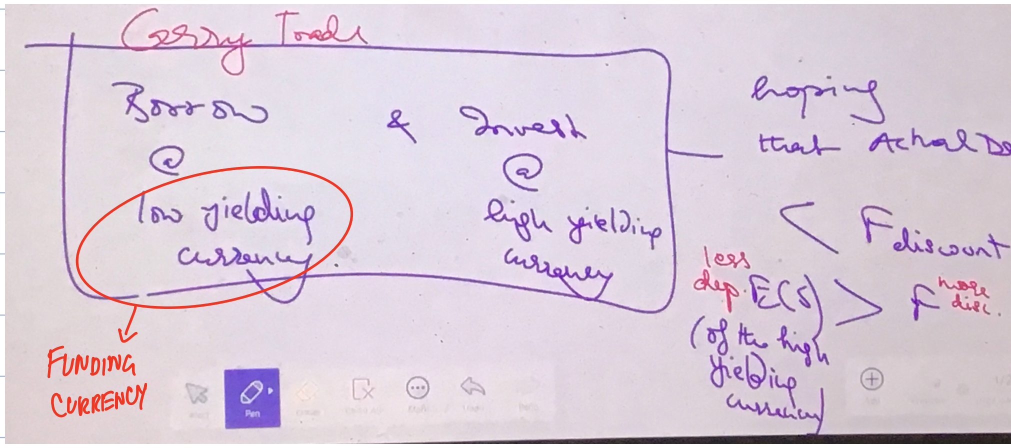
- Real is same across countries.
- No restriction.

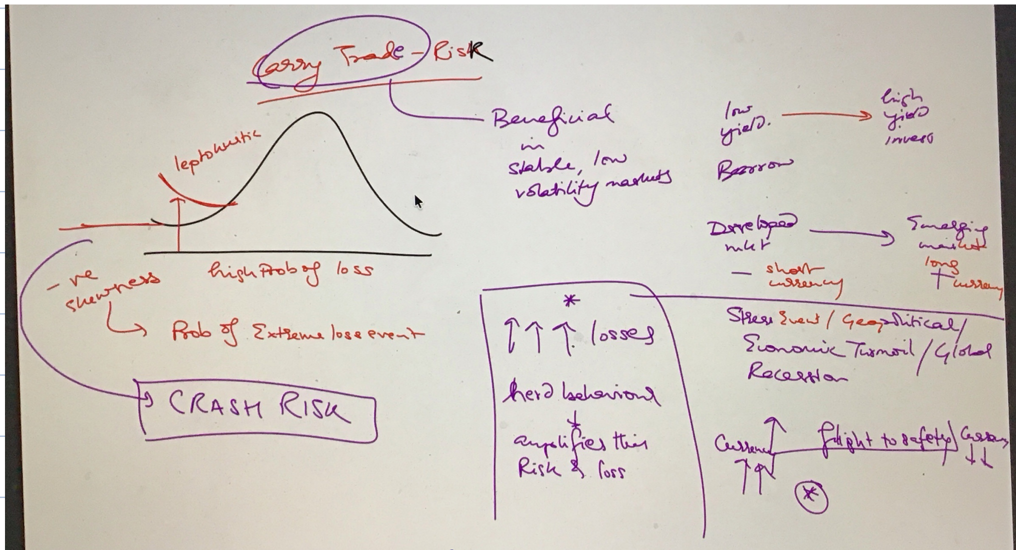
REALITY

Real rates are different

→ Sovereign risk
→ Capital controls
→ PPP fails
→ Transc. cost.
→ E(Infl) divergence
→ Balassa-Samuelson Effect. : Developing countries → lower productivity in services.
↓
HIGHER CPI.







BOP

- Current
  - Export → IN
  - Import → OUT
- Capital
  - Borrow → IN
  - Invest → OUT

FX

IMPACT

Current A/C

Capital A/C

- Flow/Supply Demand Mechanism
- Portfolio Balance Mechanism
  - ↳ Current — D|S
  - ↳ Capital — S|D
  - vice versa.
- Debt Sustainability Mechanism.

	Ex	Im
₹	↑	↓
C.A.	surplus	deficit.

deficit.
Restore
↳ initial deficit.
↳ Im↓ Ex↑ (ex: China)
↳ Exchange rate on impact.

£ – Elasticity

MUNDELL – FLEMING MODEL

- Trying to understand Monetary & Fiscal impact on forex.
- ASSUMPTION: ① Inflation is not impacted. ② Short-Term Horizon

FLEXIBLE Exch. Rate. — FIXED Rate.

FLEXIBLE Exch. Rate.

High Capital mobility

Low Capital Mobility → • CONSUMPTION STAND POINT.
Exp ⟶ Net imports ↑↑ ⟶ ₹↓
• MOSTLY in EM market.

↳ ④ Capital Acont restricted.

Monetary — Fiscal — Results.

① EXP + EXP → Deficit → BORROW → BOND ISSUE↑ ⟶ SUPPLY ↑, PRICE ↓, YIELD ↑ } → CAPITAL INFLOW ⇑ ∴ ₹↑
INT → ⓓ
↳ ∴ CAPITAL INFLOW ↓ ⟶ ₹↓

② CONTRACT. + CONTRACT. → SURPLUS → LEND → NO BOND → SUPPLY ↓, PRICE ↑, YIELD ↓ } → Capital ↓ ₹↓
INT → ⓤ
↳ CAPITAL INFLOW ↑ → ₹↑

HIGH CAPITAL MOBILITY

M	F	R
E	E	↓ ↑ – ?
E	C	↓ ↓ – ₹↓
C	E	↑ ↑ – ₹↑
C	C	↑ ↓ – ?

LOW CAPITAL MOBILITY

M	F	R
E	E	⇓ → NET IMPORT
E	C	?
C	E	?
C	C	⇑ → NET EXPORT

FIXED Rate.

THEN Govt (G) — IF THIS

84 — 86 — 88

Ⓖ
• Buy / SELL reserve to maintain fixed rate.

• EXP
• IMPORT↑
• Demand ₹ > Demand $
∴ Govt. sell $ to go to Fixed rate.
∴ ₹⇓

CONT
• IMPORT↓
• ₹⇑

MUNDELL FLEMING

→ Monetary & Fiscal

→ short-term

→ inflation constant.

- Flexi
  - HC
  - LC
- Fixed

MONETARY MODELS

PURE MONETARY MODEL

monetary ✓

Fiscal ✗

Monetary → Inflation → Exch. Rate

o/p constant.

EXP.

- Int ↓
- Inflation ↑
- PPP
- Ƶ ↓

CONT

- INT ↑
- Ƶ ↑

DORN BUSCH OVERSHOOTING MODEL

Expansionary Monetary

- Int ↓
  - $\boxed{Ƶ \downarrow}$
  - because of Capital outflow
- Inflation ↑
  - takes time to rise.
  - ∴ Ƶ ↓

∴ Actual Ƶ ↓↓ > PPP inflation depreciation

because prices are sticky.

longrun → holds

PORTFOLIO REBALANCE

- FISCAL
- LONG-TERM.

Exp

↓

Deficit

↓

Borrowing ↑

↓

Price ↓, Yield ↑

↓

Capital inflow } → Ƶ ↑

∴ $POV_{investor}$ = $\boxed{\text{Return on Bond} + Ƶ\uparrow}$

↓

Risk wtd.

if continued.

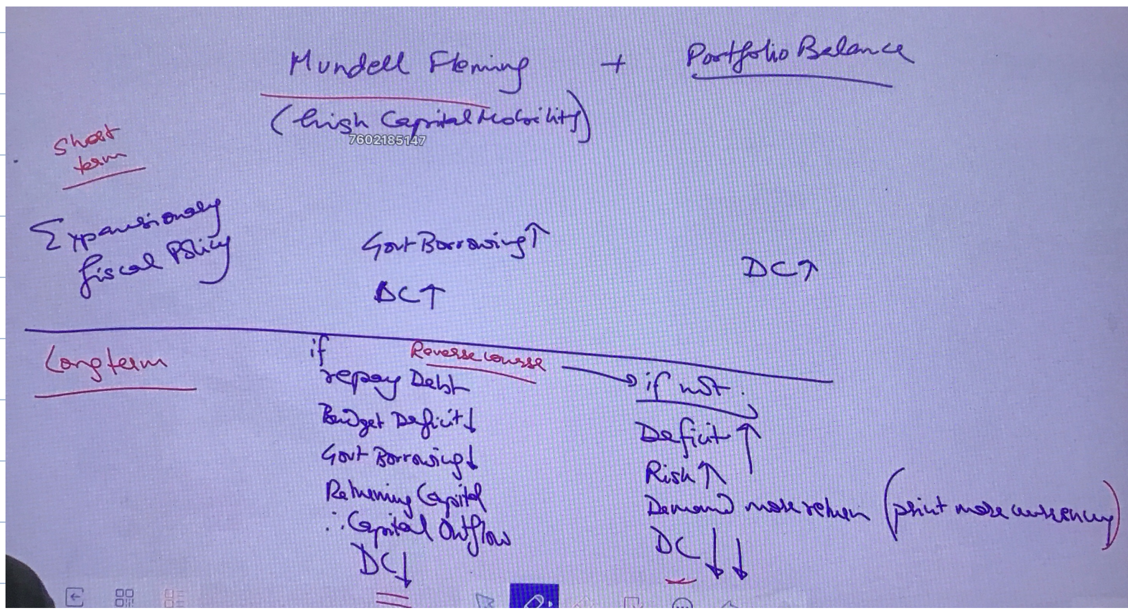
DEFICIT ↑↑

∴ Ƶ ↓↓

Credit Risk

CONT

surplus



GDP

GDP → GDP / GDP_{growth} / GDP per Capita

GDP_{growth} → CAPITAL + LABOUR

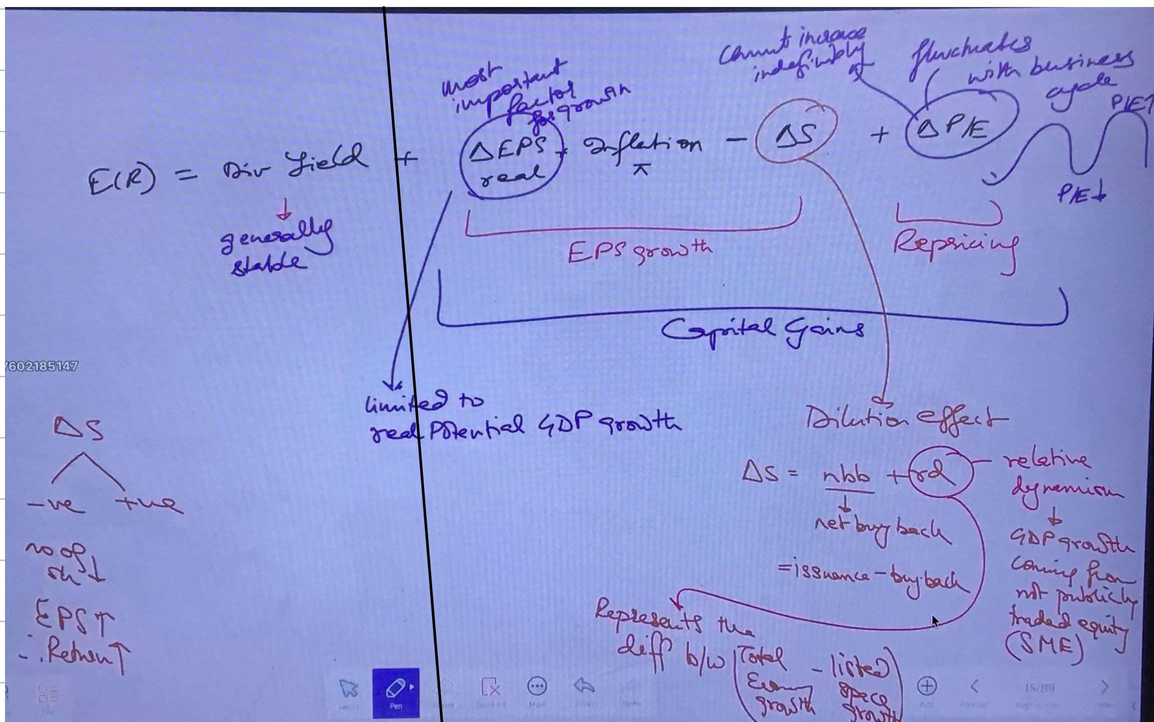
$\therefore$ $g \leq GDP_{growth}$ in long term

GRINOLD KRONER MODEL.

E(R) = Dividend Yield + Capital Gains

Capital Gains → EPS growth (ΔEPS) / Expected Repricing ($\Delta P/E$).

EPS growth → ΔEPS (real) / Inflation / ΔS (change in o/s shares)



EXPECTED INFLATION.

$\Rightarrow (1+\text{nominal}) = (1+\text{real})(1+\text{inflation})$

T-BOND

TIPS Yield

Grinold Kroner Model.

$g = \Delta P/E + E(\text{inflation}) + g_{real} + \Delta S$

$E(R) = \dfrac{\text{Dividend}}{\text{price}} - \Delta S + g + i + \Delta \dfrac{P}{E}$

% change in o/s shares

Repurchases (-)

(+) New issues

real growth

(+) inflation

Income Yield

NOMINAL GROWTH

Repricing Return.

INCOME YIELD | CAPITAL GAIN YIELD

$ERP = E(R) - R_F$

IY CG

EXPLAINATION of ΔS

DILUTION Effect.

$\Delta S =$ Net Buy Back + Grd

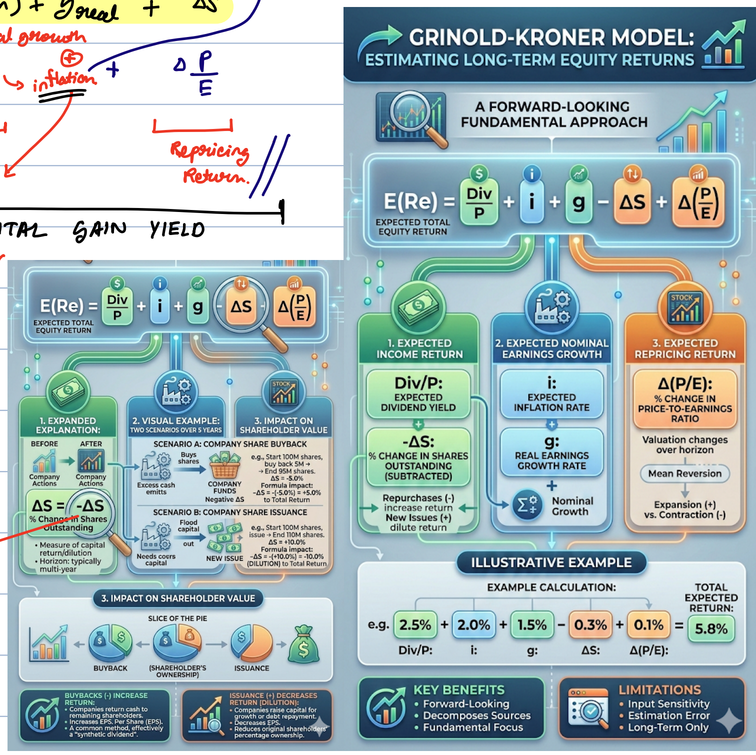
= issuance − buyback.

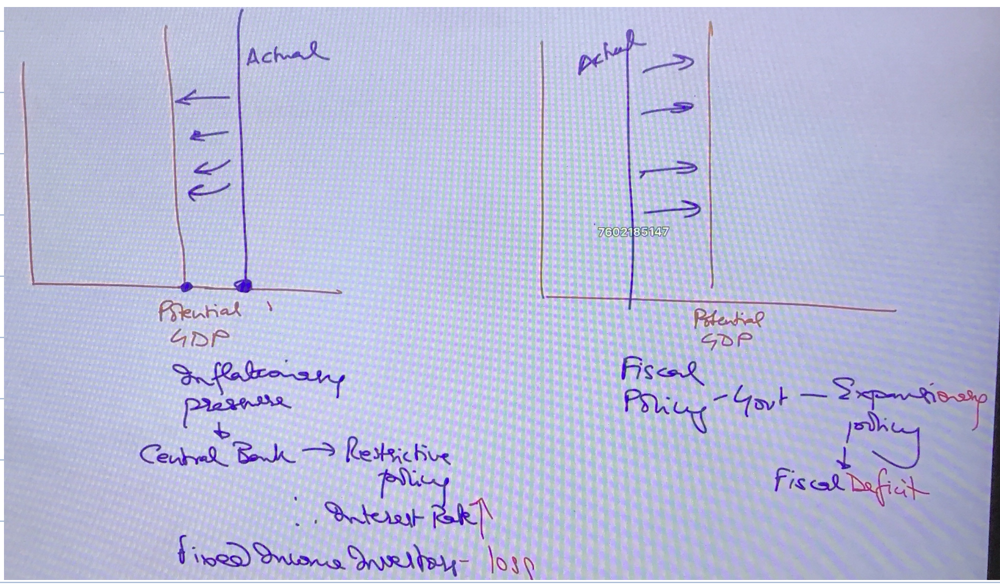
relative dynamism

GDP comig from PVT. SMEs

OR

TOTAL GROWTH − LISTED GROWTH.





COBB-DOUGLAS PRODUCTION FUNCTION

$Y = fn\,[L, K, T]$

- Y → o/p.
- L → Labour
- K → Capital
- T → Technology.

$\boxed{Y} = T \cdot K^{\alpha} \cdot L^{(1-\alpha)}$; $\boxed{\alpha < 1}$

α → Contribution → generally more in developed markets.

T → Technology → $\boxed{\text{Total factor productivity}}$

$Y = TK^{\alpha}L^{1-\alpha}$

$$\frac{Y}{L} = \frac{T \cdot K^{\alpha} \cdot \frac{L}{L^{\alpha}}}{L} = T\left(\frac{K}{L}\right)^{\alpha}$$

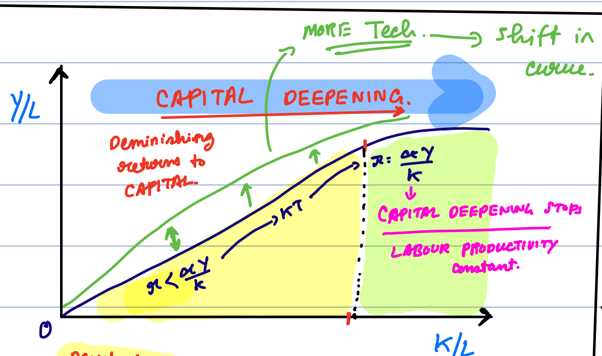
Developed	Developing
$K\uparrow \rightarrow Y_{\uparrow}$	$K\uparrow\ Y\uparrow$

$\therefore\ \Delta Y < \Delta Y$

$\alpha < \alpha$

$\frac{K}{L}\uparrow\ \alpha\downarrow$ $\frac{K}{L}\downarrow\ \alpha\uparrow$

Capital Deepening → Increase in Y/L for an increase in K/L.



Developing	Developed
$\left(\frac{K}{L}\right)\downarrow$	$\left(\frac{K}{L}\right)\uparrow$
$\alpha\uparrow$	$\alpha\downarrow$

- MPK = Marginal Product of Capital $= \alpha \cdot \frac{\Delta Y}{\Delta K}$
- " Productivity " " $= \frac{\alpha Y/L}{K}$

→ Labour Productivity Growth Rate (Y/L)

$L \Rightarrow$ = growth tech + growth CAP_a

r = cost of capital

$$\underbrace{rK}_{\text{Total return earned by contributors of capital.}} = \underbrace{\alpha Y}_{\text{proportion of capital's contribution to the return}} \longrightarrow \alpha = \frac{rK}{Y}$$

$$\boxed{\Rightarrow r = \frac{\alpha Y}{K} = \alpha\left(\frac{Y}{K}\right)}$$

Equilibrium Position.

Labour Prod

- K
  - Physical cap
    - ICT
    - Non-ICT
- Tech
- Human Capital

ICT = Infra, Comp, Telecom.

GROWTH A/C relation.

$$\frac{\Delta Y}{Y} = \frac{\Delta T}{T} + \alpha\frac{\Delta K}{K} + (1-\alpha)\frac{\Delta L}{L}$$

Growth GDP = $\boxed{\text{Growth tech}}$ α Growth Capital $(1-\alpha)$ growth in Labor.

↓

Back-Calculate [Ex-post]

$$\frac{Y}{L} = T\left(\frac{K}{L}\right)^{\alpha}$$

Growth rate in GDP = Growth in tech + Growth in labour

ECONOMIC - GROWTH - THEORIES.

Classical

- Subsistence level.
  ↓
  Minimum required income to maintain life.

population → GDP/capita

SUBSISTENCE LEVEL

✗ NOT SUPPORTED

Neo-Classical.

- Steady / Equilibrium growth rate.

  o/p / capital is constant.

  Capital / Labour ∝ o/p / Capita. → grows at equilibrium rate g^*

Sustainable Growth Rate

$$o/p\,/capita = \frac{\theta}{1-\alpha}$$ → growth in tech; $1-\alpha$ → Labour portion

$$o/p = \frac{\theta}{1-\alpha} + \Delta L$$ → TOTAL

⇒ K↑ — lead to o/p ↑

— temporarily g↑ → revert to g^*

ENDOGENOUS.

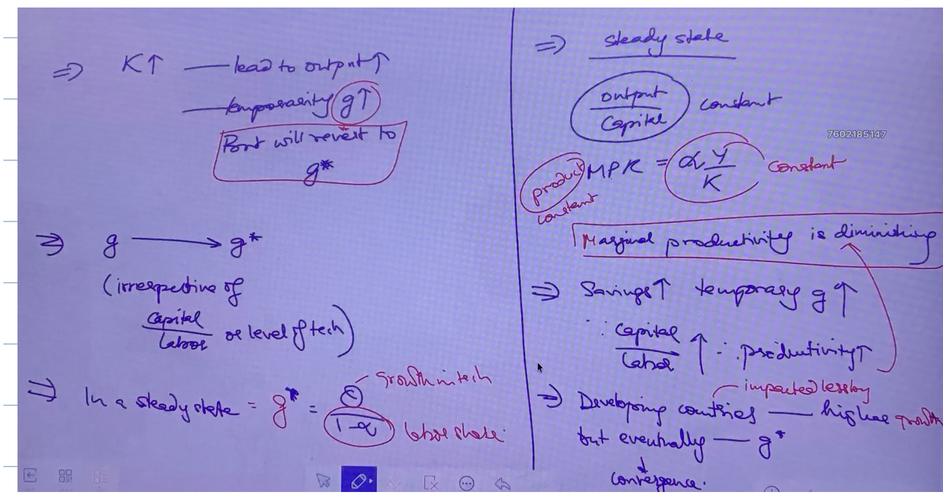
Physical Capital + Human Capital → Technology Progress
↓
$\frac{L}{K}$ > productivity ↑
↓
∴ g↑

No g^* concept

R&D — firm / external } BENEFITS

overall society benefit.

∴ growth in entire economy.



⇒ K↑ — lead to output↑

— temporarily g↑

Point will revert to g^*

⇒ $g \longrightarrow g^*$

(irrespective of Capital/Labor or level of tech)

⇒ In a steady state = $g^* = \frac{\theta}{1-\alpha}$ ← Growth in tech; Labor share

⇒ steady state

Output/Capital constant

productivity constant

$MPK = \alpha\frac{Y}{K}$ constant

Marginal productivity is diminishing

⇒ Savings↑ temporary g↑

∵ Capital/Labor ↑ ∴ productivity↑

⇒ Developing countries — higher growth (impacted lesser)

but eventually — g^*

↓

Convergence.

NEO	ENDO
SAVINGS ↑	
temporary increase in g	permanent increase in g
K↑ → Tech↑	K↑ → Tech↑

CONVERGENCE

absolute

Less Developed per Capita → Developed per Capita.

Club

- Similar character groups.
- US, UK, China etc.

conditional

↓

- depends on different state / conditions
- happens in NEO.

conditional → eventually → absolute