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Exchange Rates

Arbitrage

- CIP → covered interest rate parity
- UIP → uncovered interest rate parity

} important formules

assume you have $100 to invest

↳ should I leave in USD or not?

factors

① interest rate → 2% for USD → 3.5% for pesos

② Value of currency

Riskless arbitrage

. Futures contract: fixes the value of an asset for some time in the future

ex: currency = 2 pesos/$

↳ future could be 2.15 pesos/$ → we expect the peso to depreciate

→ a way to eliminate the foreign exchange risk

Exchange Rates

USD = 100

$i^{us} = 1\%$

$i^{f} = 3\%$

$E_{\$/f} = 1.1$

$F_{\$/f} = 1.2$

In dollars:

1 yr = $100(1.01)^1 = \$101$

In Mex:

1 yr: $\boxed{\left(\boxed{\frac{100}{1.1}}(1.03)\right)} \cdot 1.2 = \boxed{\$112.384}$

pesos today

pesos @ end of year

dollars I get back

In general, the formula will be:

in \$: $\$100(1+i^{us})$

in f: $\left(\frac{100}{E_{\$/f}}\right)(1+i^{f}) \cdot F_{\$/f}$

CIP

$$\Rightarrow \boxed{1+i^{us} = \frac{(1+i^{f})F_{\$/f}}{E_{\$/f}}}$$

holds well in practice

in general: we are good in low-risk scenarios

U.I.P

this happens when you don't sign a futures contract
↳ rather you use an expectation (EV)

$$\boxed{(1+i^{us}) = (1+i^{f})\frac{E^{e}_{\$/£}}{E_{\$/£}}}$$

approx UIP:
$i^{us} \approx i^{f}$ + expected depreciation

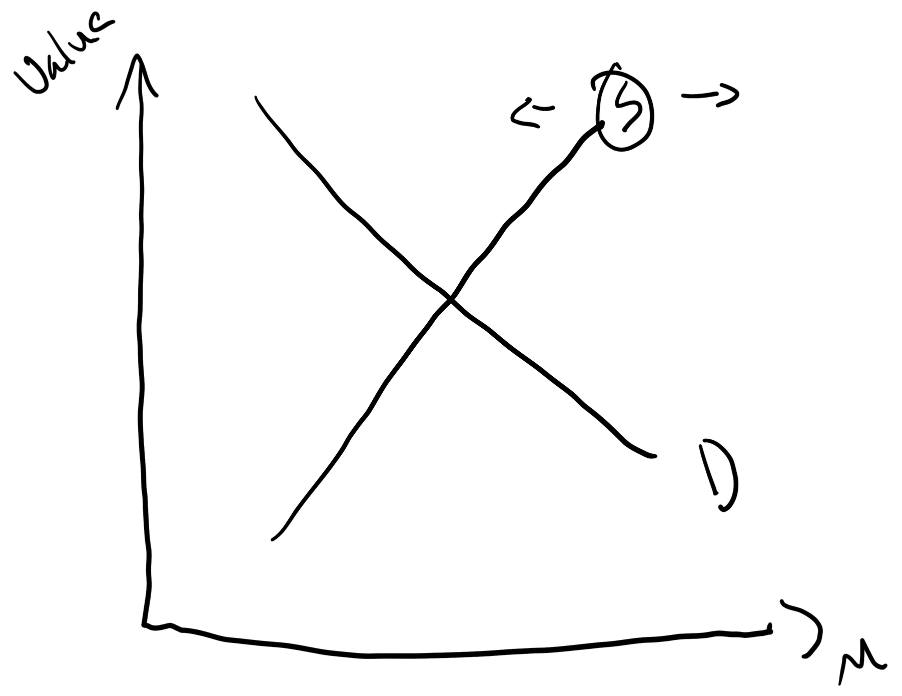
↳ $\dfrac{E^{e}_{\$/£} - E_{\$/£}}{E_{\$/£}}$ → dollar depreciation   or $\%\Delta E^{e}_{\$/£}$ → percent change of currency change

if C.I.P & U.I.P both hold, it must be that $E^{e}_{\$/£} = F_{\$/£}$

↳ this means the forward premium = expected depreciation

$$\underbrace{\frac{F_{\$/£} - E_{\$/£}}{E_{\$/£}}}_{\text{forward premium}} = \underbrace{\frac{E^{e}_{\$/£} - E_{\$/£}}{E_{\$/£}}}_{\text{expected depreciation}}$$

forex interventions



S↑ → value decreases → easier
→ can be done by buying foreign currency
→ buy bonds

S↓ → value increases → harder
↳ sell foreign currency
↳ sell bonds

9/01

Ch 3 → The monetary Approach

Ch 4 → short term E^e → long term

Long term → E^e
Inflation
M, π, PPP

1980 - 2020
countries: A
B

Pencil in 1980: 1A\$
1B\$

$E_{A/B}$ = 1A\$ = 1B\$

Pencil in 2020: → 4A\$
Aπ: 300% } exchange rate adj for this
Bπ: 200% → 3B\$

$E_{A/B}$: \$1.33 A = 1B\$

① PPP and mkt equilibrium

→ LOOP => law of one price
↳ if I have a tradeable good + perfect competition, then prices in one currency should be the same => in theory
↳ there would be arbitrage otherwise

→ PPP is the same but for a basket

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Long-Run

$E^e \rightarrow$ inflation
$\rightarrow$ prices

LOOP

$\hookrightarrow$ law of one price

$$P^g_{\$} = E_{\$/€} \, P^g_{€} \leftarrow \text{for goods}$$

Basket of goods $\rightarrow$ usually do this

$$P_{\$} = E_{\$/€} \cdot P_{€} \rightarrow \text{PPP}$$

$$\boxed{E_{\$/€} = P_{\$}/P_{€}}$$

Real exchange rate

$\hookrightarrow q_{us/Eur} = \dfrac{E_{\$/€} \cdot P_{€}}{P_{\$}} = 1$ if PPP holds

$\rightarrow$ price of buying foreign currency in $

$\rightarrow$ Price of buying at home

if $> 1 \Rightarrow$ more expensive in foreign nation
$< 1 \Rightarrow$ more expensive in U.S.

$q_{us/EUR}$ ↑ \$ real depreciation
↓ real appreciation

$E_{\$/Eur}$ ↑ \$ nominal depreciation
↓ nominal appreciation

$$\% \Delta q = 0 = \% \Delta (E_{\$/€} \cdot P_{€}) - \% \Delta (P_{\$})$$

$$= \% \Delta E_{\$/€} + \% \Delta P_{€} - \% \Delta P_{\$}$$

$$= \boxed{\% \Delta P_{\$} - \% \Delta P_{€} = \Delta E_{\$/€}}$$

$$\hookrightarrow \underbrace{\% \Delta E_{\$/€}}_{\text{Depreciation in us}} = \underbrace{\pi_{us} - \pi_{EUR}}_{\text{inflation differential}} \rightarrow \text{Relative PPP}$$

$\rightarrow$ If absolute PPP ($q=1$) holds, (no arbitrage)
relative PPP holds
(not vice versa)

Relative PPP

$\dfrac{a}{b} \rightarrow \% \Delta (a/b) = \% \Delta a - \% \Delta b$

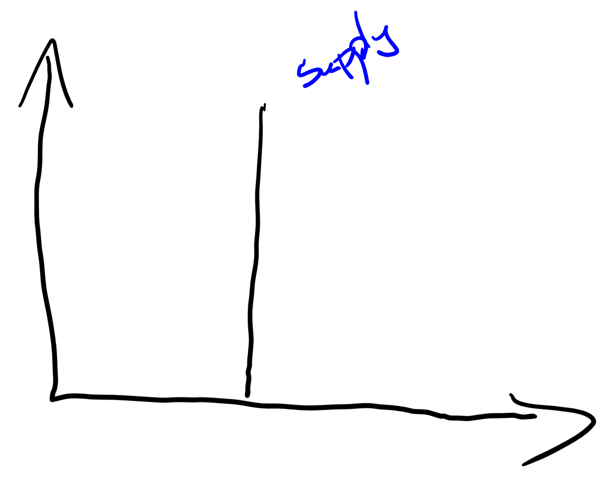
$(ab) \rightarrow \% \Delta (ab) = \% \Delta a + \% \Delta b$

Monetary Policy : E dynamics ⟷ price dynamics

Supply + demand

μ M

supply : central banks



demand :

quantity theory of money

all else equal, a rise in the nominal income will cause a proportional increase in transaction and hence, in the demand of money

↳ highly liquid forms ⟹ cash

constant (velocity)

$M^d = L \cdot \boxed{p \cdot y}$

price

9/13/2021

$E_{\$/EUR} = P_{US}/P_{EUR}$

↳ if PPP holds

money → supply

$M^d = \bar{L} \cdot \underbrace{p\,y}_{\text{nominal income}}$, where $L = \frac{1}{\text{Velocity}}$

price

production

$M^d = M^s = M = \bar{L}\, p \cdot y$

how many goods can you buy with your \$

real money supply $\left[\ \frac{M}{P} = \bar{L} y \implies \underbrace{P = \frac{M_{US}}{\bar{L}_{US}\, y_{US}}}\right.$

M_{US} → nominal money supply

$\bar{L}_{US}\, y_{US}$ → real money demand

↳ fundamental equation of the monetary model of the price level

$E_{\$/€} = \dfrac{\frac{M_{US}}{L_{US} \cdot Y_{US}}}{\frac{M_{EUR}}{L_{EUR} \cdot Y_{EUR}}} = \dfrac{M_{US}/M_{EUR}}{L_{US} \cdot Y_{US} / L_{EUR} \cdot Y_{EUR}}$

M_{US}/M_{EUR}] relative nominal money supply

$L_{US} \cdot Y_{US} / L_{EUR} \cdot Y_{EUR}$] relative real money demand

$\underbrace{\%\Delta E_{\$/€}}_{\text{rate of depreciation}} = \left[\underbrace{\%\Delta M_{US}}_{\mu_{US}} - \%\Delta M_{EUR}\right] - \left[\underbrace{\%\Delta y_{US}}_{g_{US}} - \%\Delta y_{EUR}\right]$

how fast we print \$

$\boxed{\%\Delta E_{\$/€} = (\mu_{US} - \mu_{EUR}) - (g_{US} - g_{EUR})}$

→ in the short run, value is determined by monetary policy

$\%\Delta E_{\$/€} = (\mu_{US} - g_{US}) - (\mu_{EUR} - g_{EUR})$

$= \boxed{\pi_{US} - \pi_{EUR}}$ → Fischer-effect

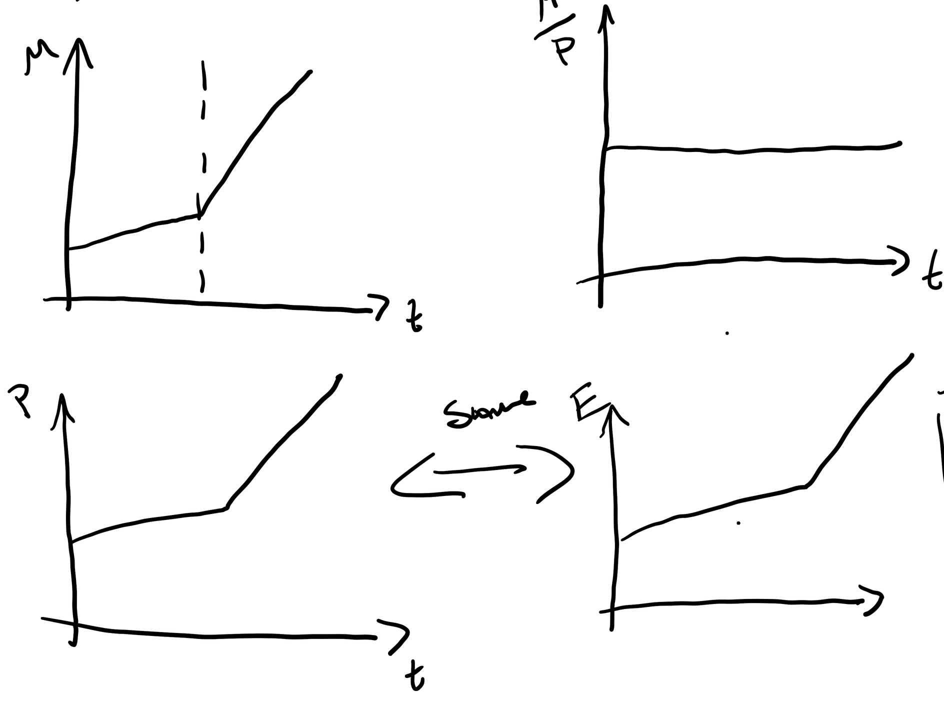
just inflation

$P = \frac{M}{\bar{L} \cdot y}$

$\pi = \mu - g$

printing ↙ ↳ growth

assume μ_{US} ↗



$\boxed{E_{\$/EUR} = \frac{P_{US}}{P_{EUR}}}$