Open economy

Jones 20.3 a) $E \times P_\$ = P_€ \; ; \; E = \frac{P_€}{P_\$}$ where E is number of € per \$

So $g_E = g_{P€} - g_{P\$}$ but $g_{P€} \equiv \pi_€ \; ; \; g_{P\$} \equiv \pi_\$$

i.e. $g_E = \pi_€ - \pi_\$$

b) $3.6 - 5.7 = -2.1\%$ i.e. 2.1% depreciation of \$ against ¥ each year.

c) Goes from around 300¥/\$ to 100¥/\$ over 20 years.

To get annual growth rate, $g_E = \left(\frac{100}{300}\right)^{\frac{1}{20}} - 1 = -0.05 \Rightarrow -5\%$

Good - different but also same 'ball park'

This is more than double the predicted depreciation rate, though in absolute terms only 3pp apart. It's possible that rational expectations about a persistently lower level of inflation in Japan led \$ to depreciate more.

d) Sticky short-term prices mean that in the short term, the RER moves with the nominal rate. From the perspective of Japan, its nominal exchange rate with the dollar appreciated over the time period, (except for in 1980-5), so the RER would've also appreciated. Over such a long period, you might expect arbitrage to drive the RER to 1, by the law of one price. But empirically this did not happen: the price of Japanese goods in units of foreign goods in fact persistently increased. This is because arbitrage is not possible with non-tradeable content of goods e.g. labour, the price of which rises via higher wages from the Japanese economy developing.

Good - this is the really key bit here

Decomposing RER

1. If $\alpha = \frac{1}{2}$, $P^H = (P^H_A)^{\frac{1}{2}} (P^H_B)^{\frac{1}{2}}$ and $P^F = (P^F_A)^{\frac{1}{2}} (P^F_B)^{\frac{1}{2}}$

Since $P^H_A = \frac{P^F_A}{E}$ and $P^H_B = \frac{P^F_B}{E}$, $P^H = \frac{(P^F_A \cdot P^F_B)^{\frac{1}{2}}}{E}$

And $RER := \frac{EP^H}{P^F}$ which in this case $= 1$, using P^F as above.

2. $RER := \frac{EP^H}{P^F} = \frac{E (P^H_A)^{\alpha} (P^H_B)^{1-\alpha}}{(P^F_A)^{1-\alpha} (P^F_B)^{\alpha}}$ (I) and $TOT := \frac{P^H_B}{P^H_A}$ (II) $= \frac{P^F_B}{P^F_A}$ by (III)

By the law of one price, $\frac{P^F_A}{P^H_A} = E = \frac{P^F_B}{P^H_B}$ so $\frac{P^H_B}{P^H_A} = \frac{P^F_B}{P^F_A}$ (III)

And since $E P^H_B = P^F_B$, substitute into (I):

$$RER = \frac{E P^H_B (P^H_A)^{\alpha} (P^H_B)^{-\alpha}}{(P^F_A)^{1-\alpha} (P^F_B)^{\alpha}} = \frac{P^F_B (P^H_A)^{\alpha} (P^H_B)^{-\alpha}}{(P^F_A)^{1-\alpha} (P^F_B)^{\alpha}} = \frac{(P^H_A)^{\alpha} (P^H_B)^{-\alpha}}{(P^F_A)^{1-\alpha} (P^F_B)^{\alpha-1}}$$

Generally I advise doing your mathematical workings down the page rather than across (just convention)

$$= \left(\frac{P_A^H}{P_B^H}\right)^{\alpha} \cdot \left(\frac{P_A^F}{P_B^F}\right)^{\alpha-1} = \left(\frac{1}{TOT}\right)^{\alpha} \cdot \left(\frac{1}{TOT}\right)^{\alpha-1} \text{ by (II) and (III)}$$

$$= TOT^{2\alpha-1}$$

~~2. RER: = EP^H/P^F = ...~~

3. $$RER := \frac{EP^H}{P^F} = \frac{E(P_T^H)^{\gamma}}{P(P_T^F)^{\gamma}} \cdot \frac{(P_N^H)^{1-\gamma}}{(P_N^F)^{1-\gamma}}$$

$$= \underbrace{\overbrace{\frac{(P_T^H)^{\gamma-1}(P_T^H)^{1-\gamma}}{(P_T^F)^{\gamma-1}(P_T^F)^{1-\gamma}}}^{\equiv 1}}_{\equiv 1} \cdot \frac{E(P_T^H)^{\gamma}}{(P_T^F)^{\gamma}} \cdot \frac{(P_N^H)^{1-\gamma}}{(P_N^F)^{1-\gamma}}$$

$$= \underbrace{\frac{EP_T^H}{P_T^F}}_{\|} \cdot \frac{(P_T^H)^{\gamma-1}}{(P_T^F)^{\gamma-1}} \cdot \frac{(P_N^H)^{1-\gamma}}{(P_N^F)^{1-\gamma}}$$

$$= TOT^{2\alpha-1} \cdot \frac{(P_T^F)^{1-\gamma}}{(P_T^H)^{1-\gamma}} \cdot \frac{(P_N^H)^{1-\gamma}}{(P_N^F)^{1-\gamma}}$$

Very efficient solution. Well done :)

$$= TOT^{2\alpha-1} \cdot \left(\frac{P_T^F/P_N^F}{P_T^H/P_N^H}\right)^{1-\gamma} \quad \text{and } X_j = P_N^j / P_T^j \text{ for } j \in \{H, F\}$$

$$= TOT^{2\alpha-1} \cdot \left(\frac{1/X_F}{1/X_H}\right)^{1-\gamma} = TOT^{2\alpha-1} \cdot \left(\frac{X_H}{X_F}\right)^{1-\gamma}$$

4. Prediction: USD will depreciate in real terms, so $NX \uparrow$ and the current account deficit (which was ~6% GDP) gets smaller. They suggested around a 20-25% depreciation, though perhaps as much as 40-50%.

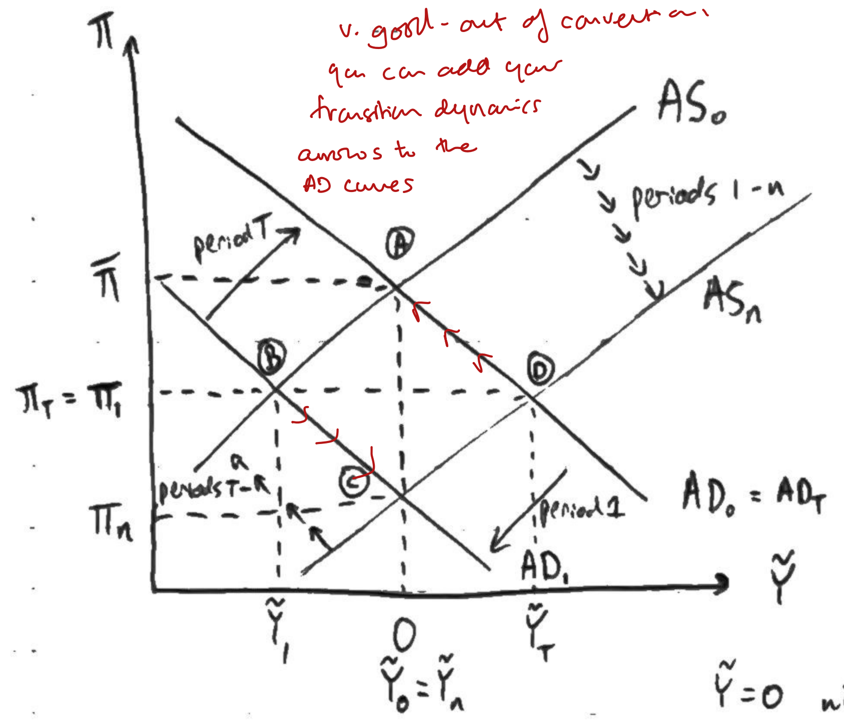
5. USD did indeed depreciate, by about 22% from 2002 - 2008. However, in that time, current acct deficit grew by about 25%.

6. OR find that non-traded goods are important in determining RER, contra Engel.

Jones 20.5 In the open economy model, AS: $\pi_t = \pi_{t-1} + \bar{\nu}\tilde{Y}_t + \bar{o}$, AD: $\tilde{Y} = \bar{a} - \bar{b}\bar{m}(\pi_t - \bar{\pi})$, where $\bar{a}$ depends positively on $(\bar{R}^w - \bar{r})$ with $\bar{R}^w$ the world real interest rate, $\bar{r} := MP_K$. Expansionary ECB policy causes $\bar{R}^w$ to fall below $\bar{r}$, so $\bar{a} < 0$ and we see a -ve AD shock in the US. This happens because relatively higher US interest rates make US bonds more attractive, so in the short run the USD nominally appreciates and sticky prices means the RER also appreciates. Since US goods are now more expensive in terms of foreign goods, NX fall, hence the -ve AD shock. (Though if the ECB prompts a boom in the EU, its imports may rise, offsetting the decrease in NX and reducing size of -ve AD shock in US).

yes

When the ECB's policy changes and EU real rates return to MP_K, the demand shock will end, and $\bar{a} = 0$. Backward-looking expectations mean the US economy will return to steady state slowly, with a



- Economy starts at (A)
- AD shock means economy moves to (B) with $-ve\ \tilde{Y}_1$ and $\pi_1 < \bar{\pi}$ in period 1 (due to lower NX)
- Adaptive expectations of lower inflation mean ~~AD~~ AS curve shifts down and economy arrives at (C)
- When AD shock ends, economy has a boom and moves to (D), then AS gradually shifts back upwards until $\tilde{Y} = 0$ with it in original position and inflation returned to $\bar{\pi}$.

Excellent answer

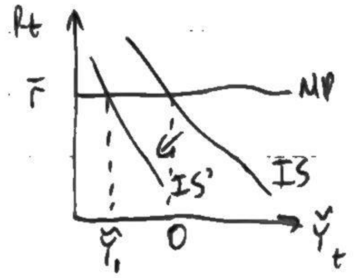
Jones 20.7. For the same reasons as above, largely, the US RER appreciates, its NX fall, and we have the effects of a -ve AD shock. (The rest of the world "gives in exchange" its currency or goods, so US imports rise ~~and~~ exports fall.)

Ex. rates and MP

2. According to quantity theory, $\bar{M}\bar{V} = P\bar{Y}$ where velocity $\bar{V}$ is fixed, output $\bar{Y}$ given by potential and exogenous growth, money supply $\bar{M}$ set by CB, and price level P adjusts. Since the nominal rate $E_{ab} := \frac{P_a}{P_b}$, mathematically it is pinned down by $\bar{M}$, assuming the quantity theory is true. However, we know that persistently high inflation (i.e. changes to P) can be a fiscal phenomenon, when governments finance spending through seignorage. In a sense, this comes back to monetary policy, but it is ultimately a fiscal ~~pro~~ issue and can still affect nominal interest rates ~~through~~ relative price levels. Also, the ratio $\bar{Y}_a / \bar{Y}_b$ may change over time, for instance if there is differential productivity growth between the two countries, which would account for changes in nominal exchange rates apart from MP alone. [This seems related to, but not the same as, the "Balassa-Samuelson effect" I found researching].

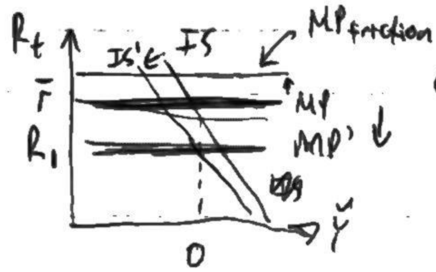
→ it's very similar; B-S helps explain why inflation in developing / emerging economies is typically higher than in developed economies → it ties in with price changes in tradables not being reflected in non tradable prices (which are high, relative to tradables, in developing economies)

Exam Q. 1a) IS: $\tilde{Y} = \bar{a} - \bar{b}(R_t - \bar{r})$ MP: $R_t = \bar{r}$.



$\bar{a} := \bar{a}_c + \bar{a}_i + \bar{a}_g + \bar{a}_{nx} - 1$ and $\bar{a}_{nx}\downarrow$ since exports $\downarrow$ so $\bar{a} < 0$ and there's a -ve AD shock which means output falls below potential, as shown.

b) CB should cut rates to stabilise output. Lowering R_t will increase business investment by incentivising borrowing, since loans become cheaper. This stimulates the economy and offsets the -ve AD shock.



output stays at potential despite -ve AD shock.

d) Financial frictions: $R_t = R^{ff} + f$
So effective real interest rate > CB base rate, and they must cut rates further, possibly hitting ZLB and needing to use unconventional MP.

c) Let $\frac{NX_t}{\bar{Y}_t} = \bar{a}_{nx} - \bar{b}_{nx}(R_t - \bar{R}^w)$ where $\bar{R}^w$ = world real interest rate. So, when the domestic RER $> \bar{R}^w$, actual NX's share of potential output falls. This can be explained through (1) Argentinian bonds are relatively more attractive to investors, (2) nominal rate appreciates in short run (to buy them, since demand ↑), (3) sticky prices mean real rate $RER := \frac{E P_a}{P_w}$, where E = nominal rate, also appreciates, (4) by definition of RER, goods in Argentina are relatively more expensive for foreigners, so net exports fall. Qualitatively, there is the same effect in (a): $\bar{a}$ falls, as $\bar{a}_{nx}\downarrow$. However, it's possible that the negative effect on NX from lower demand in Brazil is offset by ~~the~~ a nominal depreciation in the Argentinian peso (as somewhat fewer Brazillian buyers need to pay for goods in that currency), and via sticky prices RER ↓ so goods relatively cheaper. in (b), the CB will be able to cut rates by a smaller amount ~~by~~ for the same stabilisation of output as there's an additional channel for transmission of MP: currency depreciates when rates are cut, stimulating NX as well as I.

Excellent

domestic rates, foreign rates, nominal exchange rate

e) By uncovered interest parity, $i_t = \hat{i}_t + \mathbb{E}[E_{t+1}] - E_t$, absent capital controls. But if nominal rate with USD is pegged, $\mathbb{E}[E_{t+1}] = E_t$, so $i_t = \hat{i}_t$, i.e. the Argentinian CB cannot practise independent MP, since doing so would devalue the currency (as above!), contrary to maintaining a stable E. So the country will be stuck with a -ve output gap.

nice use of UIP