The Global Economy II

Nova SBE – Spring 2022/2023

Miguel Lebre de Freitas, Diogo Lima, Pedro Sousa Coelho

Mid-term assessment 21/04/2023 – Duration: 2h00

I (4.5)

*Define **three** of the following concepts (3-5 lines each):*

i. Global imbalances

ii. Financial openness

iii. Real exchange rate

iv. Fisher effect

v. Sterilization

IV (2.5)

In each question, choose one (correct answer: +0.5; wrong answer: -0.125):

1. In the National and Balance of Payments accounts, a debt forgiveness is accounted as: (i) a positive entry in the Balance of Unilateral Transfers in the Current Account; (ii) as a negative entry in the financial account; (iii) as a positive entry in the capital account; (iv) none of the above.
2. In a 2-period economy, an anticipated productivity expansion will cause: (i) an improvement in the trade balance if the economy is open; (ii) the real interest rate to fall if the economy is closed; (iii) investment to fall if the economy is open; (iv) none of the above.
3. A liquidity crisis (shortage) in the domestic banking system will cause: (i) an expansion in the money supply under fix; (ii) an exchange rate depreciation under float; (iii) an increase in the backing ratio under fix; (iv) all the above.
4. The timing of the speculative attack is such that: (i) Speculators make a capital gain swapping domestic currency for foreign currency; (ii) there are no arbitrage opportunities; (iii) The real money supply does not change at the time of the attack; (iv) all the above.

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II.A [4]

Consider a one-good economy where NIIP is initially zero. The representative consumer lives for two periods and has a lifetime utility function given by: $U = C_1 C_2$. In period 1, there is a pre-determined amount of output, equal to $Q_1 = 108$. As for the second period, there is no exogenous output, but there are investment opportunities, as described by the following production function, $Q_2 = 20\sqrt{K_2}$, where K depreciates fully after one period. Further assume that this economy is able to borrow and lend in the international markets at the interest rate $r^* = 25\%$.

a) Compute (a1) the optimal investment plan, as well as (a2) future output, (a3) the corresponding net present value (a4) optimal lifetime weath. (a5) Represent graphically the impact of the investment opportunity on the economy inter-temporal budget constraint.

b) Find out (b1) the optimal consumption path, as well as (b2) the trade balance, (b3) the current account, and (b4) gross national income for both periods.

c) Consider the case where the economy was **closed** to financial trade. Find out the: (c1) the expression of the PPF; (c2) optimal investment, (c3) optimal consumption path, (c4) autarky interest rate. (c5) Are the agents in this economy better off? Describe the gains from openness. You may use graphs to support your answer.

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II

IIA

$U = C_1 C_2 \quad Q_1 = 108 \quad Q_2 = 20\sqrt{K_2} \quad \delta = 1 \quad R^* = 0,25$

a) a1) $NPV = -K_2 + \frac{Q_2}{1+R^*} = -K_2 + \frac{20\sqrt{K_2}}{1+0,25}$

$\underset{\{K_2\}}{Max} \; -K_2 + \frac{20\sqrt{K_2}}{1,25}$ FOC: $-1 + \frac{16}{2\sqrt{K_2}} = 0 \iff \frac{8}{\sqrt{K_2}} = 1 \iff \sqrt{K_2} = 8$

$\Rightarrow K_2 = 64$

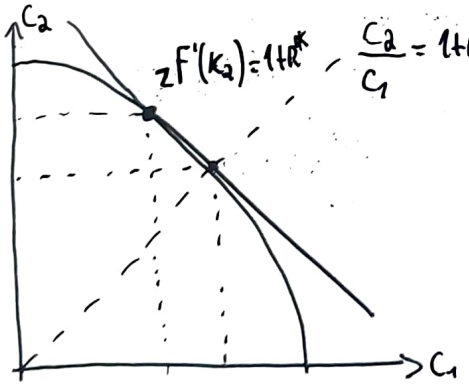
Since $\delta = 1$, $I_1 = K_2 = 64$

a2) $Q_2 = 20\sqrt{K_2} = 20\sqrt{64} = 160$

a3) $NPV = -K_2 + \frac{Q_2}{1+R^*} = -64 + \frac{160}{1,25} = 64$

a4) $\Omega_1 = Q_1 - I_1 + \frac{Q_2}{1+R^*} = (108 - 64) + \frac{160}{1,25} = 44 + 128 = 172$

a5)



In the open economy we are able to maximize the NPV and utility independently.

b) b1) $\underset{\{C_1;C_2\}}{Max} \; U = C_1 C_2$ s.t. $C_1 + \frac{C_2}{1+R^*} = \Omega_1$

$\Rightarrow \begin{cases} C_1 = \frac{\Omega_1}{2} = 172/2 = 86 \\ C_2 = \frac{\Omega_1(1+R^*)}{2} = \frac{172 \times (1,25)}{2} = 107,5 \end{cases}$

b2) $\begin{cases} TB_1 = Q_1 - C_1 - I_1 = 108 - 86 = -42 \\ TB_2 = Q_2 - C_2 = 160 - 107,5 = 52,5 \end{cases}$

b3) $B_1^* = (1+R^*)B_0^* + TB_1 = -42$

$NFIA_2 = B_1^* R^* = -42 \times 0,25 = -10,5$

b3) $\begin{cases} CA_1 = TB_1 = -42 \\ CA_2 = TB_2 + NFIA = 52,5 - 10,5 = 42 \end{cases}$

b4) $\begin{cases} GNI_1 = C_1 + I_1 + TB_1 + NFIA_1 = 86 + 64 - 42 + 0 = 108 \\ GNI_2 = C_2 + I_2 + TB_2 + NFIA_2 = 107,5 + 0 + 52,5 - 10,5 = 149,5 \end{cases}$

c)

c1) Closed Economy: $\begin{cases} Q_1 = C_1 + I_1 \\ Q_2 = C_2 \end{cases} \Leftrightarrow \begin{cases} I_1 = Q_1 - C_1 \\ C_2 = 20\sqrt{I_1} \end{cases} \Rightarrow C_2 = 20\sqrt{Q_1 - C_1}$ PPF

c2) c3) $\underset{\{C_1; C_2; I_1\}}{\text{Max}}\ U = C_1 C_2$

s.t. $C_2 = 20\sqrt{108 - C_1}$

FOC: $20\sqrt{108 - C_1} + C_1 \frac{-20}{2\sqrt{108 - C_1}} = 0 \Leftrightarrow 20\sqrt{108 - C_1} = \frac{20 C_1}{2\sqrt{108 - C_1}}$

$\Leftrightarrow C_1 = 2(108 - C_1) \Leftrightarrow 3C_1 = 216 \Rightarrow C_1 = 72$

$I_1 = Q_1 - C_1 = 108 - 72 = 36$

$C_2 = Q_2 = 20\sqrt{36} = 120$

c4) $MPK = \frac{\partial Q_2}{\partial K_2} = \frac{20}{2\sqrt{K_2}} = \frac{10}{\sqrt{K_2}} = \frac{10}{\sqrt{36}} = 10/6$

$1 + R_A = MPK \Leftrightarrow R_A = MPK - 1 \Leftrightarrow R_A = 10/6 - 6/6 = 4/3$

c5) $U_{open} = C_1 C_2 = 86 \times 107,5 = 9\,245$

$U_{closed} = C_1 C_2 = 72 \times 120 = 8\,640$

We are better off in the open economy as we reach a higher utility level. This is so because we are able to realize the existing investment opportunities by separating NPV maximization from the consumption optimization. Trade openness allows us to go beyond the PPF.

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II.B [3.5]

Consider a small open economy with two sectors, a **tradable** (**T**) and a **non-tradable** (**N**). The production functions are given as: $Y_T = 2L_T$ and $Y_N = 2L_N$. Further assume that each price weights 50% in the consumer price index [the CPI is given by $P = P_T^a P_N^{1-a}$], that the prices abroad are $P^* = 4$ and $P_T^* = 4$, and the price of foreign currency in terms of domestic currency is $e = 4$.

d) Assuming that firms maximize profits find:

(d1) the labour demand of each of the sectors in the domestic economy

↳ $\max \pi = \max P_i y_i - w L_i = \max P_i z_i L_i - w L_i$, $i = \{T, N\}$

↳ $\pi'_{L_i} = 0 \Leftrightarrow P_i z_i = w_i \Leftrightarrow \begin{cases} \frac{w}{P_T} = a & w/P_T = 2 \\ \frac{w}{P_N} = b & w/P_N = 2 \end{cases}$

(d2) the price of tradables

↳ $P_T = eP_T^* = 4 \cdot 4 = 16$ //

↑ PPP

(d3) the equilibrium wage rate

↳ $\frac{w}{P_T} = 2 \Leftrightarrow w = 2 \cdot 16 \Leftrightarrow w = 32$ //

(d4) the price of non-tradables

↳ $\frac{w}{P_N} = 2 \Leftrightarrow \frac{32}{P_N} = 2 \Leftrightarrow P_N = 16$ //

(d5) the consumer price index

↳ $P = P_T^{1/2} P_N^{1/2} = \sqrt{16} \cdot \sqrt{16} = 16$ //

(d6) the real wage

↳ $\frac{w}{P} = \frac{32}{16} = 2$ //

(d7) the real exchange rate.

↳ $\theta = \frac{eP^*}{P} = \frac{4 \cdot 4}{16} = 1$ //

e) How useful would be the relative PPP theory to predict the exchange rate in this economy? In which circumstances?

- Define relative PPP – there may be differences between P and P*, but such differences are constant over time, meaning that the real exchange rate is constant.

- To get full mark, you should refer at least 2 of the following cases where the PPP is useful (or the opposite case, mentioning that the PPP would not apply):
  - Economy in the LR
  - There are only nominal shocks
  - There are no asymmetric productivity shocks
  - There are no changes in transaction costs

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f) Assume now that there was a shock in the non-tradable sector, such that the production function in this sector is now given by $Y_N = 8L_N$. Assuming that the central bank wanted the price level to remain unchanged, what would be the impact of this shock on:

(f1) the price of tradables and the nominal exchange rate

↳ $\frac{w}{P_T} = 2 \Leftrightarrow w = 2P_T \wedge P_T = \frac{w}{2}$

↳ $\frac{w}{P_N} = 8 \Leftrightarrow w = 8P_N \wedge P_N = \frac{w}{8}$

↳ $eP_T^* = P_T \Leftrightarrow 4e = P_T$

$P_T^{1/2} P_N^{1/2} = 16 \Leftrightarrow$

$\Leftrightarrow (4e)^{1/2} \left(\frac{w}{8}\right)^{1/2} = 16 \Leftrightarrow$

$\Leftrightarrow \sqrt{4}\, e^{1/2} \left(\frac{2P_T}{8}\right)^{1/2} = 16 \Leftrightarrow$

$\Leftrightarrow 2e^{1/2} \sqrt{\frac{4e}{4}} = 16 \Leftrightarrow$

$\Leftrightarrow 2e^{1/2} e^{1/2} = 16 \Leftrightarrow$

$\Leftrightarrow e = 8$ // (↑)

Then, if $e = 8$, $P_T = 4.8 = 32$ // (↑)

(f2) the equilibrium wage rate

↳ $w = 2P_T = 2 \cdot 32 = 64$ // (↑)

(f3) the price of non-tradables

↳ $P_{NT} = \frac{w}{8} \Leftrightarrow P_{NT} = \frac{64}{8} \Leftrightarrow P_{NT} = 8$ (↓)

(f4) the consumer price index

↳ $P = P_T^{1/2} P_N^{1/2} = \sqrt{32} \cdot \sqrt{8} = 16$ (=)

↳ the goal of the CB is to keep the same price level in overall terms, being that the reason why the CSI is the same as before

(f5) the real wage

↳ $\frac{w}{P} = \frac{64}{16} = 4$ (↑)

(f6) the workers purchasing power over foreign goods.

↳ $\Theta = \frac{eP^*}{P} = \frac{8 \cdot 4}{16} = 2$ (↑)

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II.C [5.5]

Consider an economy with flexible prices where the purchasing power parity and the fisher principle hold instantaneously. Assume that $P^* = 1$, the real interest rate is 20% and the money demand is given by $m^D = \frac{Y}{5i}$. Full employment output is given by $Y_f = 200$. Initially, the money supply is growing $\mu = 20\%$ and the exchange rate is floating.

g) Describe in a graph the money market equilibrium, quantifying:

(g1) the inflation rate

↳ $\pi = \mu - g = 20\% - 0\% = 20\%$

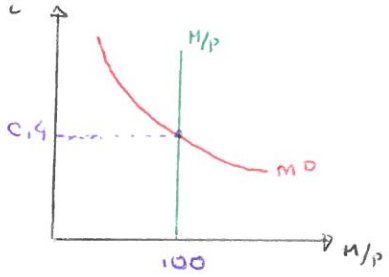
(g2) the nominal interest rate

↳ $i = r + \pi = 20\% + 20\% = 40\%$

(g3) real money demand

↳ $m^D = \frac{Y}{5i} = \frac{200}{5 \cdot 0{,}4} = 100$

(g4) Describe the money market equilibrium in a graph.



h) Now assume that at the time the domestic money supply reached the level $M = 600$, the central bank unexpectedly decided to anchor the money supply at that level.

(h1) Find the new interest rate and money demand

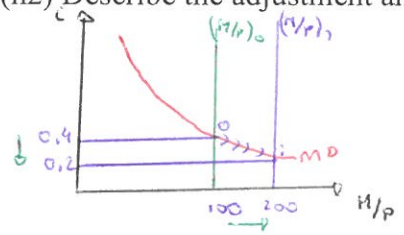
↳ If $\bar{\pi}$, $\mu = 0\%$

↳ $\pi = \mu - g = 0\%$

↳ $i = r + \pi = 20\%$

↳ $m^D = \frac{Y}{5i} = \frac{200}{5 \cdot 0{,}2} = 200$

(h2) Describe the adjustment and the new money market equilibrium in a graph.



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(h3) Assuming that prices were fully **flexible**, what would happen to the price level and the exchange rate? Quantify and draw the corresponding time paths.

↳ $t=0$ [$M=600$ and no policy implemented]

→ $M=600$

→ $\pi = 20\% \Rightarrow i = 40\% \Rightarrow m^D = \frac{200}{5 \cdot 0{,}4} = 100$

→ $\frac{M}{P} = m^D \Leftrightarrow \frac{600}{P} = 100 \Leftrightarrow P = 6$

→ $eP^+ = P \Leftrightarrow e = \frac{P}{P^+} \Leftrightarrow e = 6$

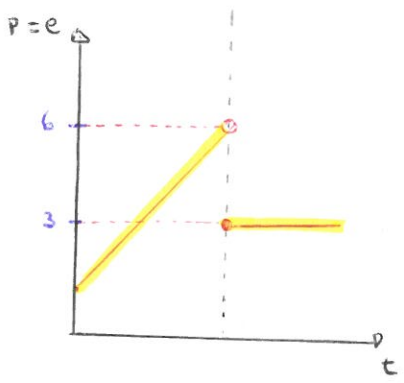
↳ $t=1$ [$M=600$ and policy implemented]

→ $M=600$

→ $\pi = 0\% \Rightarrow i = 20\% \Rightarrow m^D = \frac{200}{5 \cdot 0{,}2} = 200$

→ $\frac{M}{P} = m^D \Leftrightarrow \frac{600}{P} = 200 \Leftrightarrow P = 3$

→ $eP^+ = P \Leftrightarrow e = \frac{P}{P^+} \Leftrightarrow e = 3$



Note

PPP: $eP^+ = P$. If $P^+=1$, $P=e$ "

(h4) Discuss the pros and cons associated with this measure.

- To get full mark, you should refer at least one of the following pros:
  - May lead to price stabilization / control of inflation
  - May be appliable even if there are productivity shocks

- To get full mark, you should refer the inflation inertia /downwards stickiness of prices as con of this measure. The fact that this policy fails under unpredictable money demand or velocity was also accepted, though with a penalty.

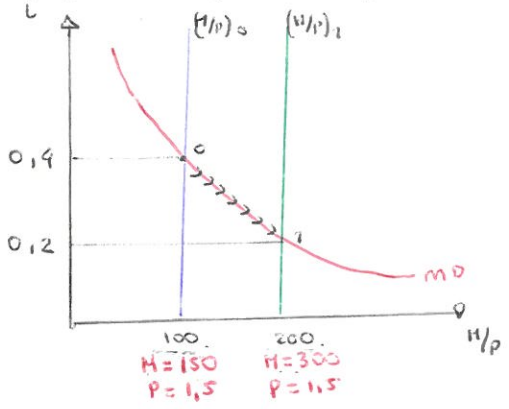
i) Assume instead that the central bank unexpectedly decided to fix the exchange rate when it reached $e = 1.5$.

(i1) Find the new interest rate and money demand.

↳ $\bar{e} \Rightarrow eP^+ = P$ } P must be fixed if e is fixed $\Rightarrow \pi = 0\%$

↳ $\pi = 0\% \Rightarrow i = 20\% \Rightarrow m^D = 200$ (as in question h1)

(i2) Compute and explain the adjustment mechanism in the money market.



↳ Before the policy [$e=1,5 \wedge$ no policy]

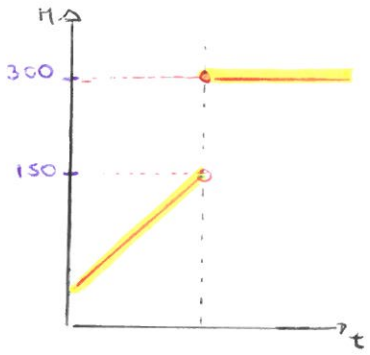
- $\pi = 20\% \Rightarrow i = 40\% \Rightarrow m^D = 100$
- $P = e = 1,5$
- $\frac{M}{P} = m^D \Leftrightarrow M = 1,5 \cdot 100 \Leftrightarrow M = 150$

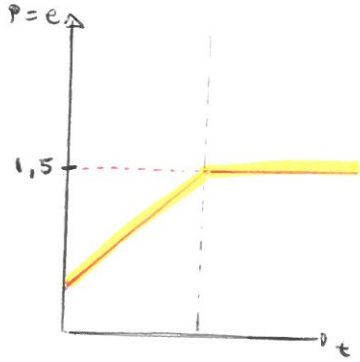
[This step was accounted in the correction of i3]

↳ After the policy [$e=1,5 \wedge$ policy]

- $\pi = 0\% \Rightarrow i = 20\% \Rightarrow m^D = 200$
- $P = e = 1,5$
- $\frac{M}{P} = m^D \Leftrightarrow M = 1,5 \cdot 200 \Leftrightarrow M = 300$

(i3) Draw the corresponding time paths [M, P and e].





(i4) Assume that initially the money supply was backed by the following amount of domestic assets: $B_c = 75$. What will happen to the central bank's foreign reserves? Explain using the central bank's balance sheet.

↳ Before the announcement

- $M = 150$ (there is still no policy)
- $M = B_{CB} + eB^{+}_{CB} \Leftrightarrow 150 = 75 + eB^{+}_{CB} \Leftrightarrow eB^{+}_{CB} = 75$

A	L
$B_{CB} = 75$	$M = 150$
$eB^{+}_{CB} = 75$	

↳ After the announcement

- $M = 300$ (policy was implemented)
- no reason to change B_{CB} [ΔM comes from ΔeB^{+}_{CB}]
- $M = B_{CB} + eB^{+}_{CB} \Leftrightarrow 300 = 75 + eB^{+}_{CB} \Leftrightarrow eB^{+}_{CB} = 225$

A	L
$B_{CB} = 75$	$M = 300$
$eB^{+}_{CB} = 225$	

(i5) Discuss the pros and cons associated with this measure.

- To get full mark, you should refer at least one of the following pros:
  - Simply and transparent measure
  - Works when the money demand / velocity is not predictable
  - Ensures credibility
  - Controls inflation / ensures price stability

- To get full mark, you should refer at least one of the following cons:
  - Requires a further increase in money supply
  - There is the possibility of imported inflation
  - Fails under productivity shocks [Balassa Samuelson effects]
  - Fails under inflation inertia [CA problems]