Exam ECON4330

Postponed

Spring 2025

The exam consists of three parts, Parts I, II and III. Each part gives different points. Carefully examine all pages so you do not miss any questions. Good luck!

1 Real Exchange Rate [50 points]

Consider a small open economy. What happens if the price of tradable goods increases? Focus on the real exchange rate, the price of non-tradable goods and wages.

To obtain the real exchange rate, we need more than our one homogeneous good. There are two sectors producing traded and non-traded goods. The production function in the two sectors is given by (subscripts T and N are for traded and non-traded):

$$Y_T = A_T K_T^{\alpha} L_T^{1-\alpha} \tag{1}$$
$$Y_N = A_N K_N^{\alpha} L_N^{1-\alpha} \tag{2}$$

where $0 < \alpha < 1$. Capital can be rented in an international market at price r. Labor is mobile between sectors at home, the wage rate is w. The price of the non-traded good is p. The price of the traded good is p_T.
The firm problems are as follows (note that the traded good is numeraire, p_T, and price of non-traded good is p):

$$\max_{K_T, L_T} \quad p_T A_T K_T^{\alpha} L_T^{1-\alpha} - wL_T - rK_T \tag{3}$$
$$\max_{K_N, L_N} \quad pA_N K_N^{\alpha} L_N^{1-\alpha} - wL_N - rK_N \tag{4}$$

The FOCs with respect to K_T, L_T, K_N, L_N are:

$$K_T: \quad \alpha p_T A_T k_T^{\alpha-1} = r \tag{5}$$
$$L_T: \quad (1-\alpha) p_T A_T k_T^{\alpha} = w \tag{6}$$
$$K_N: \quad p\alpha A_N k_N^{\alpha-1} = r \tag{7}$$
$$L_N: \quad p(1-\alpha) A_N k_N^{\alpha} = w \tag{8}$$

To solve for the wage rate in the traded sector, solve eq. (5) for k_T:

$$\alpha p_T A_T k_T^{\alpha-1} = r \Rightarrow k_T = \left(\frac{\alpha p_T A_T}{r}\right)^{\frac{1}{1-\alpha}}$$

Then insert k_T into eq. (6):

$$\begin{aligned} w &= (1-\alpha) p_T A_T k_T^{\alpha} \\ &= (1-\alpha) p_T A_T \left(\left(\frac{\alpha p_T A_T}{r}\right)^{\frac{1}{1-\alpha}}\right)^{\alpha} \\ &= (1-\alpha)(p_T A_T)^{\frac{1}{1-\alpha}} \left(\frac{\alpha}{r}\right)^{\frac{\alpha}{1-\alpha}} \end{aligned}$$

To find price p, solve both eq. (7) and (8) for p and set the equations equal to each other:
From (7):

$$p = \frac{r}{\alpha A_N k_N^{\alpha-1}} = \frac{r k_N^{1-\alpha}}{\alpha A_N}$$

From (8):

$$p = \frac{w}{(1-\alpha) A_N k_N^{\alpha}}$$

Setting them equal:

$$\frac{r k_N^{1-\alpha}}{\alpha A_N} = \frac{w}{(1-\alpha) A_N k_N^{\alpha}} \Rightarrow k_N = \frac{w}{r} \cdot \frac{\alpha}{1-\alpha}$$

cont...
Insert k_N back into one of the expressions for p:

$$\begin{aligned} p &= \frac{rk_N^{1-\alpha}}{\alpha A_N} \\ &= \frac{r}{\alpha A_N}\left(\frac{w\alpha}{r(1-\alpha)}\right)^{1-\alpha} \\ &= \frac{r^{\alpha-1}w^{1-\alpha}}{A_N\alpha^\alpha(1-\alpha)^{1-\alpha}} \end{aligned}$$

Insert w from earlier:

$$w = (1-\alpha)(p_T A_T)^{\frac{1}{1-\alpha}}\left(\frac{\alpha}{r}\right)^{\frac{\alpha}{1-\alpha}}$$

Then

$$p = \frac{r^\alpha}{A_N\alpha^\alpha(1-\alpha)^{1-\alpha}}(p_T A_T)^{\frac{1}{1-\alpha}}\left(\frac{\alpha}{r}\right)^{\frac{\alpha}{1-\alpha}} \tag{9}$$

Define the exchange rate $Q = \frac{EP^*}{P}$ and the price index as $P = (p_T)^\lambda p^{1-\lambda}$, where λ is the weight on traded goods. Assume $E = 1$ and $P^* = 1$.
Let us simplify the expression for p:

$$p = \frac{1}{A_N}(p_T A_T)^{\frac{1}{1-\alpha}} r^{\frac{\alpha-\alpha}{1-\alpha}} \cdot \underbrace{\left(\alpha^\alpha(1-\alpha)^{1-\alpha}\right)^{-1}}_{\text{Define as } B}$$

Introduce

$$B = \frac{1}{\alpha^\alpha(1-\alpha)^{1-\alpha}} \Rightarrow p = B \cdot \frac{1}{A_N}(p_T A_T)^{\frac{1}{1-\alpha}} r^{\frac{\alpha-\alpha}{1-\alpha}}$$

Now compute the real exchange rate:

$$Q = \frac{1}{P} = \frac{1}{p^{1-\lambda}} = p^{\lambda-1} = \left(B \cdot \frac{1}{A_N}(p_T A_T)^{\frac{1}{1-\alpha}} r^{\frac{\alpha-\alpha}{1-\alpha}}\right)^{\lambda-1}$$

And real wage (where w is from earlier):

$$\frac{w}{P} = (1-\alpha)\alpha^{\frac{\alpha}{1-\alpha}} B^{\lambda-1} A_N^{1-\lambda} r^{(\alpha-\alpha)(\lambda-1)-\frac{\alpha}{1-\alpha}} (p_T A_T)^{\frac{(1-\alpha)(\lambda-1)+1}{1-\alpha}}$$

Take the first derivative with respect to p_T:

$$\frac{\partial Q}{\partial p_T} = B^{\lambda-1} \cdot \frac{(1-\alpha)(\lambda-1)}{1-\alpha} A_T (p_T A_T)^{\frac{(1-\alpha)(\lambda-1)}{1-\alpha}-1} > 0$$

$$\frac{\partial (w/P)}{\partial p_T} = (\text{Positive exponent}) \cdot (p_T A_T)^{\frac{(1-\alpha)(\lambda-1)+1}{1-\alpha}-1} > 0$$

2 Part II: Sovereign Risk [15 points]

(a) What type of risk does a creditor face when lending to foreign countries/sovereigns?

> Contract enforcement in foreign countries can be difficult if court systems are imperfect/biased. Enforcement against sovereigns is particularly difficult because there is no institutionalized court system for these cases.

(b) Suppose that creditor have the possibility to impose sanctions in the case of defaults. Explain why this can make a borrowing country better off.

> International credit markets break down if repayment by foreign entities cannot be enforced (commitment problem). This hurts borrowers as well as lenders as they cannot reap the gains from trade in assets. Sanctions can partly or fully eliminate the commitment problem. Hence, they enable some asset trade and therefore let the borrower achieve a better allocation of consumption across time.

3 Part III: Mundell-Fleming-Tobin Model [35 points]

Assume the following (reduced-form) model:

$$Y = C(Y, E, i) + G + X(E, Y) \tag{1}$$

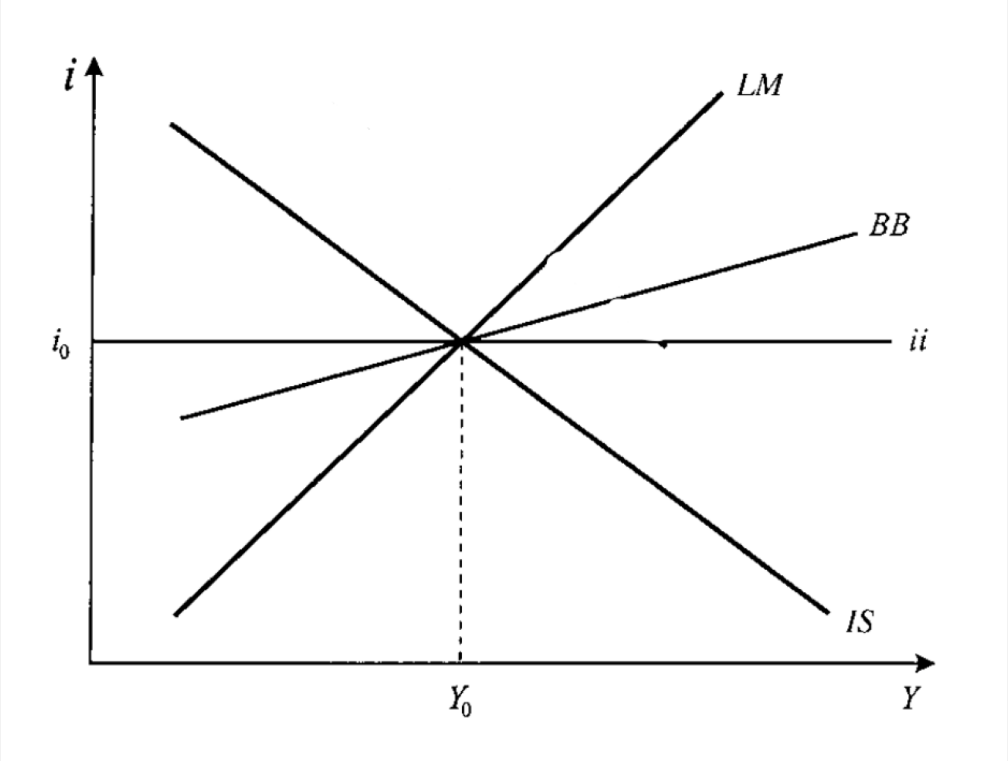
$$\frac{M}{P} = m(i, y) \tag{2}$$

$$\frac{B}{P} = W_p(E) - f(i, E) - m(i, Y) \tag{3}$$

$$F_g + F_p(i, E) + F_\star \tag{4}$$

where (1) is the is the IS curve, (2) is the LM curve, (3) is the BB curve, and (4) is the FX curve. Further, assume a fixed exchange rate regime where the interest rate is exogenous.

(a) Sketch the MFT model graphically. Explain the slope of the LM curve. Why is the LM curve steeper than the BB curve?

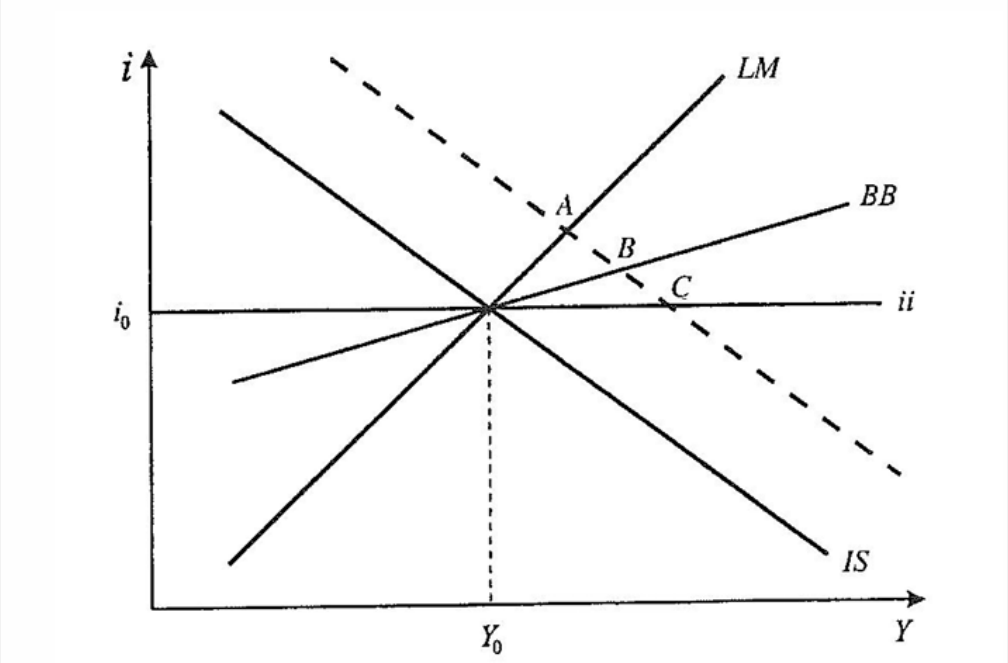


An increase in the interest rate reduces demand for money.

(b) Explain what sterilization of the money market is.

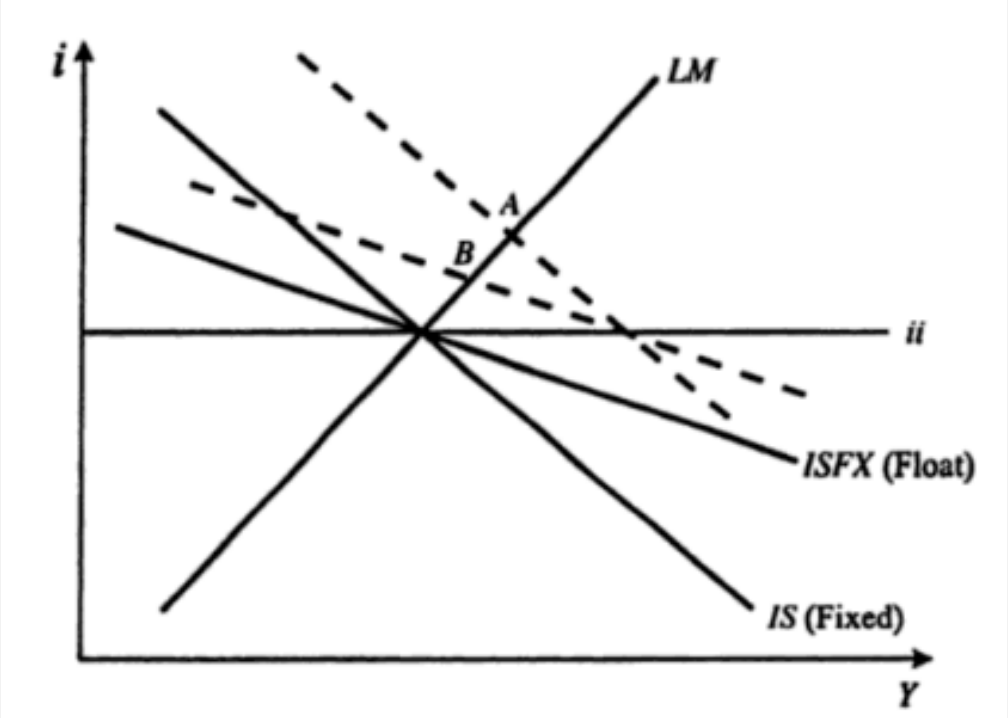
Monetary policy regime through which the CB shields domestic money market from FX market shocks/adjustments by intervening in the bond market.

(c) Assume an exogenous increase in government expenditure, G. Sketch the shock graphically and compare sterilization with fixed interest rate.



The new equilibrium with sterilization is A, without sterilization is B, and fixed interest rate is C. Sterilization leads to a higher interest rate and dampened effect on Y contrary to fixing the interest rate.

(d) Now assume a floating exchange rate regime. Sketch the difference from fixed exchange rate and explain why the relationship between i and Y (the IS curve) looks different under the floating and fixed exchange rate regime.



It combines the IS equation and the FX equation. The ISFX curve is flatter is because an increase (decrease) in the interest rate leads to an appreciation (depreciation) of the domestic currency.