

## Written exam for the M.Sc. in Economics International Monetary Economics

January 20, 2015

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**Number of questions:** This exam consists of 2 questions.

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### 1. The Monetary Approach to the Exchange Rate

Consider the following version of the Mundell–Fleming model:

$$\dot{s} = i - i^* \quad (1)$$

$$m = \sigma s + \kappa y - \theta i \quad (2)$$

and

$$\dot{y} = \chi (\alpha + \mu s - y). \quad (3)$$

Notation is standard.

- (a) Give a brief interpretation of the main assumptions and economic mechanisms underlying the equations of the model. Why is  $s$  and not the price level in the money demand function?
- (b) Derive the IS- and LM-curves.
- (c) Illustrate the model in a graph and explain the dynamics of the model. Show the effects of a monetary contraction.
- (d) Replace equation (3) with

$$\dot{p} = \gamma (\alpha + \mu (s - p) - \bar{y}) \quad (4)$$

and since output is assumed to be at its long-term equilibrium level, equation (2) becomes

$$m = \sigma s + \kappa \bar{y} - \theta i. \quad (5)$$

Explain the main assumptions underlying these equations and the differences between this model and the previous one.

- (e) Show that the model can be written as

$$\begin{bmatrix} \dot{s} \\ \dot{p} \end{bmatrix} = \begin{bmatrix} 0 & 1/\theta \\ \gamma\mu & -\gamma\mu \end{bmatrix} \begin{bmatrix} s - \bar{s} \\ p - \bar{p} \end{bmatrix} \quad (6)$$

where notation is standard.

- (f) Illustrate the model in a graph and show the effects of a monetary contraction. Compare and contrast with the effects found in question (d).
- (g) Summarize the empirical evidence on the sticky price and flexible price monetary model.

## 2. Temporary and permanent shocks in a small open production economy

Consider a two period small open economy with capital. Households receive an endowment in period 1  $y_1 = A_1 q$  where  $q$  is a constant. They allocate their endowment to consumption, investment in physical capital and borrowing/lending in international capital markets. In period 2, firms produce output according to

$$y_2 = A_2 f(k_2) = A_2 k_2^\alpha$$

with  $\alpha \in (0, 1)$  where  $k_2$  is the physical capital stock in period 2. Firms maximize profits and rent capital from households. Households own the firms and receive their profits in period 2. The international interest rate is given by  $r^*$ . Capital depreciates at rate  $\delta$ . Initial net foreign assets  $b_0$  and capital  $k_1$  are zero. Assume households have preferences given by

$$u(c_1, c_2) = \log c_1 + \beta \log c_2$$

with subjective discount factor  $\beta \in (0, 1]$ .

- (a) Assume  $A_1 = A_2 = \bar{A}$ . Solve for the equilibrium allocations: Output  $y_1, y_2$ , consumption  $c_1, c_2$ , capital  $k_2$ , profits  $\Pi_2$  and the trade balance  $TB_1$ , as functions of  $A_1$  and  $A_2$ . Show that

$$c_1(A_1, A_2) = \frac{1}{1 + \beta} \left( y_1(A_1) + \frac{1}{1 + r^*} (f(k_2(A_2)) - (r^* + \delta)k_2(A_2)) \right)$$

(Hint: Use the following steps: (i) write down the household budget constraints in period 1 and 2, (ii) derive the household lifetime budget constraint, (iii) write down the expression for firm profits in period  $\Pi_2$ , (iv) write down the household maximization problem, (iv) solve it for consumption in both periods,  $c_1$  and  $c_2$ , and the capital stock in period 2,  $k_2$ , (v) write down an expression for the trade balance  $TB_1$ .)

- (b) Consider the following temporary shock:  $A_1 = \tilde{A} > \bar{A}$ . Continue to assume that  $A_2 = \bar{A}$ . How does the economy adjust to this shock? Compute the effect of the shock on the equilibrium allocations you found in part a:  $\frac{\partial x}{\partial A_1}$  for  $x = \{y_1, y_2, k_2, \Pi_2, c_1, c_2, TB_1\}$ . Explain.
- (c) Now consider a permanent shock

$$A_1 = A_2 = \tilde{A} > \bar{A}$$

Assume in addition that that  $\beta(1+r) = 1$  and that the period 1 endowment is equal to

$$y_1 = A_1 q = A_1 \left( \frac{r^* + \delta}{\alpha \bar{A}} \right)^{\frac{\alpha}{\alpha-1}}$$

Note that this implies that  $y_1(\bar{A}) = y_2(\bar{A})$ . Analyze the effect of this shock on the economy. Is  $y_2$  after the shock higher or lower than  $y_1$  after the shock? Does  $c_1$  respond to the shock by more or less than  $y_1$ ? What is the sign of the response of the trade balance? Explain.

- (d) Compare your results under the temporary and permanent shock. Explain any differences. What do they two scenarios imply regarding the comovement of output and the trade balance?
- (e) Suppose the shock is permanent but we are in an endowment economy instead, so  $y_t = A_t, t = 1, 2$ . What changes compared to the permanent shock in the production economy?