

## International Macroeconomics Supervision 1\* DD-AA Model

### Section A

A.1 Consider a simple asset market model of the exchange rate in which the foreign exchange market is described by

$$(1 + i_t) = (1 + i_t^*) \frac{E_t [e_{t+1}]}{e_t} \quad (\text{UIP})$$

where  $i_t$  is the UK interest rate,  $i_t^*$  the US interest rate, and  $e_t$  the spot exchange rate (defined as pounds per dollar) at time  $t$ . Money market equilibrium in the UK is given by

$$\frac{M_t}{P_t} = L(i_t, Y_t) \quad (\text{LM})$$

where  $M_t$  is the money supply,  $P_t$  the aggregate price level and  $Y_t$  aggregate output in the UK at time  $t$ . Money demand  $L(\cdot)$  satisfies  $\partial L / \partial i < 0$  and  $\partial L / \partial Y > 0$ . Assume that for any period  $t$ , output equals its natural rate  $Y_t = \bar{Y}$  and the price level  $P_t$  is preset in period  $t - 1$ . The real exchange rate  $\varepsilon$  is assumed to be constant in the long run.

Suppose the Bank of England credibly announces at time  $t = 1$  that it will implement a permanent decrease in the level of the money supply  $M$  by  $x\%$  at time  $t = 2$ .

Show graphically and explain intuitively what happens to the exchange rate  $e_t$  at time  $t = 1$  and  $t = 2$ . What is the percentage change in  $e_t$ ?

### Section B

B.1 This problem analyzes the circumstances under which an unanticipated, permanent monetary expansion produces exchange rate overshooting in the DD-AA model. Assume the economy is initially in long run equilibrium.

- Suppose people expect that next year, there will be a permanent increase in the level of money supply by 100%. Show graphically the short-run effect on the exchange rate and output. Give an intuitive explanation.
- Now, consider an unanticipated permanent increase in the level of money supply by 100%. Using the graph in (a), show the short-run effect on the exchange rate and output and give an intuitive explanation. What will be the new long run equilibrium?
- Using the same graph, show the adjustment toward the new long run equilibrium after the unanticipated permanent increase in the level of money supply by 100%. Explain intuitively how the adjustment takes place.

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\*This supervision should be scheduled after February 28 (lecture 5).

- (d) Show graphically the short-run effect and long-run adjustment of an unanticipated permanent increase in the level of money supply by 100%, assuming that
- i. the exchange rate sensitivity of the current account is zero;
  - ii. the exchange rate sensitivity of the current account is infinite;
  - iii. the output sensitivity of money demand is zero;
  - iv. the output sensitivity of money demand is infinite.

In each case, explain what the slopes are of the AA and DD curves and whether exchange rate overshooting is likely to occur.

B.2 Consider the following model of a small open economy (Home), which interacts with the rest of the world (Foreign):

$$\begin{aligned} i &= i^* + E[e] - e \\ \mathbf{M} - \mathbf{P} &= \lambda \mathbf{Y} - \kappa i \\ \mathbf{Y} &= \alpha (\mathbf{e} + \mathbf{P}^* - \mathbf{P}) \end{aligned}$$

where  $i$  is the Home nominal interest rate,  $i^*$  the Foreign nominal interest rate,  $e$  the nominal exchange rate expressed as the Home price of Foreign currency,  $E[e]$  the expected future exchange rate,  $\mathbf{M}$  the Home money supply,  $\mathbf{P}$  the Home aggregate price level,  $\mathbf{P}^*$  the Foreign aggregate price level,  $\mathbf{Y}$  Home aggregate output, and all boldface variables are in logs. People have rational expectations. In the short run, the aggregate price level  $\mathbf{P}$  is fixed. In the long run, the price level  $\mathbf{P}$  is flexible and output is at its natural rate  $\bar{\mathbf{Y}}$ . Assume that  $\lambda = \kappa = 1$ ,  $\alpha = \frac{1}{2}$ ,  $i^* = \mathbf{P}^* = \bar{\mathbf{Y}} = 0$  and  $\mathbf{M} = \bar{\mathbf{M}}$ . [Tripos 2003]

- (a) Give a brief economic interpretation of the three displayed equations above.
- (b) Compute the long run equilibrium values of  $i$ ,  $\mathbf{P}$ ,  $e$  and  $E[e]$ .
- (c) Suppose that there is an unanticipated permanent decrease in the (log) Home money supply from  $\mathbf{M} = 0$  to  $\mathbf{M} = -1$ . Compute the new short run equilibrium level of output  $\mathbf{Y}$  and the exchange rate  $e$ , and give an intuitive explanation of the short run effect.
- (d) Does this decrease in the money supply lead to exchange rate overshooting? Explain intuitively how the economy adjusts to the new long run equilibrium.

### Main reading

- Krugman, Obstfeld and Melitz (2011), *International Economics: Theory and Policy* (9th edition), chapter 13-17.

### Supplementary references

- Blanchard (2012), *Macroeconomics* (6th edition), chapter 20.
- De Grauwe (1996), *International Money: Postwar Trends and Theories* (2nd edition), chapter 6.
- Feenstra and Taylor (2011), *International Economics*, chapter 13-15 and 18.
- Sachs and Larrain (1993), *Macroeconomics in the Global Economy*, chapter 14.