International finance
Solution to homework 2

1. (40 points in total) Consider the perfect-foresight version of Dornbusch model described by the following equations

$$\begin{array}{ll} \text{IS:} & y_t = \bar{z} + (e_t + p^* - p_t), \\ \text{LM:} & m_t - p_t = \bar{y} - i^* - \Delta e_{t+1}, \\ \text{Period t=1 AS:} & p_t = \bar{p}, \\ \text{Period } t > 1 \text{ AS:} & y_t = \bar{y}. \end{array}$$

Periods t>1: use IS, LM and AS for $t > 1$. Replacing for $y_t = \bar{y}$ in IS and LM and setting m_t to zero yields.

$$0 = (e_t + p^* - p_t), \tag{1}$$
$$-p_t = -i^* - \Delta e_{t+1}. \tag{2}$$

Since equation (1) implies the real exchange rate is constant its rate of growth from $t > 1$ onwards is zero and it is

$$\Delta e_{t+1} = \Delta p_{t+1} - \Delta p^*_{t+1} = 0, \tag{3}$$

given that the home rate of money growth is zero and the foreign price level is assumed to stay constant.

Replacing in (1) and (2) yields

$$0 = e_t + p^* - p_t, \tag{4}$$
$$-p_t = -i^* \tag{5}$$

which is a system of two equation in the two endogenous variables (p_t, e_t).

Period $t = 1$: use IS, LM and AS for $t = 1$. Replacing for $m_t = \bar{p} = 0$ one obtains

$$y_t = (e_t + p^*), \tag{6}$$
$$0 = -i^* - (e_{t+1} - e_t). \tag{7}$$

where $e_{t+1} = e_2$ for $t = 1$ and has been found in the previous step. Hence, this is a system of two equations in the two unknowns y_t, e_t.

(a) Here, $p^* = i^* = 0$. Using (4) and (5) one obtains $p_t = e_t = 0$ for $t > 1$. Using $e_2 = 0$ and (6) and (7) one obtains $e_t = y_t = 0$ for $t = 1$. Intuition: no shocks and $\bar{p}$ is at its flex price equilibrium level. The economy is at full employment equilibrium at all times.

(b) p^* now increases to one and stays constant thereafter. i^* still equals zero. Using (4) and (5) one obtains $p_t = 0$ and $e_t = -p^*_t = -1$ for $t > 1$. Using $e_2 = -1$ and (6) and (7) one obtains $e_t = -1$ and $y_t = 0$ for $t = 1$. Intuition: the shock affects only the goods market. So the home price level is unchanged in all periods. Even when prices are sticky, the nominal exchange rate is free to adjust to keep the real exchange rate unchanged and reestablish goods market equilibrium at unchanged output level.

(c) (15 points) i^* now increases to one and stays constant thereafter. p^* still equals zero. Using (4) and (5) one obtains $p_t = e_t = 1$ for $t > 1$. Using $e_2 = 1$ and (6) and (7) one obtains $e_t = y_2 = 2$ for $t = 1$. Intuition: the shock affects the money market. Since, prices are sticky, they cannot adjust to clear the money market in period 1. So the real money supply cannot change in period 1, which requires real money demand, hence the home nominal interest rate, also to be unchanged. With higher foreign nominal interest rate, the only way the home interest rate can be unchanged and UIP hold is if the lower home interest rate is offset by an expected appreciation of the exchange rate between period 1 and 2. For this to happen, e_1 has to depreciated by more than e_1 (overshooting) so that it appreciates between period 1 and 2.

2. (40 points) Replacing for the values of constant and exogenous variables we have

$$\text{LM: } m_t - p_t = -0.5\Delta e_{t+1}, \tag{8}$$

$$\text{PPP: } e_t = p_t. \tag{9}$$

PPP implies $\Delta e_{t+1} = \Delta p_{t+1} = \Delta m_{t+1}$ where the last inequality follows from money market equilibrium.

(a) With $\Delta e_{t+1} = \Delta m_{t+1} = 0$, equations (8) and (9) imply $p_t = e_t = m_t + 0.1$. Note that m_t changes over time (e.g. $m_1 = 0$, $m_2 = 0.2$ and so on).

(b) From $t = 2$ onwards it is $e_t = 2$ and $\Delta e_{t+1} = 0$. Therefore $m_t = p_t = 2$ from $t \geq 2$. The nominal money supply becomes endogenous as it has to be consistent with the peg. At period $t = 1$ the nominal money supply is exogenous and $p_1 = e_1$ (which is flex) has to adjust to clear the money market. Given $m_1 = 0$ and $e_2 = 2$, equations (8) and (9) imply $e_1 = p_1 = (0.5e_2)/1.5 = 2/3$. The exchange rate in period 1 is higher than in part (a) because agents expect it to increase (hence the money supply to go up) at $t = 2$.