

QUIZ 3
14.02 Principles of Macroeconomics
May 19, 2005

I. True/False (30 points)

1. A decrease in government spending and a real depreciation is the right policy mix to improve the trade balance without changing the level of domestic output.

True. A real depreciation improves the trade balance since it makes foreign goods more expensive relative to domestic goods, leading to an increase in net exports. But such an increase in net exports implies an increase in domestic output. The government can then decrease its spending to offset the resulting increase in output (Ch. 19)

2. It is possible to have a real exchange rate appreciation and a nominal exchange rate depreciation at the same time.

True. Yes, a nominal exchange rate depreciation is a decrease in E . If, at the same time, domestic prices are increasing much faster relative to foreign prices, then P/P^* could increase to swamp the decrease in E so that $\epsilon = EP/P^*$ increases, i.e., a real exchange rate appreciation. (ch. 18)

3. In an open economy with fixed exchange rates, the aggregate demand curve is downward sloping since an increase in prices reduces the real money stock, which reduces the interest rate, therefore investment, and therefore output.

False. The AD curve is downward sloping since an increase in prices appreciates the real exchange rate, which reduces net exports, and therefore output. Recall that with fixed exchange rates there is no monetary policy channel, so the money supply cannot be held fixed, as was done while deriving the AD curve in the closed economy.

4. In an open economy with flexible exchange rates, the announcement today of contractionary monetary policy to be enacted in the future leads to an appreciation of the current nominal exchange rate (assume that this announcement is credible).

True. Since contractionary monetary policy implies higher nominal interest rates in the future, the expectation of higher future interest rates will appreciate today's exchange rate. (ch. 21)

5. In an open economy with fixed exchange rates, if the financial markets expect a devaluation in the near future, then, in order to maintain the exchange rate today, the central bank has to decrease the domestic nominal interest rate.

False. The central bank should increase the nominal interest rate to signal to the markets that it is committed to defend the peg. Investors (both domestic

and foreign) are then willing to hold domestic bonds to sustain the existing peg rate. If the central bank decreases the nominal interest rate, foreign capital will flow out of the country and likely result in a depreciation. (Ch. 21)

6. Booms are always associated with decreases in the trade balance because of increases in domestic demand and prices.

False. All else equal, increases in Y and P deteriorate the trade balance. However, if the rest of the world experience larger increases in Y^* and P^* , the real exchange rate can depreciate, and exports can increase more than imports because of higher foreign demand for domestic goods. (Ch. 19)

II. Goods Market in the open economy (35 points)

Consider the following economy. The exchange rate is fixed and equal to one. Consumption, investment, government spending, taxes imports and exports are given by:

$$C = 10 + 0.8(Y - T); \quad I = 10, \quad G = \bar{G}; \quad T = 10; \quad IM = 0.3Y; \quad X = 0.3Y^*$$

1. Write down the equilibrium condition for the goods market, and derive output Y and net exports $NX = X - IM$ as functions of \bar{G} and Y^* . What is the multiplier in this economy? (5 points)

Ans:

The equilibrium condition for the goods market is domestic output Y = global demand for domestic goods Z , ie.

$$Y = Z = C + I + G + X - IM$$

$$\begin{aligned} Y &= 10 + 0.8(Y - 10) + 10 + \bar{G} + 0.3Y^* - 0.3Y \\ Y(1 - 0.8 + 0.3) &= 12 + \bar{G} + 0.3Y^* \\ Y &= 2(12 + \bar{G} + 0.3Y^*) \end{aligned}$$

$$\begin{aligned} NX &= X - IM \\ &= 0.3(Y^* - Y) \end{aligned}$$

The multiplier is 2.

2. Consider an increase in \bar{G} by $\Delta\bar{G} = 1$. Derive the effects on output Y and on net exports NX . Explain in words. (5 points)

Ans:

$$\begin{aligned}\Delta Y &= 2(12 + \bar{G}' + 0.3Y^*) - 2(12 + \bar{G} + 0.3Y^*) \\ &= 2\Delta\bar{G} \\ &= 2\end{aligned}$$

$$\begin{aligned}\Delta NX &= 0.3(Y^* - Y') - 0.3(Y^* - Y) \\ &= -0.3(Y' - Y) \\ &= -0.3\Delta Y \\ &= -0.6\end{aligned}$$

An increase in G by $\Delta\bar{G} = 1$ increase domestic output by 2 units because of the multiplier of 2. The standard consumption-income virtuous cycle goes: an increase in income leads to higher consumption which requires higher output/income in equilibrium, which in turn leads to higher consumption, and so on and so forth. Notice that in an open economy, part of the increase in domestic income goes to the foreign goods market through imports. This "leakage" weakens the multiplying effect.

An increase in government spending increases demand for both domestic and foreign goods. However, since exports are not affected by the increase in domestic output here, the increase in imports transferred to a deterioration of the trade balance one-for-one.

3. Assume that the foreign economy is the mirror image of the domestic economy, so:

$$C^* = 10 + 0.8(Y^* - T^*); \quad I^* = 10, \quad G^* = \bar{G}^*; \quad T^* = 10; \quad IM^* = 0.3Y^*; \quad X^* = 0.3Y$$

Write down the equilibrium condition for the goods market in the foreign economy, and derive foreign output Y^* as a function of \bar{G}^* and Y . (5 points)

Ans:

The equilibrium condition for the goods market in the foreign economy is foreign output $Y^* =$ global demand for foreign goods Z^* , ie.

$$Y^* = Z^* = C^* + I^* + G^* + X^* - IM^*$$

$$\begin{aligned}Y^* &= 10 + 0.8(Y^* - 10) + 10 + \bar{G}^* + 0.3Y - 0.3Y^* \\ Y^*(1 - 0.8 + 0.3) &= 12 + \bar{G}^* + 0.3Y \\ Y^* &= 2(12 + \bar{G}^* + 0.3Y)\end{aligned}$$

$$\begin{aligned}NX^* &= X^* - IM^* \\ &= 0.3(Y - Y^*)\end{aligned}$$

4. Using the equations giving Y as a function of \bar{G} and Y^* , and Y^* as a function of \bar{G}^* and Y , solve for domestic and foreign output as functions of \bar{G} and \bar{G}^* (i.e solve the system of two equations). (5 points)

Ans:

The system of two equations is:

$$Y^* = 2(12 + \bar{G}^* + 0.3Y) \quad (1)$$

$$Y = 2(12 + \bar{G} + 0.3Y^*) \quad (2)$$

substitute (2) into (1):

$$\begin{aligned}Y^* &= 2\{12 + \bar{G}^* + 0.3[2(12 + \bar{G} + 0.3Y^*)]\} \\ Y^*(1 - 0.36) &= 2\{12 + \bar{G}^* + 0.3[2(12 + \bar{G})]\} \\ Y^* &= 3.125[12 + \bar{G}^* + 0.6(12 + \bar{G})] \\ &= 3.125[19.2 + \bar{G}^* + 0.6\bar{G}]\end{aligned}$$

substitute (1) into (2):

$$\begin{aligned}Y &= 2\{12 + \bar{G} + 0.3[2(12 + \bar{G}^* + 0.3Y)]\} \\ &= 3.125[19.2 + \bar{G} + 0.6\bar{G}^*]\end{aligned}$$

5. Consider again an increase in \bar{G} by $\Delta\bar{G} = 1$. Derive the effects on domestic output, Y and foreign output, Y^* , and on net exports, NX . (5 points)

Ans:

The impact on domestic output Y :

$$\Delta Y = 3.125\Delta G = 3.125$$

The impact on foreign output Y^* :

$$\Delta Y^* = 1.875\Delta G = 1.875$$

The impact on NX :

$$\begin{aligned}\Delta NX &= 0.3(\Delta Y^* - \Delta Y) \\ &= 0.3(1.875 - 3.125) \\ &= -0.375\end{aligned}$$

6. Compare the effects of \bar{G} on Y and NX in part 2 and part 5. Explain why they differ. (10 points)

Ans:

Even though government spending increases only in the domestic economy, both Y and Y^* increase.

The impact on Y is larger than before ($3.125 > 2$). In part 2, we shut down any feedback from the foreign economy by assuming a fixed Y^* . In part 5, we allow foreign output (Y^*) to change. Thus, in addition to the usual channel, now higher foreign output can affect domestic output through the indirect channel of net exports: An increase in government spending in the domestic economy drives up the domestic demand for all goods, therefore imports of foreign goods (IM), and therefore foreign output (Y^*). An increase in foreign output increases exports in the domestic economy ($X(Y^*)$), which drives up domestic output through net exports (NX).

The impact on NX / the decrease in NX is smaller ($|-0.375| < |-0.6|$). In part 2, we only allow government spending to affect NX through the increase in domestic output (Y) and imports and shut down any feedback from the foreign economy by assuming a fixed Y^* . In part 5, we allow Y^* to change to affect the domestic economy through net exports: an increase in government spending increases foreign output (Y^*) and therefore exports. Notice that imports increase by more than before because domestic output also increases by more than before. However, foreign output increases by a substantial amount (ΔY^*) such that net exports decrease by a lesser amount. Whether net exports decrease more or less in response to a fiscal expansion depends on the propensity to import and the multiplier for each economy. Here they are the same for both countries.

[In chapter 19 when we study the effects of increases in government spending, we assume constant foreign output. With this assumption, the resulted effect is a *partial equilibrium effect*. When we allow interdependence of countries through trade, an increase in domestic output, in theory and in reality, affects foreign output, which in turn affects domestic output. This endogenous effect is a *general equilibrium effect*.]

III. AS-AD in the open economy with fixed exchange rates (35 points)

Consider the following economy:

$$\text{IS : } Y = C(Y) + I(Y, i) + G + NX(Y, Y^*, \frac{EP}{P^*})$$

$$\text{LM : } \frac{M}{P} = YL(i)$$

$$\text{IP : } (1 + i) = (1 + i^*) \frac{E}{E^e}$$

Assume throughout that this economy operates under a fixed exchange rate, so $E = E^e = \bar{E}$.

1. Show that the IS and IP relation imply a negative relation between Y and P , given G, \bar{E}, Y^*, P^* . Call this the aggregate demand relation (AD). Explain how it differs from the AD relation derived in the closed economy. (6 points)

Ans :

Since the economy is under a fixed exchange rate regime, from the IP relation, we have : $i = i^*$

The IS relation is already provided in the statement of the question : $Y = C(Y) + I(Y, i) + G + NX(Y, Y^*, \frac{EP}{P^*})$

Using $i = i^*$ and $E = \bar{E}$, in the IS relation, we have : $Y = C(Y) + I(Y, i^*) + G + NX(Y, Y^*, \frac{\bar{E}P}{P^*})$

[Note : We have replaced i with i^* in the IS relation, but this is not required. What is required is a rewriting of $\frac{EP}{P^*}$ as $\frac{\bar{E}P}{P^*}$, so that only relative prices now affect the real exchange rate]

In the closed economy, the price channel operates through the money market (the LM curve). An increase in prices reduces real money supply, thus requiring an increase in interest rates which depresses investment. This is the reason why a closed economy AD curve is downward sloping. An open economy AD curve is also downward sloping but for a different reason. Now, an increase in prices depresses demand because an increase in prices appreciates the real exchange rate and therefore depresses net exports.

Suppose the aggregate supply relation is given by the same relation as in the closed economy:

$$P = P^e(1 + \mu)F(1 - \frac{Y}{L}, z)$$

2. Draw the AD and AS curves in the P, Y space. (5 points)

Ans: See figure 1.

3. Assume that initially $P = P^e$ and $Y = Y_n$ (where Y_n is the natural level of output). Starting from this equilibrium, consider an increase in G . Characterize the short run effects on output, the price level, the real exchange rate, and net exports. (7 points)

Ans :

The short run effect would be an increase in output, an increase in prices, an appreciation of the real exchange rate and a decrease in net exports. The decrease in net exports has a depressive effect on output, but on net, output increases due to the fiscal stimulus. In the background, money supply must be increased to accommodate the increase in government spending, otherwise the goal of maintaining a fixed exchange rate would be compromised.

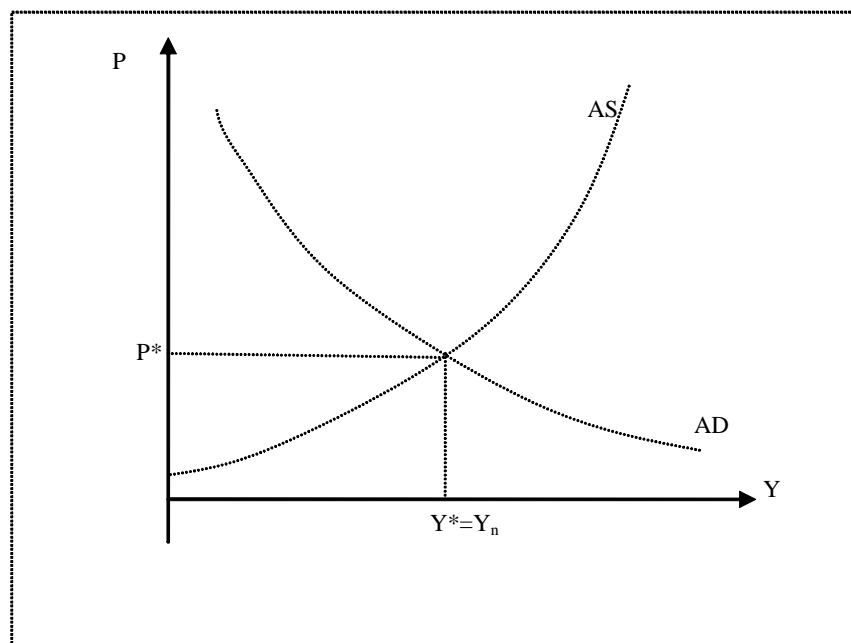


Figure 1: Part 2 - Question III

4. Characterize the medium run effects of the increase in G on output, the price level, the real exchange rate, and net exports. (7 points)

Ans :

In the medium run, output must decrease back from its short run equilibrium level to its natural level. This happens through successive shifts upward and leftward of the AS curve, as workers update their expectations of prices upward. As the price increases, some of the monetary accommodation performed in the short run is undone, but also the real exchange rate continues to appreciate, depressing net exports and output (so the IS and LM both shift back to their initial medium run positions). So when the economy is at the new medium run equilibrium, prices are higher, output is back to the natural level, the real exchange rate is appreciated even further (relative to the short run equilibrium), and net exports have declined relative to the initial medium run equilibrium by an amount exactly equal to the increase in G .

5. "In the medium run, budget deficits lead, one for one, to trade deficits." Discuss. (one or two paragraphs) (5 points)

Ans :

The statement is true in the case of fixed exchange rates. We just showed that starting from a medium run equilibrium, an increase in government spending translates in the new medium run into an exactly offsetting decrease in net

exports.

6. “In the medium run, budget deficits have no effect on investment. Fears that deficits will lead to low capital accumulation and lower output in the future are simply unfounded.” (one or two paragraphs) Discuss (5 points)

Ans :

If the economy is operating under a fixed exchange rate regime, then budget deficits which translate into trade deficits force financial markets to rethink the commitment of the policy maker to a fixed exchange rate regime. As financial markets begin to expect a devaluation, domestic interest rates rise, depressing investment and so potential output in the future. So the statement is not correct. Persistent deficits, when coupled with a fixed exchange rate regime that financial markets have come to regard with suspect, may indeed lower investment.