ECOS3010: Tutorial 5 (Answer Key)

Question 1-5. Answer True, False or Uncertain. Briefly explain your answer.

1. The Lucas Critique stresses that the government cannot design policy purely based on the reduced form correlation from the data.

True. The Lucas Critique points out that the reduced form correlations are subject to change when the government changes its policies and thus the rules under which decision makers operate. It implies that while econometric policy evaluation is useful, we also need a theory to help us understand how people react to different government policies. It is not sufficient just to look at the data.

2. In an OLG model with two countries and two monies/currencies, people would like to hold both currencies no matter what the values of these currencies are.

False. When people are free to hold and use any currency, people would choose to hold the currency (or currencies) that can help them buy the most goods. In equilibrium, only when the exchange rate satisfies $e_t = v_t^a/v_t^b$, both currencies are valued and held by people. For example, if $e_t > v_t^a/v_t^b$, no one would like to hold country a currency. On the other hand, if $e_t < v_t^a/v_t^b$, no one would like to hold country b currency.

3. In an OLG model with two countries and two currencies, suppose that foreign currency controls are in effect. The government cannot choose to both fix the exchange rate and acquire its preferred level of seigniorage.

True. When foreign currency controls are in effect, the government has to set its growth rate of money supply according to $z^a = z^b n^a/n^b$ to keep a fixed exchange rate. In this case, the government cannot freely choose its preferred level of seigniorage. If the government wants to choose z^a to generate a certain level of seigniorage, the exchange rate cannot be fixed. Overall, it is not possible to both fix the exchange rate and acquire a preferred level of seigniorage when foreign currency controls are in effect.

4. The fluctuations in exchange rates can always be attributed to changes in economic fundamentals.

False. From the data on exchange rate fluctuations, we can see a lot of extreme fluctuations cannot be tied to any changes in real economic conditions. Neither the change in money supply nor the change in money demand can explain the change in exchange rate. Fluctuations in exchange rates cannot always be attributed to changes in economic fundamentals.

5. In an OLG model with international currency traders, there exist two money market clearing conditions for the two monies. Therefore, the exchange rate is no longer indeterminate.

False. Even if there are two money market clearing conditions, exchange rate is still indeterminate as long as international currency traders can freely adjust its holding of different currencies. Basically, whenever international currency traders changes the composition of their currency portfolios, it will change the exchange rate.

6. Suppose that the United States (country a) and Great Britain (country b) have foreign currency controls in effect. The demand for money is growing at 10.25 percent in the United States and at 2 percent in Great Britain (net rates) each period. The money supplies in the United States and Great Britain are growing at 5 and 6.25 percent (net rates) in each period, respectively.

(a) Define the exchange rate (e_t) as in our lectures, what are the units in which the exchange rate is measured, U.S. dollars per British pound or British pounds per U.S. dollar?

We define exchange rate e_t as

$$e_t = \frac{\text{value of U.S. dollar}}{\text{value of British pound}} = \frac{\text{units of British pounds}}{\text{units of U.S. dollar}}.$$

The exchange rate e_t is measured as British pounds per U.S. dollar.

(b) What is the rate of return on money in the U.S.? In Great Britain?

The rate of return on money in the U.S. can be expressed as

$$\frac{v_{t+1}^a}{v_t^a} = \frac{n^a}{z^a} = \frac{1+10.25\%}{1+5\%} = 1.05.$$

The rate of return on money in Great Britain can be expressed as

$$\frac{v_{t+1}^b}{v_t^b} = \frac{n^b}{z^b} = \frac{1+2\%}{1+6.25\%} = 0.96.$$

The U.S. is experiencing deflation and Great Britain is experiencing inflation.

Note that here we use the expression for the rate of return on money directly. You can also derive it by yourself following the steps that we use in class: deriving the value of money in period t from the money market clearing condition and also deriving the value of money in period $t+1$.

(c) In a system of flexible exchange rate, what is the time path of the exchange rate between the U.S. and Great Britain (e_{t+1}/e_t)?

With foreign currency controls, the time path of the exchange rate is

$$\frac{e_{t+1}}{e_t} = \frac{\frac{v_{t+1}^a}{v_t^a}}{\frac{v_{t+1}^b}{v_t^b}} = \frac{n^a}{z^a}\frac{z^b}{n^b} = \frac{1.05}{0.96} = 1.094.$$

The exchange rate is increasing over time, since the real value of U.S. dollar is increasing over time whereas that of British pounds is decreasing over time. It implies that the relative value of the U.S. dollar to the British pound is increasing over time.

(d) Suppose the U.S. desires to fix the exchange rate. How can the U.S. government set its growth rate of money supply z^a to accomplish this goal?

If the U.S. government wants to fix the exchange rate, it has to set its growth rate of money supply z^a as

$$z^a = \frac{n^a}{n^b}z^b = \frac{1.1025}{1.02} \times 1.0625 = 1.148.$$

The growth rate of the U.S. money supply must increase to lower the rate of return on U.S. dollars.

7. Suppose that Germany (country a) and France (country b) do not have foreign currency controls in effect. The total demand for money is always 2,000 goods in Germany and 1,000 goods in France. The money supplies are 100 marks in Germany and 300 francs in France. Find the value of each country's money if the exchange rate e_t (as defined in our lectures) is 3. Do the same if $e_t = 1$. Is one exchange rate more likely than the other? Explain.

The world money market clearing condition is

$$v_t^a M_t^a + v_t^b M_t^b = N_t^a \left(y^a - c_{1,t}^a\right) + N_t^b \left(y^b - c_{1,t}^b\right).$$

We know that

$$N_t^a \left(y^a - c_{1,t}^a\right) = 2000 \quad \text{and} \quad N_t^b \left(y^b - c_{1,t}^b\right) = 1000.$$

We also know that

$$M_t^a = 100 \quad \text{and} \quad M_t^b = 300.$$

If we substitute these numbers into the world money market clearing condition, we have

$$100v_t^a + 300v_t^b = 3000.$$

When the exchange rate e_t is 3, it implies that

$$e_t = \frac{v_t^a}{v_t^b} = 3 \quad \text{or} \quad v_t^a = 3v_t^b.$$

We can solve for v_t^b from

$$100 \times 3v_t^b + 300v_t^b = 3000 \quad \rightarrow \quad v_t^b = 5.$$

It follows that

$$v_t^a = 3v_t^b = 15.$$

When the exchange rate is 1, we have

$$e_t = \frac{v_t^a}{v_t^b} = 1 \quad \text{or} \quad v_t^a = v_t^b.$$

We can then solve for v_t^b from

$$100 \times v_t^b + 300v_t^b = 3000 \quad \rightarrow \quad v_t^b = 7.5.$$

It follows that

$$v_t^a = v_t^b = 7.5.$$

It is important to note that either exchange rate "works as well" as the other and neither is more likely than the other. In fact, we could have picked any exchange rate we wanted. This is what is meant by the "indeterminacy of the exchange rate".

8. Suppose that there are three types of people in our model of two countries and two currencies. Type a people can hold only the money of country a, type b can hold only the money of country b, and type c can hold the money of either country. Every individual wants to hold 10 goods worth of money when young. There are 300 type a people, 200 type b people, and 100 type c people. There are 100 units of country a money and 200 units of country b money.

(a) Find the range of stationary equilibrium values for v_t^a, v_t^b and e_t.

With international currency traders, the value of country a money and the value of country b money are

$$\begin{aligned} v_t^a &= \frac{N_t^a \left(y^a - c_{1,t}^a\right) + \lambda_t N_t^c \left(y^c - c_{1,t}^c\right)}{M_t^a}; \\ v_t^b &= \frac{N_t^b \left(y^b - c_{1,t}^b\right) + (1 - \lambda_t) N_t^c \left(y^c - c_{1,t}^c\right)}{M_t^b}. \end{aligned}$$

The exchange rate can be expressed as

$$e_t = \frac{v_t^a}{v_t^b} = \frac{\frac{N_t^a\left(y^a - c_{1,t}^a\right) + \lambda_t N_t^c\left(y^c - c_{1,t}^c\right)}{M_t^a}}{\frac{N_t^b\left(y^b - c_{1,t}^b\right) + (1-\lambda_t) N_t^c\left(y^c - c_{1,t}^c\right)}{M_t^b}}$$

From the question, we know that

$$\begin{aligned} N^a &= 300,\ N^b = 200 \text{ and } N^c = 100; \\ y^a - c_{1,t}^a &= y^b - c_{1,t}^b = y^c - c_{1,t}^c = 10; \\ M_t^a &= 100 \text{ and } M_t^b = 200. \end{aligned}$$

Substituting these values into the expression of v_t^a, v_t^b and e_t, we have

$$\begin{aligned} v_t^a &= \frac{3000 + 1000\lambda_t}{100} = 30 + 10\lambda_t; \\ v_t^b &= \frac{2000 + 1000\,(1 - \lambda_t)}{200} = 15 - 5\lambda_t; \\ e_t &= \frac{\frac{3000+1000\lambda_t}{100}}{\frac{2000+1000(1-\lambda_t)}{200}} = \frac{6 + 2\lambda_t}{3 - \lambda_t}. \end{aligned}$$

Given that λ_t ranges from 0 to 1, the value of v_t^a ranges from 30 to 40. The value of v_t^b ranges from 10 to 15. The value of e_t ranges from 2 to 4.

(b) Now suppose that 100 type a people and 100 type b people become type c people. Now find the range of stationary equilibrium values for v_t^a, v_t^b and e_t. Has the range of equilibrium exchange rates expanded or contracted? Explain this change.

When 100 type a people and 100 type b people become type c people, the populations of the three types of people are

$$N^a = 200,\ N^b = 100 \text{ and } N^c = 300.$$

we need to update our expressions as

$$\begin{aligned} v_t^a &= \frac{2000 + 3000\lambda_t}{100} = 20 + 30\lambda_t; \\ v_t^b &= \frac{1000 + 3000\,(1 - \lambda_t)}{200} = 20 - 15\lambda_t; \\ e_t &= \frac{\frac{2000+3000\lambda_t}{100}}{\frac{1000+3000(1-\lambda_t)}{200}} = \frac{4 + 6\lambda_t}{4 - 3\lambda_t}. \end{aligned}$$

As λ_t ranges from 0 to 1, the value of v_t^a ranges from 20 to 50. The value of v_t^b ranges from 5 to 20. The value of e_t ranges from 1 to 10. Since more multinational people who can freely switch between the holding of the two currencies, the range of the exchange rate expands.