Econ 0200   University of Pennsylvania

Second Midterm Solutions

Instructions

1. This quiz is 120 minutes long, from 17:30 to 19:30.

2. This exam is closed note and book.

3. You may use a calculator. The use of cellphone or laptop calculators is not allowed.

4. This quiz has a total of 100 points and eight pages (including this one), please check you are not missing any page.

5. In all the numerical questions, in order to get full credit you must show your work.

6. Please answer each question in the space provided below the question (you can also use the back of each sheet to answer the question). Towards the end of the exam there are two additional blank pages you can use to answer the questions, but please indicate clearly where each question is answered.

7. There is a formulary sheet at the end of the exam. You can detach it and use it to solve the problems. Please do not detach any other sheet from the exam.

Name: _____

My signature certifies that I have complied with the University of Pennsylvania's Code of Academic Integrity in completing this examination.

Please sign here _____ Date _____

Short Answer Questions (5 Points Each)

Answer FIVE out of the following seven questions. If you answer more than five questions I will deduct ten points from your final score.

1. (5 Points) Professor Z claims that all bubbles are a sign of a potential crisis. Is this statement correct? Give an example of a bubble in your answer.

   Professor Z is wrong. A bubble occurs when an asset has market value that is different from its intrinsic value. Yes, bubbles may lead to crisis (like the housing bubble of 2008), but in general they are not a sign of neither good nor bad times. For example, consider paper money, which is a bubble and it is used in both booms and recession times.

2. (5 Points) What are the discount rate, the interest rate on reserves, and the federal funds rate? What is the relationship between these three rates?

   The discount rate is the interest that the FED charges private banks for loans. The interest rate on reserves is the amount paid by the FED to private banks whenever they deposit reserves. The federal funds rate is the interest rate at which private banks loan each other. They are related in the following way:

   $$\text{Interest Rate Reserves } \leq \text{ Federal Funds Rate } \leq \text{ Discount Rate}$$

3. (5 Points) What is the LM curve? Why does it have a positive slope?

   A higher GDP level leads to an increase in the money demand (since there is a need for more liquidity). Since there is a fixed money supply, and demand is increasing, the price of money (the interest rate) has to increase. Hence, higher GDP implies higher interest rate.

4. (5 Points) What is the Taylor rule? Explain two variables that are used in it.

   The Taylor rule is a monetary policy rule that stipulates how much the Central Bank should change the nominal interest rate in response to changes in economic conditions. Two variables used in this rule are, for example, expected inflation and the output gap.

5. (5 Points) Explain what the Crowding Out Effect is. Do a graph as well.

   The crowding out effect occurs when an increase in government deficit leads to a decrease in investment. Higher deficit implies lower public savings, which reduces total savings and hence investment (which in equilibrium is equal to savings). Intuitively, this effect happens because the government is competing with private investors for the same resources.
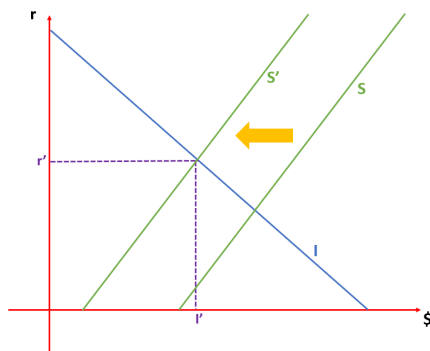
6. (5 Points) What is an expansionary monetary policy? Give two examples of expansionary monetary policies.

   An expansionary monetary policy happens whenever the Central Bank's actions lead to an increase in the money supply. This can be achieved by decreasing the reserve requirement for private banks or by buying bonds in an open market operation.

7. (5 Points) According to the Fiscal Multiplier model, what would be the effect of a tax increase on GDP? Give some intuition in your answer.

An increase in taxes distorts consumption and savings decisions, since it directly affects disposable income. Increasing taxes reduces the fiscal multiplier (you can see that easily in the formula), and hence it reduces GDP. This happens because the government is taking resources from the private sector, which reduces consumption and investment.

Numerical Answer Questions

1. (25 Points) Suppose an economy with the following characteristics: the marginal propensity to consume is 60%, the marginal tax rate is 30% (parameter τ), government spending is 1600, the natural production level is 4000, minimal consumption is 1000 (parameter a), social security benefits are 2000, and $u = 0.3$. With this information answer the following questions, considering the Fiscal Multiplier Model (that means $d = 0$):

   (a) (5 Points) Compute the GDP of this economy, as well as the amount of public savings.

   In this economy the fiscal multiplier is:

   $$\frac{1}{1 - 0.4 - 0.6(1 - 0.3 - 0.3)} = 2.77$$

   And GDP is then $Y = 2.77(1000 + (0.6)2000 + (0.3)(0.6)4000 + 1600) = 12,520.4$. Taxes are then $T = 0.3Y = 3756.12$, Transfers are $Tr = 2000 + 0.3(4000 - Y) = -556.12$, and Public Savings are $S_{Pub} = T - G - Tr = 3756.12 - 1600 + 556.12 = 2712.24$.

   (b) (8 Points) Imagine that Thanos, a candidate for the next election, proposes to increase the social security benefits to 3000. Compute the new GDP and the new amount of public savings.

   Notice that this policy does not change the fiscal multiplier of this economy. Hence the new GDP is $Y = 2.77(1000 + (0.6)3000 + (0.3)(0.6)4000 + 1600) = 14,182.4$. Taxes are then $T = 0.3Y = 4254.7$, Transfers are $Tr = 4000 + 0.3(4000 - Y) = -54.7$, and Public Savings are $S_{Pub} = T - G - Tr = 2709.64$.

   (c) (8 Points) Kang, the other candidate, proposes to cut taxes to $\tau = 25\%$ but to leave social security benefits as they are. Compute the new GDP and the new amount of public savings if Kang were to rule.

   This policy does change the fiscal multiplier, which now becomes

   $$\frac{1}{1 - 0.4 - 0.6(1 - 0.25 - 0.3)} = 3.03$$

   Hence the new GDP is $Y = 3.03(1000 + (0.6)2000 + (0.25)(0.6)4000 + 1600) = 13,695.6$. Taxes are then $T = 0.25Y = 3423.9$, Transfers are $Tr = 2000 + 0.3(4000 - Y) = -908.68$, and Public Savings are $S_{Pub} = 2732.58$.

   (d) (4 Points) If society only cares about not generating a higher debt, which politician should they vote for? Explain your answer.

   Remember that debt increases whenever the deficit increases. The fiscal deficit is equal to the negative of public savings. Hence, society should vote for Kang, since his policy generates the lowest deficit.

2. (25 Points) In Rivendell, banks are required to keep 25% of their deposits as reserves, while elves have a currency to deposit ratio of 50%. Assume that in Rivendell the monetary base is equal to 3000. Finally, let us assume that the price level in Rivendell is $P = 5$. With this information answer the following questions:

(a) (5 Points) Compute the real money supply in Rivendell.

The money supply in Rivendell is given by:

$$M^S = \frac{1 + 0.5}{0.25 + 0.5} 3000 = 6000,$$

and hence the real money supply is $M^S/P = 1200$.

(b) (5 Points) If in Rivendell the real money demand is given by:

$$\frac{M^D}{P} = 1500 - 1200r,$$

where r is the interest rate, compute the equilibrium interest rate in Rivendell.

In equilibrium the real money supply should be equal to the real money demand. Hence $1200 = 1500 - 1200r$, which implies $r = 0.25$.

(c) (5 Points) Suppose that Elrond, ruler of Rivendell, wants to increase the monetary base through an open market operation. What type of operation should Elrond conduct? What will happen to the interest rate in Rivendell in the short-run (meaning if P is constant)? Make a graph.

Elrond should buy bonds in an open market operation. This will increase the monetary base, which will leads to an increase in the money supply and a decrease in the interest rate. This is shown in the graph below.
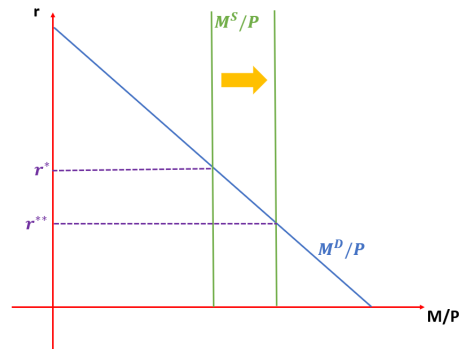

(d) (10 Points) Compute the new equilibrium interest rate in Rivendell if banks were now required to keep 50% of their deposits as reserves. Compare this new equilibrium with the one from part (b). Make a graph.

Now, the money supply is given by:

$$M^S = \frac{1 + 0.5}{0.5 + 0.5} 3000 = 4500,$$

and hence the real money supply is $M^S/P = 900$. The new equilibrium is then $900 = 1500 - 1200r$, which implies $r = 0.5$. This is shown in the graph below.
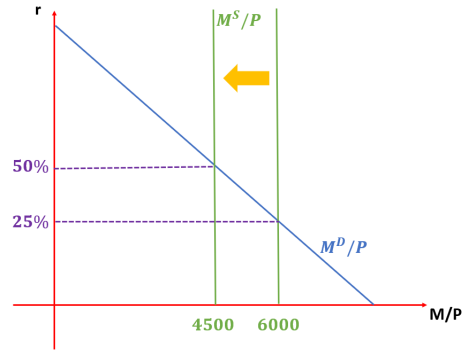
3. (25 Points) In Hill Valey, the marginal propensity to save is 50%, the marginal tax rate is $\tau = 50\%$, and $u = 0$. Minimal consumption (parameter a) is equal to 100, social security transfers are equal to 200, government expenditures are 100, and $d = 1000$. On the other hand, the real money supply is equal to 3000 while the real money demand is given by:

$$\frac{M^D}{P} = 6Y - 18000r.$$

The price level in Hill Valley is $P = 10$. With this information answer the following questions:

(a) (8 Points) Compute the IS and LM curves for Hill Valley.

For the money market to be in equilibrium, the real money demand should be equal to the real money supply. Hence $3000 = 6Y - 18000r$. Solving for Y we get that $Y = 3000r + 500$. This is the LM curve.

For the goods and services market to be in equilibrium, it must be the case that:

$$Y = \frac{1}{1 - 0.5 - 0.5(1 - 0.5)}(300 - 1000r) = 1200 - 4000r.$$

This is the IS curve.

(b) (7 Points) Compute the equilibrium interest rate and the equilibrium GDP in Hill Valley. What is the amount of taxes paid by the citizens of Hill Valley?

The equilibrium is characterized by the intersection between the IS and LM curves. In this case this happens when $Y = 800, r = 10\%$. Taxes are then $T = 0.5Y = 400$.

(c) (5 Points) Suppose that Hill Valley's government wants to increase GDP by 200 by changing G. **Using the LM curve**, compute the new equilibrium interest rate if GDP were to increase by 200. Make a graph.

This expansionary fiscal policy will shift the IS curve to the right, and will not shift the LM curve. In this new equilibrium, GDP has to be equal to $Y = 1000$. According to the LM curve, this happens if $1000 = 3000r + 500$, which implies $r = 16\%$. The graph is shown below.

(d) (5 Points) Now, **using the IS curve**, compute the value of G such that in the new equilibrium GDP increases by 200.

Now, lets call G' the new value of government expenditures. The new IS curve is then:

$$Y = 4(200 + G' - 1000(0.16)),$$

and we know that $Y = 1000$. This implies that $G' = 210$. So, government expenditures must increase from 100 to 210, in order to guarantee that GDP will change from 800 to 1000.