

Economics 102  
Summer 2016  
Answers to Homework #5  
Due 7/13/16

**Directions:** The homework will be collected in a box **before** the lecture. Please place your name on top of the homework (legibly). Make sure you write your name as it appears on your ID so that you can receive the correct grade. Late homework will not be accepted so make plans ahead of time. **Please show your work.** Good luck!

**Please realize that you are essentially creating “your brand” when you submit this homework. Do you want your homework to convey that you are competent, careful, and professional? Or, do you want to convey the image that you are careless, sloppy, and less than professional. For the rest of your life you will be creating your brand: please think about what you are saying about yourself when you do any work for someone else!**

1. Use the Keynesian Model to answer this set of questions. Suppose that in the economy we are analyzing that the consumption function is given as  $C = 100 + .5(Y - T)$  and that taxes are autonomous and equal to \$40 million. For this problem assume that the aggregate price level is constant and does not change with the implementation of activist policy.

a. Draw a graph of the consumption function measuring consumption spending on the vertical axis and GDP, or  $Y$ , on the horizontal axis. In your graph make sure you identify the values of any intercepts and indicate on the graph the level of consumption for  $Y$  levels of \$100 million, \$200 million, \$300 million, and \$400 million.

Suppose you know that in this economy government spending is constant (autonomous) and equal to \$40 million, investment spending is constant (autonomous) and equal to \$10 million, and net exports are constant (autonomous) and equal to \$5 million. In this economy assume that there is no inflation and therefore the aggregate price level is constant.

b. Given this information, is this country operating with a trade deficit or a trade surplus? What is the value of capital inflows for this country? Explain your answer.

c. Given this information, describe the government budget balance for this economy.

d. Given this information determine the economy's equilibrium level of output. Show how you found this equilibrium level of output.

e. At this equilibrium level of output what is the value of private savings? Show how you computed this value.

f. At this equilibrium level of output what is the value of national savings? Show how you computed this value.

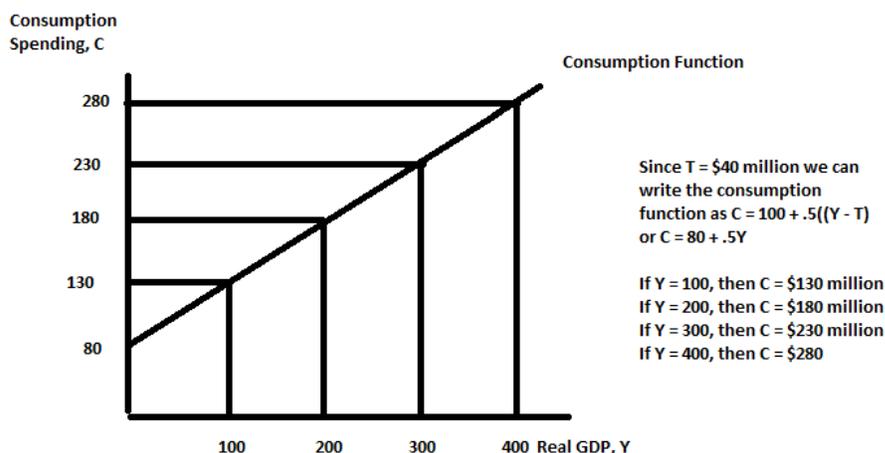
g. Does the sum of private savings, government savings, and capital inflows equal the value of investment when this economy is in equilibrium? Show your work and explain your answer. (Hint: if this is not true, then you have made an error and you need to go back and correct your work!)

h. Suppose that you know that the full employment level of output for this economy is  $Y_{fe} = \$300$  million. The leader of this country asks you to come up with three fiscal policy proposals

(a spending policy, a taxing policy, and a balanced budget policy) for restoring this economy to full employment. Prepare the report outlining the three fiscal policies that could be pursued. Show the mathematical analytics behind each of these policies.

Answer:

a.



b. This country is operating with a trade surplus since net exports are positive: this tells us that the country is exporting a high dollar value of goods and services than it is importing. When a country operates with a trade surplus, then it has negative capital inflows: this country is lending funds to other countries. We do not know the value of this country's exports or its imports, but we do know that the difference is that exports exceed imports by \$5 million.

c. This country currently has a balanced budget since its government expenditures of \$40 million are equal to its tax revenue of \$40 million.

d. In equilibrium we know that production,  $Y$ , equals aggregate expenditure,  $AE$ . We can write  $AE$  as  $AE = C + I + G + (X - M)$ . Thus, in equilibrium

$$Y = AE$$

$$Y_e = C + I + G + (X - M)$$

$$Y_e = 80 + .5(Y_e) + I + G + (X - M)$$

$$Y_e = 80 + .5(Y_e) + 10 + 40 + (5)$$

$$.5Y_e = 80 + 55$$

$$.5Y_e = 135$$

$$Y_e = 270 = \$270 \text{ million}$$

e. We can write a general formula for private savings as:

$$Sp = -a + (1 - b)(Y - T)$$

Referring to the consumption function written with respect to disposable income we have:

$$C = 100 + .5(Y - T)$$

From this equation we can find the value of "a" as 100 and the value of "b" as .5. So,

$$Sp = (-100) + (1 - .5)(Y - T)$$

We know that  $T = \$40$  million. So,

$$Sp = (-100) + .5Y - 20$$

$$Sp = .5Y - 120$$

Since  $Y_e = \$270$  million we can compute  $Sp$  when this economy is in equilibrium as:

$$Sp = .5(270) - 120 = 135 - 120 = 15$$

f. National Savings = NS = Sp + Sg = 15 + Sg

Sg = T - G = 40 - 40 = 0

NS = 15 + 0 = 15

Since the government is operating with a balanced budget Sg is equal to 0.

g. Sources of Savings = Sp + Sg + KI = 15 + 0 + -5 = 10 = \$10 million

Uses of Savings = Investment Spending = \$10 million

Yes, when this economy is in equilibrium the sources of savings (Sp, Sg, and KI) do equal the uses of savings (I).

h. For all three policies we basically need to have Y increase from \$270 million to \$300 million or an increase of \$30 million (Change in Y = \$30 million). The three fiscal policies we can consider are: 1) get to full employment by changing the level of government spending; 2) get to full employment by changing the level of autonomous taxes; and 3) get to full employment by changing the level of government spending and the level of autonomous taxes by equivalent amounts so that the fiscal policy does not alter the zero budget balance.

Policy 1) Reaching full employment by changing the level of government spending:

(Change in output) =  $(1/(1 - MPC))(\text{Change in government spending})$

$30 = (1/.5)(\text{Change in government spending})$

Change in government spending = \$15 million

So, increase government spending from \$40 million to \$55 million and you can get this economy back to full employment.

Policy 2) Reaching full employment by changing the level of autonomous taxes:

(Change in output) =  $(-MPC/(1 - MPC))(\text{Change in autonomous taxes})$

$30 = (-.5/.5)(\text{Change in autonomous taxes})$

Change in autonomous taxes =  $(-.5/.5)(30) = -30 = -\$30$  million

So, decrease autonomous taxes from \$40 million to \$10 million and you can get this economy back to full employment.

Policy 3) Reaching full employment by using a balanced budget amendment policy: this is a policy that requires that any change in government spending be offset by an equivalent change in taxes. So, for example, if government spending decreases by \$5 million, then autonomous taxes would also need to decrease by \$5 million. So, in this example:

(Change in output) =  $(1/(1 - MPC))(\text{Change in government spending}) + (-MPC/(1 - MPC))(\text{Change in autonomous taxes})$

$30 = 2(\text{Change in government spending}) + (-1)(\text{Change in autonomous taxes})$

But, (change in government spending = (change in autonomous taxes) given the balanced budget approach we are proposing. Thus,

$30 = (\text{Change in government spending})$

So, to reach full employment with this approach we would need to have government spending increase by \$30 million from \$40 million to \$70 million and we would also need to have autonomous taxes increase by \$30 million from \$40 million to \$70 million. Same balanced budget as before, but with a lot more government provided services and a lot higher taxes. Notice we could have gotten the same impact with a much smaller increase in government spending.

2. Suppose you are using a Keynesian Model to analyze an economy and you are given the following information:

Autonomous Taxes = T = \$80 million

Government spending =  $G = \$100$  million  
 Net Exports =  $(X - M) = \$40$  million  
 Autonomous Investment =  $I = \$60$  million  
 Aggregate Price Level is fixed and constant: there is no inflation in this

economy

You are also given the following table:

Y or Real GDP	C or Consumption Spending
\$0 million	\$-44 million
\$100 million	
\$200 million	
\$400 million	\$276 million

a. Given the above information, find the consumption function expressed as a function of disposable income for this economy. Show your work.

b. Given the above information calculate the equilibrium level of real GDP for this economy. Show your work.

Suppose consumer confidence in this economy increases so that the level of autonomous consumption spending is now \$40 million higher than it was initially.

c. Given this change in consumer confidence, what is the change in real GDP in this economy? Show your work.

d. What is the size of the multiplier for changes in autonomous consumption spending given your work in (c)? Explain your answer.

e. Suppose that  $Y_f$  for this economy is equal to \$900 million but that the economy is still experiencing the increase in consumer confidence. Suppose the government wants to restore this economy's production to  $Y_f$  using government spending. How much government spending will there need to be for this economy to be at  $Y_f$ ? Assume everything else stays constant except for the increase in autonomous consumption due to the change in consumer confidence. Show your work and then provide a proof that your answer will get this economy back to  $Y_f$ .

**Answer:**

a. In general we can write the consumption function expressed as a function of disposable income as  $C = a + b(Y - T)$  where "a" is autonomous consumption and "b" is the marginal propensity to consume. From the table we have two values of (Y, C): (0, -44) and (400, 276). We can use these two coordinate points and the value for autonomous taxes to calculate two points (Y - T, C): (-80, -44) and (320, 276). Use these two points to calculate the change in (Y - T) as 400 and the change in consumption as 320 and then use these values to find the value of the MPC:  $b = MPC = (\text{change in consumption spending})/(\text{change in disposable income}) = 320/400 = .8$ . This allows us to write out consumption function as with respect to real GDP as  $C = a + .8(Y - T)$ . But, we need to find the value for "a". So, substitute one of our known points into this equation:

$$-44 = a + .8(0 - T)$$

We also know that  $T = 80$ , so:

$$-44 = a + .8(0 - 80)$$

$$a = 20$$

The consumption function with respect to real GDP is  $C = 20 + .8(Y - T)$ .

To write the consumption function with respect to disposable income we need to replace T in the above equation with 80. Thus,

$$C = 20 + .8(Y - 80)$$

$$C = 20 + .8Y - 64$$

$$C = .8Y - 44$$

b. In equilibrium, aggregate expenditure is equal to production. Thus,

$$AE = C + I + G + (X - M) \text{ and in equilibrium,}$$

$$Y_e = AE$$

$$Y_e = C + I + G + (X - M)$$

From our answer in (a) we have the consumption function and the provided information gives us values for T, I, G, and (X - M): thus,

$$Y_e = .8Y_e - 44 + 60 + 100 + 40$$

$$.2Y_e = 156$$

$$Y_e = 780$$

$$Y_e = \$780 \text{ million}$$

c. The increase in consumer confidence will change the consumption function to  $C' = 60 + .8(Y - T)$  or  $C' = .8Y - 4$ . So, we go back to compute the new level of real GDP and then the change in real GDP. We should anticipate that real GDP is going to be larger since consumers have more confidence in the economy and are therefore spending more. So, here's the calculation:

$$Y_e' = C' + I + G + (X - M)$$

$$Y_e' = 60 + .8(Y_e' - T) + 60 + 100 + 40$$

$$.2Y_e' = 60 - 64 + 200$$

$$.2Y_e' = 196$$

$$Y_e' = \$980 \text{ million}$$

$$\text{Change in real GDP} = Y_e' - Y_e = 980 - 780 = \$200 \text{ million}$$

d. The multiplier =  $(\text{Change in real GDP}) / (\text{Change in autonomous spending}) = 200 / 40 = 5$ . When autonomous consumption increases by \$40 million we see that real GDP increases by \$200 million, or there is a multiplier effect of 5 times the change in autonomous consumption spending.

e. In equilibrium  $AE = Y_e$ . So,

$Y_e'' = C' + I + G' + (X - M)$  where  $C'$  is the consumption function that includes the decrease in consumer confidence and  $G'$  is the new level of government spending implemented to get this economy back to full employment.  $Y_e'' = \$900$  million (this number was given to us).

Thus,

$$Y_e'' = 60 + .8(Y_e'' - T) + I + G' + (X - M)$$

$$900 = 60 + .8(900 - 80) + 60 + G' + 40$$

$$900 = 60 + 656 + G' + 100$$

$$G' = 84 \text{ and the change in government spending} = G' - G = 84 - 100 = -\$16 \text{ million}$$

Government spending needs to decrease by \$16 million so that it is at \$84 million.

Let's check to see if this actually works: so replace G with \$84 million and solve for  $Y_e$ . If this works,  $Y_e$  should be equal to  $Y_e = Y_e'' = \$900$  million. So,

$$Y_e = C' + I + G' + (X - M)$$

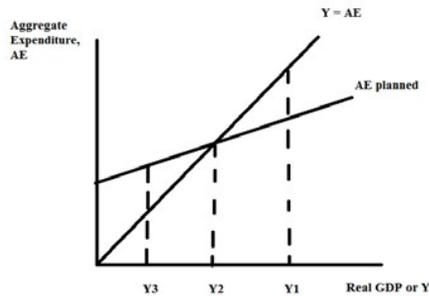
$$Y_e = 60 + .8(Y_e - T) + 60 + 84 + 40$$

$$.2Y_e = 60 - 64 + 184$$

$$.2Y_e = 180$$

$$Y_e = 900 = \$900 \text{ million!} = Y_f$$

3. Use the Keynesian cross diagram depicted below to answer this question.



a. You are told that in this economy inventories are decreasing. What level of real GDP in the provided graph is consistent with this information?

b. You are told that in this economy unplanned inventories are not changing from their planned levels. What level of real GDP in the provided graph is consistent with this information?

c. You are told that the level of planned expenditure in this economy is greater than the level of production in this economy. What level of real GDP in the provided graph is consistent with this information?

d. You are told that the level of production in this economy is lower than the level of planned expenditure in this economy. What level of real GDP in the provided graph is consistent with this information?

e. Suppose that this economy is initially in equilibrium in the above graph. You are told that the government has passed a bill to decrease its level of spending in the economy. Holding everything else constant and given the planned AE line in the above graph, what level of real GDP in the provided graph is the best illustration of the outcome of this new government spending policy?

f. Suppose that this economy is initially in equilibrium in the above graph. You are told that the government has passed a bill to increase its level of taxation in the economy. Holding everything else constant and given the planned AE line in the above graph, what level of real GDP in the provided graph is the best illustration of the outcome of this new government spending policy?

**Answer:**

a. Y3 since at Y3,  $AE > \text{Production}$  and this means that there will be decreases in unplanned inventories.

b. Y2 since at Y2,  $AE = \text{Production}$  and this means that there will no change in unplanned inventories.

c. Y3 since at Y3,  $AE > \text{Production}$ .

d. Y3 since at Y3,  $AE > \text{Production}$ .

e. If government spending decreases this will cause the Planned AE line to shift down and this will lead to a lower level of equilibrium real GDP: a level like Y3.

f. If taxes increase this will cause the Planned AE line to shift down and this will lead to a lower level of equilibrium real GDP: a level like Y3.

4. Use the AD/AS Model for this question. Assume that the AD/AS Model for the economy is initially in long-run equilibrium and then analyze the short-run and long-run adjustments for each of the given scenarios. Illustrate each answer with a graph.

a. Suppose the petroleum exporting countries form a cartel that initially leads to a major increase in the price of petroleum. But, over time this cartel breaks down due to the members producing more petroleum than the cartel agreement amount. What is the short-run impact on real GDP and the aggregate price level given this breakdown in the cartel agreement? What is the long-run impact on real GDP and the aggregate price level? Provide a graph to illustrate your answer.

b. The country decides to invest in a major upgrade of transportation and communication infrastructure and this decision results in a significant increase in government spending to finance the extra expenditures on this transportation and communication systems upgrade. What is the short-run impact on real GDP and the aggregate price level? What is the long-run impact on real GDP and the aggregate price level? Provide a graph to illustrate your answer.

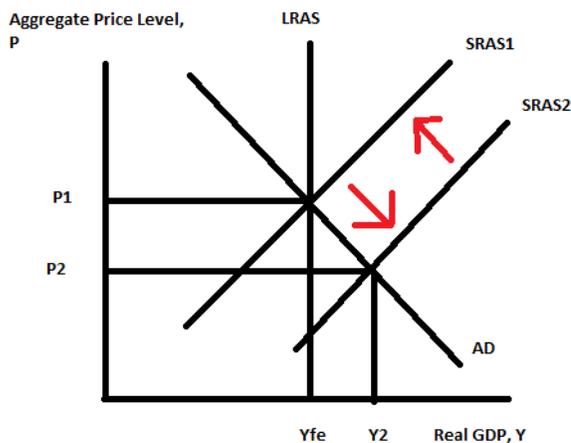
c. The petroleum exporting countries form a cartel that leads to a major increase in the price of petroleum. What is the short-run impact on real GDP and the aggregate price level? What is the long-run impact on real GDP and the aggregate price level? Provide a graph to illustrate your answer.

d. The petroleum exporting countries form a cartel that leads to a major increase in the price of petroleum. At the same time, government officials worried about the recessionary impact of these higher petroleum prices have adopted a policy of increasing government demand in an amount to always offset any reduction in production due to higher petroleum prices. What is the short-run impact on real GDP and the aggregate price level? What is the long-run impact on real GDP and the aggregate price level? Provide a graph to illustrate your answer.

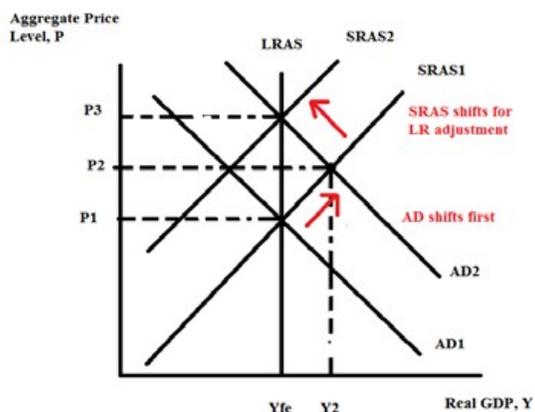
e. Suppose consumer confidence decreases. What is the short-run impact on real GDP and the aggregate price level? What is the long-run impact on real GDP and the aggregate price level? Provide a graph to illustrate your answer.

**Answer:**

a. In the short-run the SRAS curve will shift to the right with the fall in petroleum prices. This will lead to a lower aggregate price level and a higher level of real GDP (real GDP will be greater than  $Y_{fe}$ ): the economy will experience an economic boom. In the long run if there is no government intervention in the form of fiscal or monetary policy we can expect that nominal wages will rise due to a tight labor market. This will result in the SRAS curve shifting back to the left and restoring this economy to its initial level of real GDP (real GDP at  $Y_{fe}$ ) and its initial aggregate price level.

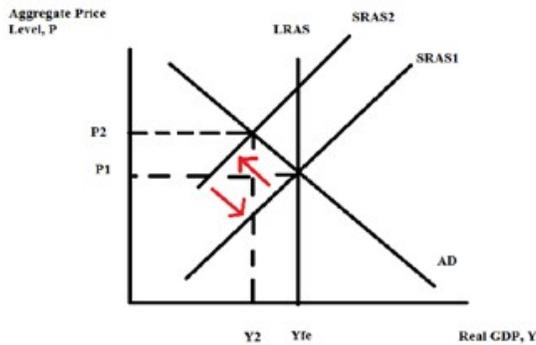


b. In the short-run the AD curve will shift to the right and there will be a movement along the short-run AS curve: real GDP will increase beyond  $Y_{fe}$  to  $Y2$  and the aggregate price level will rise from  $P1$  to  $P2$ . In the long-run the short-run AS curve will shift to the left due to higher wages (since  $Y2$  is greater than  $Y_{fe}$  this implies that we are producing at a level of production that results in an unemployment level below the natural rate of unemployment) and this will return the economy to  $Y_{fe}$  and an even higher aggregate price level,  $P3$ . The graph below illustrates these ideas.

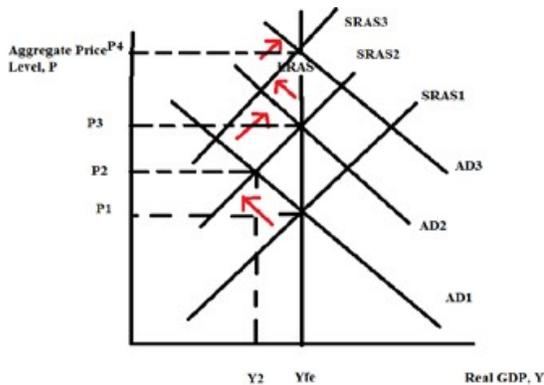


c. In the short-run the short-run AS curve will shift to the left and there will be a movement along the AD curve: real GDP will decrease from  $Y_{fe}$  to  $Y2$  and the aggregate price level will rise from  $P1$  to  $P2$ . In the long-run the short-run AS curve will shift to the right as workers

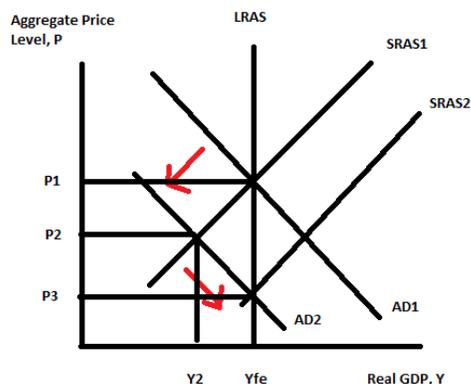
accept lower wages (since  $Y_2$  is less than  $Y_{fe}$  the economy is in a recession and that means the number of unemployed have increased) and this will return the economy to  $Y_{fe}$  and the original price level,  $P_1$ . The graph below illustrates these ideas.



d. In the short-run the short-run AS curve will shift to the left and this will cause a movement along the AD curve moving the economy toward a lower level of production than  $Y_{fe}$ . The government will respond to this movement toward recession by increasing government spending and this will shift the AD curve to the right: it is likely that output in this economy will stay approximately at  $Y_{fe}$ , but that the aggregate price level will rise initially to  $P_3$ , and then as the cartel continues to push to increase petroleum prices and the government responds to the recessionary impact by increasing government spending, the price level should continue to rise. An inflationary spiral! Here's the graph....



e. In the short-run the AD curve will shift to the left and there will be a movement along the short-run AS curve: real GDP will decrease from  $Y_{fe}$  to  $Y_2$  and the aggregate price level will fall from  $P_1$  to  $P_2$ . In the long-run the short-run AS curve will shift to the right due to lower prices and wages (since  $Y_2$  is less than  $Y_{fe}$ ) and this will return the economy to  $Y_{fe}$  and an even lower aggregate price level,  $P_3$ . The graph below illustrates these ideas.



5. This is a complicated problem using your knowledge of the AD/AS Model as well as your knowledge of the Keynesian Model. Suppose you are given the following information about an economy:

$$C = 200 + .75(Y - T) - 10P$$

$$T = \$60 \text{ million}$$

$$G = \$70 \text{ million}$$

$$I = \$20 \text{ million}$$

$$(X - M) = -\$20 \text{ million}$$

The full employment unemployment rate is 5% and you are told that for every \$100 million that real GDP is less than full employment real GDP that the unemployment rate increases by 1%.

$$Y_{fe} = \text{real GDP at full employment} = 1000$$

$$\text{AD equation: } AD = Y = C + I + G + (X - M)$$

$$\text{SRAS equation: } SRAS = Y = 50P$$

$$\text{LRAS equation: } LRAS = Y_{fe} = 1000$$

P is the aggregate price level

Let's start by analyzing the data you have been given. Answer the following questions based on this initially data that you have.

- What is the level of government saving,  $S_g$ , for this economy? Is this economy currently operating with a balanced budget, a budget deficit, or a budget surplus? Explain your answer.
- What is the level of capital inflow,  $KI$ , into this economy? Is this economy currently operating with a trade balance, a trade deficit, or a trade surplus? Explain your answer.
- Make a prediction of what the value of private savings,  $S_p$ , is for this economy if it is operating at its short-run equilibrium. Show your work. [Warning: this is going to take some thinking and some pulling together of material you learnt about the loanable funds market as well as the Keynesian Model: but, you can do this!] DO NOT CALCULATE  $Y_e$  IN ORDER TO THEN CALCULATE  $S_p$ ....FIND AN ALTERNATIVE WAY TO FIND  $S_p$ !
- Given the above information, find the equation for the AD curve for this economy. Write this equation in x-intercept form (where Y or real GDP is measured on the horizontal axis and P, the aggregate price level, is measured on the vertical axis). Show your work in its entirety here.

e. Given your equation for AD (see (d)), and the short-run AS equation you were given, find the short-run equilibrium level of real GDP,  $Y_e$ , for this economy. Then, find the aggregate price level for this economy. Finally, draw a graph depicting this economy's short-run equilibrium as well as the AD curve, the SRAS curve, the LRAS curve, and  $Y_e$ . Measure the aggregate price level,  $P$ , on the vertical axis and real GDP,  $Y$ , on the horizontal axis. Make sure your graph is completely and carefully labeled.

f. Given your answer in (e), what is the actual unemployment rate in this economy in the short-run? Is this unemployment rate greater than or less than the full employment rate of unemployment? What kind of unemployment does this economy exhibit in the short-run?

g. Given your answer in (e), calculate the value of  $C$  in the short-run. Then calculate the value of  $S_p$  in the short-run and verify that your answer is the same as the one you gave in (c).

h. Suppose that the political leader in this economy wishes to return this economy to  $Y_e$  through government spending policy. First, will government spending need to be increased or decreased given the current economic situation? Then, calculate what the value of government spending will need to be in order to get this economy back to full employment. **WARNING: THE MULTIPLIER WILL NOT WORK HERE BECAUSE THE AGGREGATE PRICE LEVEL IS NOT CONSTANT!** Show your work and then prove that your answer will do the trick! [Hint: this is a multi-step calculation: so provide the step-by-step analysis you are using.] Assume that the SRAS and LRAS curves are not changing and that the slope of the new AD curve after the implementation of the fiscal policy is the same as the initial AD curve's slope.

i. Given your answer in (h), what happens to the level of government saving,  $S_g$ ? What was the rate of inflation? Explain your answers.

**Answer:**

a.  $S_g = T - G = 60 - 70 = -10$

The government is currently operating with a budget deficit since its level of government spending,  $G$ , is greater than its level of taxes,  $T$ .

b.  $KI = -(X - M) = M - X = 20$

This economy is currently running a trade deficit and that means that it has capital inflows of \$20 million or that its  $KI$  are \$20 million.

c. For this answer, the key provides two approaches:

For the first approach, we know that income earned by households can be spent ( $C$ ), saved ( $S_p$ ), or used to pay taxes ( $T$ ). Thus,  $Y = C + S_p + T$  or  $S_p = Y - C - T$ . But, we don't know  $Y$  at this point, so that is not very helpful. We also know that total savings,  $TS$ , in an economy is equal to the sum of capital inflows ( $KI$ ), private savings ( $S_p$ ), and government savings ( $S_g$ ).

So, we can write:

$$TS = KI + S_p + S_g \text{ or}$$

$$S_p = TS - KI - S_g$$

From our earlier work in (a) and (b) we know  $KI$  and  $S_g$ :

$$S_p = TS - (20) - (-10)$$

$$S_p = TS - 10$$

Now, for the thinking part (or perhaps you think you have already been thinking fairly hard??). Recall that if the loanable funds market is in equilibrium we must have  $I = TS$ . We

know that  $I$  is \$20 million, so we use that piece of data to infer that  $TS = \$20$  million and therefore  $Sp$  is equal to \$10 million when we are in equilibrium.

Here's an alternative approach to getting the answer:

$$S - I = NX$$

$$Sp + Sg - I = NX$$

$$Sp + (T - G) - I = NX$$

$$Sp = NX + I - (T - G)$$

$$Sp = -20 + 20 + 10$$

$$Sp = 10$$

d. Use the basic equation for AD:

$Y = C + I + G + (X - M)$  and then substitute all the data you have been given:

$$Y = 200 + .75(Y - T) - 10P + 20 + 70 - 20$$

$$.25Y = 200 - 45 - 10P + 70$$

$$.25Y = 225 - 10P$$

$$Y = 900 - 40P$$

The equation for AD written in x-intercept form is:  $Y = 900 - 40P$

e. We have the SRAS curve as  $Y = 50P$  and the AD curve as  $Y = 900 - 40P$ . To find the short-run equilibrium  $Y_e$  and  $P_e$  for this economy set these two curves equal to one another.

Thus,

$$50P_e = 900 - 40P_e$$

$$90P_e = 900$$

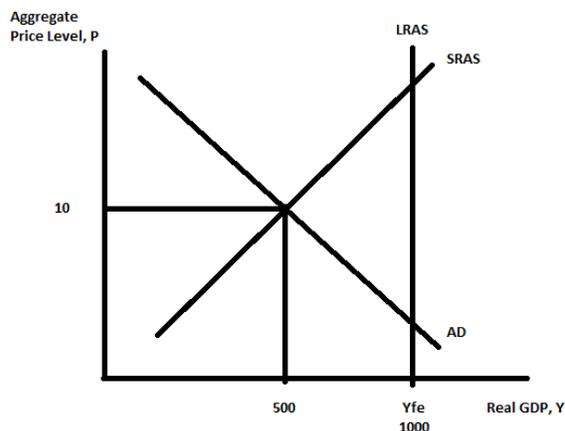
$$P_e = 10$$

Then, to find  $Y_e$  use either the SRAS curve or the AD curve and  $P_e = 10$ :

$$Y_e = 50P_e = 50(10) = \$500 \text{ million}$$

$$\text{Or, } Y_e = 900 - 40P_e = 900 - 40(10) = \$500 \text{ million}$$

Here's the graph:



f. Since this economy is producing at  $Y_e$  less than  $Y_{fe}$  (\$500 million instead of \$1000 million) we know that this economy is in a recession. That tells us that we have not only frictional and structural unemployment (the unemployment that the natural rate of unemployment or the full employment unemployment rate includes) but also cyclical unemployment. The actual unemployment rate will equal the full employment rate of unemployment plus whatever extra unemployment we have because this economy is not operating at full employment. So,  $Y_{fe}$  is \$500 million greater than  $Y_e$ : so for every \$100 million decrease in production we are told that unemployment rises by 1%. So we can see that this \$500 million shortfall in production will result in an unemployment rate of 10%!

g. We know that  $Y_e$  in the short-run is equal to \$500 million. We also know that  $C = 200 + .75(Y - T) - 10P$ . So, let's calculate  $C$  based on  $(Y_e, P_e) = (500, 10)$ . Thus,  $C = 200 + .75(500 - 60) - 10(10)$   
 $C = 430$

Now, to find  $S_p$ : remember that  $Y = C + S_p + T$ . So,  $Y_e = C$  in equilibrium +  $S_p$  in equilibrium +  $T$

$$500 = 430 + S_p + 60$$

$$500 - 490 = S_p$$

$$S_p = \$10 \text{ million}$$

This value of  $S_p$  should be the value you calculated in (c).

h. To get the economy to  $Y_{fe}$  we need more spending and the proposal to get that additional spending is to increase government spending. We will need to get enough additional spending to shift the AD curve to the right so that it intersects both the SRAS and the LRAS curve at their point of intersection.

To get the economy to  $Y_{fe}$  we must be at the point where the LRAS curve and the SRAS curve intersect: this occurs at  $(Y_{fe}, P_e')$ . So, let's start by solving for this point:

$$1000 = 50P_e'$$

$$P_e' = 20$$

So, when the economy produces at  $(Y_{fe}, P_e') = (\$1000 \text{ million}, 20)$  the economy will be at full employment. So, we now need to figure out what the new equation for AD needs to be in order for it to go through this particular point. The new AD equation will contain the point  $(Y_{fe}, P_e') = (1000, 20)$  and be parallel to the initial AD curve. Thus,

New AD curve:  $Y = b - 40P$  and using our known point

$1000 = b - 40(20)$  or  $b$ , the x-intercept of the new AD curve equation is 1800. We can write the new AD equation as  $Y = 1800 - 40P$ . Now, all we need to do is calculate what the new value of government spending needs to be. So, here's the work and the proof afterwards that it works!

$Y_e = C + I + G' + (X - M)$  where  $G'$  is the new level of government spending

$1000 = 200 + .75(1000 - 60) - 10(20) + 20 + G' - 20$  (here I have substituted  $Y_e = 1000$  and  $P_e' = 20$  into the equilibrium equation)

$$1000 = 200 + 705 - 200 + 20 + G' - 20$$

$$1000 = 705 + G'$$

$$G' = 295 = \$295 \text{ million}$$

So, if government spending were \$295 million instead of \$70 million we would be at  $Y_{fe}$ .

Here's the proof that this will work:  $Y = C$

+  $I + G' + (X - M)$  in equilibrium

$$Y_e' = 200 + .75(Y_e' - T) - 10P + 20 + 295 - 20$$

$$.25Y_e' = 155 - 10P + 295$$

$$.25Y_e' = 450 - 10P$$

$Y_e' = 1800 - 40P$ : this is the equation for the new AD curve! Set this

new AD equation equal to SRAS:

$$1800 - 40P_e' = 50P_e'$$

$$90P_e' = 1800$$

$$P_e' = 20$$

Then, use either the new AD equation or the SRAS to solve for  $Y_e'$ :  $Y_e' =$

$$1800 - 40P_e' = 1800 - 40(20) = \$1000 \text{ million} = Y_{fe}$$

$$\text{Or, } Y_e' = 50P_e' = 50(20) = \$1000 \text{ million} = Y_{fe}$$

i.  $S_g' = T - G' = 60 - 295 = -\$235$  million. Yes, this government stimulus did result in a bigger deficit, but it got the economy back to  $Y_{fe}$  and unemployment back to its full employment unemployment rate. Rate of inflation is  $[(\text{Aggregate price level now} - \text{Aggregate price level initially}) / (\text{Aggregate price level initially})] * (100\%) = [(20 - 10) / 10] * (100\%) = 100\%$ . So, this policy got unemployment to decrease but it also created inflation.

6. Suppose that the required reserve ratio is 20% of demand deposits and that the financial system we are analyzing here has no currency drains (that is, all monies are held as demand deposits and no one holds currency) and that banks do not have excess reserves. Answer this set of questions based on this information. Assume that net worth for the banks in the financial system is equal to \$0 (this simplifies our calculations a lot!).

a. If the banking system has \$300 million in demand deposits, what level of reserves did the central bank put into the monetary system in order to support this level of demand deposits? Explain your answer.

b. If the banking system has \$300 million in demand deposits, what is the level of loans in the banking system? Explain your answer and in your answer provide a T-account.

c. Suppose that the central bank decides to buy \$20 million in T-bills from the banks in the financial system. How will this transaction affect the banking system's overall T-account (we are just using one T-account here), what happens to the money supply in this economy, and what happens to the interest rate (predict whether the interest rate increases or decreases given the central bank's policy action). Show all calculations and provide the modified T-account depicting the overall impact of this policy.

d. Suppose that the central bank instead decides to sell \$20 million in T-bills to the banks in the financial system. How will this transaction affect the banking system's overall T-account (we are just using one T-account here), what happens to the money supply in this economy, and what happens to the interest rate (predict whether the interest rate increases or decreases given the central bank's policy action). Show all calculations and provide the modified T-account depicting the overall impact of this policy.

Answers:

a. If the level of demand deposits is \$300 million in the financial system and the required reserve ratio is 20%, then we know the following:

$$\text{Money Supply} = (1/rr)(\text{reserves})$$

$$\$300 \text{ million} = (1/.2)(\text{reserves})$$

\$300 million = 5(reserves)  
 Reserves = \$60 million

b. We can think about this using our T-Account:

Assets of Banking System		Liabilities of Banking System	
Required Reserves	60	Demand Deposits	300
Loans	240		

If the banking system has \$300 million in demand deposits, and holds 20% of this as required reserves (therefore \$60 million) then it can loan out the difference between the demand deposits and required reserves. It can loan out \$240 million.

c. The central bank buys \$20 million in T-bills from the banking system: so we can see that this impacts the money supply as follows:

$$\begin{aligned} \text{(Change in money supply)} &= (1/rr)(\text{Change in reserves}) \\ \text{(Change in money supply)} &= (1/.2)(\$20 \text{ million}) \\ \text{(Change in money supply)} &= (5)(\$20 \text{ million}) \\ \text{(Change in money supply)} &= \$100 \text{ million} \end{aligned}$$

New Money Supply = (Initial Money Supply) + (Change in money supply)  
 New Money Supply = \$300 million + (\$100 million) = \$400 million = new level of demand deposits

Since the money supply has increased from \$300 million to \$400 million we can predict that, holding everything else constant, the interest rate will decrease.  
 Here's the new T-account.

Assets of Banking System		Liabilities of Banking System	
Required Reserves	<del>60</del> 80	Demand Deposits	<del>300</del> 400
Loans and Earning Assets, Including T-Bills	<del>240</del> 320		

d. The central bank sells \$20 million in T-bills to the banking system: so we can see that this impacts the money supply as follows:

$$\begin{aligned} \text{(Change in money supply)} &= (1/rr)(\text{Change in reserves}) \\ \text{(Change in money supply)} &= (1/.2)(-\$20 \text{ million}) \\ \text{(Change in money supply)} &= (5)(-\$20 \text{ million}) \\ \text{(Change in money supply)} &= -\$100 \text{ million} \end{aligned}$$

New Money Supply = (Initial Money Supply) + (Change in money supply)  
 New Money Supply = \$300 million + (- \$100 million) = \$200 million = new level of demand



CALCULATE  $S_p$ ...FIND AN ALTERNATIVE WAY TO FIND  $S_p$ !

e. Given the above information, find the equation for the AD curve for this economy. Write this equation in x-intercept form (where Y or real GDP is measured on the horizontal axis and P, the aggregate price level, is measured on the vertical axis). Show your work in its entirety here.

f. Given your equation for AD (see (e)), and the short-run AS equation you were given, find the short-run equilibrium level of real GDP,  $Y_e$ , for this economy. Then, find the aggregate price level for this economy. Finally, draw a graph depicting this economy's short-run equilibrium as well as the AD curve, the SRAS curve, the LRAS curve, and  $Y_e$ . Measure the aggregate price level, P, on the vertical axis and real GDP, Y, on the horizontal axis. Make sure your graph is completely and carefully labeled.

g. Given your answer in (f): what do you know about the actual level of unemployment relative to the full employment level of unemployment or the natural rate of unemployment. Explain your answer.

h. Given your answer in (f), calculate the value of C in the short-run. Then calculate the value of  $S_p$  in the short-run and verify that your answer is the same as the one you gave in (c).

i. Suppose that the political leader in this economy wishes to return this economy to  $Y_e$  through monetary policy. First, will money supply need to be increased or decreased given the current economic situation? Then, calculate what the value of the change in reserves and thus, the change in the money supply that will be needed in order to get this economy back to full employment. WARNING: THE MULTIPLIER WILL NOT WORK HERE BECAUSE THE AGGREGATE PRICE LEVEL IS NOT CONSTANT! Show your work and then prove that your answer will do the trick! [Hint: this is a multi-step calculation: so provide the step-by-step analysis you are using.] Assume that the SRAS and LRAS curves are not changing and that the new AD curve after the implementation of the new monetary policy is parallel to the initial AD curve.

Answer:

a.  $S_g = T - G = 50 - 70 = -20$

The government is currently operating with a negative budget balance or a government deficit since its level of government spending, G, is greater than its level of taxes, T.

b.  $KI = -(X - M) = -(50) = -50$ . This economy has negative capital inflows and we can see that the economy is operating with a trade surplus since imports are less than exports.

c. The money market will be in equilibrium when the money supply is equal to the money demand. So,  $12,000 - 500r = 10,000$  or

$$2000 = 500r$$

$$r = 4\%$$

Use this equilibrium interest rate from the money market to determine the level of investment spending:

$$I = (10,000/3) - (1000/3)r \text{ or } I =$$

$$(10,000/3) - 1000(4)/3$$

$$I = 6000/3 = 2000$$

d. We know that total saving in an economy is equal to capital inflows plus private savings plus

government savings or

$$TS = \text{total savings} = KI + Sp + Sg$$

We also know that total savings equals investment,  $I$   $TS = I$   
 $= 2000$

So, let's see what this gives us:

$$2000 = -50 + Sp + -20$$

$$Sp = 2070$$

e. The AD equation can be found using the equation:

$Y = C + I + G + (X - M)$  and substituting in the information we have been provided or that we have calculated. Thus,

$$Y = 20 + .8(Y - T) - 2P + 2000 + 70 + 50$$

$$Y = 20 + .8(Y - 50) - 2P + 2120$$

$$.2Y = 2140 - 40 - 2P$$

$$.2Y = 2100 - 2P$$

$$Y = 10,500 - 10P: \text{ This is the equation for AD.}$$

f. To find the equilibrium level of real GDP and the equilibrium aggregate price level use the AD equation you found in (e) and the SRAS equation you were given. Thus,

$$Y = 10,500 - 10P \text{ and } Y = 20P$$

In equilibrium,  $AD = SRAS$ , so

$$10,500 - 10P = 20P$$

$$30P = 10,500$$

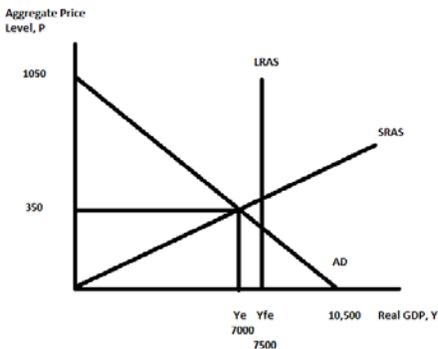
$$P = 350$$

Then, use this aggregate price level to calculate the equilibrium level of real GDP: you can use either the AD equation or the SRAS equation:

$$Ye = 10,500 - 10P = 10,500 - 10(350) = 7,000 \text{ Or,}$$

$$Ye = 20P = 20(350) = 7000$$

Here's the graph:



g. This economy is in an economic contraction and its current level of output is less than its full employment level of output. This implies that the actual unemployment rate is higher than the natural unemployment rate: we would anticipate that this is not sustainable for long!

h. To find the short-run value of  $C$  use the consumption function,  $Ye$  and  $Pe$ :  $C =$

$$20 + .8(Y - T) - 2P$$

$$C = 20 + .8(7000 - 50) - 2(350)$$

$$C = 20 + 5560 - 700$$

$$C = 5580 - 700$$

$$C = 4880$$

Then, to find  $S_p$ , use the equation  $Y = C + S_p + T$ . Thus,  $7000 =$

$$4880 + S_p + 50$$

$$7000 = 4930 + S_p$$

$S_p = 2070!$  And this is the answer we got in (d)!

i. So, first we need to visualize what needs to happen. Return to the graph you drew in (f) and note that we need the new AD curve to go through the point of intersection where the LRAS and SRAS curves intersect. So, first figure out the  $(Y, P)$  coordinates of that point of intersection.

$$20P = 7500 \text{ or } P = 375$$

So, the point of intersection for SRAS and LRAS is  $(Y, P) = (7500, 375)$  and we need the AD curve to go through this point. And, we know that the new AD curve will have the same slope as the initial one: so we can take the initial one and just put in a variable for the x- intercept and use our point to find the new AD curve:

$$\text{Old AD: } Y = 10,500 - 10P \text{ New}$$

$$\text{AD: } Y' = b - 10P'$$

$$7500 = b - 10(375)$$

$$b = 11,250$$

$$\text{New AD: } Y' = 11,250 - 10P'$$

Now, for that monetary policy: monetary policy affects this economy by setting the interest rate which then impacts the level of investment. When investment spending goes up or down we will get a different  $Y_e'$ . So, let's use that thought and solve for what  $I'$  needs to be in order to get this economy to  $Y_e' = 7500$  and  $P_e' = 375$ .

So, we know that the AD curve can be found as  $Y = C + I + G + (X - M)$  but we want the new AD curve ( $Y' = 11,250 - 10P'$ ) that reflects the new level of investment spending,  $I'$ . So,

$$Y' = C + I' + G + (X - M)$$

$$Y' = 20 + .8(Y' - T) - 2P + I' + 70 + 50$$

$$Y' = 140 + .8(Y' - 50) - 2P + I'$$

$$.2Y' = 100 - 2P + I'$$

$$Y' = (5)(100 + I') - 10P$$

We know from our earlier work that  $(5)(100 + I')$  must equal 11,250. So,

$$11,250 = 500 + 5I'$$

$$10,750 = 5I'$$

$$I' = 2150$$

So we need  $I$  to increase from 2000 to 2150: this should intuitively make sense to you. An increase in investment spending will through the multiplier effect cause an increase in  $Y_e$  and since  $Y_e'$  is higher than our initial  $Y_e$  this is what we want.

So, what interest rate will give us  $I' = 2150$ ?

$$I' = (10,000/3) - (1000/3)r$$

$$2150 = (10,000/3) - (1000/3)r$$

$$6450 = 10,000 - 1000r$$

$$1000r = 3550$$

$$r = 3.55\%$$

So, for  $I'$  to equal 2150, we need the interest rate to fall from 4% to 3.55%. This requires an

increase in the money supply, but how big an increase? First, let's return to the money market and plug  $r = 3.55\%$  into the  $M_d$  equation. This will tell us what the amount of money demanded is when the interest rate is 3.55%. So,

$$M_d = 12,000 - 500r$$

$$M_d = 12,000 - 500(3.55) = 12,000 - 1775 = 10,225$$

So, for  $M_d$  to equal  $M_s$  at an interest rate of 3.55%, we need  $M_s'$  to be 10,225 instead of the 10,000 it was initially. Check to verify that this works:

$$M_d = M_s'$$

$$12,000 - 500r = 10,225$$

$$1775 = 500r$$

$$r = 3.55\%$$

So, we need the change in the money supply to be 225 (an increase from 10,000 to 10,225). Recall that the money supply and the required reserve ratio are related to one another via the following formula:

$$(\text{Change in money supply}) = (1/rr)(\text{change in reserves})$$

$$225 = (1/.1)(\text{change in reserves})$$

$$22.5 = \text{change in reserves}$$

So, the central bank (the Fed) needs to buy 22.5 T-bills to increase the reserves in the banking system and this will in turn increase the money supply from 10,000 to 10,225 which will drive the interest rate down to 3.55%.

Let's check that this works:

$$Y' = Y_{fe} \text{ is what we want}$$

$$Y' = C + I' + G + (X - M)$$

$$Y' = 20 + .8(Y' - T) - 2P' + 2150 + 70 + 50$$

$$.2Y' = 20 + .8(-50) - 2P' + 2270$$

$$.2Y' = 2250 - 2P'$$

$$Y' = 11,250 - 10P' \text{ and this is our new AD curve}$$

$$\text{SRAS: } Y' = 20P'$$

$$\text{LRAS: } Y_{fe} = 7500$$

Set SRAS equal to the new AD curve:

$$11,250 - 10P' = 20P'$$

$$30P' = 11,250$$

$$P' = 375 \text{ (the aggregate price level we need!)}$$

$$\text{Then, } Y_{e'} = 11,250 - 10(375) = 7500 = Y_{fe}! \text{ Or,}$$

$$Y_{e'} = 20(375) = 7500 = Y_{fe}!$$

You did it!