Economics 102
Spring 2018
Answers to Homework #5
Due 5/3/2018

Directions: The homework will be collected in a box **before** the lecture. Please place your name, TA name and section number 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. Please remember the section number for the section **you are registered**, because you will need that number when you submit exams and homework. Late homework will not be accepted so make plans ahead of time. **Please show your work**. Good luck!

Please remember to

- Staple your homework before submitting it.
- Do work that is at a professional level: you are creating your "brand" when you submit this homework!
- Do not submit messy, illegible, sloppy work.

1. Consider the country Romanovia. In 2012 this country is a closed economy and that implies that capital inflows (KI) are therefore equal to zero. The loanable funds market is characterized by the following demand function, D_{LF}, where the demand for loanable funds curve includes only investment demand for loanable funds:

Demand for loanable funds: r = 10 - (1/2000)Q

where r is the real interest rate expressed as a percent (e.g., if r = 10 then the interest rate is 10%) and Q is the quantity of loanable funds. The relationship between the supply of private savings (Sp) and the interest rate can be expressed by the equation:

Supply of loanable funds for private savings: r = 2 + (1/2000)Q

In 2012 the government of Romanovia had government expenditures (G) of $8000, transfer payments (TR) of $2000, and collected taxes (T) equal to $14,000.

a) Calculate the value of government savings (Sg). Is the government running a budget deficit or a budget surplus? Show how you got your answer.

Sg = T – TR – G
Thus, Sg = 14,000 – 2,000 – 8,000 = 4,000
Since Sg is a positive number, this tells us that the government is running a budget surplus since the government's tax collections exceeds its expenditures.

b) Derive an equation that expresses this economy's supply of loanable funds curve. Make sure that you include not only private savings but also government savings in this equation. (In this question we want you to model the supply of loanable funds as including both the private savings as well as the government savings.)

Suppose you think of the initial loanable funds curve as the supply of private savings equation that you are given. When the government runs a budget surplus this effectively shifts this supply of loanable funds curve to the right by the amount of the government savings. Thus, the new supply of loanable funds curve that includes not only the private saving but also the government saving will be parallel to the initial supply of loanable funds curve and shifted to the right by 4000. The two curves will have the same slope but a different y-intercept. Thus, r = b + 0.0005Q and we know that when r = 2, Q is now 4000. Use this point to find the value of "b": 2 = b + .005(4000) or b = 0. The supply of loanable funds curve can be written as r = 0.0005Q or r = (1/2000)Q.

c) Given the demand for loanable funds curve you were given and the supply of loanable funds curve you derived in (b) calculate the equilibrium interest rate and the equilibrium quantity of loanable funds in this market. Show your work.

Use r = 10 - .0005Q and r = .0005Q to find the equilibrium. Thus, 10 - .0005Q = .0005Q or Q = 10,000. And, r = 10 – 5 = 5 or 5%.

d) What is the level of private investment (I) in this economy when the loanable funds market is in equilibrium? Is there any crowding out of private investment in this market? Explain your answer.

The level of private investment can be calculated using the demand for loanable funds equation: r = 10 - .0005Q and since r = 5% in equilibrium, we have that private investment is equal to 10,000. There is no crowding out of private investment in this economy because the government is running a budget surplus and is therefore not demanding any loanable funds in this market.

2013 starts with a natural disaster in Romanovia. A flood brings destruction in the southern part of the country. The government decides to take care of the reconstruction needed due to this flood. The government expenditure (G) in 2013 increases to $14000, the level of transfers (TR) is unchanged from 2012 and the level of taxes (T) is equal to $12,000. There is no change in the supply of loanable funds from private savings and there is no change in the demand for loanable funds for private investment.

e) Calculate the value of government savings (Sg) for 2013 in this economy. Is the government running a budget surplus or a budget deficit?

To calculate government savings use the formula Sg = T – TR – G. Thus, Sg = 12,000 – 2,000 – 14,000 = -4000. The negative number tells us that the government's tax collections are less than its expenditures: the government is running a budget deficit.

f) Consider your answer in (e). If you wanted to model the government's budget situation on the supply of loanable funds side of the market would your answer in (e) cause the supply of loanable funds curve to shift to the left or to the right? Explain your answer.

When the government runs a budget deficit and you wish to model this on the supply of loanable funds side of the market, this effectively shifts the supply of loanable funds curve to the left since at every interest rate the government is effectively supplying fewer loanable funds to this market.

g) Consider your answer in (e). If you wanted to model the government's budget situation on the demand for loanable funds side of the market would your answer in (e) cause the demand for loanable funds curve to shift to the left or to the right? Explain your answer.

When the government runs a budget deficit and you wish to model this on the demand for loanable funds side of the market, this effectively shifts the demand for loanable funds curve to the right since at every interest rate the government is effectively demanding more loanable funds in this market.

h) Write an equation expressing the new demand for loanable funds curve in this market assuming that you are modelling both the demand for loanable funds for private investment as well as the demand for loanable funds to finance the government budget deficit.

The new demand for loanable funds curve will have the same slope as the initial demand for loanable funds curve for private investment but will be shifted to the right by 4000. Thus, r = b - .0005Q is the general equation and then we can plug in a point that we know is on the new demand curve. We know that (10,000; 5) was on the original demand for loanable funds curve: that implies that (14,000; 5) will be on the new demand for loanable funds curve. Thus, 5 = b - .0005(14,000) or b = 12. The new loanable funds curve equation can be written as r = 12 - .0005Q.

2. Suppose that you are giving the following information for a certain economy:

Autonomous Taxes = T= $50 million
Government spending = G = $70 million
Exports = $60 million
Imports = $20 million
Autonomous Investment = I = $100 million

Assume that Transfers, TR, are equal to zero in this economy. You are also given the following relationship between household consumption (C) and after-tax income (Y-T):

After-tax income	Household consumption
$100 million	$30 million
$150 million	$70 million
$200 million	$110 million
$250 million	$150 million

Use the Keynesian Model to answer the following set of questions:

a) Find the marginal propensity to consume (MPC) and the autonomous level of consumption in this economy.

In the Keynesian model, household consumption is modelled as:

$$C = \text{autonomous consumption} + MPC * (Y - T)$$

Use the information in the table. When (Y-T) = 100, C = 30. When (Y - T) = 150, C = 70. This tells us that the MPC is equal to:

$$\frac{70-30}{150-100} = \frac{40}{50} = 0.8$$

Plug in (Y - T) = 100, C=30, and MPC=0.8 into the consumption equation, we get

$$30 = \text{autonomous consumption} + 0.8 * 100$$

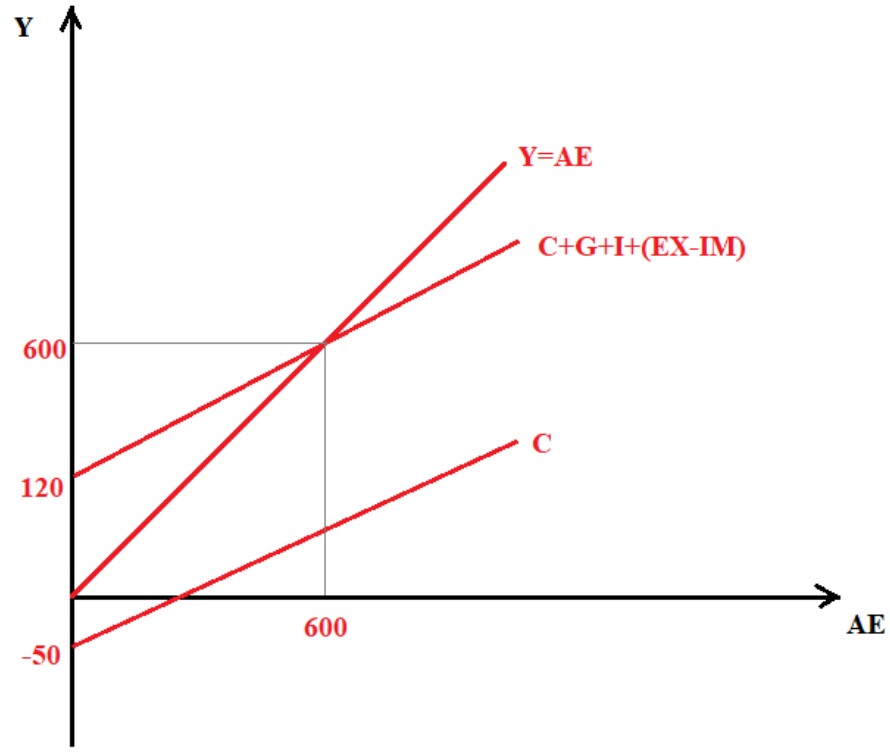
So autonomous consumption is equal to -50.

b) Find the equilibrium level of GDP, Y, in this economy. Provide a graph that illustrates this equilibrium. In your graph measure Aggregate Expenditure, AE, on the vertical axis, and real GDP, or Y, on the horizontal axis.

In the Keynesian model, at the equilibrium GDP or total income (Y) should be equal to aggregate spending (AE). In other words,

$$Y = AE = C + G + I + (EX - IM) = -50 + 0.8 * (Y - 50) + 70 + 100 + (60 - 20)$$

This gives us Y = 120 + 0.8Y, or 0.2Y = 120. Then the equilibrium level of Y is equal to 600 million.



c) Find the equilibrium level of private saving in this economy. Show that the loanable funds market is also in equilibrium.

Private saving is equal to the after-tax income (Y-T) minus the household consumption (C).

At the equilibrium, Y = 600, T = 50, and C = -50 + 0.8*(600-50) = 440. So private saving is equal to 600 – 50 – 440 = 160 million.

The government is currently running a budget deficit, while the economy is running a trade surplus. For the loanable funds market to be at equilibrium, we should have:

Private saving = private investment + government deficit + trade surplus

Plug in the numbers, we have

$$160 = 100 + (70 - 50) + (60 - 20)$$

The equation holds. Therefore, the loanable funds market is indeed at equilibrium when our Keynesian or Aggregate Expenditure Model is in equilibrium.

d) Suppose that the full employment level of output for this economy is 800 million. To boost the GDP to the full employment level, the government decides to increase its spending while holding the tax rate constant. How much should the government spending be increased by?

Plugging in Y = 800 into the Y = AE equation, we get:

$$800 = -50 + 0.8 * (800 - 50) + G' + 100 + (60 - 20) = 690 + G$$

So G' = 800 – 690 = 110 million. Government spending has increased by 40 million from its initial level.

e) Instead of a government spending increase, the government decides to use a tax cut to increase the GDP to the full employment level while holding the level of government spending fixed. What is the size of the tax cut?

Plugging in Y = 800 into the Y = AE equation, we get:

$$800 = -50 + 0.8 * (800 - T') + 70 + 100 + (60 - 20) = 800 - 0.8T'$$

So T' = 0. The tax cut needs to completely eliminate the tax for consumers. Taxes will be decreased by 50 dollars.

f) Due to a trade dispute with foreign countries, both imports and exports for this economy have fallen to zero. The government still wants to restore the GDP to the full employment level of 800 million using a tax cut. Given this information, and holding everything else constant, can the government still reach its goal through this policy?

Plugging in Y = 800 into the Y = AE equation and let EX = IM = 0, we get:

$$800 = -50 + 0.8 * (800 - T) + 70 + 100 = 760 - 0.8T$$

This gives us T = -50 million. In other words, the government needs to collect a *negative* tax from the consumers. In other words, the government needs to pay consumers a subsidy rather than collect positive tax revenue from them.

g) Continue with the scenario in part f). The government now increases its spending to raise the level of GDP to 800 million. However, it simultaneously raises the tax in order to keep it budget deficit at a constant level. How much should the government spending be increased by?

Plugging in Y=800 into the Y=AE equation and let EX = IM = 0, we get:

$$800 = -50 + 0.8 * (800 - T") + G" + 100$$

We also need to keep the government deficit at the constant level of 70 - 50 = 20 million. So T" should be equal to (G" - 20).

$$800 = -50 + 0.8 * \big(800 - (G" - 20)\big) + G" + 100 = 706 + 0.2G"$$

So G" = (800-706)/0.2 = 470 million. Government spending has increased by 470 – 70 = 400 million from its initial level.

3. The balance sheets (sometimes called T-Accounts) of the Central Bank and the private banking system in Prelimania are provided below. In this economy we assume that no one holds currency (i.e., money doesn't leave our circular flow framework) and all purchases are made via debit cards or checks. We also assume that private banks do not hold excess reserves and fully adjust their holdings after a change in monetary policy. Use this information to answer the following questions:

Central Bank

ASSETS		LIABILITIES	
T-BILLS	**$15,000**	**Reserves**	**$15,000**

Private Banking System

ASSETS		LIABILITIES	
RESERVES	**$15,000**	**Demand Deposits**	**$60,000**
T-BILLS	**$32,500**		
LOANS	**$12,500**		

a. Given the above information, what is the required reserve ratio in Prelimania?

Given our assumption that banks do not hold excess reserves, the amount reserves is the required reserves. We know that the Required Reserve Ratio = (required reserves)/(demand deposits) = 15,000/60,000 = 0.25 or 25%.

b. Now, suppose that the Central Bank makes an Open Market Purchase of $5,000 worth of Treasury Bills (also called T-bills) from the banking system. Show how this impacts the t-accounts before the banking system adjusts to the required reserve level.

ASSETS		LIABILITIES	
T-BILLS	**$15,000**	**Reserves**	**$15,000**
	+$5,000		**+$5,000**
	= $20,000		**=$20,000**

ASSETS		LIABILITIES
RESERVES	**$15,000**	**Demand Deposits $60,000**
+$5,000		
=$20,000		
T-BILLS	**$32,500**	
	-$5,000	
	=$27,500	
LOANS	**$12,500**	

c. Immediately after the Open Market Operations in part (b), does the banking system have excess reserves or insufficient reserves?

The require reserve ratio is still 0.25, and demand deposits have not changed, but reserves held have increased therefore the banking system has excess reserves in the amount of $5,000.

d. Starting from the T-account in part (c), show how the banking system adjusts its reserve holdings to eliminate insufficient or excess reserves.

ASSETS		LIABILITIES	
T-BILLS	**$15,000**	**Reserves**	**$15,000**
	+$5,000		
	= $20,000	**+$5,000**	
		=$20,000	

ASSETS		LIABILITIES	
RESERVES	**$15,000**	**Demand Deposits**	**$60,000**
+$5,000		**+$20,000**	
=$20,000		**=$80,000**	

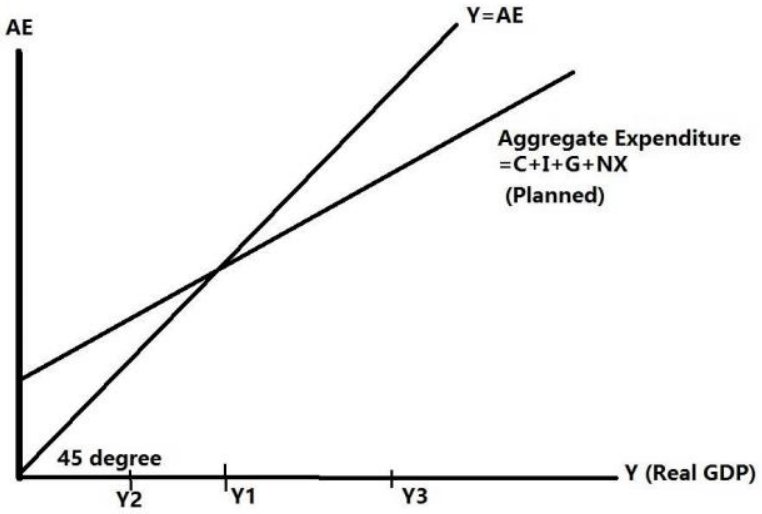
T-BILLS	**$32,500**	
		-$5,000
		=$27,500
LOANS	**$12,500**	
		+$20,000
		=$32,500

e. What will happen to the money supply of the economy after the Open Market Operation described in part (b)? Holding everything else constant, what happens to the equilibrium market interest rate?

The money supply increases from $60,000 to $80,000. The change in the Money Supply = (money multiplier)*(change in reserves) =(1/(required reserve ratio)*(5,000) = (1/0.25)*(5,000) = $20,000.

Holding everything else constant, an increase in the supply of money causes the equilibrium market interest rate to decrease.

4. Use the following graph and the Keynesian Model to answer this question. Assume that the aggregate price level is fixed in this problem.



a. Given the above graph, what is the interpretation of the slope of the planned aggregate expenditure line?

Answer: The slope of the aggregate demand curve is the MPC (marginal propensity to consume).

b. Given the above graph, what is the equilibrium level of output (Y1, Y2 or Y3)?

Answer: The equilibrium of output is Y1.

c. Suppose that the level of aggregate output or production is less than the level of planned aggregate expenditure. Which level of output (Y1, Y2 or Y3) in the above graph best describes this situation? How will inventories adjust for this economy to return back to the equilibrium level of real GDP?

Answer:

Y2 is the best representation among the labelled points for an output where aggregate expenditure is greater than aggregate production. At Y2 the level of output produced is lower than the level of planned aggregate expenditure. When the level of production is below the equilibrium level of output, the change in inventories will be negative telling us that unplanned inventory reductions are occurring in this economy. This unplanned fall in inventories will act as a signal to firms to increase their level of production toward the equilibrium level of real GDP.

d. Suppose you are told that the full employment level of production is equal to Y2. Given this information and the above graph, how would you describe the current state of this economy? In your answer, make sure you describe the current state of unemployment and that you also contrast and compare the unemployment rate at Y1 and Y2.

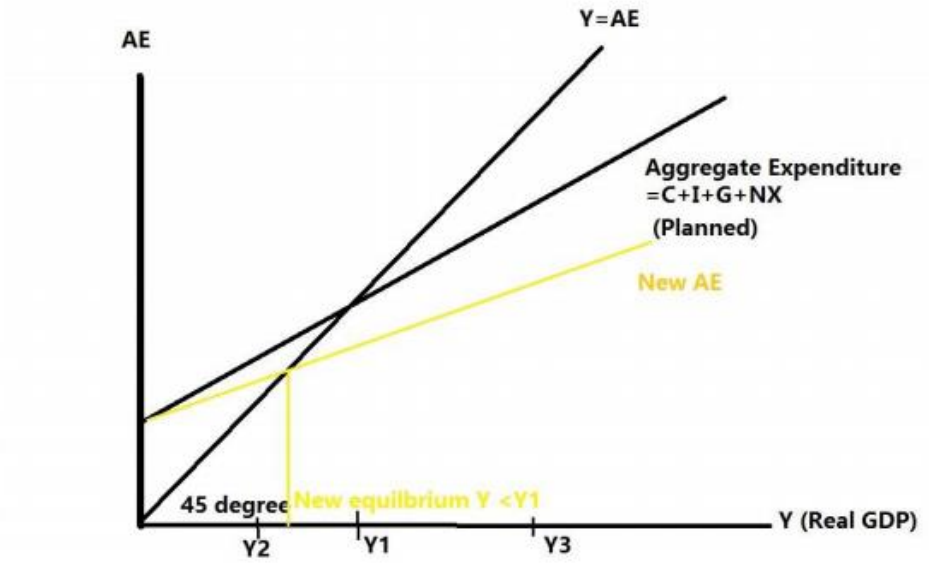
Answer:

When the full employment of output is less than the equilibrium level, then we say the economy is in a boom. The unemployment rate atY1 is smaller than the unemployment rate at Y2. When this economy operates at Y1 where Y1 is greater than Yfull employment (Y2), then we know that this economy's unemployment rate is lower than its natural rate of unemployment.

e. Suppose you know that people in this economy decide to start saving more aggressively for each additional dollar of income that they earn (note: they will still save at a constant rate, but it would be a different constant rate). Would this change in behavior alter the equilibrium level of real GDP you found in (b)? Draw a graph that illustrates the initial situation and then the new situation given this change in saving behavior. Explain in words what you have depicted in your graph.

Answer:

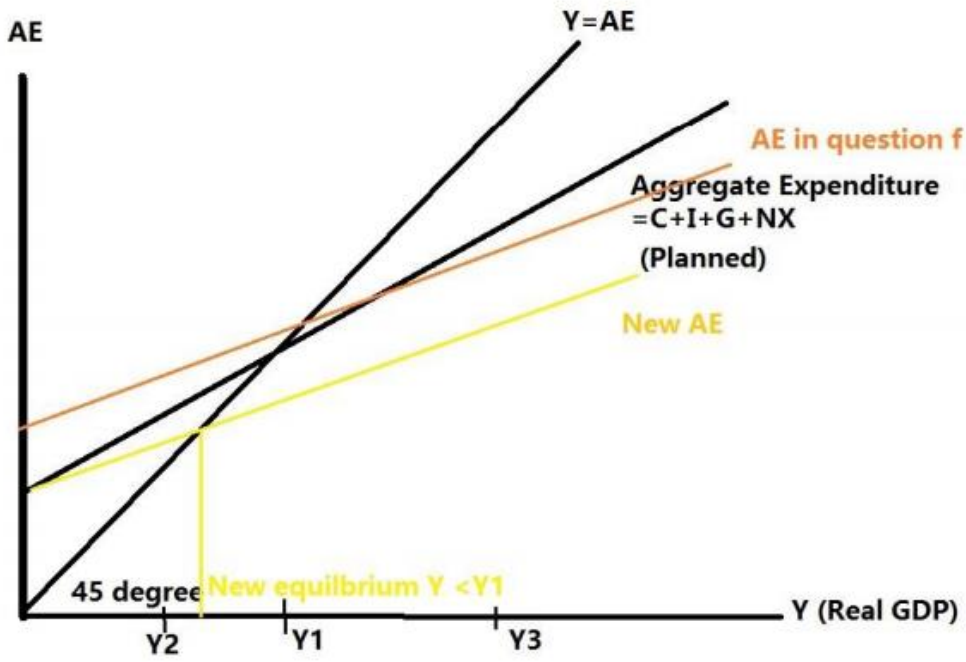
We are told that people are now saving more of each additional dollar of income: this implies that the MPC is decreasing from its initial level and that the MPS is increasing relative to its initial level. The change in the MPC will alter the slope of the AE curve (it will flatten) and the new equilibrium level of real GDP will be less than the initial equilibrium level of Y1.



f. Assume that the changes in (e) are still in effect in this economy. Suppose the government now decides to increase its spending and assume that this does not change the new saving behavior. How does this policy change affect the planned aggregate expenditure and the level of output in equilibrium relative to the equilibrium you found in (b)?

Answer:

We know that the change in saving behavior alters the slope of the planned AE (see yellow line). With the increase in the government spending program this will cause the planned AE line to shift up (the orange line). However, we don't know whether the new equilibrium level of output will be higher or lower than Y1. It depends on how much the new planned AE line shifts up with the change in government spending.



5. Suppose you are given the following information about an economy:

Required reserve ratio is 10%

Money Demand (Md): Md = 30,000 – 500r where r is the interest rate (When the interest rate is 3%, it means r = 3)

Investment Spending (I): I = 700 – 20r

Aggregate Expenditure (AE): AE = C + I + G + (X – IM)

Consumption Spending (C): C = 3600 + 0.2(Y – T) - 100P where P is the aggregate price level

Government Spending (G): G = 450

Net Exports (NX): NX = X – IM = – 350

Autonomous Taxes (T): T = 100

Assume that Transfers (TR) = 0

Aggregate Demand (AD): AD = AE = Y = C + I + G + (X – IM)

Long run Aggregate Supply (LRAS): LRAS = Yfe = 4,000

Short run Aggregate Supply (SRAS): Y = 600P – 1,875

a. Given the above information and that the equilibrium level of Investment Spending (I) is 620, what is the equilibrium interest rate in this economy?

Answer:

When Investment Spending (I) is in equilibrium, the following condition holds from the demand function of Investment Spending (I):
620 = 700 – 20r
r = 4 or 4%

b. If the money market clears (i.e. the supply of money equals the demand of money), what is the level of the money supply in the economy?

Answer:

Given Part (a), the demand of money in equilibrium is given by:
Md = 30,000 – 500(4) = 28,000
Since the money market clears, the supply of money equals the demand of money:
Ms = Md = 28,000

c. Given the above information, find the equation that expresses this economy's Aggregate Demand for goods and services.

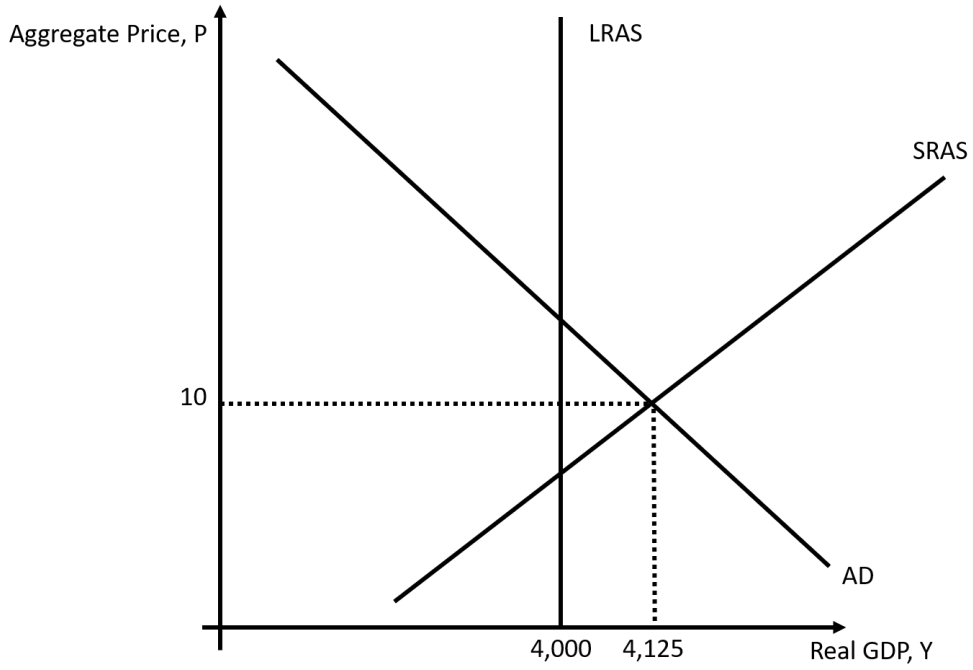
Answer:

We know that AD = AE = Y and AE = C + I + G + NX. Hence,
Y = C + I + G + NX
Y = 3,600 + 0.2(Y – T) – 100P + I + G + NX
Y = 3,600 + 0.2(Y – 100) – 100P + 620 + 450 + (– 350)
Y = 5,375 – 125P
The equation for AD can be written as Y = 5,375 – 125P.

d. In the short run, what is the equilibrium level of real GDP (Y) and the aggregate price level (P)? Show your calculations in finding this value of Y. Draw a graph illustrating this short run equilibrium. In your graph include the LRAS curve as well. In your graph measure the aggregate price level on the vertical axis and real GDP on the horizontal axis.

Answer:

To find the short run equilibrium we will want to see where the AD curve intersects the SRAS curve. Thus,
5,375 – 125P = 600P – 1,875
7,250 = 725P
Pe = 10
Ye = 5,375 – 125P = 5,375 – 125(10) = 4,125



e. What is the equilibrium price (P) and output (Y) level in the long run? Assume that the government does not intervene in this market in order to get to the long run equilibrium. How does the short run equilibrium output calculated in Part (d) compare to the long run equilibrium level? How does the short run unemployment rate compare to the natural rate of unemployment?

Answer:

In the long run, the equilibrium output level is dictated by the full employment output level:
$Y^* = Yfe = 4{,}000$
From Aggregate Demand function, we could calculate the long run equilibrium price level by solving:
$4{,}000 = 5{,}375 - 125P$
$P^* = 11$
The short run equilibrium output level calculated in Part (d) $Ye = 4{,}125$ is greater than the long run (full employment) level $Y^* = 4{,}000$. This is possible because more workers are being employed in the short run equilibrium than in the long run (full employment). Hence the short run unemployment rate is below the natural rate of unemployment.

f. The economy is current at the short run equilibrium. Suppose the government sets the goal to "cool down" the economy and achieve full employment through fiscal policies (changing the level of government spending). To achieve full employment and holding everything else constant, how much should the level of government spending be decreased by? Hint: you will need to first find the aggregate price level for this economy when it returns to full employment through the use of fiscal policy. It is okay to approximate this aggregate price level to two places past the decimal.

Answer:

In order to achieve full employment, the level of short run equilibrium output $Ye = 4,125$ must be reduced to the full employment level of 4,000. Using fiscal policy to reach this goal implies that the government plans to shift the AD curve to the left so that it intersects the SRAS curve at an output level of 4,000. This means that we will need to know what aggregate price level corresponds to the point on the SRAS curve where $Y = 4{,}000$. We can use the short run aggregate supply curve to find this aggregate price level. Thus,

$Y = 600P - 1875$
$4000 = 600P - 1875$
$5875 = 600P$
$P \approx 9.79$

Now, to figure out the level of government spending that will enable the new Aggregate Demand curve to intersect the SRAS at $Y = 4000$ and $P = 9.79$. Here's the work:
$Y = C + I + G + (X - IM)$
$4000 = 3600 + .2(4000 - 100) - 979 + G' + 620 - 350$
$G' = 329$
So government spending needs to decrease from 450 to 329 or a decrease of 121.

You might be tempted to use the multiplier here, but that won't work because the SRAS curve is upward sloping rather than horizontal. We could use the multiplier in the Keynesian model because of the assumption of a fixed price level.