**Economics 102**
**Fall 2017**
**Answers to Homework #5**
**Due 12/12/2017**

**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.
- Show your work to get full credit.

1. The following table gives some information regarding GDP (Y), Consumption (C), and Taxes in the nation of Gondor. Assume that transfers (TR) are equal to zero in this nation.

| | Y | C | T |
|---|---|---|---|
| 2016 | 600 | 350 | 75 |
| 2017 | 700 | 400 | 75 |

a. Given the above information, assuming that autonomous consumption and the marginal propensity to consume are constant, find an equation for consumption as **a function of disposable income** (Disposable Income = $Y_d = Y - T$).

Answer:
The fact that autonomous consumption and MPC are constant tells us that the consumption function is linear; thus, we need only identify two points that lie on the consumption function line to solve for the line.

For 2016, we have $Y_d = 600 - 75 = 525$, and $C = 350$. For 2017, $Y_d = 700 - 75 = 625$, and $C = 400$. Using these two points and standard algebra, we can find the equation for consumption as a function of disposable income: $\mathbf{C_d = 87.5 + (1/2)Y_d}$

b. Now, write the equation for consumption as **a function of total income** (GDP or Y).

Answer:
To write consumption as a function of total income, we must pull out the tax term from $Y_d$ as follows: $C = 87.5 + (1/2)Y_d = 50 + (1/2) \times (Y - 75) = 87.5 - 37.5 + (1/2)Y$

Thus, **C = 50 + (1/2)Y**.

c. Finally write the private savings functions: first, **as a function of disposable income**, and then as **a function of total income**.

Answer:
First, to get private savings as a function of disposable income, we need only switch the sign on autonomous consumption and replace the slope (MPC) with the **MPS = (1 - MPC)**:
**$S_d$ = - 87.5 + (1/2)$Y_d$**.
To get savings as a function of total income, we need to pull out the terms as we did in the previous part: S = - 87.5 + (1/2) × (Y - 75)
Thus, **S = - 125 + (1/2)Y**.

d. Given the information about this economy described in the table below, find the equation for Aggregate Expenditure (that is, AE = C + I + G + NX). What is the equilibrium level of GDP in this economy in 2016? Also, what was the change in inventories in 2016?

| Other Expenditure Levels in 2016 | |
|---|---|
| Investment (I) | $150 |
| Government Spending (G) | $100 |
| Export (X) | $100 |
| Import (IM) | $75 |

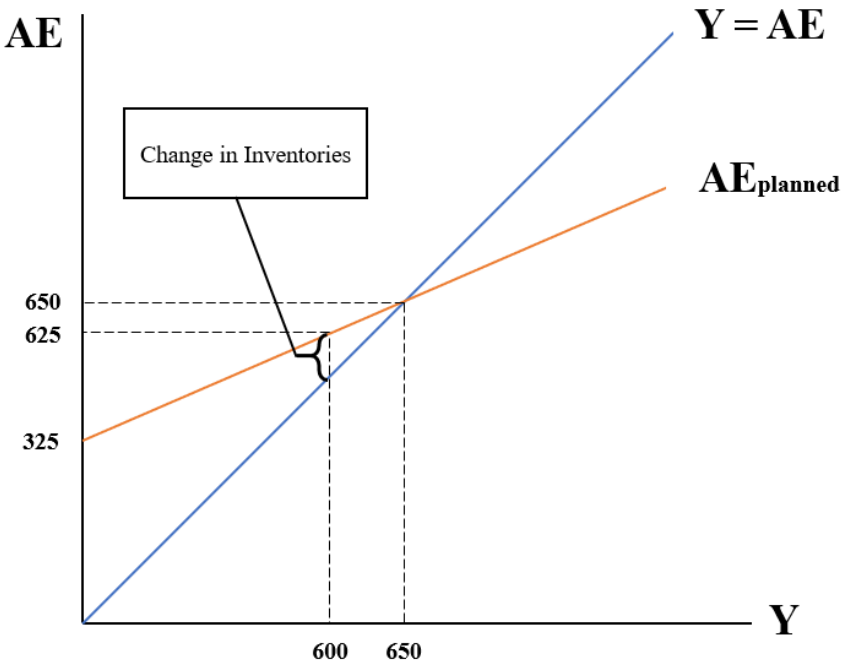
Answer:
Using the result from part (b) and the table we have:
AE = C + I + C + (X – IM)
AE = 50 + (1/2)Y + 150 + 100 + (100 – 75)
AE = (1/2)Y + 325

The equilibrium level of output is where $AE_{planned}$ = Y (so there is no accumulation or draw down on inventories). Thus, we solve:

Y = (1/2)Y + 325

And with some algebra, we find $Y_{equilibrium}$ = $650.

The difference between planned aggregate expenditure (AEplanned) and actual production (Y) must be due to a change in inventories. In 2016, planned aggregate expenditure was less than the equilibrium level of production. This implies there was greater spending in the economy than production, so producers must have been drawing down their inventories to meet this demand for goods and services. To determine how much inventories were drawn down, we must determine the difference between the AE curve and the 45-degree line (the Y = AE curve) as shown below.




To solve for this algebraically, we use the following method inspired by the above diagram. We know:

AE = (1/2)Y + 325
Y = 600, so:
AE = 300 + 325 = 625
We also know that:
AE = Y + inventory and when Y = 600, we have:
625 = 600 + inventory
inventory = $25

Solving through, we find that $25 worth of inventory was sold in 2016 to make up for the difference between AE and output.

2. **[Continued from Question 1]** Suppose now that you are an economist working for the government of Gondor. In 2016, you know that the full employment output in this economy ($Y_{fe}$) is equal to $700.

a. From your result from No.1 and the given information regarding the full employment output in this economy, determine whether the economy of Gondor in 2016 is at FE (the full employment level of output) or not.

Answer:
From No.1, $Y_{equilibrium} = \$650 < \$700 = Y_{fe}$.
Therefore, the economy of Gondor in 2016 is not at FE.

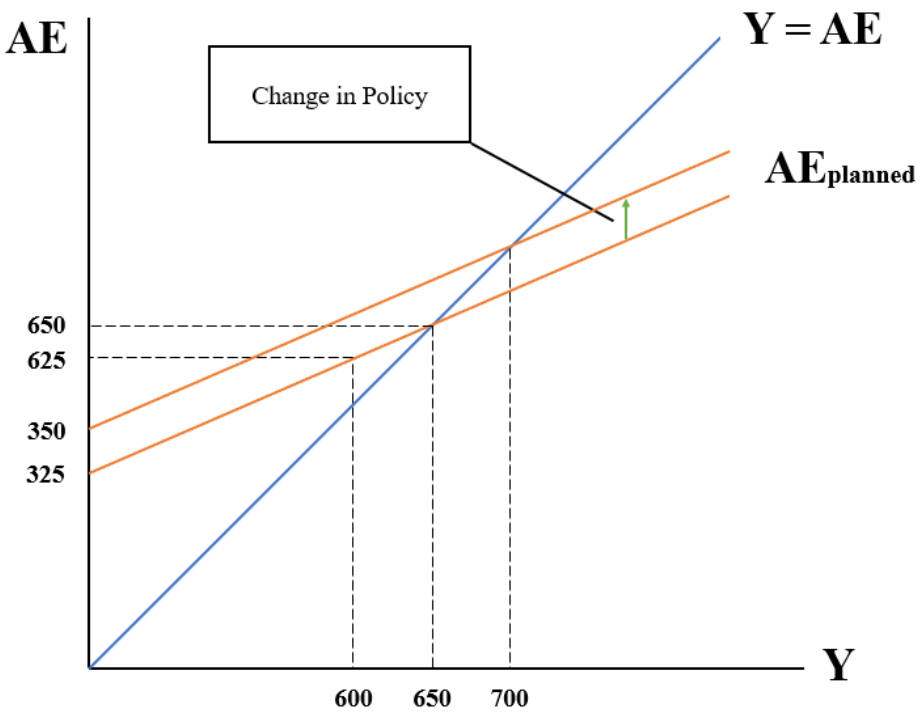
Now, you are supposed to come up with an idea for leading the economy to reach FE in 2016. You can implement some government policy packages: a change in government spending (G), or a change in taxes (T).

b. Calculate the change in government spending needed in order to reach FE in 2016. Can this policy consideration lead the economy to reach FE during this year?

Answer:
Recall from the previous question that we found the AE equation could be written as:
$AE = 325 + (1/2)Y$

After implementing the policy that changes the level of government spending in order to reach the FE level of output we have:
$AE_{new} = C + I + G + NX = 50 + (1/2)Y + 150 + G_{new} + (100 – 75) = 225 + G_{new} + (1/2)Y$

If we find the intersection between this $AE_{new}$ and the 45-degree line;
$Y = AE_{new} = 225 + G_{new} + (1/2)Y$
$Y = 2 \times (225 + G_{new})$.
We want to find the level of government spending, $G_{new}$, which result in this economy producing the FE level of output, that is, the equilibrium Y = $700.
Therefore,
$Y = 2 \times (225 + G_{new})$
$700 = 2 \times (225 + G_{new})$
$G_{new} = 700/2 – 225 = 350 – 225 = 125$
That is, if government spending equals $125 and everything is held constant, then this economy will produce at its FE level of output where Y = $700.
The change in the government spending = $G_{new} – G = 125 – 100 = \$25$




c. Suppose that instead of a change in government spending to reach the FE level of output that this government implements a change in autonomous taxes in order to reach the same FE level of output in 2016. For this problem assume there is no change in the level of autonomous consumption with respect to disposable income (you found this value in (a) of problem #1) and there is no change in the marginal propensity to consume. All other levels of spending stay constant in this economy: what must the new level of autonomous taxes be in order to reach the FE level of output in 2016?

Answer:
Desired level of output, Y = FE level of output in 2016 = 700
Y = AE in equilibrium
Y = C + G + I + (X – IM)
C = a + b(Y – T') where T' is the new level of autonomous taxes in the economy. T' is the level of autonomous taxes needed for this economy to produce at the FE level of output.
C = 87.5 + .5(Y – T') from part (a) of problem #1.
Y = 87.5 + .5(Y – T') + 100 + 150 + 100 – 75
.5Y = 362.5 - .5T'
But, we know Y = 700
So, 350 = 362.5 - .5T'
.5T' = 12.5
T' = 25

So, if taxes are reduced from $75 to $25 in 2016, then this economy will produce at the FE level of output holding everything else constant. Let's check that this actually works:
In Equilibrium, Y = AE. We would like Y = Y' = 700, but let's see if this is what we get.

$Y' = C + G + I + (X - IM)$
$Y' = 87.5 + .5(Y' - T') + G + I + (X - IM)$
$.5Y' = 87.5 - .5T' + 100 + 150 + (100 - 75)$
$.5Y' = 362.5 - .5(25)$
$.5Y' = 350$
$Y' = 700$! This works!

3. Suppose we have a loanable funds market in equilibrium, where the government has a balanced budget and trade is balanced. The equations for the quantity of loanable funds demanded and the quantity of loanable funds supplied are given by the following equations:

$Q^D = 4000 - 50r$
$Q^S = 100r + 1000$

where r is the interest rate in percent (i.e. 5 = 5%).

a. Which of the above equations represents the relationship between the interest rate and the level of private savings? Which of the above equations represents the relationship between the interest rate and the level of private investment?

Answer:

$Q^D$ represents the relationship between the interest rate and the level of private investment, and $Q^S$ represents the relationship between the interest rate and the level of private savings.

b. Holding everything else constant, suppose the government runs a deficit. Model this as a shift in the supply curve of loanable funds curve. What happens to the equilibrium interest rate relative to its initial level because of this change? What happens to the quantity of loanable funds relative to its initial level because of this change?

Answer:

The supply curve of loanable funds will shift to the left since the government is providing less savings. The equilibrium interest rate rises relative to its initial level, and the quantity of loanable funds decreases.

c. Now, model the same government deficit as a shift in the demand for loanable funds curve. What happens to the equilibrium interest rate relative to its initial level because of this change? What happens to the quantity of loanable funds relative to its initial level because of this change?

Answer:

The demand curve will shift to the right since the government is demanding more loanable funds due to the deficit. The equilibrium interest rate rises relative to its initial level , and the quantity

of loanable funds increases.

d. Are your answers for the direct of the changes in the interest rate and quantity of loanable funds from (b) and (c) the same? Why or why not?

Answer:

The interest rate change is the same. The quantity of loanable funds is different since in the first situation, we are equating private investment with private savings minus the absolute value of the government's deficit and in the second situation we are equating private savings with private investment plus the absolute value of the government's deficit.

e. Consider the same government deficit. What happens to the level of private savings relative to its initial level, the level of private investment relative to its initial level, and the level of consumption spending relative to its initial level? Does it alter your answer to this question whether you model the government deficit on the supply of loanable funds side of the market or the demand for loanable funds side of the market? Why or why not?

Answer:

When the interest rate rises due to the government running a deficit, private savings will increase relative to its initial level, private investment will decrease relative to its initial level, and the level of consumption spending will decrease relative to its initial level. This will be the case no matter which side of the market the deficit was modeled on.

f. Now, suppose the government is back to its initial situation where it has a balanced budget again. What is the equilibrium interest rate in this economy? What is the equilibrium quantity of loanable funds? Show your work.

Answer:

Equating demand and supply,

$4000 – 50r = 100r + 1000$

$5000 = 150r$

$r = 20\ \%$

Plugging back in,

$Q = 4000 – 50(20) = \$3000$

g. Suppose that holding everything else constant, the economy increases imports by $2000 and decreases exports by $500. Given this information, does the economy have a trade surplus or a trade deficit? Does it have positive or negative net capital inflows?

Answer:

The economy has a trade deficit (since (X – IM) < 0), which means they have positive net capital inflows (since (IM – X) > 0.

h. Given the changes in exports and imports described in (g), what is the new equilibrium interest rate in this economy? What are the new levels of private investment and private savings?

Answer:

Since net capital inflows have increased by $1500, the supply curve in the loanable funds market shifts to the right. At every interest level, supply has increased by $1500, so we can add $1500 to the intercept of the supply curve to get a new $Q^{S*} = 100r + 2500$. Equating this with the original demand curve,

$100r + 2500 = 4000 – 50r$
$150r = 1500$
$r = 10\%$

To find the new private investment, we can plug r = 10 into our original demand curve, since we didn't shift that curve and it still represents only private investment. We get $Q^D = 4000 – 50 (10) = \$3500$

To find the new private savings, we can plug r = 10 into the original supply curve, since it represents private savings. We get $Q^S = 100(10) + 1000 = \$2000$. We also could have plugged the new interest rate into the new supply curve to get $Q^S = 100(10) + 2500 = \$3500$, then subtracted the net capital inflows of $1500 to get $2000 of private savings.

4. Consider the AS-AD model to answer the following questions. Suppose for each scenario that we start in long-run equilibrium.

a. Suppose that the government raises taxes, holding everything else constant. What happens to real GDP and aggregate price level in the short run? What happens to real GDP and aggregate price level in the long run?

Answer:

The short-run aggregate demand curve will shift to the left since an increase in taxes means a decrease in disposable income received by consumers, so consumption spending decreases. So, in the short run real GDP and the aggregate price level both decrease relative to their initial long run levels. Unemployment rises in the short run, but in the long run, nominal wages fall in response to high unemployment and the short run aggregate supply shifts to the right until we are back at long run equilibrium. This causes real GDP to increase back to its original level, but the aggregate price level to fall even further from its initial long run equilibrium level.

b. Suppose a widespread survey of consumers and businesses indicates that there is increased optimism for the future. What do you expect to happen to real GDP and aggregate price level in the short run and long run?

Answer:

The short run aggregate demand curve will shift to the right since consumers and businesses have become more optimistic. Real GDP rises, the aggregate price level rises, and the level of unemployment falls in the short run relative to the initial long run equilibrium situation. In the long run, nominal wages will rise in response to the lower unemployment, so the short run aggregate supply curve will shift to the left until we are back at long run equilibrium. This will cause real GDP to return to its original long-run equilibrium evel, while the aggregate price level rises relative to its initial long run level.

c. Suppose that the government passes regulations that require workers in retail to fill out daily forms based on their sales for the day. What happens to real GDP and the aggregate price level in the short run and long run?

Answer:

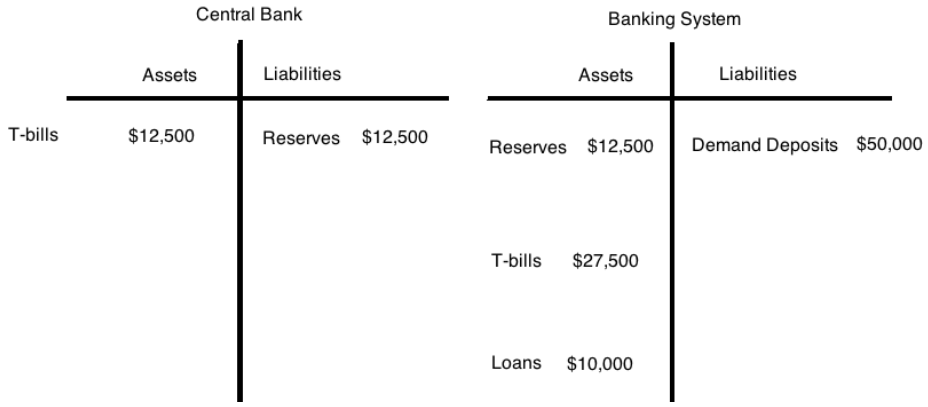
When workers have to spend time filling out forms, they will become less productive, so the short run aggregate supply curve will shift to the left. This will cause real GDP to decrease and the aggregate price level to increase relative to their initial long run equilibrium levels. Short run unemployment will increase. In the long run, nominal wages will decrease in response to high levels of short run unemployment, so the short run aggregate supply curve will shift to the right until the economy returns to its initial real GDP and its initial aggregate price level.

d. Suppose the government increases spending and at the same time increases taxes. What happens to real GDP and the aggregate price level in the short run and long run given these changes?

Answer:

It's unclear what will happen in the short run, since the increase in government spending will increase aggregate demand (causing aggregate demand to shift to the right), but the increase in taxes will decrease aggregate demand (causing aggregate demand to shift to the left). However, we know that in the long run, real GDP will return to its initial level. We can't say what will happen to aggregate prices since we don't know which way the aggregate demand curve shifted in the short run.

5. The balance sheets (also known as the T-Account) of the central bank and the private banking system in Utopia are provided below. In this economy no one holds currency (i.e., there are no currency drains) and all purchases are made by writing checks (or using debit cards). Furthermore, private banks never hold excess reserves after the banks make full adjustment for any monetary policy change. Use this information to answer the following questions.




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

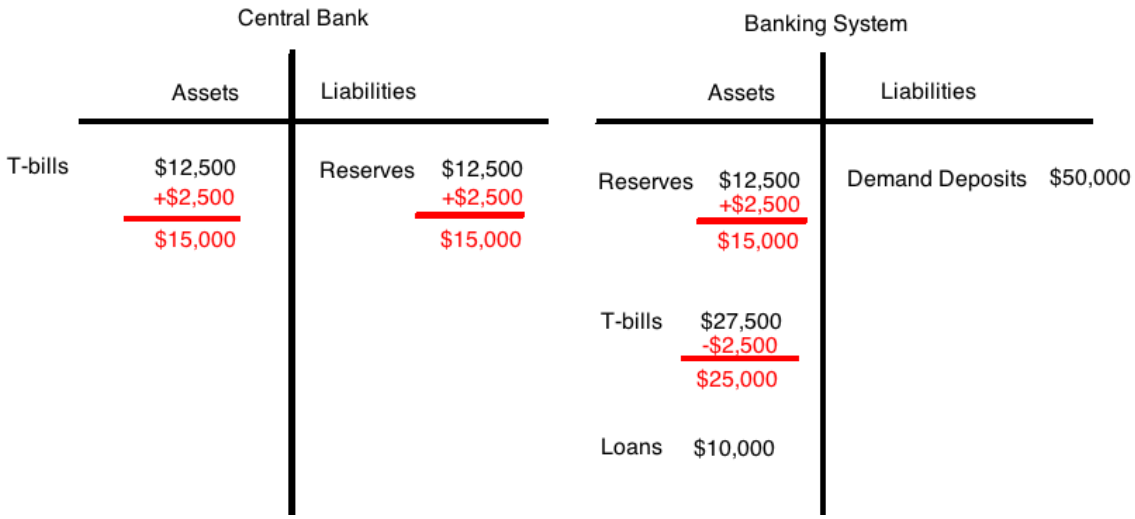
Answer:

Since private banks do not hold excess reserves, the amount of reserves is equal to the amount of the Required Reserves. The required reserve ratio is given by:

Required Reserve Ratio = (Required Reserves)/(Demand Deposits) = 12,500/50,000 = 0.25 or 25%.

b. The central bank now makes an Open Market Purchase of $2,500 worth of Treasury Bills (T-bill) from the banking system. Show how this decision first impacts these t-accounts before any adjustment with regard to returning to the required reserve levels has been made (show just the first round effects of this transaction and not the final full adjustment to this transaction).

Answer:



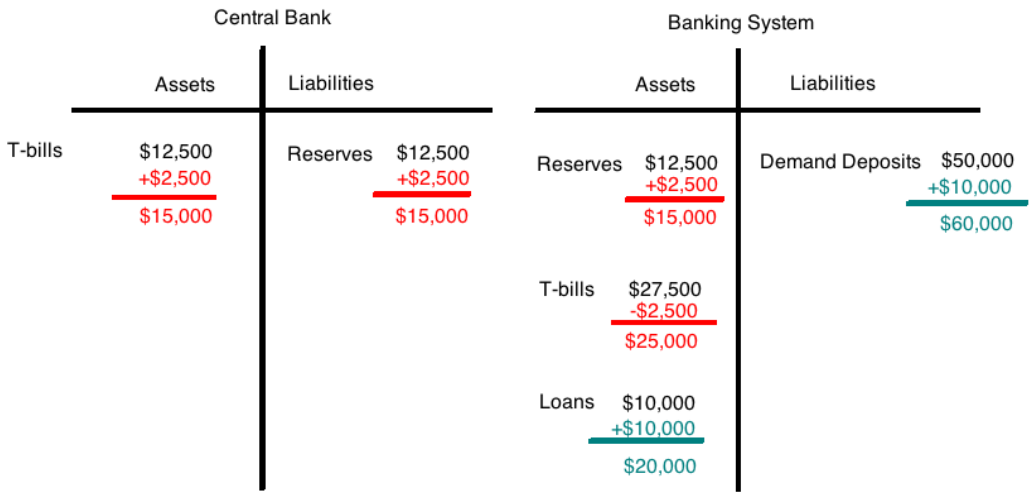

c. Immediately after the central bank's Open Market Operation described in part (b), does the banking system have insufficient or excess reserves? Quantify the level of these reserves relative to the required amount for the given amount of demand deposits.

Answer:

Since private banks do not hold excess reserves and the level of demand deposits has not changed in this first round after the Central Bank's policy was implemented, the required reserve amount has not changed. But, the banking system has more reserves: $15,000 versus the $12,500 they had initially. The banking system therefore has excess reserves after this first round of adjustment to the central bank's purchase of $2500 worth of T-bills from the banking system. As a result, the banking system now holds $2,500 of excess reserves.

d. Holding excess reserves is costly for the banks because banks could have lent out the excess reserves and earned interest from these loans. Starting from the T-account you provided in (c), show how the banking system adjusts its reserve holdings to eliminate any insufficient or excess reserves they have given this open market purchase. Show clearly how this decision impacts these t-accounts.

Answer:




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 will happen to the equilibrium market interest rate?

Answer:

The money supply of the economy increases from $50,000 to $60,000 because reserves are being injected into the banking system. Holding everything else constant, an increase in the supply of money will cause equilibrium market interest rate to decrease.

The change in the money supply = (the money multiplier)(the change in reserves)

The change in the money supply = (1/rr)(2500)

The change in the money supply = (1/.25)(2500) = $10,000!

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

Required reserve ratio is 10%

Money Supply (Ms): Ms = 20,000

Money Demand (Md): Md = 25,000 – 1000r where r is the interest rate (When the interest rate is 3%, it means r = 3)

Investment Spending (I): I = 350 – 10r

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

Consumption Spending (C): C = 2400 + 0.5(Y – T) - 100P where P is the aggregate price level

Government Spending (G): G = 500

Net Exports (NX): NX = X – IM = -100

Autonomous Taxes (T): T = 200

Assume that Transfers (TR) = 0

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

Long run Aggregate Supply (LRAS): LRAS = Yfe = 4,500

Short run Aggregate Supply (SRAS): Y = 500P – 1,000

a. Given the above information, what is the equilibrium interest rate in this economy?

Answer:

To find the equilibrium interest rate you need to find the interest rate that equates money supply to money demand. Hence,

20,000 = 25,000 – 1000r

r = 5 or 5%

b. Given the above information, what is the level of investment spending in this economy?

Answer:

We know that I = 350 – 10r and we just calculated that r = 5%. So,

I = 350 – (10)(5) = $300

c. Given the above information, calculate an 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 = 2400 + 0.5(Y – T) – 100P + I + G + NX

Y = 2400 + 0.5(Y – 200) – 100P + 300 + 500 + (-100)

Y = 6,000 – 200P

The equation for AD can be written as Y = 6,000 – 200P.

d. Find the short run equilibrium level of real GDP (Y) and the short run aggregate price level (P). Then 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:

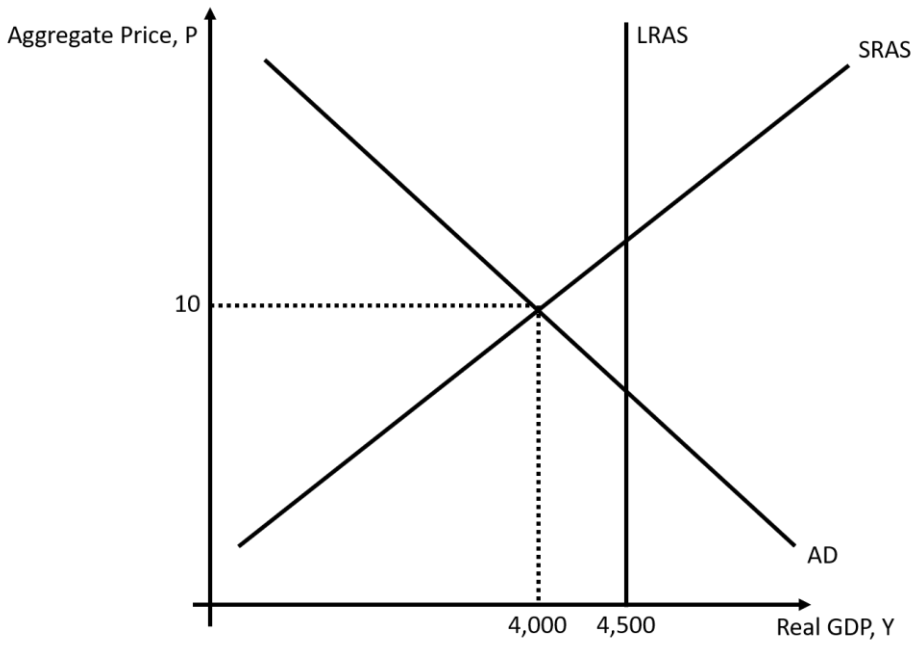
To find the short run equilibrium we will want to see where the AD curve intersects the SRAS curve. Thus,

6,000 – 200P = 500P – 1,000

7,000 = 700P

Pe = 10

Ye = 6,000 – 200P = 6,000 – 200(10) = 4,000




e. The government now sets a goal of using monetary policy to reach full employment. Can the government reach this goal using only monetary policy? In your answer remember that it is not possible to have the nominal interest rate go below 0% (the "Zero Lower Bound").

HINT: Holding everything else constant, what is the highest level of real GDP in the short run this economy can attain if the government engages in activist monetary policy?

Answer:

The conduit for monetary policy in this model is the interest rate and its impact on the level of investment. So, let's start with thinking about the maximum amount of investment spending that will occur in this economy. This maximum level of investment spending is that level associated with a nominal interest rate of 0%. So, I = 350 - 10r and if r = 0% then we have:

I = 350

When the interest rate is 0% this will result in investment spending being equal to $350. So, given this policy and its impact, new AD curve is given by:

Y = C + I' + G + NX

Y = 2400 + 0.5(Y – T) – 100P + I' + G + NX

Y = 2400 + 0.5(Y – 200) – 100P + 350 + 500 + (-100)

Y = 6,100 – 200P

Use the SRAS curve and this new AD curve to find the new equilibrium aggregate price level and the new equilibrium real GDP. Thus,

6,100 – 200P = 500P – 1,000

700P = 7,100

P = 10.14

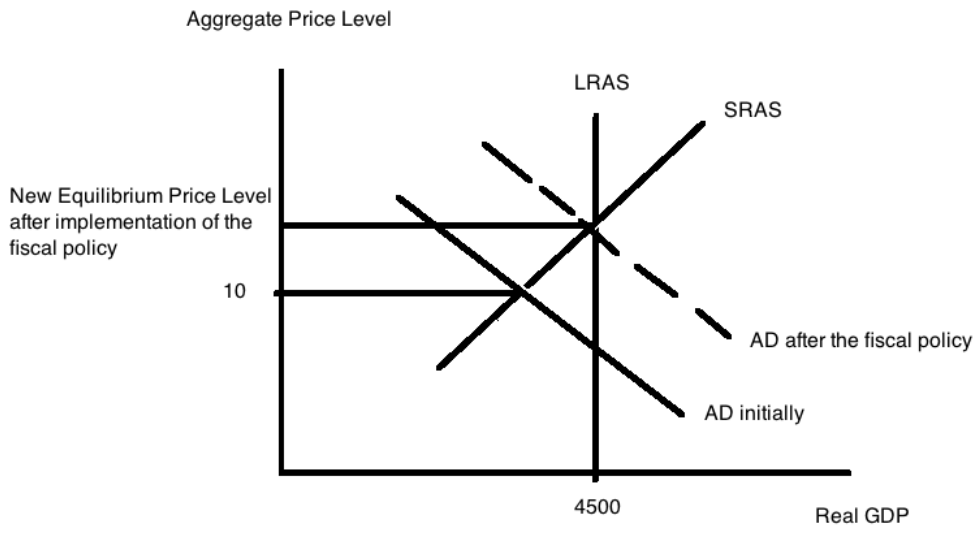
Y = 6,100 – 200(10.14) = 4,072 < 4,500 = Yfe

Since the equilibrium output level when the interst rate is equal to 0% is below the full employment level of output, it is not possible for this economy to reach full employment solely through monetary policy.

f. The government now sets a goal of using fiscal policy to reach full employment. Can the government reach this goal using only fiscal policy? To make this as simple as possible, assume that the fiscal policy is a change in the level of government spending holding everything else constant? Calculate what the new level of government spending would need to be if this economy was to reach full employment using fiscal policy only. Show your work.

Answer:

Looking at a graph we know that we are looking to shift the AD curve to the right through fiscal policy so that Y = 4500 and the aggregate price level is at the level where the SRAS and the LRAS intersect. Here's the graph that will guide the work we need to do:




We know that Yfe = 4500. When Y = Yfe = 4500 and the LRAS = SRAS, what is the aggregate price level, P'? Equate the SRAS to the LRAS:

500P' – 1000 = 4500

500P' = 5500

P' = 11

We also know that AD can be found as Y = C + I + G + (X – IM). We are only planning on changing G from its initial level of $500 to some new level that we will call G'. We also know that P' if we are at the FE level of output and also on the SRAS is going to equal P' = 11.

Y = 2400 + .5(Y – T) – 100P + 300 + G' + (-100)

Y = 2400 + .5(Y – 200) – 100(11) + 300 + G' + (-100)

.5Y = 2600 – 100 - 1100 + G'

Y = 2800 + 2G'

But, we know that we want Y = Yfe = 4500. So,

4500 = 2800 + 2G'

2G' = 1700

G' = 850

So, if this economy increases government spending from $500 to $850, this economy will be a the FE level of output, Y = $4500. Let's check to make sure this works:

AD': Y' = C + I + G' + (X – IM)

AD': Y' = 2400 + .5(Y' – T) – 100P' + 300 + 850 + (-100)

AD': .5Y' = 2400 - .5(200) – 100P' + 1050

AD': Y' = 6700 – 200P'

SRAS: Y' = 500P' – 1000

Set AD' equal to SRAS: 6700 – 200P' = 500P' – 1000

7700 = 700 P'

P' = 11 (this is what we needed the aggregate price level to be!)

Y' = 6700 – 200(11) = 4500 or

Y' = 500(11) – 1000 = 4500! This works!