Name:
Section:
T.A. Name:

180.101 ELEMENTS OF MACROECONOMICS

Fall, 2011 **Problem Set #4** **Prof. Louis J. Maccini**

Answer Key

INSTRUCTIONS: Above, write your name, section number and T. A. name. Answer each question in the space provided, or on the back of the same sheet.

1. Consider an economy in which tax collections are always $400 and in which the three components of aggregate demand are as follows:

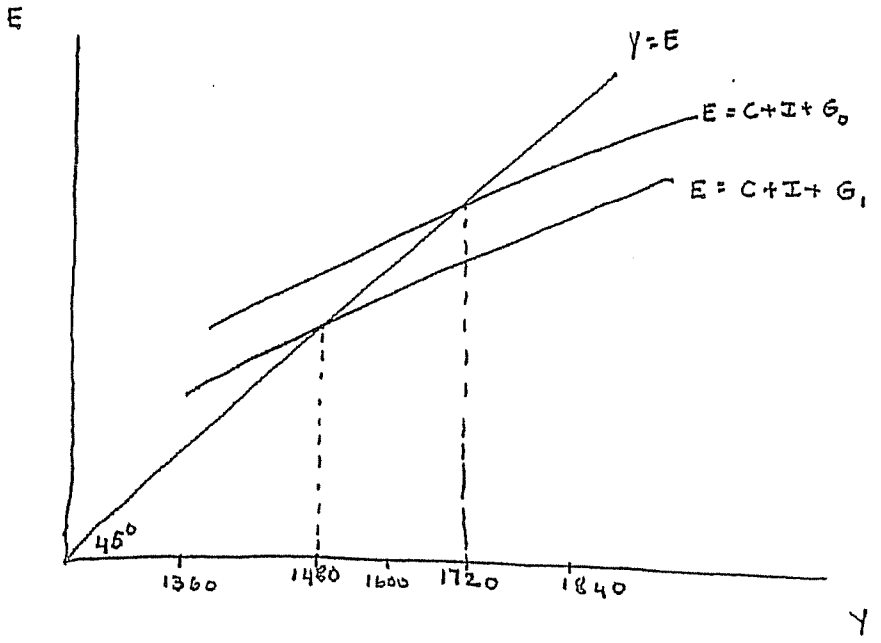
GDP	Taxes	Disp. Income	C	I	G
$1,360	$400	$960	$720	$230	$500
1,480	400	1,080	810	230	500
1,600	400	1,200	900	230	500
1,720	400	1,320	990	230	500
1,840	400	1,440	1080	230	500

Find the equilibrium of this economy graphically. What is the marginal propensity to consume? What is the multiplier? What would happen to equilibrium GDP if government purchases were reduced by $60 and the price level remained unchanged?

Using E=C+I+G we can calculate total planned expenditures for different levels of income.

GDP	C	I	G	E
$1,360	$720	$230	$500	$1,450
1,480	810	230	500	1,540
1,600	900	230	500	1,630
1,720	990	230	500	1,720
1,840	1080	230	500	1,810

Graphically:



Equilibrium GDP is 1720 since Y=E. The marginal propensity is given by $\frac{\Delta C}{\Delta Y_{dis}}$. Looking at the data table one can see that as Y_{dis} increases from 960 to 1080, consumption increases from 720 to 810. Hence we have the marginal propensity to consume equals $b = \frac{90}{120} = \frac{3}{4} = 0.75$. The multiplier is $\frac{1}{1-b} = \frac{1}{1-0.75} = 4$. If government purchases fell by 60, and the price level were unchanged, GDP would fall by $60 \times 4 = 240$ to 1480.

2. Consider an economy similar to that in the preceding question in which investment is also $230, government purchases are also $500 and the price level is also fixed. But taxes now vary with income and, as a result, the consumption schedule looks like the following:

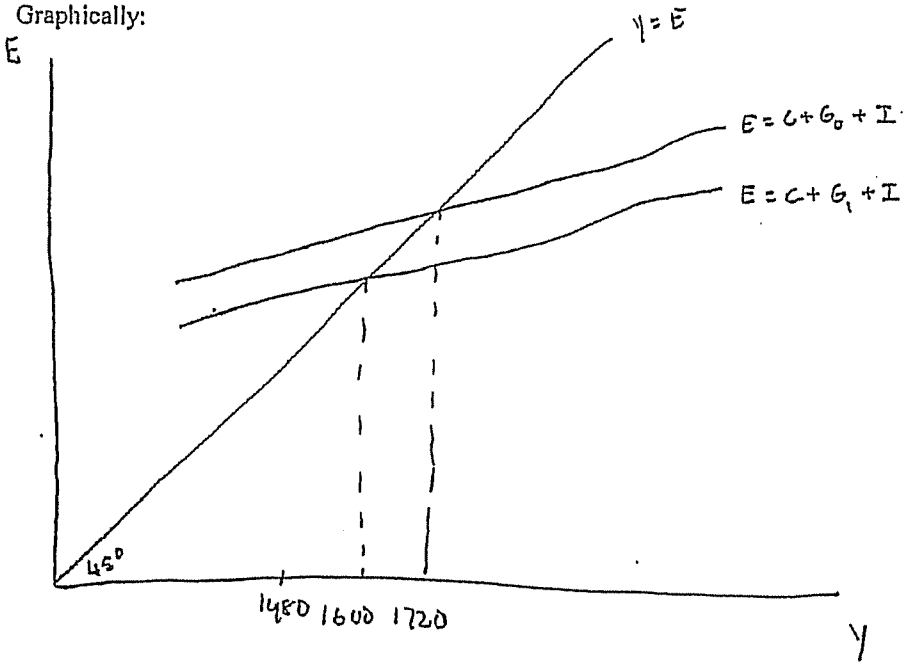
GDP	Taxes	Disp. Income	C
$1,360	$320	$1,040	$810
1,480	360	1,120	870
1,600	400	1,200	930
1,720	440	1,280	990
1,840	480	1,360	1,050

Find the equilibrium graphically. What is the marginal propensity to consume? What is the tax rate? Use your diagram to who the effect of a decrease of $60 in government purchases. What is the multiplier? Compare this answer to your answer to Question 1 above. What do you conclude?

As in the previous question we can calculate total planned expenditures:

GDP	C	I	G	E
$1,360	$810	$230	$500	$1,540
1,480	870	230	500	1,600
1,600	930	230	500	1,660
1,720	990	230	500	1,720
1,840	1,050	230	500	1,780

Graphically:



Compared to question 1, the total expenditure line has a flatter slope, but it still crosses the 45-degree line at a GDP of 1720. The marginal propensity to consume is still 0.75. Now, however, the marginal tax rate is 1/3 (that is, when income rises by 3, taxes rise by 1). Consequently the multiplier is given by: $\frac{1}{1-(1-t)b} = \frac{1}{1-(2/3)\times 0.75} = 2$. A reduction in G of 60 will lower equilibrium GDP by $2 \times 60 = 120$, to a new level of 1600. Comparison of the two questions shows that the introduction of a variable tax lowers the multiplier.

3. Consider an economy described by the following set of equations:

$$C = 120 + 0.8Y_{dis}$$

$$I = 240$$

$$G = 480$$

$$TX = 200 + 0.25Y$$

Y is real income or output, C is real consumption expenditure, I is real investment expenditure, G is real government spending, Y_{dis} is real disposable income and TX is real tax revenues. Find the equilibrium level of GDP. Next, find the multipliers for government purchases and for fixed taxes. If full employment comes at Y=1,800, what are some policies that would move GDP to that level?

$$Y_{dis} = Y - TX$$

$$C = 120 + 0.8(Y - TX)$$

$$C = 120 + 0.8(Y - 200 - 0.25Y)$$

$$Y = C + I + G$$

$$Y = 120 + 0.8Y - 0.8 \times 200 - 0.8 \times 0.25Y + 240 + 480$$

$$Y = 120 + 0.8Y - 160 - 0.2Y + 240 + 480$$

$$Y = 680 + 0.6Y$$

$$(1 - 0.6)Y = 680$$

$$Y = \frac{1}{0.4} 680$$

$$Y = 1700$$

The multiplier for government expenditures equals:

$$\frac{1}{1 - b(1-t)} = \frac{1}{1 - 0.8 \times (1 - 0.25)} = \frac{1}{1 - 0.6} = \frac{1}{0.4} = 2.5$$

The multiplier for fixed taxes equals:

$$-\frac{b}{1-b(1-t)} = -\frac{0.8}{1-0.8\times(1-0.25)} = -\frac{0.8}{1-0.6} = -\frac{0.8}{0.4} = -2$$

To raise GDP by 100, a) raise G by 40, and the multiplier of 2.5 will do the rest, or b) lower taxes by 50, and the multiplier of -2 will do the rest.

4. This question is a variant of the previous problem that approaches things in the way that a fiscal planner might. In an economy whose consumption function and tax function are as given in question 3, with investment fixed at 240, find the value of G that would make GDP equal to 1,800.

   There are two ways of answering this question:

   1) Having done question 3, we know the equilibrium level of output is 1,700. Therefore we need to increase G such that equilibrium output increases by 100. Since the multiplier for government expenditures is 2.5, G needs to increase by $100/2.5 = 40$. Therefore the level of G that would make GDP equal to 1,800 is 480+40=520.

   2) We can assume that Y=1800 and solve for the level of G that satisfies the equilibrium condition. We have:

      $$Y = 120 + 0.8Y - 160 - 0.2Y + 240 + G$$

      $$Y = 200 + 0.6Y + G$$

      $$0.4Y = 200 + G$$

      Using the fact that Y=1,800 we get:

      $$G = 520$$

5. Suppose banks keep no excess reserves and no individuals or firms hold on to cash. If someone suddenly discovers $12 million in buried treasure, explain what will happen to the money supply if the required reserve ratio is 10 percent. How does your answer change if the reserve ratio of 25 percent or 100 percent?

The money multiplier is given by: $1/\varepsilon$ where ε is the reserve ratio. Since we are assuming that banks keep no excess reserves and no individuals or firms hold cash the reserve ratio equals the required reserve ratio which is 10 percent. Therefore the money multiplier equals $1/0.1 = 10$. An initial increase of $12 million in reserves will lead to an increase in the money supply of $12 \times 10 = 120$ million dollars.

If the reserve ratio is 25 percent the money multiplier is $1/0.25 = 4$ and the increase in money supply is $12 \times 4 = 48$ billion dollars. If the reserve ratio is 100 the money multiplier is $1/1 = 1$ and the increase in money supply is $12 \times 1 = 12$ billion dollars.