

ECO 209Y
MACROECONOMIC THEORY
Solution to Problem Set 5-6

1. a) First, we must obtain the aggregate expenditure function:

$$AE = C + I + G$$

$$= (\bar{C} + c YD) + (\bar{I} - b i + f Y) + \bar{G}$$

$$\text{where } YD = Y - TA + TR = Y - t Y + TR = (1 - t) Y + \bar{TR}$$

$$= \bar{C} + c [(1 - t) Y + \bar{TR}] + \bar{I} - b i + f Y + \bar{G}$$

$$= \bar{AE} - b i + [c(1 - t) + f] Y$$

$$\text{where } \bar{AE} = \bar{C} + c\bar{TR} + \bar{I} + \bar{G}.$$

In equilibrium, $Y = AE$:

$$Y = \bar{AE} - b i + [c(1 - t) + f] Y \quad | \quad [1 - c(1 - t) - f] Y = \bar{AE} - b i.$$

And solving for i , we obtain the equation for the IS curve:

$$i = \frac{\bar{AE}}{b} - \frac{1 - c(1 - t) - f}{b} Y.$$

- b) The LM curve is found from the money market equilibrium:

$$L = M/P \rightarrow k Y - h i = \bar{M}/\bar{P}.$$

And solving for i :

$$i = (k/h) Y - (1/h) (\bar{M}/\bar{P}).$$

- c) To find equilibrium income (Y^*) we must equate the IS and LM curves:

$$\bar{AE}/b - (1/b) [1 - c(1 - t) - f] Y = (k/h) Y - (1/h) (\bar{M}/\bar{P})$$

$$(1/b) [1 - c(1 - t) - f + bk/h] Y = \bar{AE}/b + (1/h) (\bar{M}/\bar{P})$$

$$Y^* = \frac{\bar{AE} + (b/h) (\bar{M}/\bar{P})}{1 - c(1 - t) - f + bk/h}.$$

And the equilibrium rate of interest (i^*) is:

$$i^* = (k/h) Y^* - (1/h) (\bar{M}/\bar{P})$$

- d) The fiscal policy multiplier is:

$$\frac{\Delta Y^*}{\Delta G} = \frac{1}{1 - c(1 - t) - f + bk/h}$$

And the monetary policy multiplier is:

$$\frac{\Delta Y^*}{\Delta(M/P)} = \frac{b/h}{1 - c(1 - t) - f + bk/h}.$$

- e) Given $i^* = (k/h) Y^* - (1/h) (\overline{M/P})$,
 $\Delta i^*/\Delta G = (k/h) (\Delta Y^*/\Delta G)$
 $\Delta i^*/\Delta (M/P) = (k/h) [\Delta Y^*/\Delta (\overline{M/P})] - (1/h)$
3. a) $\alpha_{AE} = 1 / (1 - \text{slope of AE curve}) = 2 \rightarrow \text{Slope of AE curve} = 0.5$
 $AE = 200 - 5i + 0.5 Y$
 $Y = AE \rightarrow Y = 200 - 5i + 0.5 Y \rightarrow 5i = 200 - 0.5 Y \rightarrow i = 40 - 0.1 Y$
- b) Slope of LM curve = $k/h = 0.2 \rightarrow 4/h = 0.2 \rightarrow h = 20$
 $400 = 4Y - 20i \rightarrow 20i = -400 + 4Y \rightarrow i = -20 + 0.2Y$
- c) $40 - 0.1 Y = -20 + 0.2Y \rightarrow 0.3Y = 60 \rightarrow Y^* = 200$
 $i^* = 40 - 0.1(200) = 20$
- d) The slope of the AE curve is equal to $c(1-t) - m$, and thus $\alpha_{AE} = 1 / [1 - c(1-t) + m]$. If m increases from 0.1 to 0.2, then the slope of the AE curve will decrease from 0.5 to 0.4 and the value of the multiplier will decrease from 2 to $1\frac{2}{3}$.
5. a) First, we must find the equation for the AE curve:
 $AE = C + I + G$
 $= [325 + 0.8(Y - TA + TR) - 10i] + [100 - 15i + 0.08Y] + 260$
 $= 685 - 25i + 0.08Y + 0.8[Y - 50 - 0.1Y + 100]$
 $= 685 - 25i + 0.08Y + 0.8(0.9Y + 50)$
 $= 725 - 25i + 0.8Y$
 Second, we must find the equilibrium in the goods market by equating Y and AE :
 $Y = 725 - 25i + 0.8Y \rightarrow 25i = 725 - 0.2Y \rightarrow i = 29 - 0.008Y$
- b) 1) We have found above the equation for the AE curve as a function of i and making the replacement we find:
 $AE = 725 - 25i + 0.8Y = 725 - 125 + 0.8Y = 600 + 0.8Y$
 2) To find equilibrium income we must equate Y and AE :
 $Y = AE \rightarrow Y = 600 + 0.8Y \rightarrow 0.2Y = 600 \rightarrow Y^* = 3000$
 3) Finally, the expression for the expenditure multiplier is:
 $\alpha_{AE} = 1 / (1 - \text{slope of AE curve}) = 1 / (1 - 0.8) = 1 / 0.2 = 5$
- c) Since $S = YD - C$, let's find the values of YD and C :
 $YD = Y - TA + TR = Y - 50 - 0.1Y + 100 = 50 + 0.9Y = 50 + 0.9(3000) = 2750$
 $C = 325 + 0.8YD - 10i = 325 + 0.8(2750) - 10(5) = 325 + 2200 - 50 = 2475$
 Therefore, $S = YD - C = 2750 - 2475 = 275$
 $BS = TA - (G + TR) = 50 + 0.1(3000) - (260 + 100) = -10$
 $S_N = S + BS = 275 - 10 = 265$
 $I = 100 - 15i + 0.08Y = 100 - 15(5) + 0.08(3000) = 100 - 75 + 240 = 265.$
- d) The economy is in a deep recession since $Y = 3000$ and $Y_{fe} = 3500$. In addition, the government is running only a small deficit since $BS = -10$, which represents about 0.33 percent of GDP. Moreover, this deficit is not only small but cyclical in nature since at the level of full employment income (\$3500) the government would be running a surplus. Indeed, $BS_{fe} = TA - G - TR = 50 - 0.1(3500) - 260 - 100 = 400 - 360 = 40$.
- Therefore, it seems clear that expansionary fiscal policy should be implemented in order to get Y closer to full employment even at the cost of increasing the government deficit in the short run.

- e) A structural deficit means that at the current level of expenditure the government would also be running a deficit at the level of full employment income. We have shown above that this is not the case – the government would be running a surplus of \$40 at $Y = \$3500$. Therefore, the government could increase its purchases by \$40 and still have a balanced budget at Y_{fe} .

An increase in G equal to \$40 would cause equilibrium income to increase by:

$$\Delta Y = \alpha_{AE} \Delta G = 5 (\$40) = \$200.$$

Therefore, the new level of income would be $Y = \$3200$.

- f) Since $Y_{fe} = \$3500$, equilibrium income must increase by \$500. Given that $\alpha_{AE} = 5$, ΔG must be \$100. Given $\Delta G = \$100$ and $Y_{fe} = \$3500$,

$$BS_{fe} = 50 + 0.1 (3500) - 360 - 100 = 400 - 460 = -60.$$

Should the government increase G by \$100? It could be argued that the government should increase G enough to stop the decline in Y and, at the same time, trigger a sufficient increase in Y to restore some degree of confidence on the part of the private sector. The crucial point here is to regain the confidence of households in order for them to start spending once again. In turn, once consumers start spending, at some point the business sector will also start investing once again. Will a \$100 increase in G be enough? Or will it be too much? A \$100 increase in G will cause the government to increase its deficit in the short run to more than 3% of the current level of GDP. This is a relatively large deficit but the economy is in a deep recession and this increase in G might not be even enough to jump start the economy and restore the confidence of the private sector. In any case, in these circumstances it's better to err on the plus side rather than on the minus side. If the increase in G is excessive there is always time to reduce it at a faster pace as the level of economic activity starts moving closer to full employment and inflationary pressure builds up. That's why most of the increase in G should be on infrastructure investment since, in addition to increasing economic efficiency, once the projects are completed G can go back to its initial level.