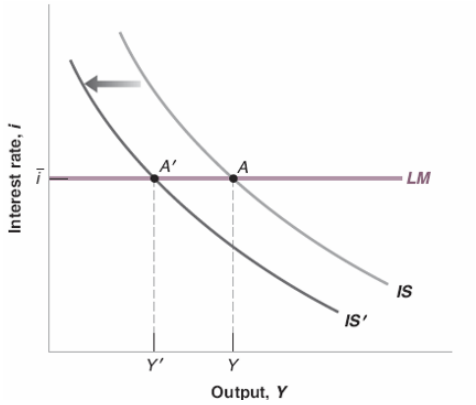
Nanyang Technological University
School of Social Sciences

HE2002 Macroeconomics II AY23-24 SEMESTER 2

Solution to Tutorial 3

1. **Chapter 5, Q3. The response of the economy to fiscal policy**

   (a) The IS curve shifts left. Output falls at the same interest rate. Investment, which depends positively on the level of output and negatively on the interest rate, also falls. The interest rate remains the same and output falls. So, investment falls.



   Now consider the following IS-LM model:

$$C = c_0 + c_1(Y - T)$$

$$I = b_0 + b_1 Y - b_2 i$$

$$Z = C + I + G$$

$$i = \bar{i}$$

   (b) Solve for equilibrium output when interest rate is $\bar{i}$. Assume $c_1 + b_1 < 1$.

$$Y = (\tfrac{1}{1-c_1-b_1})(c_0 - c_1 T + b_0 - b_2\bar{i} + G)$$

   (c) Solve for equilibrium level of investment.

$$I = b_0 + b_1 Y - b_2 i = b_0 + b_1(\tfrac{1}{1-c_1-b_1})(c_0 - c_1 T + b_0 - b_2\bar{i} + G) - b_2\bar{i}.$$

   This is obtained by substitution of the equilibrium level of income into the equation for investment.

   (d) From part (b), the equilibrium level of income is

$$Y = [1/(1 - c_1 - b_1)](c_0 - c_1 T + b_0 - b_2\bar{i} + G).$$

This value is substituted into the LM relation so that:

$$M/P = d_1[(\frac{1}{1-c_1-b_1})(c_0 - c_1T + b_0 - b_2\bar{i} + G)] - d_2\bar{i}$$

This term could also be simplified by collecting terms if desired. Real money supply is an increasing function of government spending. If government spending increases, output (equivalently, production or income) increases, real money demand increases. To maintain the interest rate $\bar{i}$, real money supply increases and vice versa.

2. **Chapter 5, Q5.**

Considering the following numerical example of the IS-LM model:

$$C = 100 + 0.3Y_D$$

$$I = 150 + 0.2Y - 1000i$$

$$G = 200$$

$$T = 100$$

$$i = 0.03$$

(a) Derive the IS relation. (Hint: You want an equation with Y on the left side and everything else on the right.)

$$Y = C + I + G = 100 + 0.3(Y - 100) + 150 + 0.2Y - 1000i + 200$$

$$Y = 840 - 2000i$$

(b) Substitute the interest rate of 3% (numerical value 0.03) into $Y = 840 - 2000 * (0.03) = 780$.

(c) Now, substitute both the equilibrium income of 780 and the interest rate of 3% into the right-hand side of the real money demand expression.

$$(M/P) = 1560 - (0.03 * 4000) = 1440$$

(d) Solve for the equilibrium values of C and I, and verify the value you obtained for Y by adding C, I and G.

$$C = 100 + 0.3(Y - T) = 304;\ I = 150 + 0.2Y - 1000i = 276;$$
$$G = 200;\ C + I + G = 780.$$

(e) Equate the IS relation in (a) with LM relation in (c). $Y = 840 - 2000i$ (in (a)) and $(M/P) = 2Y - 4000i$ (in (c)), we have $(M/P) = 2 * (840 - 2000i) - 4000i$, $(M/P) = 1680 - 8000i$, substitute the (real) money supply of 1500 into the equation, $Y = 795$ (and $i = 2.25\%$). $C = 100 + 0.3Y_D = 100 + 0.3(Y - T) = 308.5$; $I = 150 + 0.2Y - 1000i = 286.5$. The increase in the money supply (money expansion) decreases the interest rate (IS curve does not shift, LM curve shifts down, which leads to higher output and lower interest rate). Consumption and investment increase because output increases and interest rates decrease.

(f) At the initial rate of 3%, Y equals 980 when G is increased to 300 ($Y = C + I + G = 440 + 2G - 2000i$). A fiscal expansion increases output (from 780 to 980). Consumption increases ($C = 100 + 0.3(Y - T) = 364$) because output increases. When the central bank keeps interest rates at 3% then investment increases ($I = 150 + 0.2Y - 1000i = 316$) as output increases. $M/P = 2Y - 4000i = 2 * 980 - 4000 * 3\% = 1840$, real money supply increases to 1840 to maintain the interest rate of 3%.