Solution 8: Economic Fluctuations

Problem 1 (*General Equilibrium*)

(a) The goods market is in equilibrium if output Y equals demand Z.

$$Y = 200 + 0.75(Y - T) + 50 - 5r + G$$

Rearranging yields the IS-Curve.

$$Y = 1{,}000 - 3T - 20r + 4G \tag{1}$$

The financial market is in equilibrium if liquidity demand L equals money supply M.

$$Y - 80r = M$$

Rearranging yields the LM-Curve.

$$Y = M + 80r \tag{2}$$

Substituting equation (1) into equation (2) and solving yields the interest rate in general equilibrium as a function of taxes, government consumption, and money supply.

$$r^*(T, G, M) = 10 - 0.03T + 0.04G - 0.01M \tag{3}$$

(b) Substituting $T = 100$ into equation (3) yields

$$r^*(G, M) = 7 + 0.04G - 0.01M.$$

Total differentiation yields

$$\frac{dr^*}{dG} = 0.04 - 0.01\frac{dM}{dG} = 0 \quad \Rightarrow \quad \frac{dM}{dG} = 4.$$

Problems 2-7 (*General Equilibrium*)

The goods market is in equilibrium if output Y equals demand Z.

$$Y = 100 + 0.8(Y - T) + 100 - 8r + G$$

Rearranging yields the IS-Curve.

$$Y = 1{,}000 - 4T - 40r + 5G \tag{4}$$

The financial market is in equilibrium if liquidity demand L equals money supply M.

$$Y - 60r = M$$

Rearranging yields the LM-Curve.

$$Y = M + 60r \tag{5}$$

Substituting equation (4) into equation (5) and solving yields the interest rate in general equilibrium as a function of taxes, government consumption, and money supply.

$$r^*(T, G, M) = 10 - 0.04T + 0.05G - 0.01M \tag{6}$$

Substituting equation (6) into equation (4) or equation (5) yields output in general equilibrium as a function of taxes, government consumption, and money supply.

$$Y^*(T, G, M) = 600 - 2.4T + 3G + 0.4M \tag{7}$$

Problem 2

Differentiating equation (4) with respect to G yields the government-consumption multiplier.

$$\frac{\partial Y}{\partial G} = 5$$

$\Rightarrow$ **(C)** is correct.

Problem 3

Differentiating equation (4) with respect to T yields the tax multiplier.

$$\frac{\partial Y}{\partial T} = -4$$

$\Rightarrow$ **(A)** is correct.

Problem 4

Substituting $T = 200$, $G = 200$, and $M = 700$ into equation (7) yields general-equilibrium output.

$$Y^* = 1{,}000$$

$\Rightarrow$ **(A)** is correct.

Problem 5

In general equilibrium, investment equals savings. Thus, general-equilibrium savings $S^* = 60$ require

$$I^*(r) = 100 - 8r^* = 60 \quad \Leftrightarrow \quad r^* = 5.$$

Substituting $r^* = 5$ as well as $T = 200$ and $G = 300$ into equation (6) and solving yields the corresponding money supply.

$$M = 1{,}200$$

$\Rightarrow$ **(C)** is correct.

Problem 6

Ceteris paribus,

(A) an increase in taxes T (contractionary fiscal policy) shifts the IS-Curve to the left, while an increase in money supply M (expansionary monetary policy) shifts the LM-Curve downwards. This implies a decrease in the interest rate r^* and thus results in an increase in investment I^* and savings S^*, respectively, in general equilibrium.

(B) an increase in government consumption G (expansionary fiscal policy) shifts the IS-Curve to the right, while a decrease in money supply M (contractionary monetary policy) shifts the LM-Curve upwards. This implies an increase in the interest rate r^* and thus results in a decrease in investment I^* and savings S^*, respectively, in general equilibrium.

(C) a decrease in taxes T (expansionary fiscal policy) shifts the IS-Curve to the right, while an increase in money supply M (expansionary monetary policy) shifts the LM-Curve downwards. This implies an increase in output Y^* which – together with the given decrease in taxes – leads to an increase in disposable income $Y^* - T$ resulting in an increase in private consumption C^* in general equilibrium.

(D) a decrease in government consumption G (contractionary fiscal policy) shifts the IS-Curve to the left, while a decrease in money supply M (contractionary monetary policy) shifts the LM-Curve upwards. This implies a decrease in output Y^* which leads to a decrease in disposable income $Y^* - T$ resulting in a decrease in private consumption C^* in general equilibrium.

$\Rightarrow$ **(D)** is correct.

Problem 7

Goods Market: For any combination (Y, r) located to the left (right) of the IS-curve, the goods market is not in equilibrium; at the given interest rate r, output Y is too small (large), hence investment $I(r)$ exceeds (falls short of) savings $S(Y)$.

Financial Market: For any combination (Y, r) located below (above) the LM-curve, the financial market is not in equilibrium; at the given output Y, the interest rate r is too low (high), hence liquidity demand $L(Y, r)$ exceeds (falls short of) money supply M.

Accordingly, any combination (Y, r) located

(A) to the left of the IS-curve and below the LM-curve satisfies $I > S$ and $L > M$.

(B) on the IS-curve and above the LM-curve satisfies $I = S$ and $L < M$.

(C) to the right of the IS-curve and on the LM-curve satisfies $I < S$ and $L = M$.

(D) to the right of the IS-curve and above the LM-curve satisfies $I < S$ and $L < M$.

$\Rightarrow$ **(A)** is correct.