Chapter 9: Aggregate Supply / Aggregate Demand

Consider the model of aggregate supply and aggregate demand. In this economy,

$$K = 100 \tag{1}$$

$$L = 25 \tag{2}$$

$$M = 200 \tag{3}$$

$$V = 25 \tag{4}$$

LRAS:

$$Y = F(K, L) = K^{\frac{1}{2}} L^{\frac{1}{2}} \tag{5}$$

SRAS:

$$P = 25 + 1.5Y \tag{6}$$

With the information above, please answer the following questions:

a) Write an equation for the AD curve.

$$MV = PY \;\Rightarrow\; P = \frac{MV}{Y} = \frac{(200)(25)}{Y} = \frac{5000}{Y}$$

b) In the long-run, identify P_{LR} and Y_{LR}.

Aggregate demand:

$$P = \frac{5000}{Y} \;\Rightarrow\; Y_{LR} = \frac{5000}{P_{LR}}$$

Long-run equilibrium:

$$LRAS = AD \;\Rightarrow\; Y_{LR} = K^{\frac{1}{2}} L^{\frac{1}{2}} = \frac{5000}{P_{LR}}$$

$$Y_{LR} = (100)^{\frac{1}{2}}(25)^{\frac{1}{2}} = 50 = \frac{5000}{P_{LR}} \;\Rightarrow\; P_{LR} = \frac{5000}{50} = 100$$

$$(P_{LR}, Y_{LR}) = (100, 50)$$

c) Check that your long-run equilibrium satisfies the SRAS curve.

Substitute (P_{LR}, Y_{LR}) into the equation for the short-run aggregate supply curve:

$$P_{LR} = 25 + 1.5Y_{LR}$$

$$100 = 25 + 1.5(50) = 100$$

which is a true statement. Therefore, the SRAS curve is consistent with long-run equilibrium at $(P_{LR}, Y_{LR}) = (100, 50)$.

d) Suppose that V increases to 30 in this economy; this only affects the AD curve. Derive the new AD curve.

$$P = \frac{MV}{Y} = \frac{(200)(30)}{Y} = \frac{6000}{Y}$$

e) Find the new short-run equilibrium (P_{SR}, Y_{SR}).

Short-run aggregate supply:

$$P = 25 + 1.5Y \;\Rightarrow\; Y_{SR} = \frac{P_{SR} - 25}{1.5} = \frac{2P_{SR} - 50}{3}$$

Short-run equilibrium:

$$SRAS = AD \;\Rightarrow\; \frac{2P_{SR} - 50}{3} = \frac{6000}{P_{SR}}$$

$$2P_{SR}^2 - 50P_{SR} = 18000 \;\Rightarrow\; 2P_{SR}^2 - 50P_{SR} - 18000 = 0$$

$$P_{SR} = 108.188 \;\Rightarrow\; Y_{SR} = \frac{2(108.188) - 50}{3} = 55.459$$

$$(P_{SR}, Y_{SR}) = (108.188, 55.459)$$

f) Find the new long-run equilibrium (P_{LR}, Y_{LR}).

Long-run equilibrium:

$$LRAS = AD \;\Rightarrow\; Y_{LR} = K^{\frac{1}{2}} L^{\frac{1}{2}} = \frac{6000}{P_{LR}}$$

$$Y_{LR} = (100)^{\frac{1}{2}}(25)^{\frac{1}{2}} = 50 = \frac{6000}{P_{LR}} \;\Rightarrow\; P_{LR} = \frac{6000}{50} = 120$$

$$(P_{LR}, Y_{LR}) = (120, 50)$$

g) Let's say that the long-run adjustment mechanism shifts the SRAS curve up to meet the new intersection of the AD and LRAS curves. Solve for the SRAS curve that will prevail in long-run equilibrium.

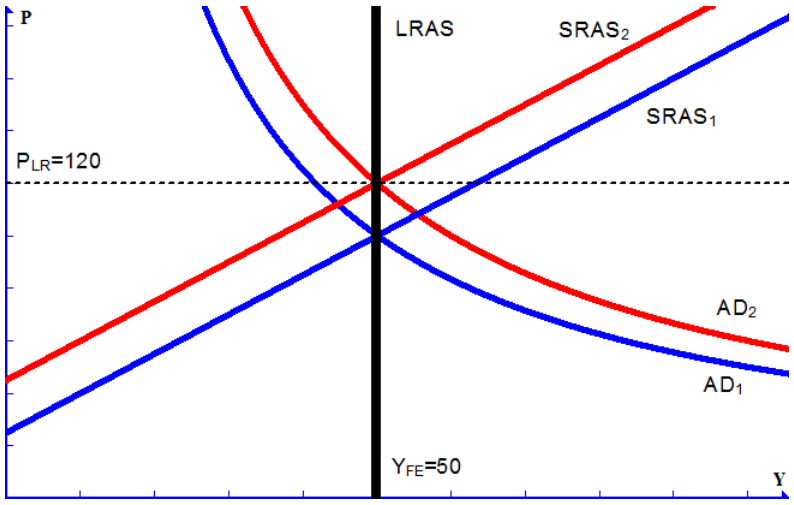
Solve for y-intercept b in the equation for the new SRAS curve:

$$P = b + 1.5Y \;\Rightarrow\; P_{LR} = b + 1.5Y_{LR}$$

$$120 = b + 1.5(50) \;\Rightarrow\; b = 120 - 75 = 45$$

The SRAS curve has shifted up by 20 units, which matches the long-run price increase due to the AD shift ($V \uparrow$).

h) Draw a graph in P vs. Y space that represents the AD shift that occurs in part (d). Label equilibrium points (P_{SR}, Y_{SR}) and (P_{LR}, Y_{LR}). Draw arrows indicating the adjustment path from short-run to long-run equilibrium. Why does the SRAS curve shift during long-run adjustment?



1. $(P_{SR}, Y_{SR}) = (108.188, 55.459)$ is at the intersection point of the AD_2 and $SRAS_1$ curves.
2. $(P_{LR}, Y_{LR}) = (120, 50)$ is at the intersection point of the AD_2, $SRAS_2$, and $LRAS$ curves.
3. Arrows indicating the adjustment path would start at the $SRAS_1$ curve and end at the $SRAS_2$ curve. If you want, you can place them along the AD_2 curve from $SRAS_1$ to $SRAS_2$.
4. With output above the full employment level in the short-run, unemployment declines below its natural rate, resulting in a leftward shift of the labor supply curve (S_1^L to S_2^L; workers are scarce). This results in an increase in wages (w_1^* to w_2^*). The SRAS curve shifts up during long-run adjustment because of higher labor costs due to a supply-constrained labor market; the unit cost of output has increased. Please see the graph of the labor market below.