

Exercise AS-AD Model

Assume that the following is true about the economy:

$$C = 70 + 0.1(Y - T)$$

$$I = 40 - 200i + 0.1Y$$

$$G = 100$$

$$T = 100$$

$$M^d = \$Y(0.4 - i)$$

$$M^s = 80$$

Assume the following wage setting relation:

$$W = P^e(z - 30u) \text{ where}$$

$z = 140/13$ is a parameter that represents the workers bargaining power and u is the unemployment rate.

The following is the price setting relation

$$P = (1 + \mu)W \text{ where}$$

$\mu = 0.3$ is the markup.

The economy production function is:

$$Y = N$$

The labor force is

$$L = 300.$$

- 1) Derive the AS relation and graph the AS curve.
- 2) Derive the AD relation and graph the AD curve.
- 3) Calculate and graph the medium run equilibrium.
- 4) Imagine an expansionary monetary policy such that $\Delta M^s = 80$, that is the money supply increases by 80, from 80 to 160.

Assume two different scenarios:

- a) $P^e \neq P$ (Expectations can differ from the actual price level in the short run);
- b) $P^e = P$ (Expectations are always equal to the actual price level).

Describe the short run equilibriums in both scenarios – you need to do calculations only for b).

5) Show the dynamics to the medium run equilibrium in both scenarios, using diagrams with explanations. Conclude by explaining how the effects of the monetary policy depend on the expectation formation process.

6) Assume that the medium run equilibrium you calculated in part 3) is perturbed by a shock that dramatically increases μ by 1.3, to a value of 1.6. Calculate the new medium run equilibrium. How can the government and the central bank restore the pre-shock medium run equilibrium you calculated in part 3)?

ANSWERS:

Assume that the following is true about the economy:

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The economy production function is:

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The labor force is

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1) Derive the AS relation and graph the AS curve.

The AS relation represents the equilibrium points in the labor market.

$$\begin{cases} P = (1 + \mu)W \\ W = P^e(z - 30u) \end{cases}$$

$$P = P^e(1 + \mu)(z - 30u)$$

Given that

$$u = \frac{U}{L} = \frac{L - N}{L} = 1 - \frac{Y}{300}$$

$$\mu = 0.3$$

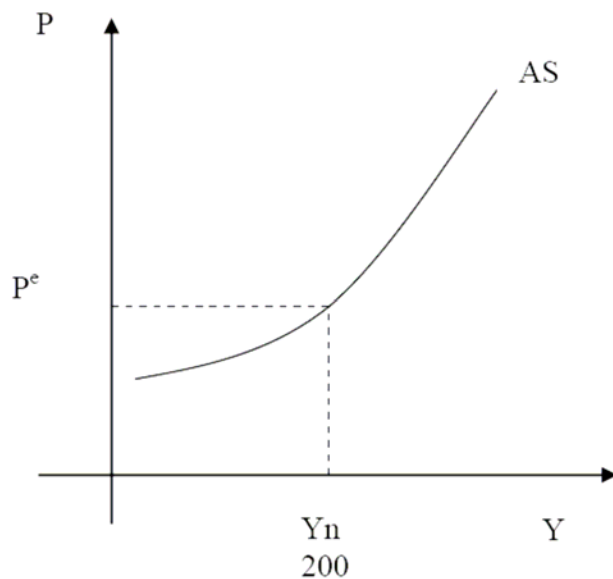
$$z = \frac{140}{13}$$

we get

$$P = P^e \left(1 + 0.3 \right) \left(\frac{140}{13} - 30 \left(1 - \frac{Y}{300} \right) \right)$$

$$P = P^e \left(\frac{39}{300} Y - 25 \right).$$

The AS curve has to pass through the point (P^e, Y) such that $Y = Y_n = 200$: the natural level of output.



2) Derive the AD relation and graph the AD curve.

The AD relation represents the equilibrium points in the goods market and in the money market.

$$Y = C + I + G = 70 + 0.1(Y - 100) + 40 - 200i + 0.1Y + 100$$

$$Y = 200 + 0.2Y - 200i$$

$$Y = 250 - 250i \text{ (IS relation)}$$

$$M^d = \$Y(0.4 - i)$$

$$M^s = 80$$

Given that $\$Y = PY$

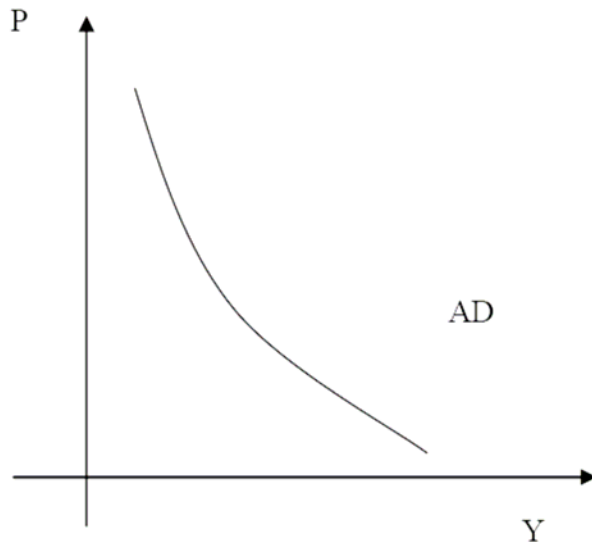
$$80 = PY(0.4 - i)$$

$$i = 0.4 - 80/PY \text{ (LM relation)}$$

Combining the IS and LM relations gives

$$Y = 250 - 100 + 20000/PY$$

$$Y^2 - 150Y - 20000/P = 0$$

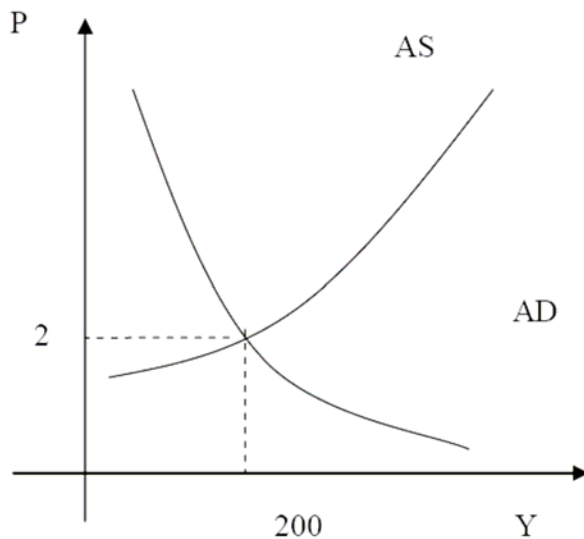


3) Calculate and graph the medium run equilibrium.

In the medium run equilibrium $P = P^e$ and $Y = Y_n = 200$.

$$(200)^2 - 150(200) = 20000/P$$

$$P=2$$



4) Imagine an expansionary monetary policy such that $\Delta M_s = 80$, that is the money supply increases by 80, from 80 to 160.

Assume two different scenarios:

a) $P^e \neq P$ (Expectations can differ from the actual price level in the short run);

b) $P^e = P$ (Expectations are always equal to the actual price level).

Describe the short run equilibriums in both scenarios – you need to do calculations only for b).

a) If $P^e \neq P$, the monetary policy can have a real effect in the short run. The increase in the money supply shifts the AD curve to the right. This implies an increase in both price level and output. If, at the same time, the expectations of the price level adjust upwards, the AS curve shifts up. This movement can dampen or annihilate the expansionary effect on output (depending on how much P^e increases).

b) If $P^e = P$ the AS curve is a vertical line at $Y=200$.

The new equilibrium P is

$$160 = PY(0.4 - i)$$

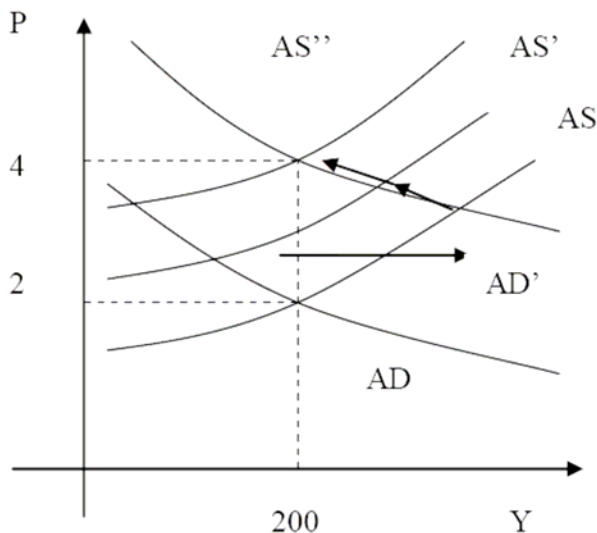
$$Y^2 - 150Y - 40000/P = 0$$

$$(200)^2 - 150(200) = 40000/P$$

$$P = 4.$$

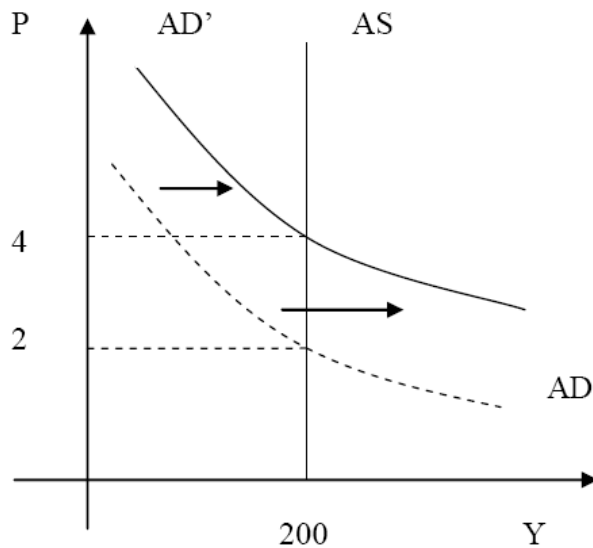
5) Show the dynamics to the medium run equilibrium in both scenarios, using diagrams with explanations. Conclude by explaining how the effects of the monetary policy depend on the expectation formation process.

Starting with $P^e \neq P$ expectations of the price level increase, moving the AS curve up. The economy moves along the AD curve through a sequence of short run equilibrium points. In the dynamics, output keep decreasing and price level keep increasing. In the medium term the AS curve reaches the point corresponding to which $Y_n = Y$ and $P^e = P$.



If $P^e = P$, there are no dynamics towards a medium term equilibrium. The economy immediately settles down to the new equilibrium with a higher price level and the same output level.

The monetary policy is neutral even in the short run.



The real effect of monetary policy on output lasts longer, the slower wage setters update their expectations to the new price level equilibrium.

6) Assume that the medium run equilibrium you calculated in part 3) is perturbed by a shock that dramatically increases μ by 1.3, to a value of 1.6. Calculate the new medium run equilibrium. How can the government and the central bank restore the pre-shock medium run equilibrium you calculated in part 3)?

The new medium run equilibrium is given by

$$P = P^e (1 + 1.6) \left(\frac{140}{13} - 30 \left(1 - \frac{Y}{300} \right) \right)$$

$$\frac{26}{100} Y = 51$$

$$Y = \frac{5100}{26} \approx 196$$

Note that the natural output does not change much given that we are assuming a very inelastic wage setting relation.

In order to restore the previous equilibrium value $Y_n = 200$, we cannot rely on monetary policy since it is neutral in the medium run.

Fiscal policy also does not have a long lasting effect on the equilibrium Y . The government could intervene by changing the labor market structure (the parameter z in our economy).

$$P = P^e(1 + 1.6) \left(z - 30 \left(1 - \frac{Y}{300} \right) \right)$$

$$1 = 2.6 \left(z - 30 \left(1 - \frac{200}{300} \right) \right)$$

$$1 = 2.6(z - 10)$$

$$z = \frac{270}{26}$$

This corresponds to decreasing the bargaining power of the workers.