The Monetary Policy and Aggregate Demand Curves
ECON 4673
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Answers

1. *When the inflation rate increases, what happens to the federal funds rate? Operationally, how does the Federal Reserve adjust the federal funds rate?*

   The Federal Reserve raises its federal funds rate target in response to higher inflation. Operationally, the Federal Reserve conducts open-market sales of bonds to remove reserves from the banking system, which causes the federal funds rate to increase.

2. *How does an autonomous tightening or easing of monetary policy affect the MP curve?*

   An autonomous tightening of monetary policy results in $\bar{r}$ increasing and the MP curve shifting upward. Conversely, an autonomous easing of monetary policy results in $\bar{r}$ decreasing and the MP curve shifting downward.

3. *What factors affect the size of the decline in output after an increase in inflation?*

   The equation for the aggregate demand curve indicates: $\Delta Y = - \theta \times (d + x)/(1 - MPC) \times \Delta\pi$. Thus, output declines more after an increase in inflation when θ, d, x, and MPC are large.

4. *If net exports are not sensitive to changes in the real interest rate, is monetary policy more or less effective in changing output?*

   Monetary policy would be less effective in changing output, since net exports represent a channel, in addition to investment, through which interest rate changes impact output.

5. *Consider an economy described by the following data: $\bar{C}$ = $3.25 trillion, $\bar{I}$ = $1.3 trillion, $\bar{G}$ = $3.5 trillion, $\bar{T}$ = $3.0 trillion, $\overline{NX}$ = – $1.0 trillion, MPC = 0.75, d = 30, x = 10, $\bar{f}$ = 0.01, $\bar{r}$ = 0.02, π^* = 0.01, and θ = 1.*

   a. *Derive the expression for the IS curve.*

   The IS curve is given by
   $$Y = C + I + \bar{G} + NX:$$
   $$Y = 1 + 0.75 \times Y + 1 - 30 \times r + 3.5 - 1 - 10 \times r$$
   $$0.25 \times Y = 4.5 - 40 \times r$$
   $$Y = 18 - 160 \times r$$

   b. *Derive the expressions for the MP curve (assume $\pi^e = \pi$).*

   The MP curve is given by
   $$r + \pi = \bar{r} + \pi + \theta \times (\pi - \pi^*)$$
   $$r = \bar{r} + \theta \times (\pi - \pi^*)$$
   $$r = 0.02 + (\pi - 0.01)$$
   $$r = 0.01 + \pi$$

c. *Derive the expressions for the AD curve.*

Combining the equations for the IS and MP curves produces the AD curve
$$Y = 18 - 160 \times (0.01 + \pi)$$
$$Y = 18 - 1.6 - 160 \times \pi$$
$$Y = 16.4 - 160 \times \pi$$

d. *Assume that $\pi = 0.01$. Calculate the real interest rate and the equilibrium level of output.*

From the AD curve,
$$Y = 16.4 - 160 \times \pi$$
$$Y = 16.4 - 160 \times 0.01$$
$$Y = 16.4 - 1.6$$
$$Y = 14.8$$

From the MP curve,
$$r = 0.01 + \pi$$
$$r = 0.01 + 0.01$$
$$r = 0.02$$

e. *Suppose the Federal Reserve increases $\bar{r}$ to $\bar{r} = 0.03$. Calculate the real interest rate and the equilibrium level of output at this new level of $\bar{r}$. You can assume $\pi = 0.01$.*

From the MP curve,
$$r + \pi = \bar{r} + \pi + \theta \times (\pi - \pi^*)$$
$$r = \bar{r} + \theta \times (\pi - \pi^*)$$
$$r = 0.03 + (0.01 - 0.01)$$
$$r = 0.03$$

From the IS curve,
$$Y = 18 - 160 \times r$$
$$Y = 18 - 160 \times 0.03$$
$$Y = 18 - 4.8$$
$$Y = 13.2$$

6. *Suppose the monetary policy curve is given by $r = 0.015 + 0.75 \times \pi$, and the IS curve is given by $Y = 13 - 100 \times r$.*

a. *Calculate an expression for the aggregate demand curve.*

Combining the equations for the IS and MP curves

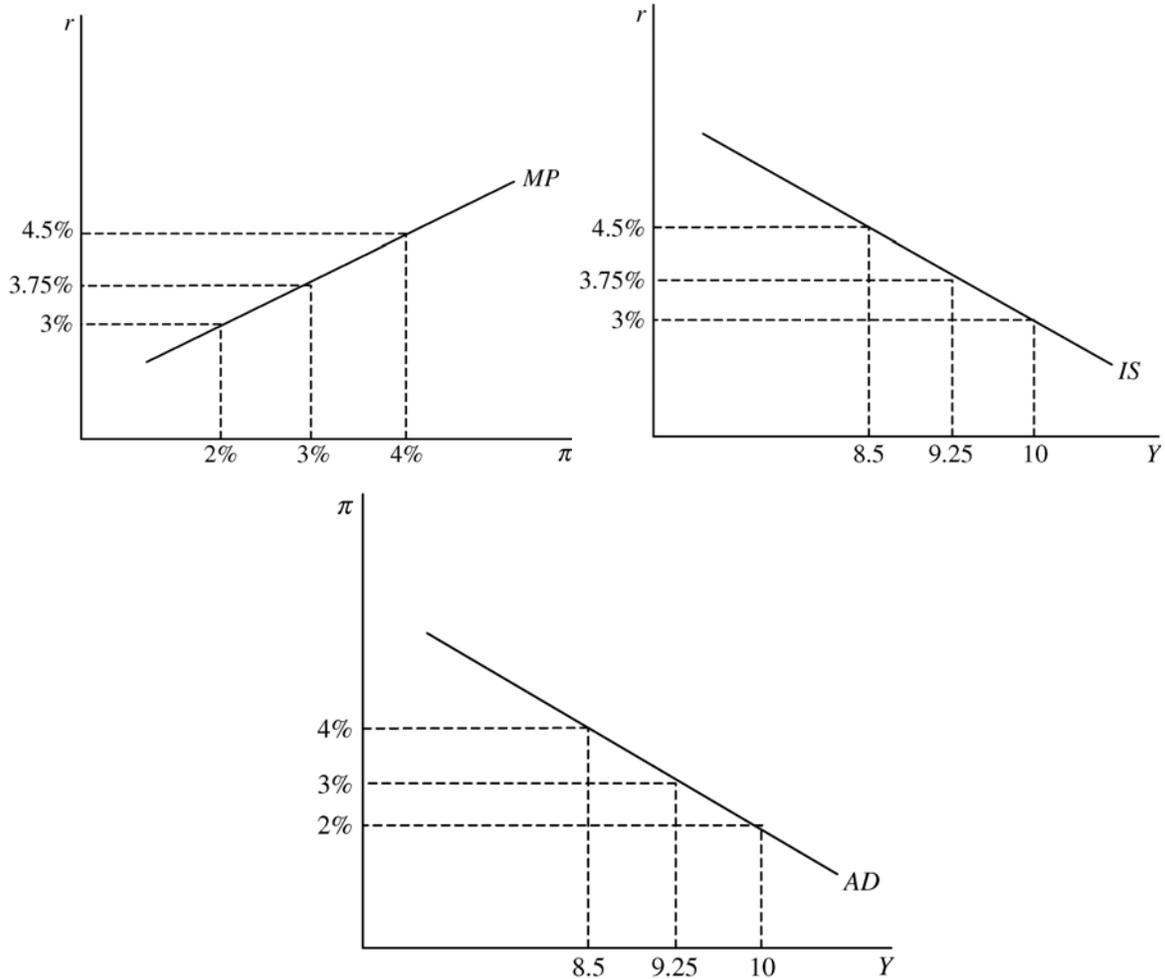$$Y = 13 - 100 \times (0.015 + 0.75 \times \pi)$$
$$Y = 11.5 - 75 \times \pi.$$

b. *Calculate the real interest rate and aggregate output when the inflation rate is 2%, 3%, and 4%.*

When the inflation rate is 2%, 3%, and 4%, the real interest rate is 3%, 3.75%, and 4.5%, respectively. Aggregate output is 10, 9.25, and 8.5, respectively.

c. *Draw graphs of the IS, MP, and AD curves, labeling the points from part (b) on the appropriate graphs.*

Graphs are below.

7. *Describe the impact of the following situations on the IS, MP, and AD curves.*

a. *A decrease in financial frictions.*

A decrease in financial frictions raises output and shifts the IS and AD curves to the right while the MP curve is not affected.

b. *An increase in the Federal Reserve's inflation target.*

An increase in the target inflation rate cause the real interest rate to decline and the MP curve to shift down. The lower real interest rate pushes up investment and net exports which stimulates output and shifts the AD curve to the right. That lower real interest rate and the higher level of output are represented by a downward movement along the IS curve.

c. *An increase in the current inflation rate.*

   An increase in the current inflation rate represents an upward movement along the MP curve, which causes an increase in the real interest rate. That jump in the real interest rate lowers investment and net exports which reduces output and is represented by an upward movement along the IS curve. Finally, the higher inflation rate and lower output is demonstrated by an upward movement along the AD curve.

d. *Firms become more optimistic about the future of the economy.*

   Autonomous investment increases which raises output. That increase shifts the IS and AD curves to the right. The MP curve, on the other hand, does not change.

e. *A new Federal Reserve chair puts more emphasis on fighting inflation.*

   When the Federal Reserve more aggressively fights inflation, θ rises. That change causes the real interest rate to respond more aggressively to changes in inflation which is represented by a steeper MP curve. The higher real interest rate reduces output more which leads to a flatter AD curve and an upward movement along the IS curve.