

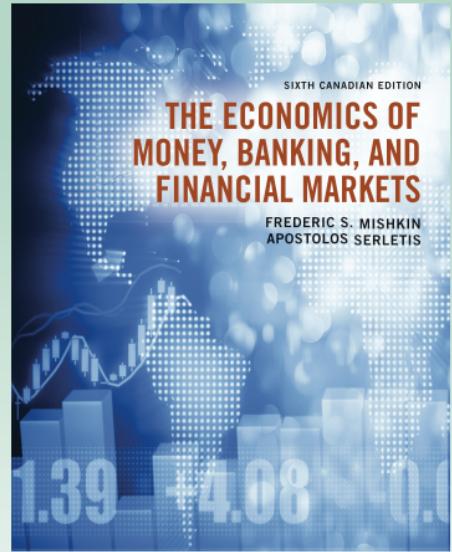
Mishkin/Serletis

# The Economics of Money, Banking, and Financial Markets

Sixth Canadian Edition

## Chapter 24

# Monetary Policy Theory



# Learning Objectives

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- 1. Illustrate and explain the policy choices that monetary policymakers face under the conditions of aggregate demand shocks, temporary supply shocks, and permanent supply shocks
- 2. Identify the lags in the policy process, and summarize why they weaken the case for activist policy
- 3. Explain why monetary policymakers can target any inflation rate in the long run but cannot target a level of aggregate output in the long run

## Learning Objectives (cont'd)

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- . Identify the sources of inflation and the role of monetary policy in propagating inflation
- . Explain the unique challenges that monetary policymakers face at the zero lower bound, and illustrate how nonconventional monetary policy can be effective under such conditions

Monetary autonomy refers to the independence of a country's central bank to affect its own money supply and through that, conditions in its domestic economy. In a floating exchange rate system, a central bank is free to control the money supply.

# Response of Monetary Policy to Shocks

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- Monetary policy should try to minimize the difference between inflation and the **inflation target**
- In case of both demand shocks and permanent supply shocks
  - *Policy makers can simultaneously pursue price stability and stability in economic activity*
- Following a temporary supply shock
  - *Policy makers can achieve either price stability or economic activity stability, but not both*
  - *This tradeoff poses a dilemma for central banks with dual mandates*

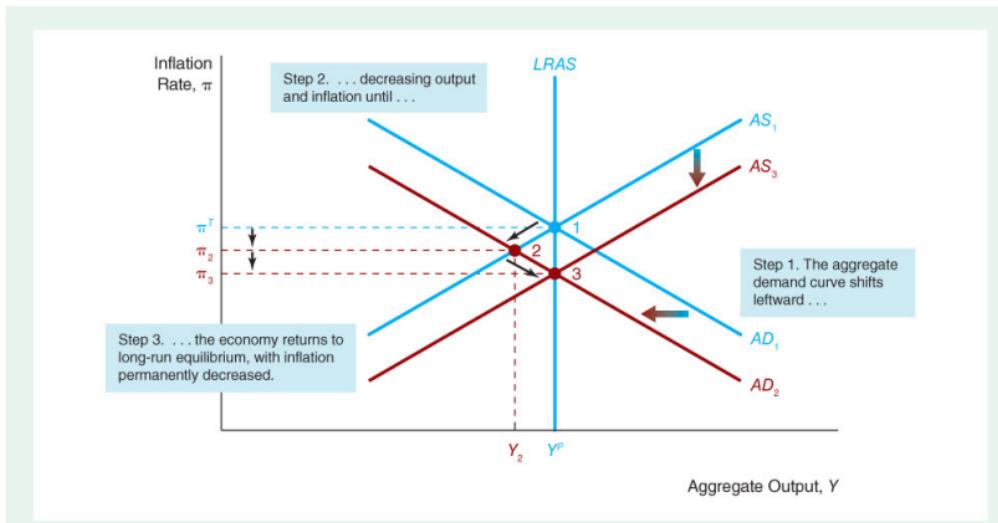
- With a goal of price stability, the Bank wants to keep  $\pi$  as close as possible to  $\pi^T$
- $\pi^T = \text{inflation target}$
- Monetary policy is intended to minimize the difference between actual inflation and the inflation target
  - $(\pi - \pi^T) = \text{inflation gap}$
- With a goal of output stability, the Bank wants to keep  $Y$  as close as possible to  $Y^P$
- Monetary policy is intended to minimize the difference between aggregate output and potential output
  - $Y - Y^P = \text{output gap}$

# Response to an Aggregate Demand Shock

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- Policy makers can respond in two possible ways:
  - *No policy response*
  - *Policy stabilizes economic activity and inflation in the short run*
- In the case of aggregate demand shocks:
  - *No tradeoff between the pursuit of price stability and economic activity stability*

# Aggregate Demand Shock: No Policy Response



**FIGURE 24-1** Aggregate Demand Shock: No Policy Response

An aggregate demand shock shifts the aggregate demand curve leftward from  $AD_1$  to  $AD_2$  and moves the economy from point 1 to point 2, where aggregate output falls to  $Y_2$  and inflation falls to  $\pi_2$ . With output below potential, the short-run aggregate supply curve shifts down to  $AS_3$  and the economy moves to point 3, where output is back at  $Y^P$  but inflation has fallen to  $\pi_3$ .

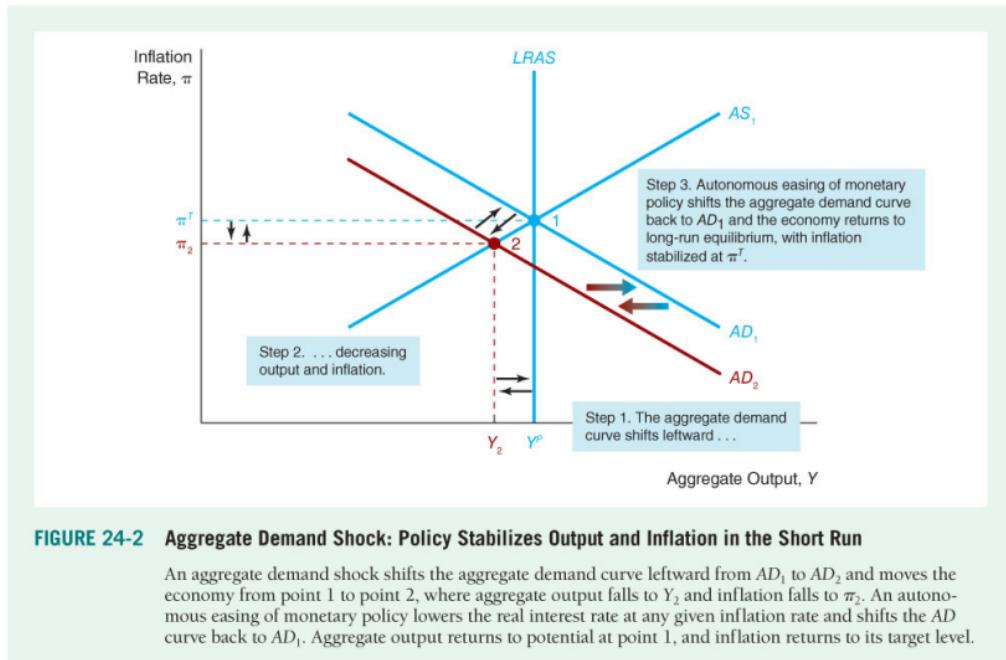
Starting in equilibrium where  $Y = Y^P$  and  $\pi_U = \pi_U^T$

- AD decreases
- Output falls below  $Y^P$
- Inflation falls below  $\pi_U^T$

Given these outcome .

- $\pi^e$  falls and SRAS shifts down and right
- Output is back to  $Y^P$
- inflation is even lower

# Aggregate Demand Shock: Policy Stabilizes Output and Inflation in the Short Run



**FIGURE 24-2** Aggregate Demand Shock: Policy Stabilizes Output and Inflation in the Short Run

An aggregate demand shock shifts the aggregate demand curve leftward from  $AD_1$  to  $AD_2$  and moves the economy from point 1 to point 2, where aggregate output falls to  $Y_2$  and inflation falls to  $\pi_2$ . An autonomous easing of monetary policy lowers the real interest rate at any given inflation rate and shifts the  $AD$  curve back to  $AD_1$ . Aggregate output returns to potential at point 1, and inflation returns to its target level.

Starting in equilibrium where  $Y=Y^P$  and  $\pi=\pi^T$

- AD decreases
- Bank responds by easing monetary policy,  $j_r$
- Investment spending increases, AD increases.
- Economy returns to its pre-shock level.

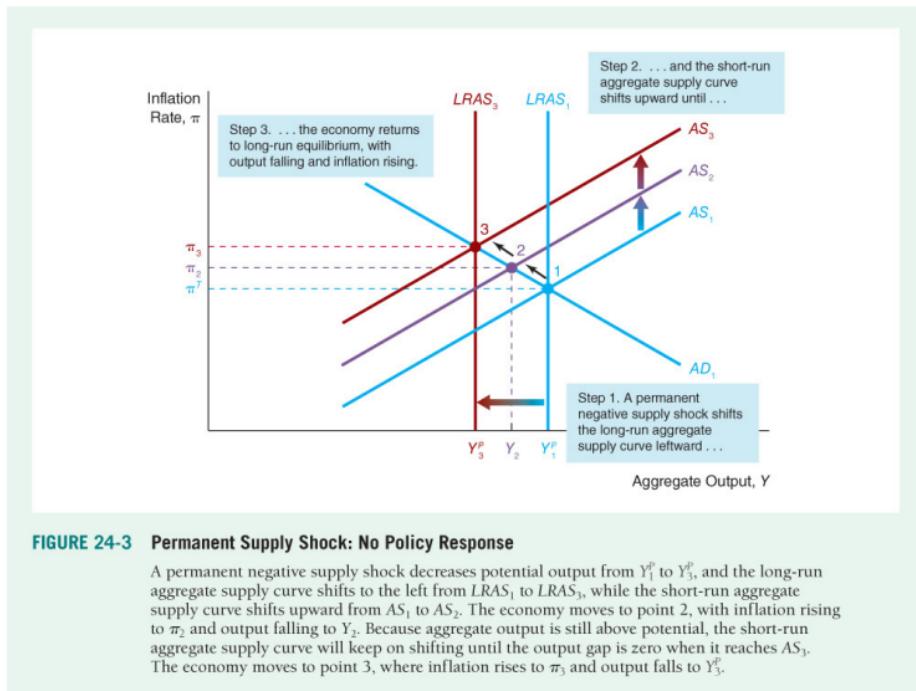
# Response to a Permanent Supply Shock

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- Two policy responses to a permanent supply shock:
  1. *No policy response*
  2. *Policy stabilizes inflation*
- There is no trade off between the dual objectives of stabilizing inflation and stabilizing economic activity
  - *The **divine coincidence** holds*

In economics, divine coincidence refers to the property that there is no trade-off between the stabilization of the inflation and the stabilization of the output gap for central bank.

# Permanent Supply Shock: No Policy Response



**FIGURE 24-3 Permanent Supply Shock: No Policy Response**

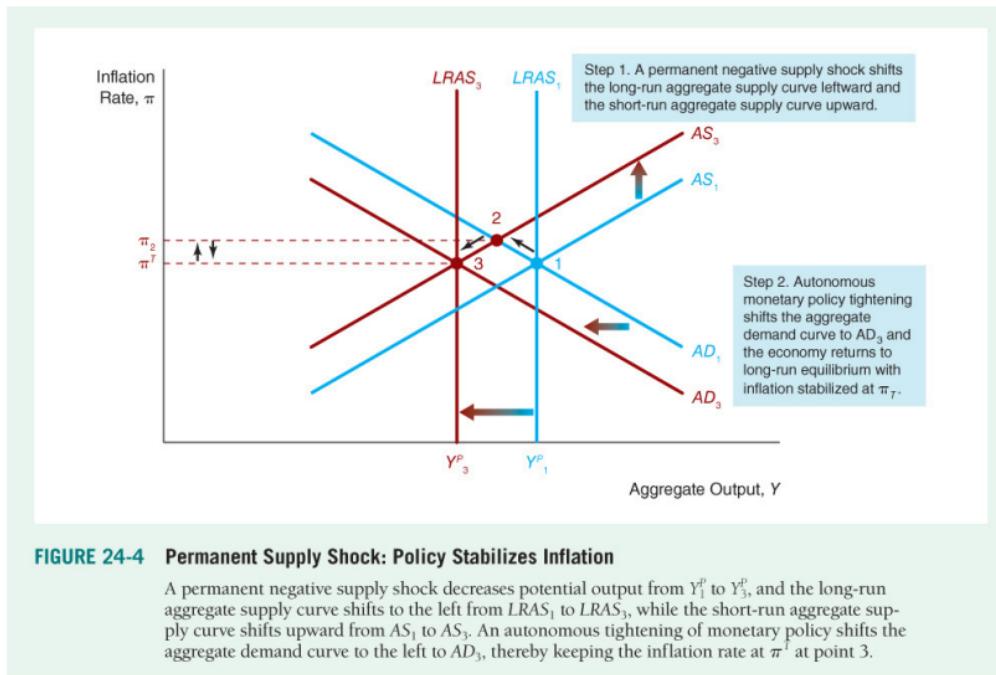
A permanent negative supply shock decreases potential output from  $Y_1^p$  to  $Y_3^p$ , and the long-run aggregate supply curve shifts to the left from  $LRAS_1$  to  $LRAS_3$ , while the short-run aggregate supply curve shifts upward from  $AS_1$  to  $AS_2$ . The economy moves to point 2, with inflation rising to  $\pi_2$  and output falling to  $Y_2$ . Because aggregate output is still above potential, the short-run aggregate supply curve will keep on shifting until the output gap is zero when it reaches  $AS_3$ . The economy moves to point 3, where inflation rises to  $\pi_3$  and output falls to  $Y_3^p$ .

## Case 1 : No Policy Response.

Starting in eq where  $\gamma = \gamma^P$  and  $\pi_U = \pi^T$ .

- Potential output falls
- Immediately  $\pi_U \uparrow$ ,  $\pi^e \uparrow$ , SRAS shifts up and left.
- SRAS will continue to shift up and left ( $\pi^e \uparrow$ ) until  $\pi^e = \pi_3$
- However,  $\pi > \pi^T$ , and potential output is lower at  $\gamma_3^P$

# Permanent Supply Shock: Policy Stabilizes Inflation



## Case 2 : Stabilize Inflation

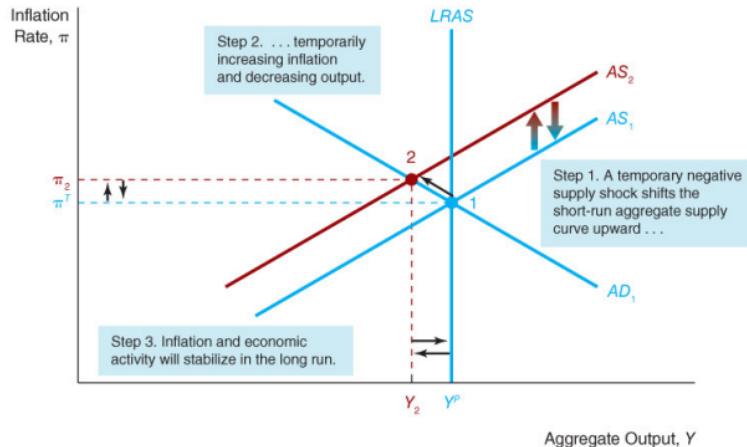
- Potential Output falls.
- SRAS shifts up and left.
- Policy makers can keep inflation at the target  $\pi^*$  by shifting AD to the left
- To achieve that, policy makers would automatically tighten policy by  $\uparrow r$
- Investment spending would decrease, and the AD will shift to the left
- Notice, the output gap is zero and the inflation gap is zero
- Stabilizing inflation also stabilized output

# Response to a Temporary Supply Shock

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- When a supply shock is temporary, policymakers face a short-run tradeoff between stabilizing inflation and economic activity
- Policymakers can respond to the temporary supply shock in three possible ways:
  1. *No policy response*
  2. *Policy stabilizes inflation in the short run*
  3. *Policy stabilizes economic activity in the short run*

# Response to a Temporary Aggregate Supply Shock: No Policy Response



**FIGURE 24-5 Response to a Temporary Supply Shock: No Policy Response**

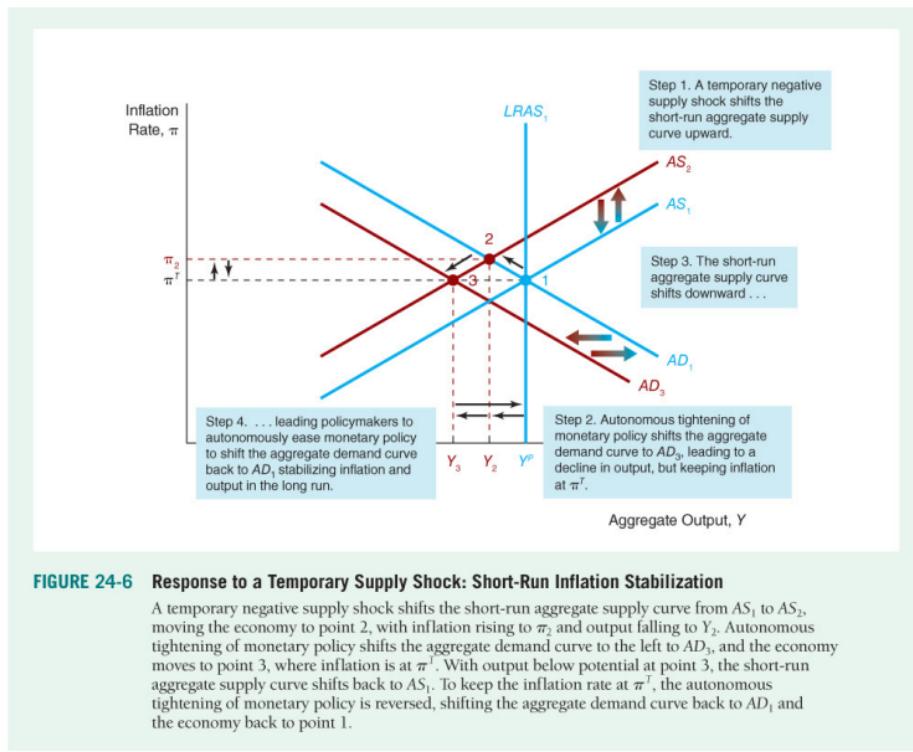
A temporary negative supply shock shifts the short-run aggregate supply curve upward from  $AS_1$  to  $AS_2$ , moving the economy to point 2, with inflation rising to  $\pi_2$  and output falling to  $Y_2$ . If the autonomous monetary policy remains unchanged, the short-run aggregate supply curve will shift back down and to the right in the long run, eventually returning to  $AS_1$ , and the economy will move back to point 1.

Example: the price of oil increases due to political unrest

Starting in equilibrium where  $Y = Y^P$  and  $\pi = \pi^J$

- SRAS shifts up and left
- LRAS remains unchanged
- Outcome:  $\pi \uparrow$ ,  $Y \downarrow$
- Since  $Y < Y^P$ , eventually  $\pi^e \downarrow$  and SRAS will shift back down and right
- Inflation returns to  $\pi^J$
- Output returns to  $Y^P$
- Both inflation and output will stabilize over time
- How much time?

# Response to a Temporary Aggregate Supply Shock: Short-Run Inflation Stabilization



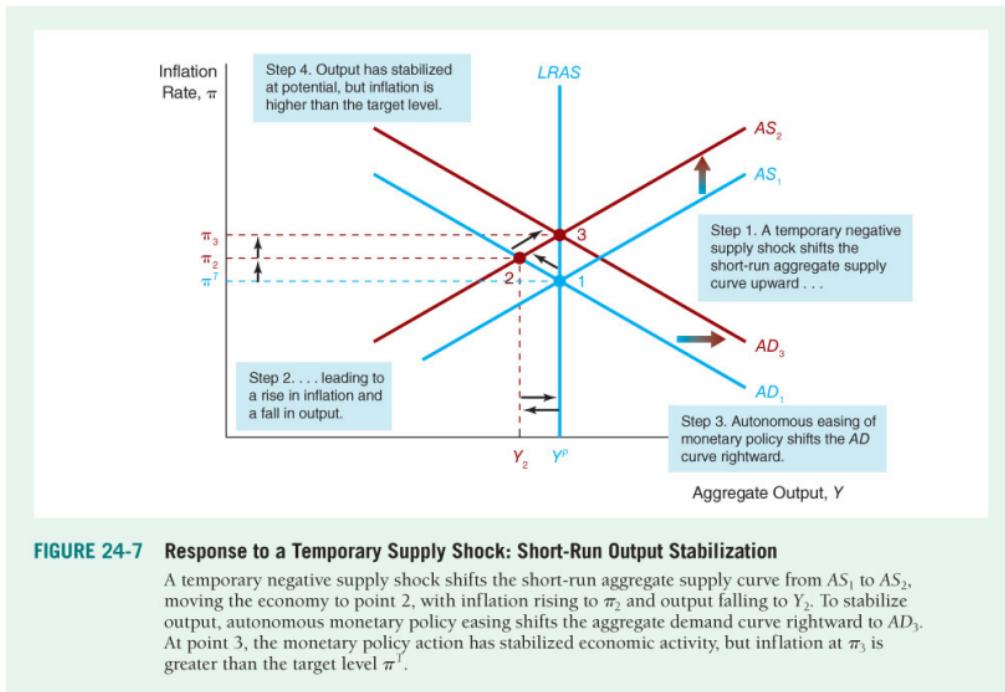
**FIGURE 24-6 Response to a Temporary Supply Shock: Short-Run Inflation Stabilization**

A temporary negative supply shock shifts the short-run aggregate supply curve from  $AS_1$  to  $AS_2$ , moving the economy to point 2, with inflation rising to  $\pi_2$  and output falling to  $Y_2$ . Autonomous tightening of monetary policy shifts the aggregate demand curve to the left to  $AD_3$ , and the economy moves to point 3, where inflation is at  $\pi^t$ . With output below potential at point 3, the short-run aggregate supply curve shifts back to  $AS_1$ . To keep the inflation rate at  $\pi^t$ , the autonomous tightening of monetary policy is reversed, shifting the aggregate demand curve back to  $AD_1$  and the economy back to point 1.

SRAS has shifted up and left due to its temporary supply shock.

- To keep inflation at  $\pi^T$ , policymakers can autonomously tighten monetary policy by  $\uparrow r$
- Investment spending  $\downarrow$ , AD shifts to the left.
- A negative output gap still exists, so eventually SRAS will shift back down and right
- To re-stabilize  $\pi^T$ , policymakers will ease monetary policy, reversing course,  $\downarrow r$  and  $\downarrow AD$ .
- Inflation and output stabilized in the long-run, but the output gap was very large and economic activity was destabilized for some time

# Response to a Temporary Aggregate Supply Shock: Short-Run Output Stabilization



**FIGURE 24-7** Response to a Temporary Supply Shock: Short-Run Output Stabilization

A temporary negative supply shock shifts the short-run aggregate supply curve from  $AS_1$  to  $AS_2$ , moving the economy to point 2, with inflation rising to  $\pi_2$  and output falling to  $Y_2$ . To stabilize output, autonomous monetary policy easing shifts the aggregate demand curve rightward to  $AD_3$ . At point 3, the monetary policy action has stabilized economic activity, but inflation at  $\pi_3$  is greater than the target level  $\pi^T$ .

SRAS has shifted up and left due to this temporary adverse supply shock.

- To stabilize output, policymaker can TAD by autonomously easing monetary policy by  $\downarrow r$ .
- Investment spending  $\uparrow$ , AD shifts to the right.
- Output gap is reduced to zero
- inflation remains above  $\pi^T$

# The Bottom Line: The Relationship Between Stabilizing Inflation and Stabilizing Economic Activity

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We can draw the following conclusions :

1. *If most shocks to the economy are aggregate demand shocks or permanent aggregate supply shocks, then policy that stabilizes inflation will also stabilize economic activity, even in the short run*
  
2. *If temporary supply shocks are more common, then a central bank must choose between the two stabilization objectives in the short run*

# How Actively Should Policy Makers Try to Stabilize Economic Activity?

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- All economists have similar policy goals (to promote high employment and price stability)
- They often disagree on the best approach to achieve those goals
  - *Nonactivists* believe government action is unnecessary to eliminate unemployment
  - *Activists* see the need for the government to pursue active policy to eliminate high unemployment when it develops

Non activists - believe wages and prices are flexible and the economy will return to long-run equilibrium rapidly

Activists - (Keynesians) believe wages and prices are sticky and the adjustment to long-run equilibrium will only happen slowly.

# Lags and Policy Implementation

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- Several types of lags prevent policymakers from shifting the aggregate demand curve instantaneously:
  - **Data lag:** *the time it takes for policy makers to obtain data indicating what is happening in the economy*
  - **Recognition lag:** *the time it takes for policy makers to be sure of what the data are signaling about the future course of the economy*

# Lags and Policy Implementation (cont'd)

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- ***Legislative lag:*** *the time it takes to pass legislation to implement a particular policy*
- ***Implementation lag:*** *the time it takes for policy makers to change policy instruments once they have decided on the new policy*
- ***Effectiveness lag:*** *the time it takes for the policy actually to have an impact on the economy*

## Lags and Policy implementation .

- Shifting the AD curve is not instantaneous.
- The existence of these lags is the best argument against activism.
- If the lags are too long, by the time AD curve shifts to the right, the self-correcting mechanism will kick-in and the result will be an economy that is now too "hot" and inflationary pressure will now exist.

## FYI The Activist/Nonactivist Debate Over the Obama Fiscal Stimulus Package

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- Many activists argued that the government needed to do more by implementing a fiscal stimulus package
- Nonactivists opposed the fiscal stimulus package, arguing that fiscal stimulus would take too long to work because of long implementation lags
- The Obama administration proposed the American Recovery and Reinvestment Act of 2009, a \$787 billion fiscal stimulus package that Congress passed on February 13, 2009

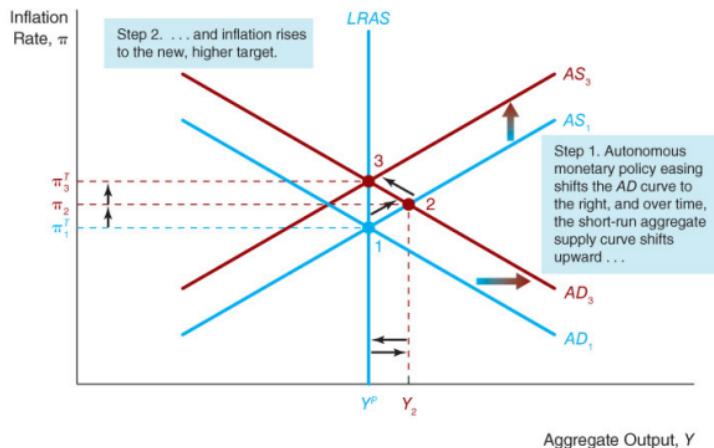
# Inflation: Always and Everywhere a Monetary Phenomenon

— Milton Friedman

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- This adage is supported by our aggregate demand and supply analysis because it shows that monetary policy makers can target any inflation rate in the long run by shifting the aggregate demand curve with autonomous monetary policy

# A Rise in the Inflation Target



**FIGURE 24-8 A Rise in the Inflation Target**

To raise the inflation target to  $\pi_3^T$ , the central bank undertakes an autonomous monetary policy easing by lowering the real interest rate at any given inflation rate, thereby shifting the aggregate demand curve rightward to  $AD_3$ . The economy then moves to point 2, and the short-run aggregate supply curve shifts up and to the left, eventually stopping at  $AS_3$ . The economy then moves to point 3, with the output gap at zero and inflation at  $\pi_3^T$ .

- Start in the equilibrium where  $Y=Y^P$  and  $\pi_U=\pi_U^T$
- To raise the target, policymakers can ease monetary policy by  $\downarrow r$ .
- Investment spending will increase and AD will increase.
- Because of the positive output gap,  $\pi_U \uparrow$  and SRAS shifts up and left.
- Outcome: the output gap is reduced to zero and the policy goal of a higher  $\pi_U^T$  has been achieved.

As we have seen, policymakers can choose any inflation rate in the long run. So, why does high inflation exist?

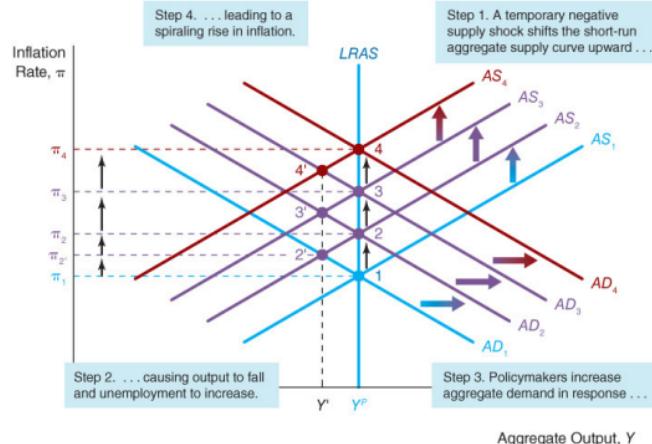
- The pursuit of high employment can result in high inflation.
- There are two types

# Causes of Inflationary Monetary Policy

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- High Employment Targets and Inflation
- ***Cost-push inflation*** results either from a temporary negative supply shock or a push by workers for wage hikes beyond what productivity gains can justify
- ***Demand-pull inflation*** results from policy makers pursuing policies that increase aggregate demand

# Cost-Push Inflation



**FIGURE 24-9** Cost-Push Inflation

A cost-push shock (which acts like a temporary negative supply shock) shifts the short-run aggregate supply curve up and to the left to  $AS_2$ , and the economy moves to point 2'. To keep aggregate output at  $Y^P$  and to lower the unemployment rate, policymakers shift the aggregate demand curve to  $AD_2$  so that the economy will return quickly to potential output at point 2 and an inflation rate of  $\pi_2$ . Further upward and leftward shifts of the short-run aggregate supply curve, to  $AS_3$  and beyond, lead the policymakers to continue increasing aggregate demand, leading to a continuing increase in inflation—a cost-push inflation.

## Cost-push Inflation.

Start in long-run equilibrium.

- SRAS shifts up and left for some reason.
  - Higher wage demand
  - Adverse supply shock

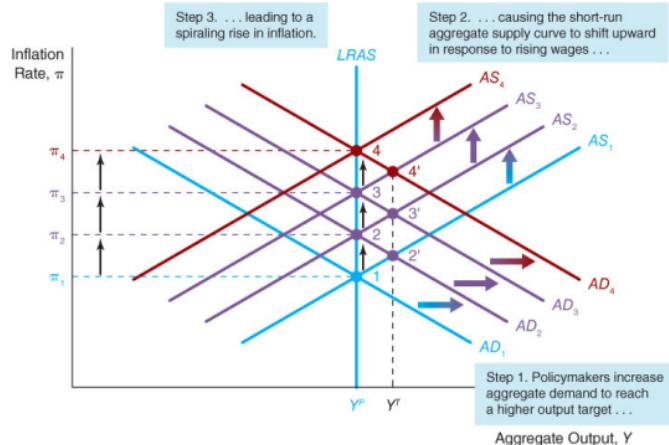
No activist Response

- SRAS shifts up and eventually back

Activist Policy

- When the SRAS shifts up and left, output falls below  $y^*$  and unemployment increases.
- With a goal of high employment, policymakers will try to increase AD
  - $\uparrow G$ .
  - $\downarrow T$
  - Autonomous easing by  $\downarrow r$ .
- If the reason for the shift up and left of SRAS were to continue, and the activist policy against those changes were to continue, the result will be an inflationary spiral.

# Demand-Pull Inflation



**FIGURE 24-10** Demand-Pull Inflation

Too low an unemployment target (too high an output target of  $Y^t$ ) causes the government to increase aggregate demand, shifting the  $\bar{AD}$  curve rightward from  $\bar{AD}_1$  to  $\bar{AD}_2$  to  $\bar{AD}_3$  and so on. Because at  $Y^t$  the unemployment rate is below the natural rate level, wages will rise and the short-run aggregate supply curve will shift up and leftward, from  $AS_1$  to  $AS_2$  to  $AS_3$  and so on. The result is a continuing rise in inflation known as a demand-pull inflation.

## Demand - Pull Inflation.

- A goal of high employment can mistakenly set the target for unemployment lower than the natural rate of unemployment.
- This is equivalent to setting the target for output greater than potential output

$$U^T < U_n \equiv Y^T > Y^P$$

- Start in equilibrium where  $Y = Y^P < Y^T$
- To hit their  $U^T$ , policymakers have to TAD to hit their output target,  $Y^T$ .
- The positive output gap means SRAS will shift up and left,  $\uparrow \pi$ .
- If policymakers continue with their expansionary fiscal policy or autonomous monetary easing, the AD curve will continue to shift right.
- Each time, the SRAS curve will shift up left.
- Result in inflationary spiral.

# Monetary Policy at the Zero Lower Bound

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- So far, we've assumed central banks lower the real interest rate as inflation falls. What happens at zero?
- At the zero lower bound, the monetary policy curve has a kink when nominal rates are zero
  - *When inflation is lower than that kink point, the monetary policy curve becomes downward (instead of upward) sloping*
  - *The aggregate demand curve also becomes upward sloping at these low inflation rates*

## The Monetary Policy Curve.

- The Bank's main monetary policy instrument is the overnight interest rate
- The Bank can set the ONR by managing the amount of reserves in the banking system.
  - ↑ reserves - more liquidity, ↓ONR
  - ↓ reserves, lack of liquidity, ↑ONR
- ONR is a nominal interest rate
- The decision making variable is the real interest rate.
- Recall the Fisher equation :  $r = \pi^e - \pi^e$
- In the short run, with sticky prices,  $\pi^e$  is not changing. So  $\Delta i$  affects  $r$ .
- ↓ONR ↓r ; ↑ONR ↑r

Monetary Policy curve - the relationship btw the real interest rate set by the Bank ( $r$ ) and the inflation rate ( $\pi$ )

- The MP curve equation can be written as:

$$r = \bar{r} + \lambda \pi$$

where  $r$  = real interest rate

$\bar{r}$  = autonomous component of  $r$ .

$\lambda$  = slope of the MP line or the responsiveness of  $r$  to changes in  $\pi$

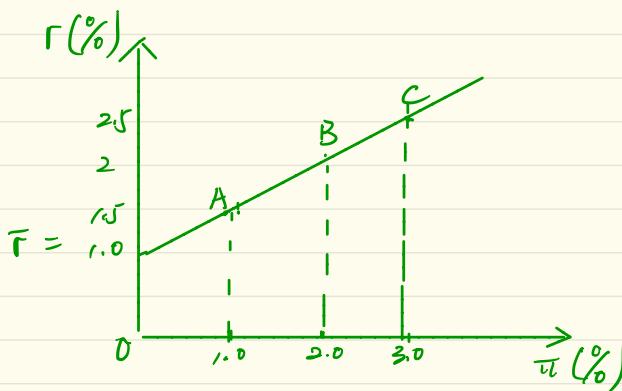
Example :

$$\bar{r} = 1.0 + 0.5 \pi$$

$$\text{Point A: } \pi = 1\% \quad r = 1.0 + 0.5(1) = 1.5\%.$$

$$\text{Point B: } \pi = 2\% \quad r = 2\%.$$

$$\text{Point C: } \pi = 3\% \quad r = 2.5\%$$



Why the MP curve has an upward slope.

Taylor Principle : The Bank will raise the nominal interest rate by more than the rise in expected inflation. so that the real interest rate will rise when there is a rise in inflation.

Example:  $\uparrow i > \uparrow \pi^e$ . If  $\pi^e \uparrow$  by 1%,  $\uparrow i$  by 2%

Initially:  $r = i - \pi^e = 3 - 2 = 1$ .

Now:  $r = 5 - 3 = 2$

If not, if  $r \downarrow$ , this would stimulate the economy and lead to even higher inflation.

Note: these changes are movement along the MP curve.

What would shift the MP curve?

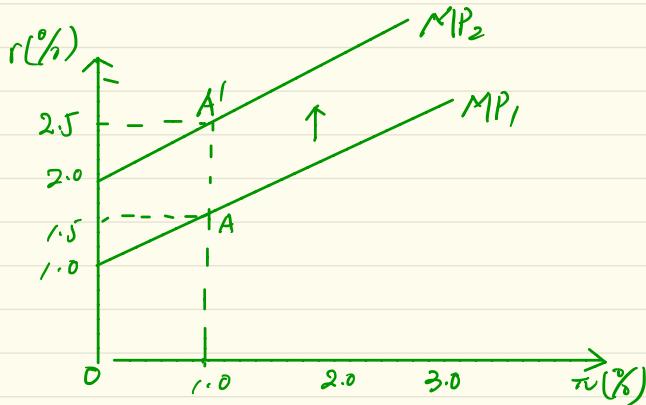
- Changes in the autonomous component of the real interest rate.
  - Autonomous tightening ( $\uparrow \bar{r}$ ) shifts the MP curve upward.
  - Autonomous easing ( $\downarrow \bar{r}$ ) shifts the MP curve downward.

Example: Tightening the real interest rate to  $\bar{r} = 1\%$ .

Let  $\bar{r} = 1\%$   $\lambda = 0.5$   $\pi_U = 1\%$ .

Initially  $r = \bar{r} + \lambda \pi_U = 1.5\%$ .

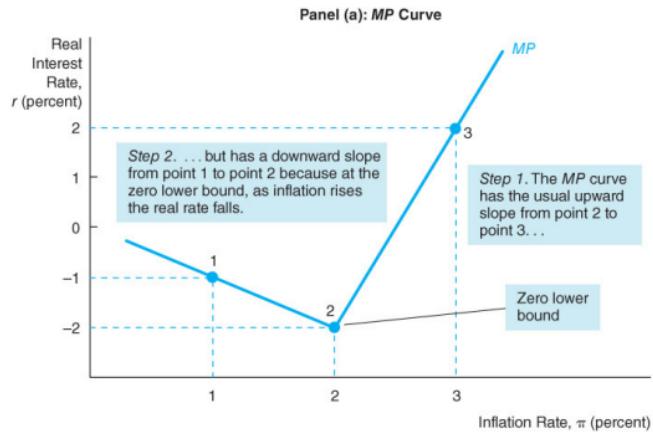
Now  $\uparrow \bar{r}$  to  $2\%$   $r = 2 + 0.5(1) = 2.5$



- An increase in  $\bar{r}$  will cause the economy to contract

- So far, we assume the Bank can  $\downarrow$  ONR to  $\downarrow r$  as  $\pi \downarrow$
- Recall, the ONR is a nominal rate and it can never fall below zero
- A negative ONR would mean banks are willing to lend at a lower return than they could earn by simply holding cash with zero return.
- In theory, the floor of the operating bank cannot go below 0, called the zero lower bound.

# Derivation of the Aggregate Demand Curve with a Zero Lower Bound



Start : point(3)

$$\pi = 3\%$$

$$r = 2\%$$

Let  $\pi$  fall to 2%. point(2)

$$\pi = 2\%$$

$$r = -2\%$$

Following the Taylor Principle,  $\downarrow i$  to  $\downarrow r$  along the MP curve

$$i = r + \pi$$

$i = -2 + 2 = 0$  At Point 2, the ZLB has been reached

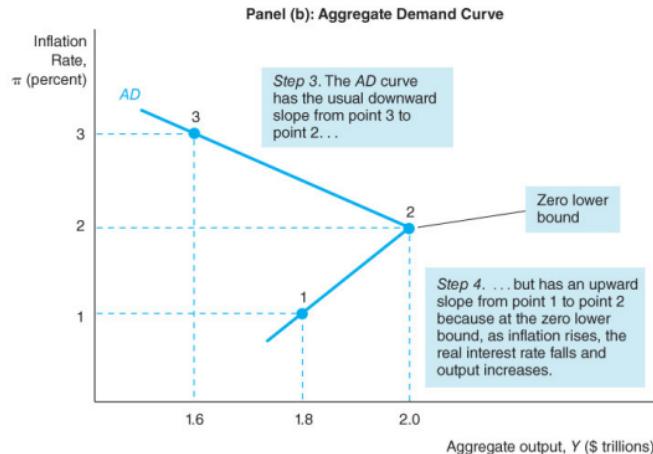
- so far, the MP curve slopes upward, as expected

Let  $\pi$  fall to 1%, Point(1)

- Policymakers would like to lower  $r$  by lowering the OMR again.
- But, they can't, because it has already hit the ZLB
- Notice, at Point 1  
 $r = i - \pi$   
 $= 0 - 1$   
 $= -1\%$  (which is actually higher)

- The MP curve connecting Point 1 and Point 2 is downward sloping

# Derivation of the Aggregate Demand Curve with a Zero Lower Bound (cont'd)



**FIGURE 24-11** Derivation of the Aggregate Demand Curve with a Zero Lower Bound

In panel (a), the MP curve has the usual upward slope in going from point 2 to point 3, but it slopes downward in the segment from point 1 to point 2 because, with the policy rate at the floor of zero, as inflation and expected inflation fall, the real interest rate rises. This produces a kink in the aggregate demand curve as shown in panel (b).

What happens to AD?

$$\pi_U = 3\% \quad \text{Point 3}$$

$$r = 2\% , Y = \$1.6 \text{ trillion}.$$

Let  $\pi_U$  fall to 2% Point 2

$$r = -2\% , Y = \$2 \text{ trillion}.$$

- (Lower r, higher investment spending)
- This is the ZLB.
- AD is downward-sloping, as expected.

Let  $\pi_U$  fall to 1% , Point 1.

$$r = -1\% \text{ (higher)} , Y = \$1.8 \text{ trillion (lower)}$$

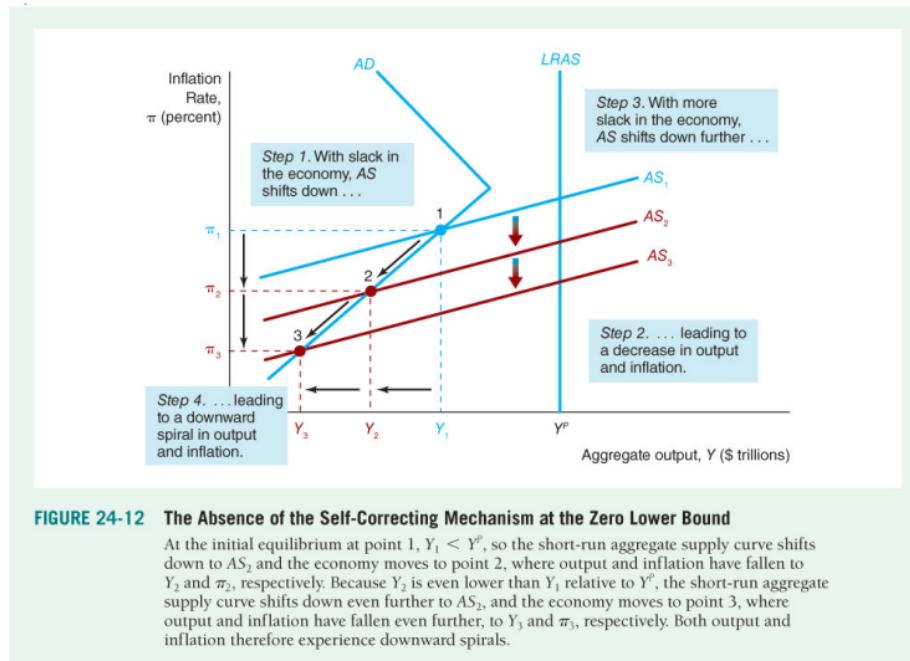
- AD is upward-sloping btw point 1 and 2
- Called a kinked AD curve

# Disappearance of the Self-Correcting Mechanisms at the Zero Lower Bound

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- With an upward sloping  $AD$  curve for low inflation rates when we're at the zero lower bound,
  - The self-correcting mechanisms is no longer operational. Output will not be restored to its potential level if policymakers do nothing. Indeed, the opposite occurs.*
  - The economy goes into a deflationary spiral, where inflation and output continually decline*

# The Absence of the Self-Correcting Mechanism at the Zero Lower Bound



**FIGURE 24-12** The Absence of the Self-Correcting Mechanism at the Zero Lower Bound

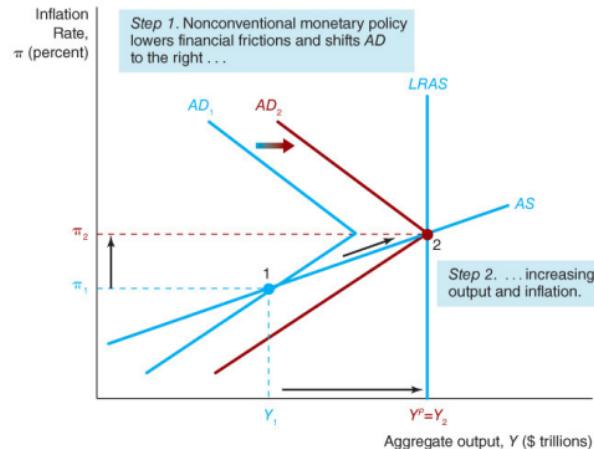
At the initial equilibrium at point 1,  $Y_1 < Y^p$ , so the short-run aggregate supply curve shifts down to  $AS_2$  and the economy moves to point 2, where output and inflation have fallen to  $Y_2$  and  $\pi_2$ , respectively. Because  $Y_2$  is even lower than  $Y_1$  relative to  $Y^p$ , the short-run aggregate supply curve shifts down even further to  $AS_3$ , and the economy moves to point 3, where output and inflation have fallen even further, to  $Y_3$  and  $\pi_3$ , respectively. Both output and inflation therefore experience downward spirals.

# Nonconventional Monetary Policy and Quantitative Easing

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- At the zero lower bound, conventional expansionary monetary policy is no longer an option
- Three forms of nonconventional policy:
  - *Liquidity provision*
  - *Asset purchases (quantitative easing)*
  - *Management of expectations*

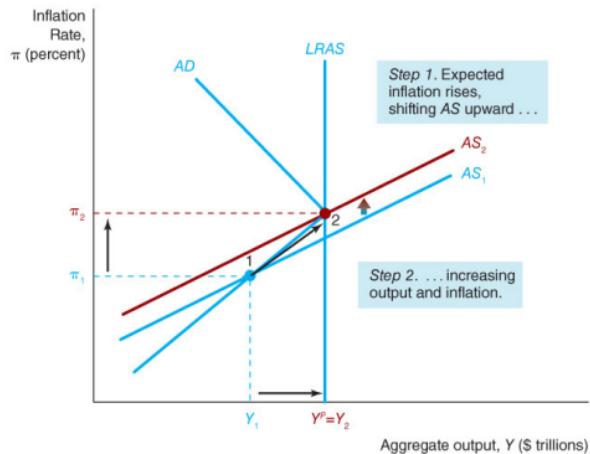
# Response to Nonconventional Monetary Policy



**FIGURE 24-13** Response to Nonconventional Monetary Policy

Nonconventional monetary policy, whether it involves liquidity provision, asset purchases, or management of expectations, lowers  $\bar{f}$ , which in turn lowers the real interest rate for investments at any given inflation rate and shifts the aggregate demand curve to  $AD_2$ . The economy moves to point 2, where output and inflation have risen to  $Y_2$  and  $\pi_2$ , respectively.

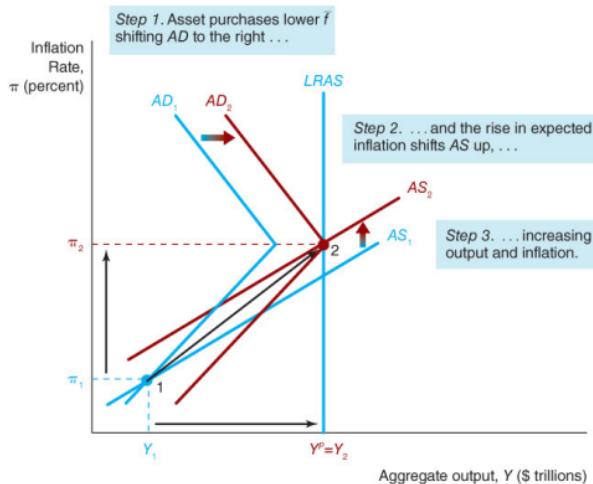
# Response to a Rise in Inflation Expectations



**FIGURE 24-14 Response to a Rise in Inflation Expectations**

A rise in inflation expectations causes the short-run aggregate supply curve to shift up to  $AS_2$  and the economy to move to point 2, where output and inflation rise to  $Y_2$  and  $\pi_2$ , respectively.

# Response to the Shift in Japanese Monetary Policy in 2013



**FIGURE 24-15 Response to the Shift in Japanese Monetary Policy in 2013**

The Bank of Japan's revised asset purchase program lowers  $\bar{r}$ , which lowers the real interest rate on investments at any given inflation rate and shifts the aggregate demand curve to the right, from  $AD_1$  to  $AD_2$ . The rise in inflation expectations causes the short-run aggregate supply curve to shift upward from  $AS_1$  to  $AS_2$ . The economy moves to point 2, where output and inflation rise to  $Y_2$  and  $\pi_2$ , respectively.

