

EE432 Monetary Theory and Policy



Lecture 12 Output, inflation, and monetary policy

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Outline

- Output and Inflation in the long run
- Monetary Policy and the Dynamic Aggregate Demand Curve
- Aggregate Supply
- Equilibrium and the Determination of Output and Inflation

Chapter 21

Output, Inflation, and Monetary Policy

Output and Inflation in the Long Run

Output and Inflation in the Long Run

- **Fluctuations** in the *business cycle* are *deviations from long-run equilibrium level*.
- In the long run, **current output** equals *potential output* and the **inflation rate** equals the **level implied by the rate of money growth**.

Potential Output

- **Potential output** is the *level of output* given existing technology and the normal use of resources.
- If *the increase in demand is permanent*, firms will *change their scales of business*.
- *Technological improvements* allow them to *increase production* at given levels of *capital and labor*.

Potential Output

- **Potential output** *tends to rise* over time.
- **Unexpected events** can *push current output away* from *potential output* called an **output gap**
- For example, when ***current output*** is **above** ***potential***, it creates an **expansionary output gap**.

Long-Run Inflation and Money Growth

- Money growth plus the change in the velocity of money *equals* inflation plus real economic growth

$$\% \Delta M + \% \Delta V = \% \Delta P + \% \Delta Y$$

In the long run :

$$\% \Delta Y = \% \Delta Y^P$$

$$\% \Delta V = 0$$

Therefore :

$$\% \Delta P = \% \Delta M - \% \Delta Y^P$$

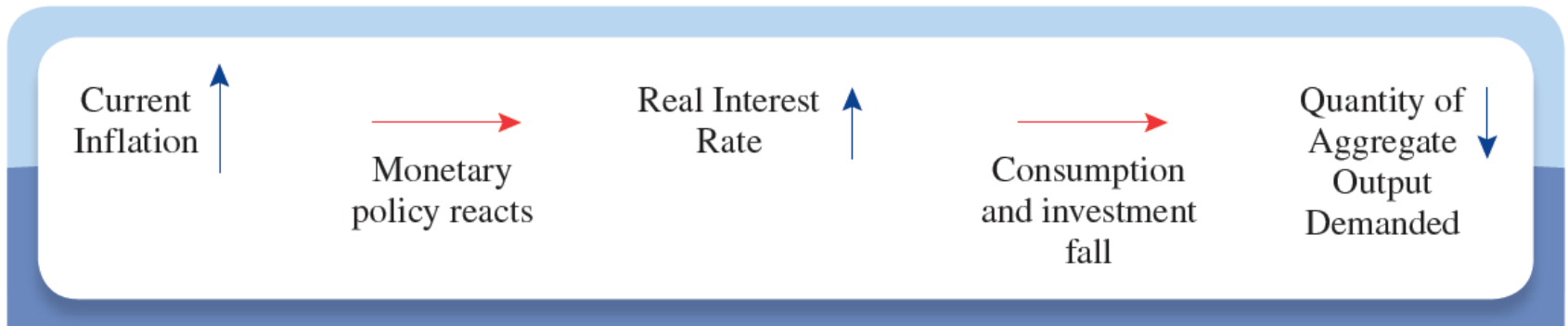
- In the long run, inflation equals *money growth* minus *growth in potential output*.

Monetary Policy and the Dynamic Aggregate Demand Curve

Monetary Policy and the Dynamic Aggregate Demand Curve

Figure 21.1

Inflation, Monetary Policy, and Aggregate Demand



Monetary Policy and the Dynamic Aggregate Demand Curve

1. **Aggregate expenditure and the real interest rate:**
 - There is a *downward sloping* relationship.
2. **Inflation and the real interest rate, and the monetary policy reaction curve:**
 - There is an *upward sloping* relationship that we call the *monetary policy reaction curve*.
3. **Inflation and aggregate output :**
 - This is a *downward sloping* relationship, which represents the **dynamic aggregate demand curve**.

Monetary Policy and the Dynamic Aggregate Demand Curve

- **Economic decisions** *depend on* the **real interest rate**, not the nominal interest rate.
- **Central banks** must therefore *influence the real interest rate*.

Monetary Policy and the Dynamic Aggregate Demand Curve

- Remember that $i = r + \pi^e$
solving for r :
$$r = i - \pi^e$$
- For a central bank that *effectively stabilize inflation and output*, **inflation expectations** adjust slowly to changes in economic conditions.**
- The ***changes in the nominal interest rate*** alter the ***real interest rate***.

Aggregate Expenditure and the Real Interest Rate

- The **components of aggregate expenditure**:

$$\text{Aggregate Expenditures} = \text{Consumption} + \text{Investment} + \text{Government Expenditures} + (\text{Exports} - \text{Imports})$$

$$Y = C + I + G + (X - M)$$

Aggregate Expenditure and the Real Interest Rate

- For investment, the **higher the cost of borrowing**, the *less likely* that an investment will be profitable.
- Higher real interest rates lead to:
 - ***Lower*** levels of *business and residential investment*
- For consumption, **higher real interest rates** mean
 - ***Higher*** inflation-adjusted *loan payments and saving* –thus, *less spending*.

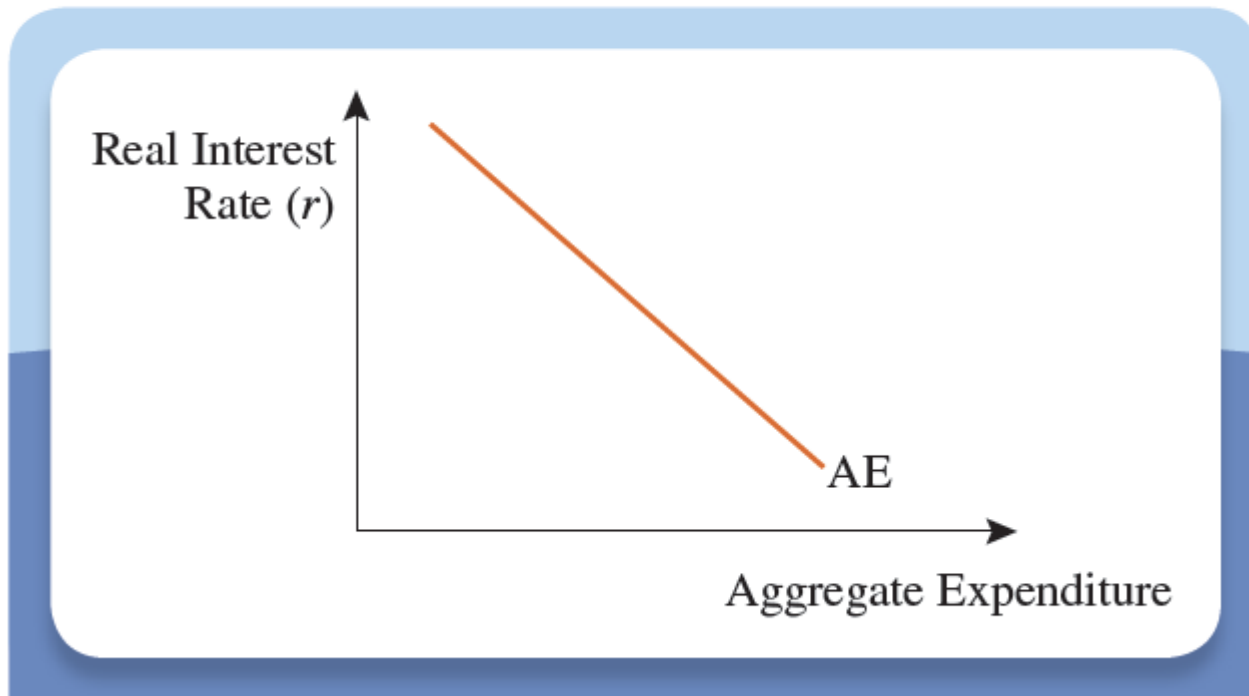
Aggregate Expenditure and the Real Interest Rate

- Net exports *fall* because the domestic currency has appreciated, making *imports cheaper* and *exports more expensive*.
- A rise in the real interest rate reduces the level of aggregate expenditure.
- This leads to a *downward sloping aggregate expenditure (AE) curve*.

Aggregate Expenditure and the Real Interest Rate

Figure 21.3

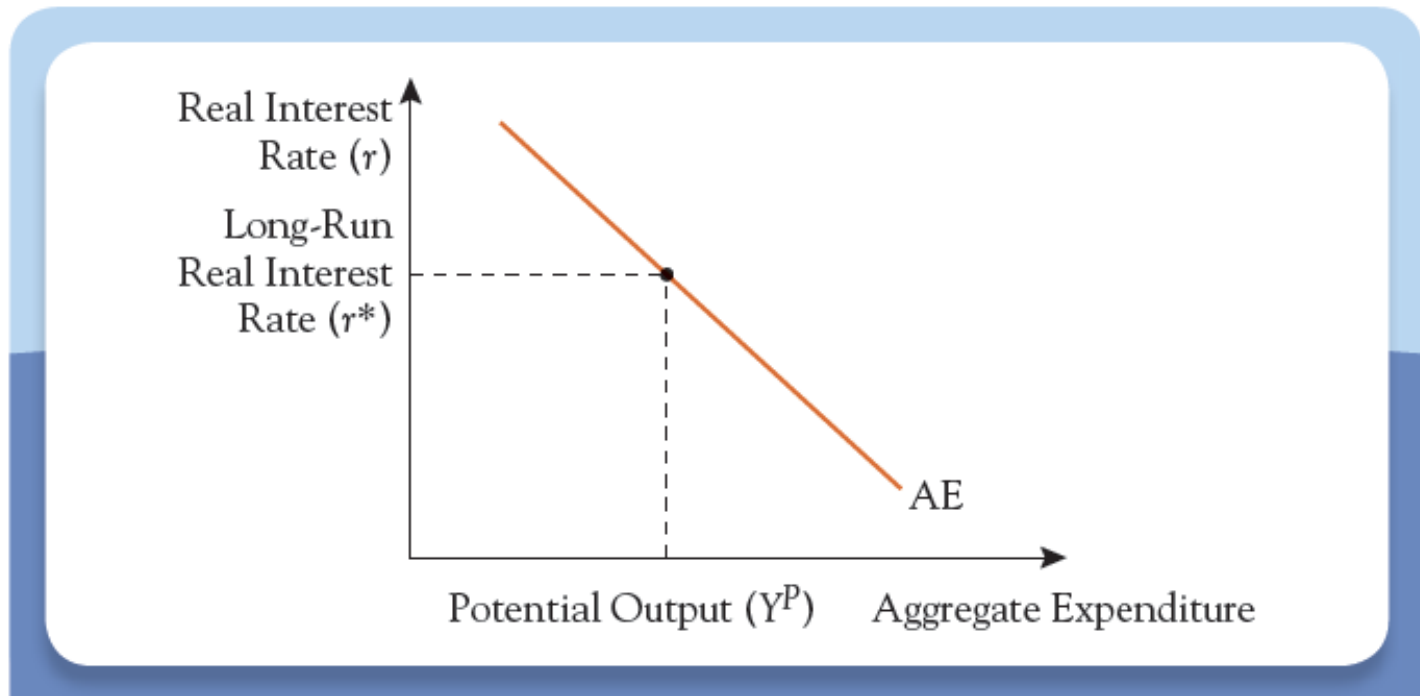
Aggregate Expenditure and the Real Interest Rate



The Long-Run Real Interest Rate

Figure 21.4

The Long-Run Real Interest Rate



The **long run real interest rate** equates the *level of aggregate expenditure* to the *quantity of potential output*.

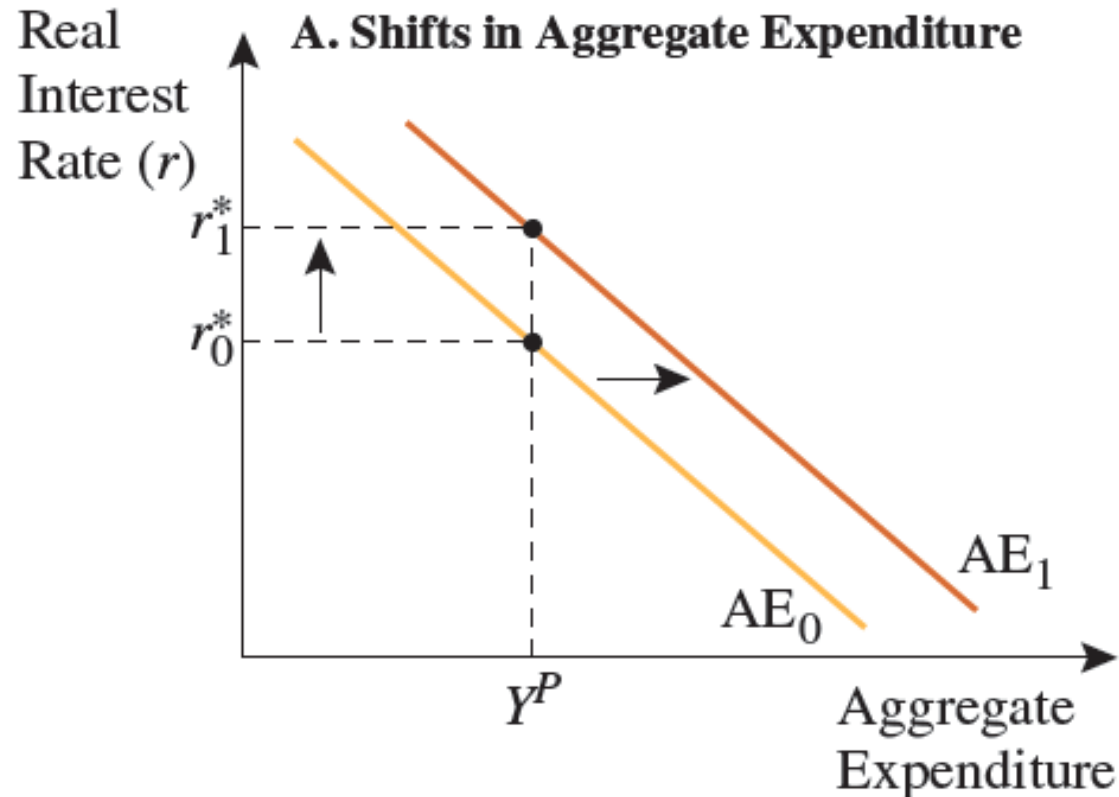
The Long-Run Real Interest Rate

- When there is a *rise in exogenous spending*, for example, **government purchases**:
 - The level of ***aggregate expenditure*** increases at every real interest rate.
 - This shifts ***aggregate expenditure curve*** to the right.
 - For the level of ***aggregate expenditure*** to remain equal to potential output, the interest-sensitive components of ***aggregate expenditure*** must fall.
 - That means the ***long-run real interest rate*** must rise.

The Long-Run Real Interest Rate

Figure 21.5

Change in the Long-Run Real Interest Rate



When aggregate expenditure shifts *right* from AE_0 to AE_1 , the long-run real interest rate *increases* from r_0^* to r_1^* .

Inflation, the Real Interest Rate, and the Monetary Policy Reaction Curve

- When **current inflation** is *high* or **current output** is *running above* potential output, central bankers will raise policy interest rate.
- ***Changes*** in the **nominal policy interest rate** will *translate into* a **change** in the **real interest rate**.

Deriving the Monetary Policy Reaction Curve

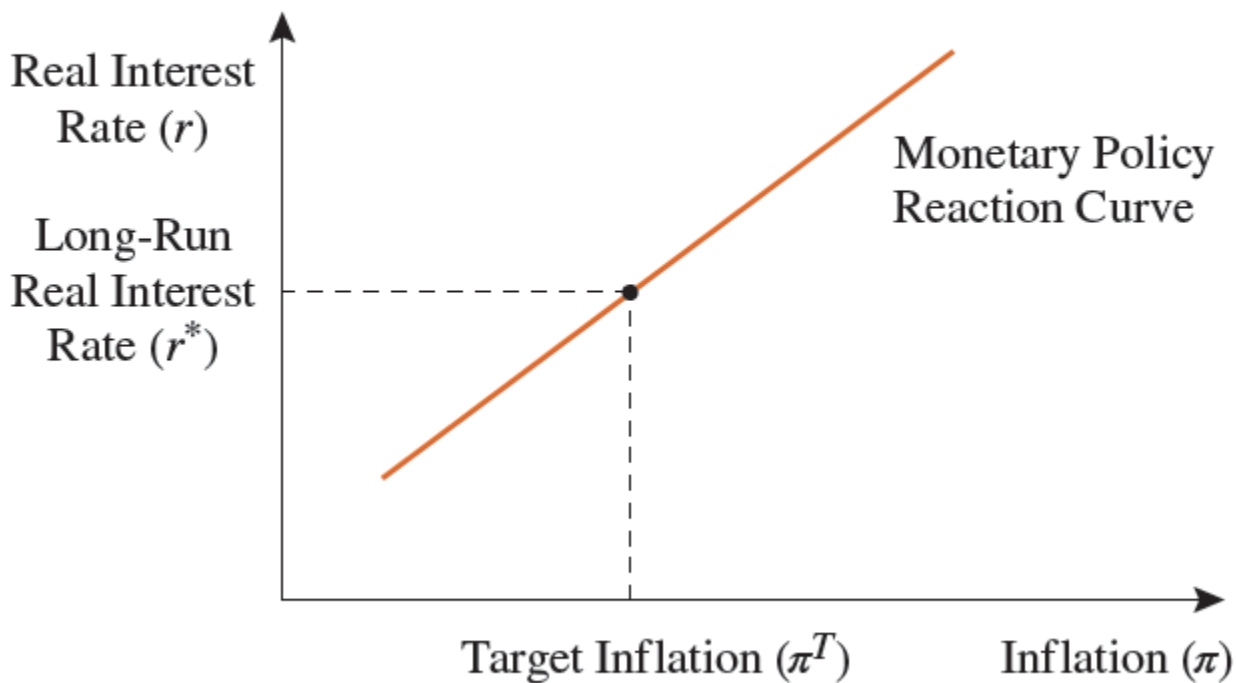
- The **monetary policy reaction curve** is *set* so that when *current inflation* equals *target inflation* (π^T), the *real interest rate* equals the *long-run real interest rate*.

$$r = r^* \text{ when } \pi = \pi^T$$

Deriving the Monetary Policy Reaction Curve

Figure 21.7

The Monetary Policy Reaction Curve

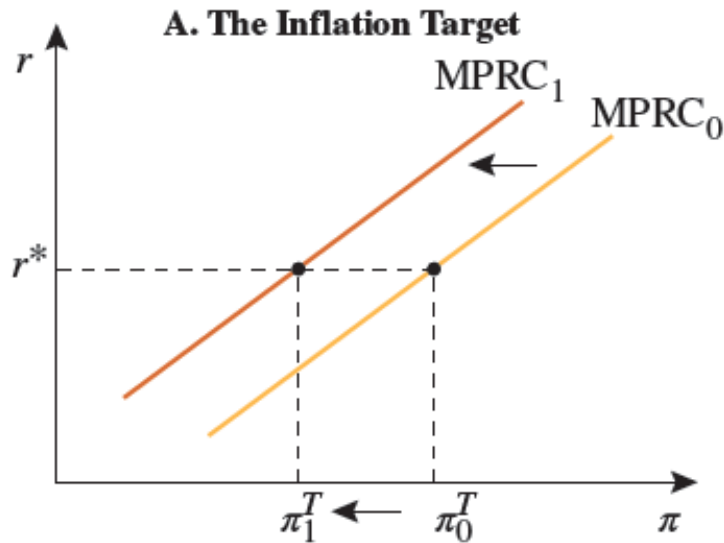


A movement along the curve is a reaction to a change in current inflation.

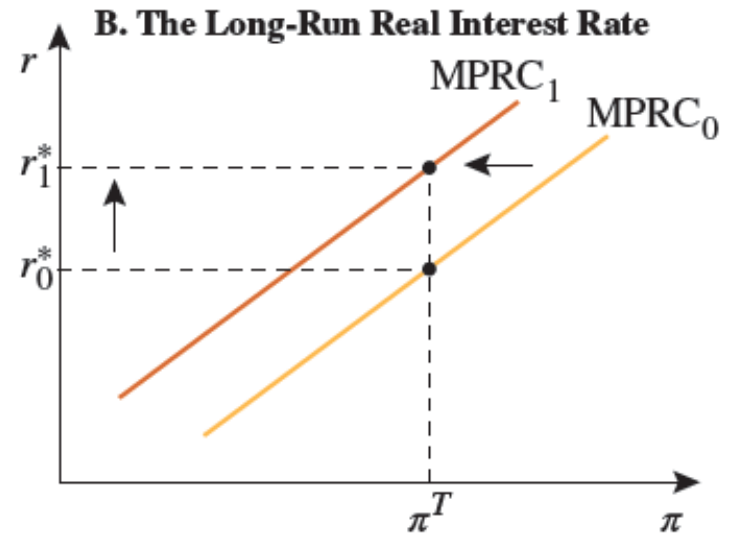
Shifting the Monetary Policy Reaction Curve

Figure 21.8

Shifting the Monetary Policy Reaction Curve



A decline in the inflation target from π_0^T to π_1^T shifts the monetary policy reaction curve to the left from $MPRC_0$ to $MPRC_1$.



An increase in the long-run real interest rate from r_0^* to r_1^* shifts the monetary policy reaction curve to the left from $MPRC_0$ to $MPRC_1$.

Deriving the Dynamic Aggregate Demand Curve

- The **dynamic aggregate demand curve** *relates inflation and the level of output,*
- Accounting for the fact that *monetary policymakers respond to* changes in current *inflation* by *changing the interest rate.*

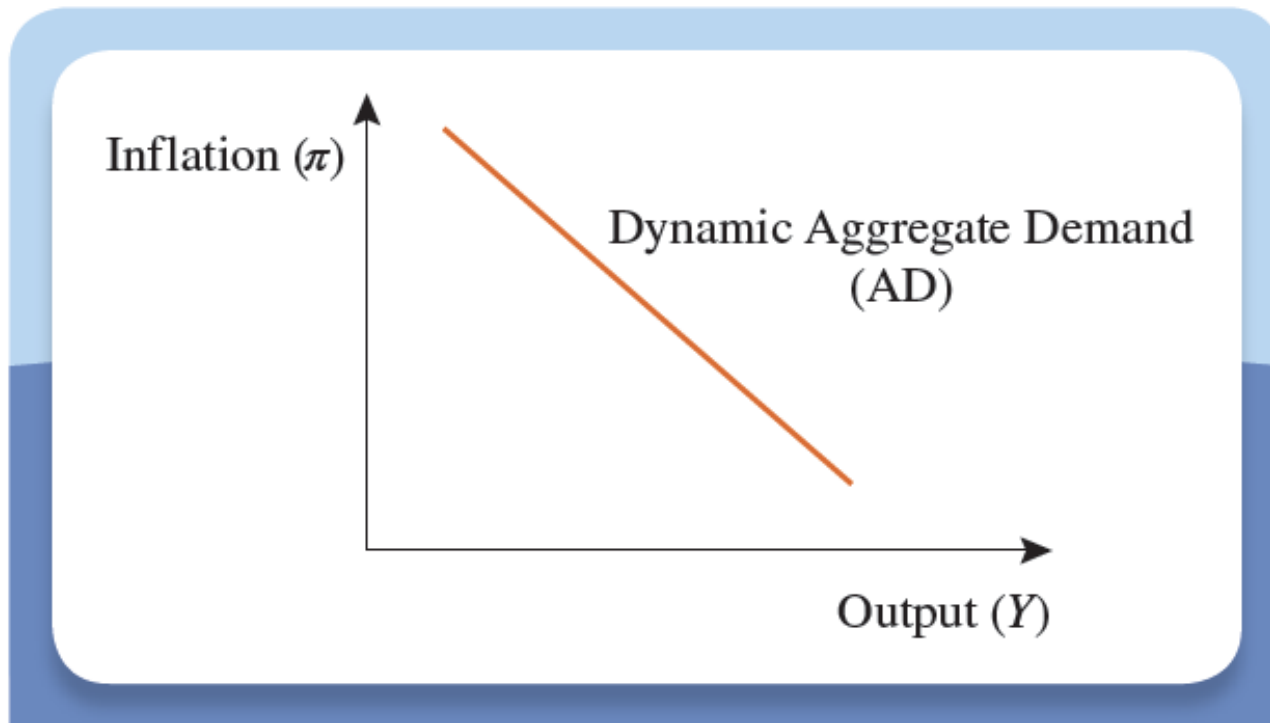
Deriving the Dynamic Aggregate Demand Curve

- When current **inflation rises**:
 - Monetary policymakers **raise** the **real interest rate**, moving the economy upward *along* the **monetary policy reaction curve**.
 - The ***higher*** real interest rate **reduces** the *interest-sensitive components* of ***aggregate expenditure***.
 - This ***causes*** a **fall** in the quantity of ***aggregate output***.
- Thus, *changes in* current ***inflation*** move the economy *along* a **downward-sloping** dynamic aggregate demand curve.

Deriving the Dynamic Aggregate Demand Curve

Figure 21.9

The Dynamic Aggregate Curve



Shifting the Dynamic Aggregate Demand Curve

- All of the following **increase** in **exogenous expenditure**, thereby **shifting** the ***dynamic aggregate demand curve*** to the **right**:
 - Increased **consumer confidence**
 - Increased **optimism** about **future business prospects**
 - Increased **government spending** or **expansionary fiscal policy**
 - Increased **net exports**

Shifting the Dynamic Aggregate Demand Curve

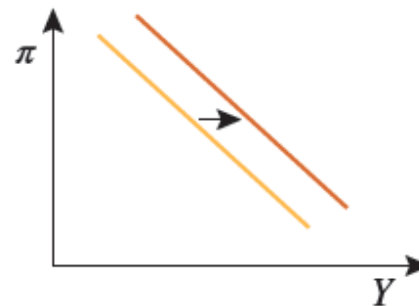
Figure 21.10

Shifting the Dynamic Aggregate Demand Curve

Changes in Components of Aggregate Expenditure

$C \uparrow, I \uparrow, G \uparrow, NX \uparrow$

Increases in consumption, investment, government expenditure, or net exports (all unrelated to the real interest rate) shift the dynamic aggregate demand curve to the *right*.



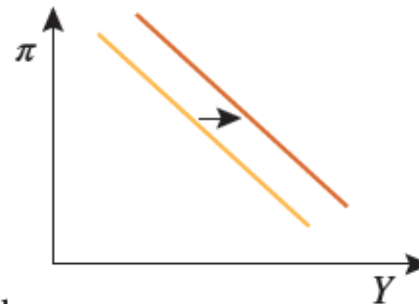
Shifts in the Monetary Policy Reaction Curve

$\pi^T \uparrow$

Increases in the central bank's inflation target shift the dynamic aggregate demand curve to the *right*.

$r^* \downarrow$

Decreases in the long-run real interest rate shift the dynamic aggregate demand curve to the *right*.



Shifting the Dynamic Aggregate Demand Curve

- Whenever the **monetary policy reaction curve** shifts, the **dynamic aggregate demand curve** shifts, too.
- Consider an increase in the **central bank's inflation target**.
 - The **monetary policy reaction curve** shifts right.
 - The **real interest rate** that policymakers **set** at every level of **inflation** falls.
 - The **lower real interest rate** increases the quantity of **aggregate output** demanded at every level of **inflation**.
 - The **dynamic aggregate demand curve** shifts right.

Shifting the Dynamic Aggregate Demand Curve

- Changes in the *long-run real interest rate* r^* shift the dynamic aggregate demand curve.
- Suppose the level of potential output increases.
 - The long-run real interest rate r^* must fall.
 - This *drives up* the interest-rate-sensitive components of aggregate expenditure.
 - This shifts the dynamic aggregate demand curve rightward.

Shifting the Dynamic Aggregate Demand Curve

- Any ***shift*** in the **monetary policy reaction curve** ***shifts*** the **dynamic aggregate demand curve** in the *same direction*.
- For example, **expansionary monetary policy** *shifts* the **dynamic aggregate demand curve** to the ***right***.

Aggregate Supply

Aggregate Supply

- The **aggregate supply (AS) curve** tells us where along the **dynamic aggregate demand curve** the economy *ends up*.
- When *combined with the dynamic aggregate demand curve*, the **short-run AS curve** tells us **where the economy settles** at any particular time.
- The **long-run AS curve** together *with dynamic aggregate demand*, tells us the **levels of inflation** and the **quantity of output** that the economy is **moving toward in the long term**.

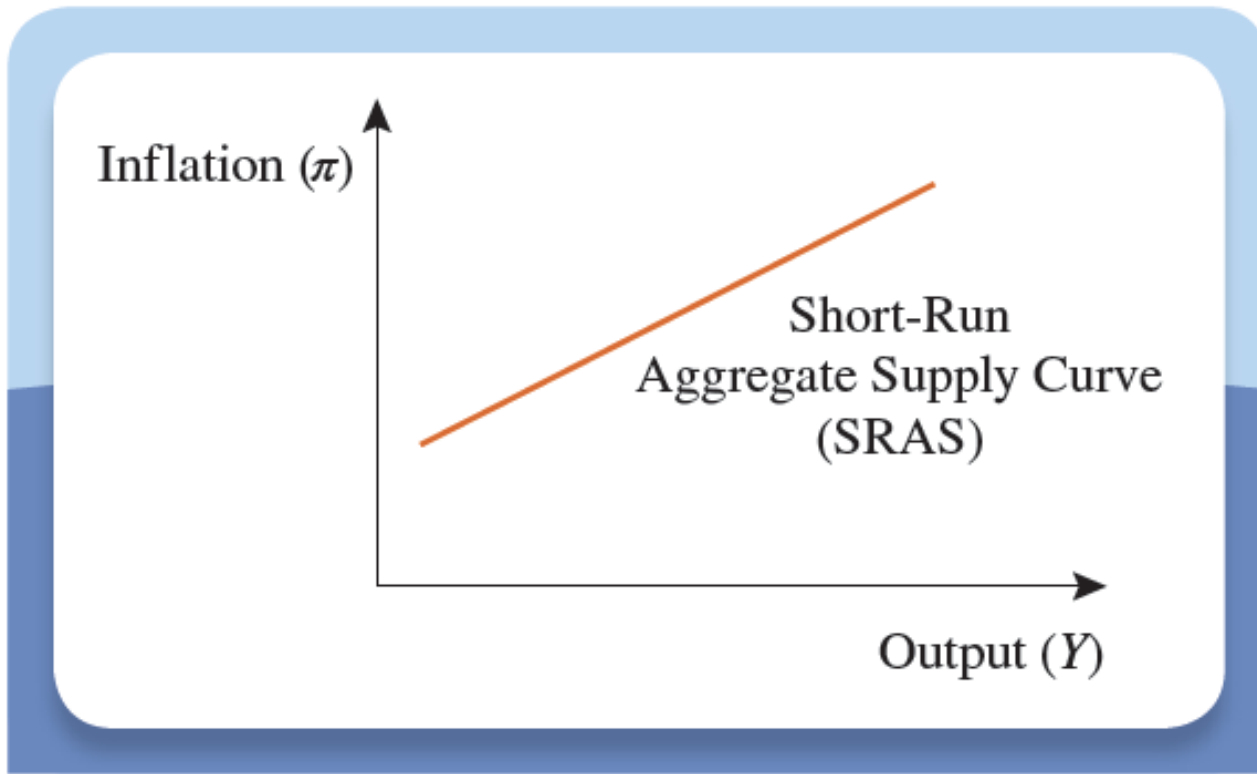
Short-Run Aggregate Supply

- In the short term, when product **prices *rise***, firms ***increase supply*** in order to take advantage.
- The **short-run AS curve** is the ***upward-sloping*** relationship between current **inflation** and the quantity of **output**.

Short-Run Aggregate Supply

Figure 21.11

Short-Run Aggregate Supply Curve



Shifts in the Short-Run Aggregate Supply Curve

- When production costs *change*, the ***short-run AS curve shifts***.
 1. ***Changes*** in expectations of future inflation.
 2. ***Factors*** that drive production costs up or down.

Shifts in the Short Run Aggregate Supply Curve

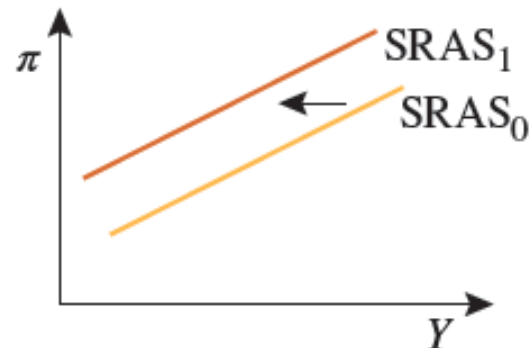
- An ***increase*** in **expected inflation** *increases* **production costs** lowering production at every level of current inflation.
 - This *shifts* the **short-run AS curve** to the *left*.
- An ***increase*** in the **oil price** or **labor wage** *shifts* the **short-run AS curve** *leftward*.

Shifts in the Short Run Aggregate Supply Curve

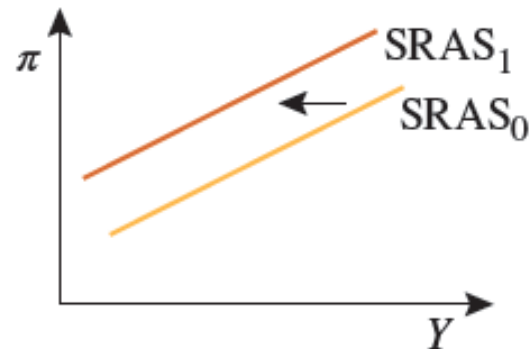
Figure 21.12

Shifting the Short-Run Aggregate Supply Curve

Expected $\pi \uparrow$
A rise in *expected future inflation* shifts the short-run aggregate supply curve to the *left* from $SRAS_0$ to $SRAS_1$.



Costs of Production Inputs $\uparrow$
A rise in costs of inputs into the production process, like energy, shifts the short-run aggregate supply curve to the *left* from $SRAS_0$ to $SRAS_1$.



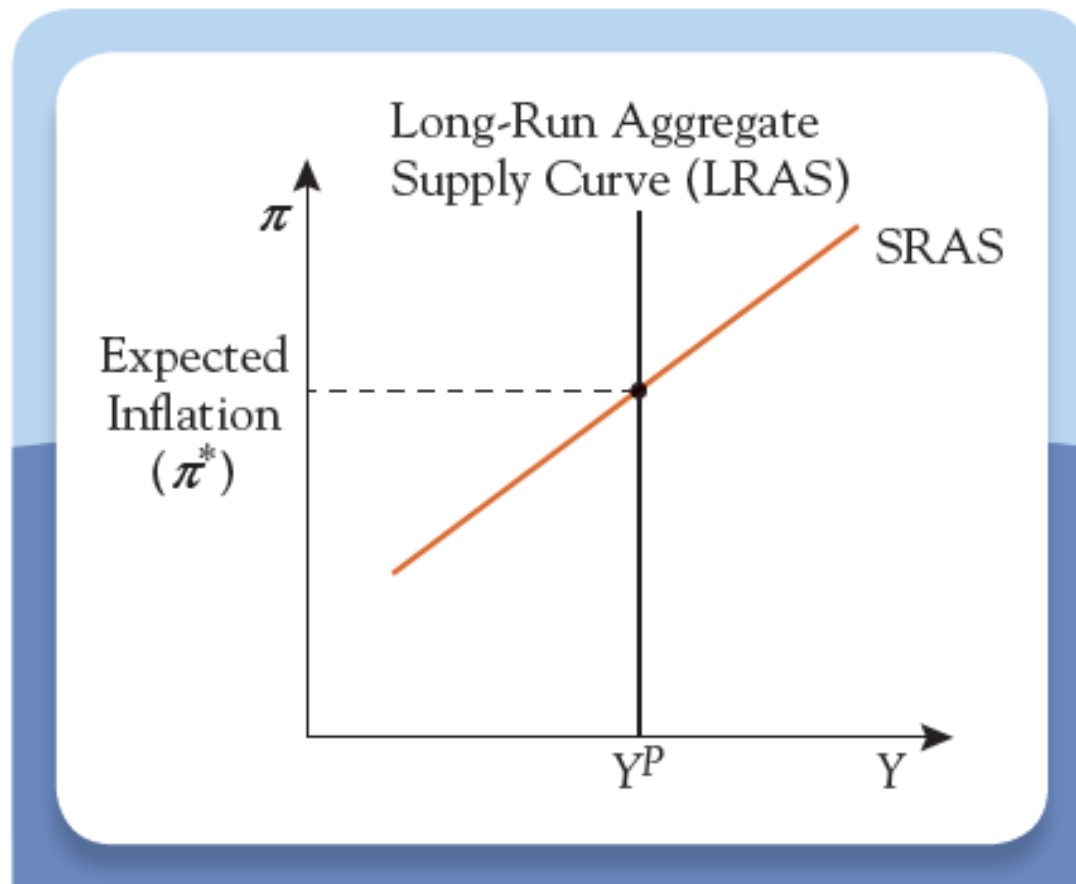
The Long-Run Aggregate Supply Curve

- In the *long run*, *output and inflation are unrelated* and the **long-run aggregate supply curve (LRAS)** is vertical at the point *where current output equals **potential output***.
- In the long-run,
 - **Current output** must equal **potential output**
 - **Inflation** must be *determined by* **monetary policy**
- For the economy to be in long-run equilibrium, **current inflation** must equal **expected inflation**

Long-Run Aggregate Supply

Figure 21.14

Short- and Long-Run Aggregate Supply Curves



Equilibrium and the Determination of Output and Inflation

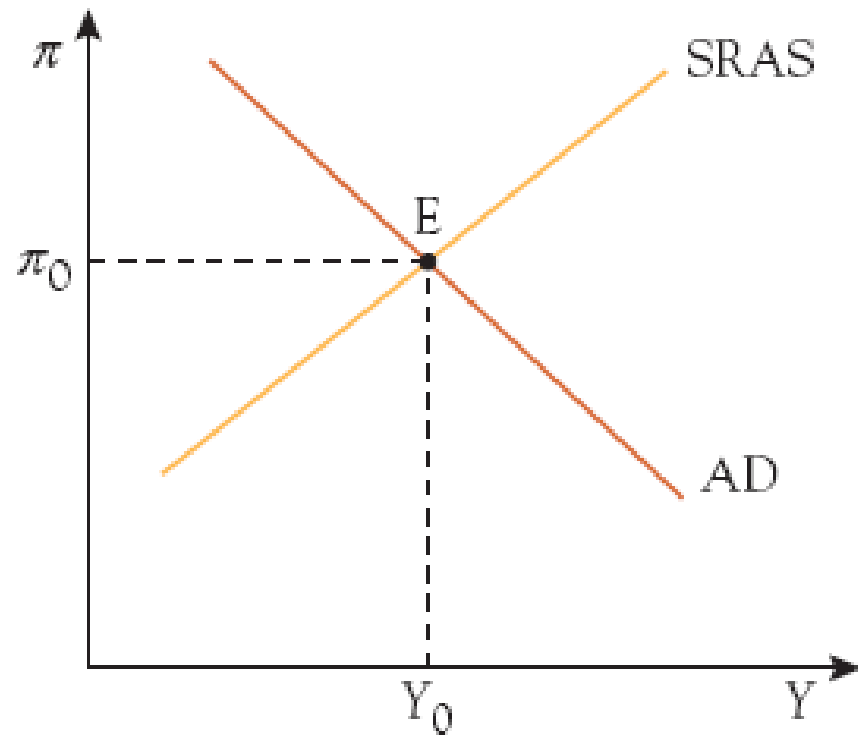
Equilibrium and the Determination of Output and Inflation

Figure 21.15

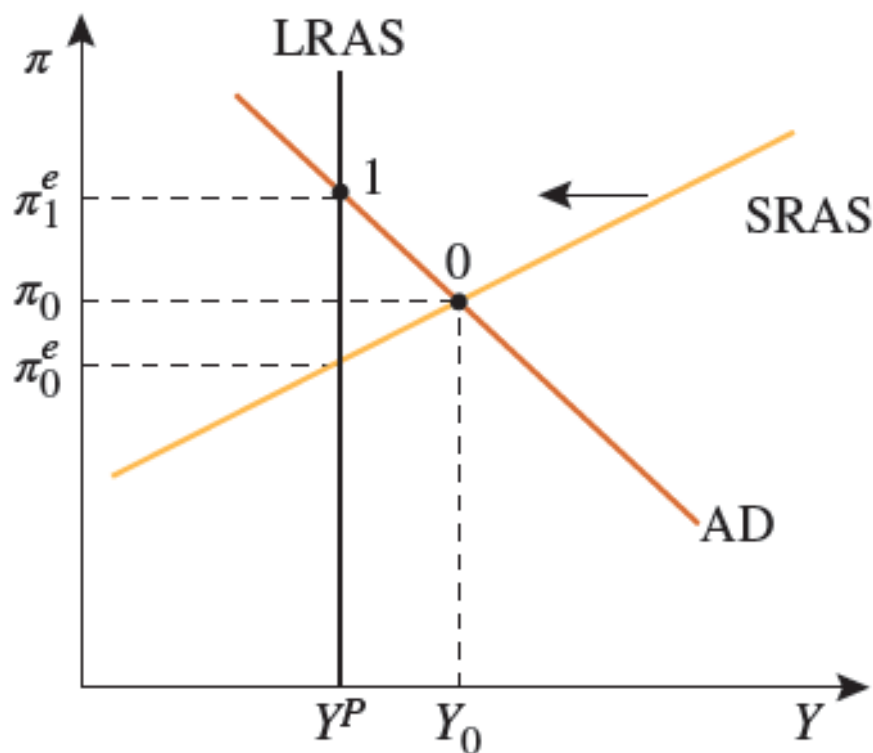
Short-Run Determination of Output and Inflation

Short Run Equilibrium

- SR equilibrium is *determined by the intersection* of:
 - The **dynamic aggregate demand curve (AD)** and
 - The **short-run aggregate supply curve (SRAS)**.

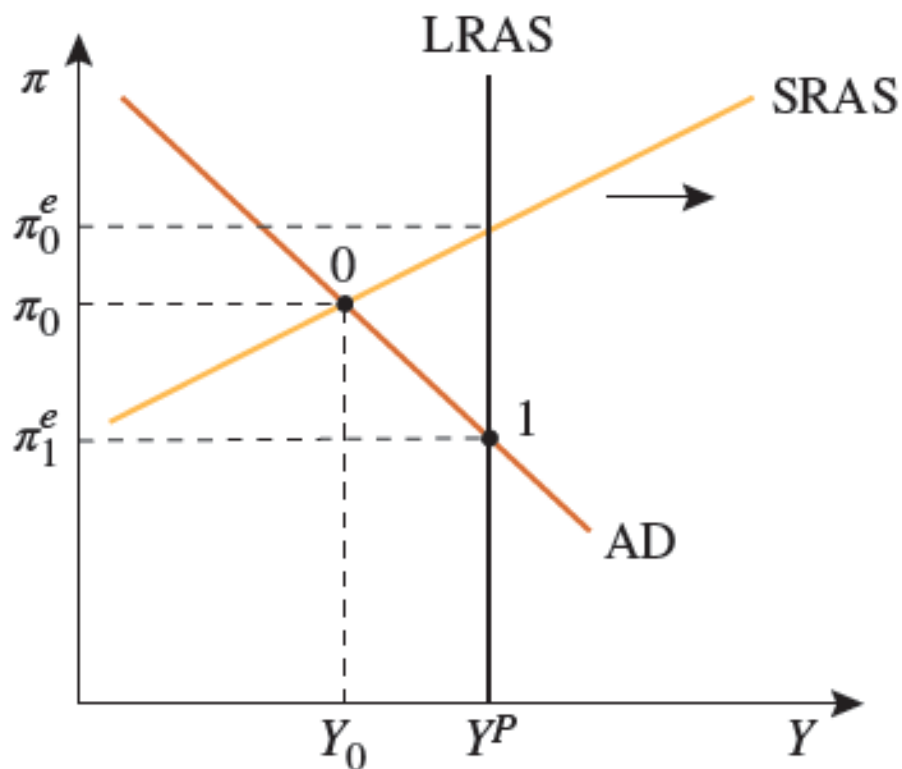


Adjustment to Long-Run Equilibrium



- **Expansionary output gaps** that represents economic operation above potential level (excess demand), pushing **current inflation above expected inflation**
- **Current inflation** is *greater* than **expected inflation** so *expected inflation rises*
- **SRAS shifts left** until current inflation and expected inflation are equal.

Adjustment to Long-Run Equilibrium



- **Contractionary output gaps** that reflects insufficient demand, causing wage setters to cut their expected inflation.
- **Current inflation** is *less* than **expected inflation** so *expected inflation falls*.
- **SRAS shifts right** until current inflation and expected inflation are equal.

Adjustment to Long-Run Equilibrium

Implications

1. The economy has a *self-correcting mechanism*.
2. The fact that *inflation changes* whenever there is an *output gap*, so that the long run output returns to potential output.

Adjustment to Long-Run Equilibrium

There are **three conditions** for long run equilibrium:

1. Current inflation equals expected inflation: $\pi = \pi^e$.
2. Current output equals potential output: $Y = Y^P$.
3. Current inflation is *steady* and *equal* to target inflation: $\pi = \pi^T$

The Sources of Fluctuations in Output and Inflation

- Inflation *in the long run* will only change if policymakers have *changed inflation target*.
- In the **short run** fluctuations can *come from*
 - Increases in exogenous spending (*shift of AD*)
 - A permanent easing of monetary policy (*shift of monetary policy reaction curve*)
 - Increases in the costs of production (*shift of SRAS*).

End of lecture