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**

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

$$\text{In the long run :}$$

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

$$\%\Delta V = 0$$

$$\text{Therefore :}$$

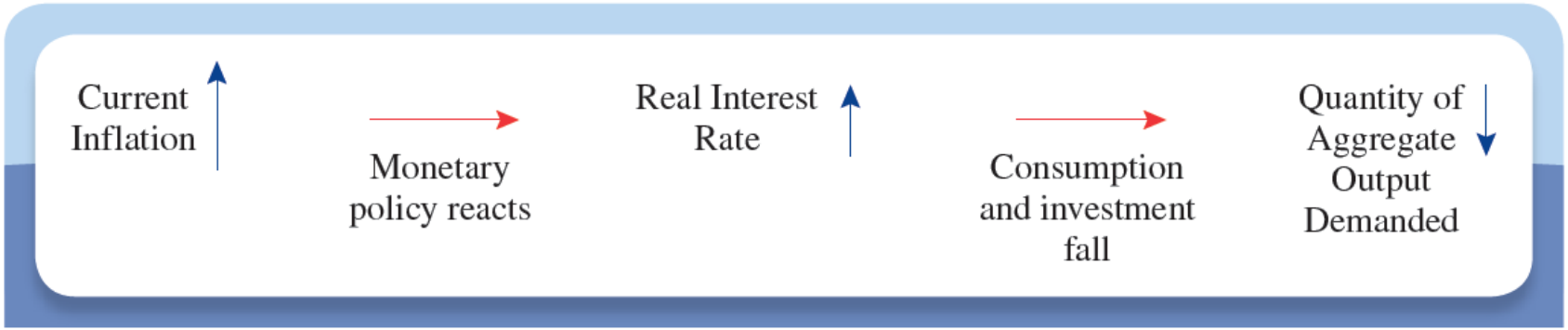
$$\%\Delta P = \%\Delta M - \%\Delta Y^{P}$$

- 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**:

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

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

Aggregate Expenditure and the Real Interest Rate

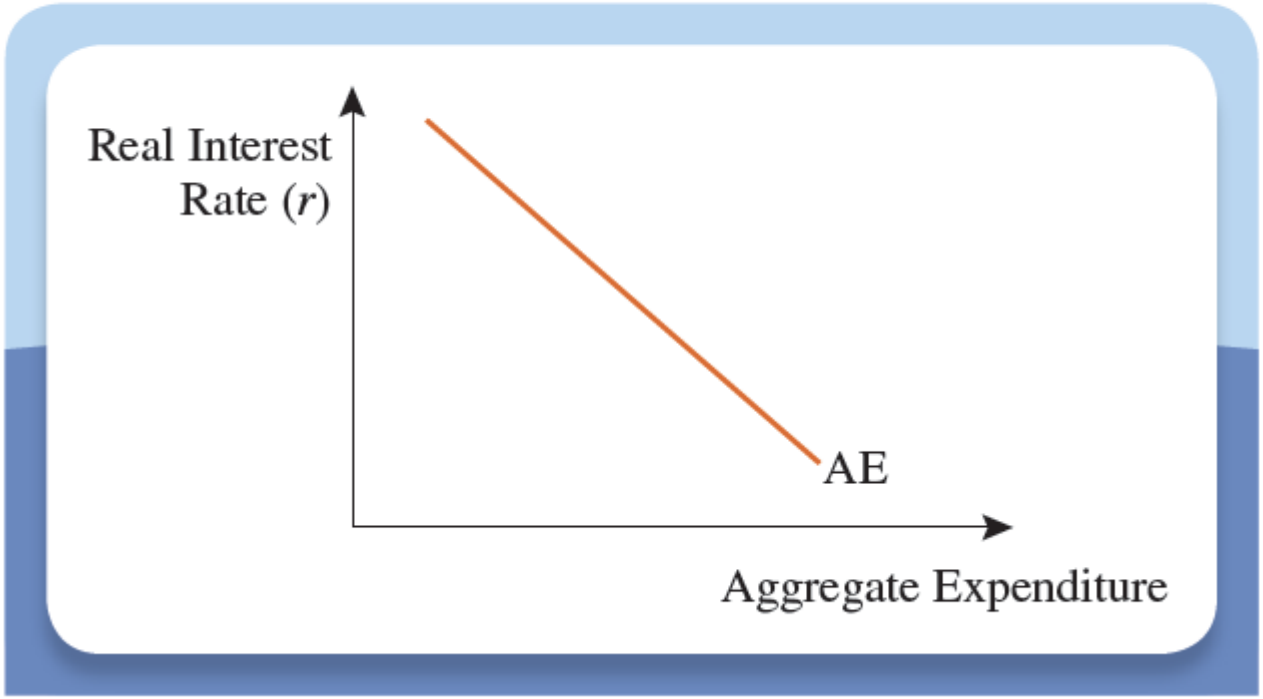
- For investment, the **higher the cost of borrowing**, the ***less likely*** that an **investment will be profitable**.
- **Higher real interest rates** lead to:
  - ***Lower*** levels of *business and residential* **investment**
- For consumption, **higher real interest rates** mean
  - ***Higher***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

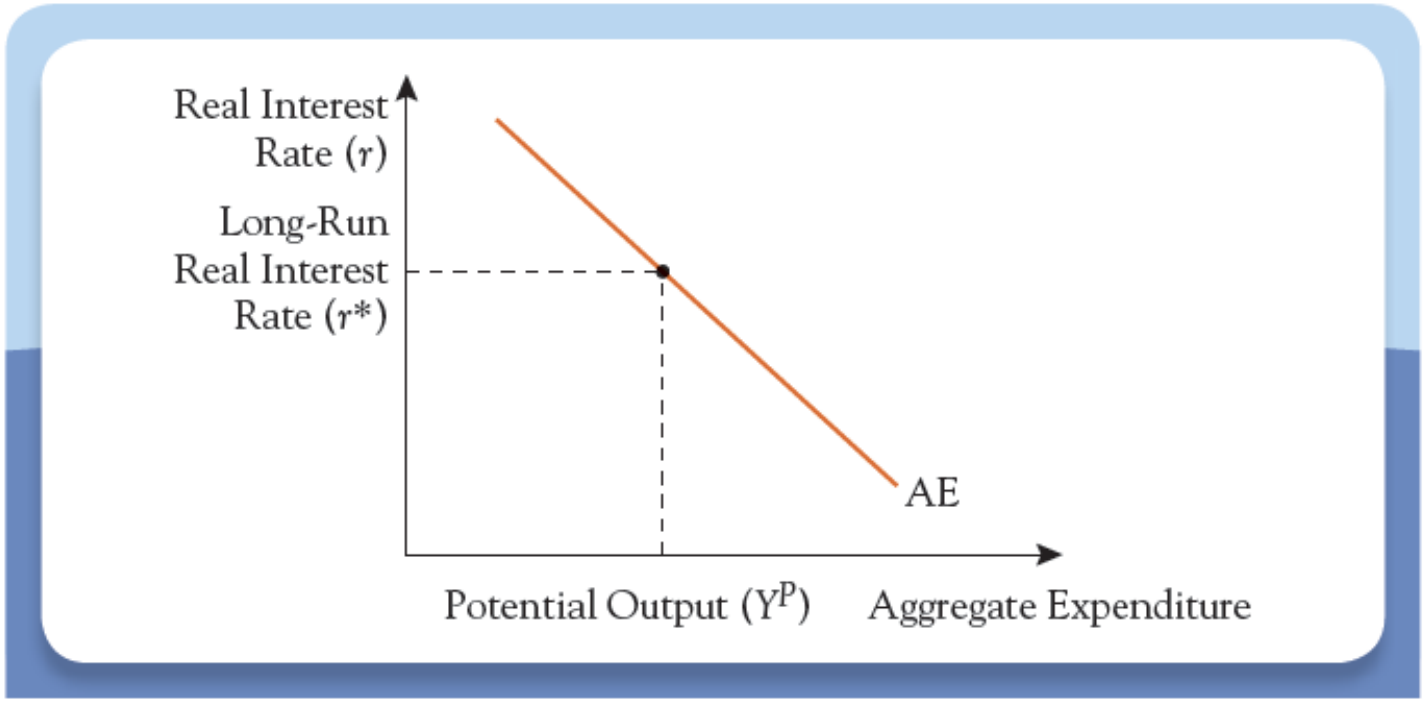
Aggregate Expenditure and the Real Interest Rate

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



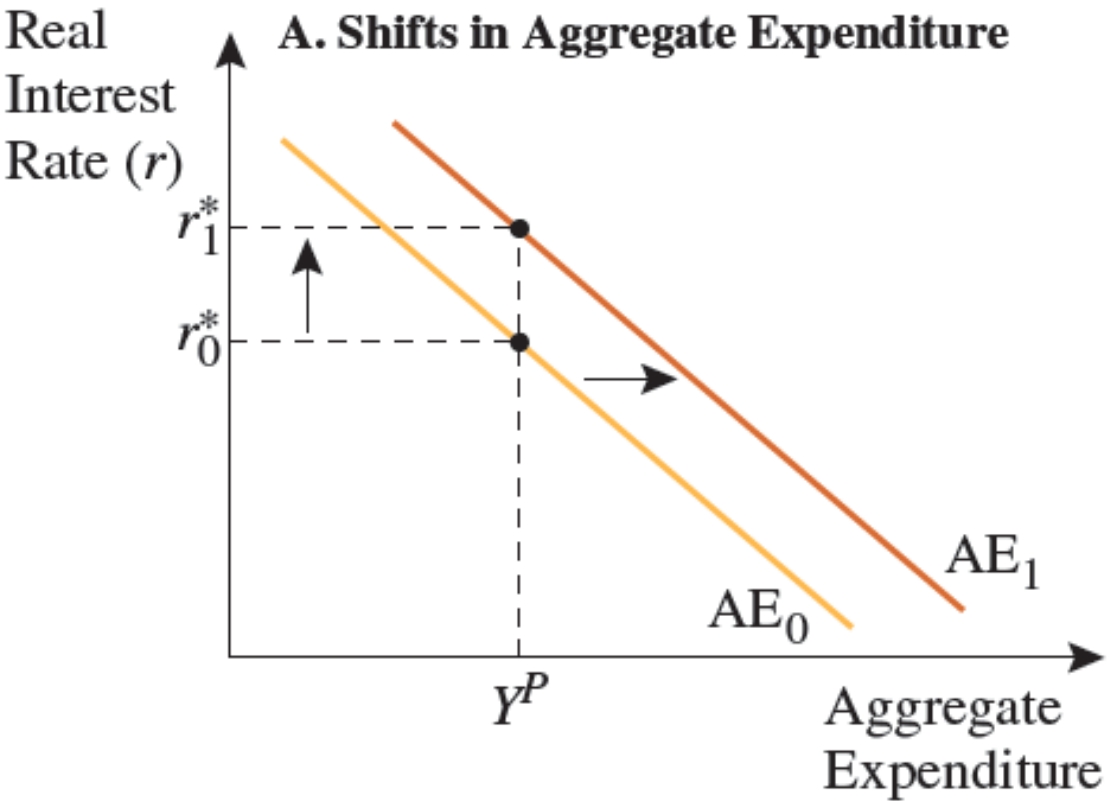
The **long run real interest rate** *equates the* ***level of aggregate expenditure*** *to the* ***quantity of potential output.***

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**.

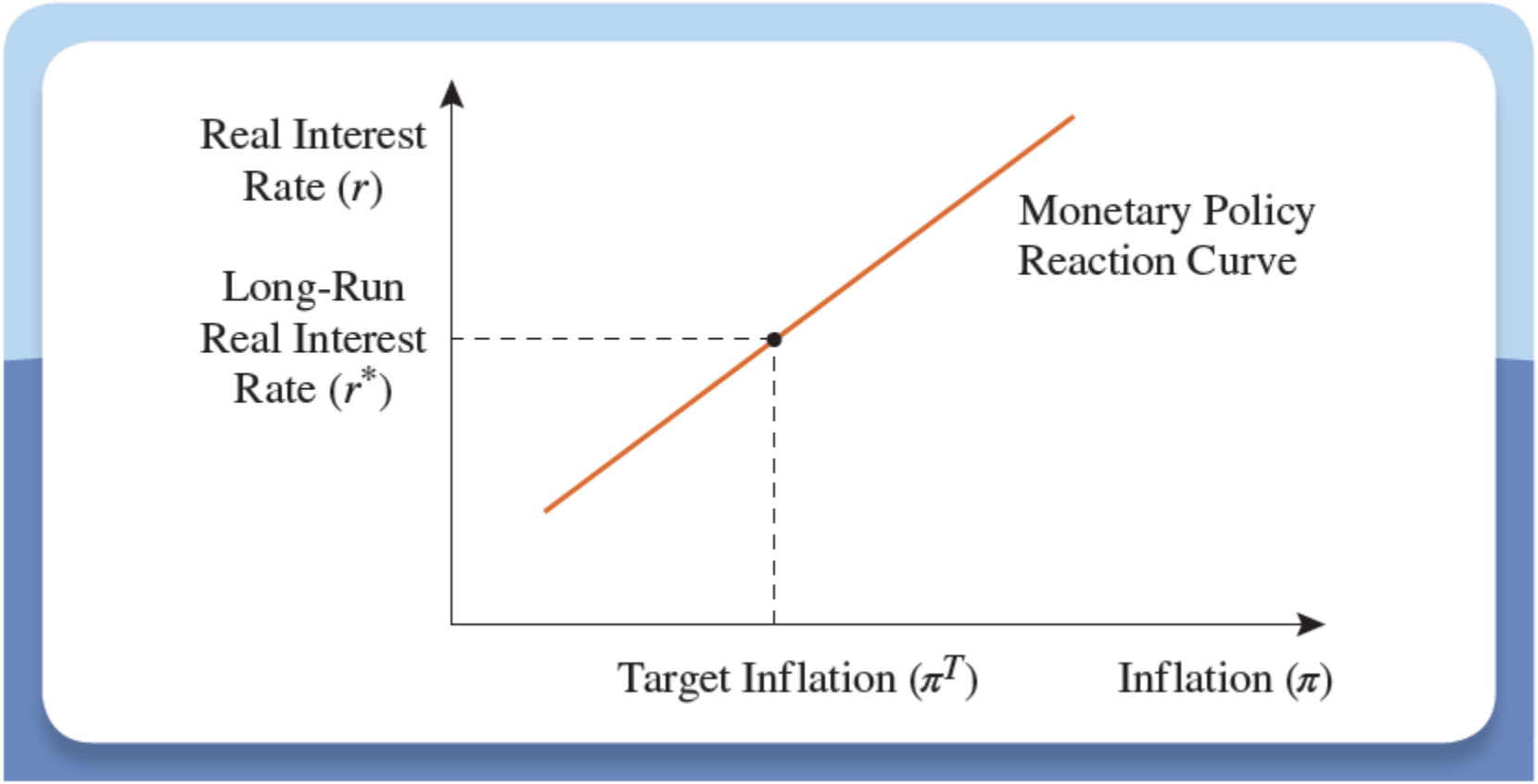
Deriving the Monetary Policy Reaction Curve

- 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

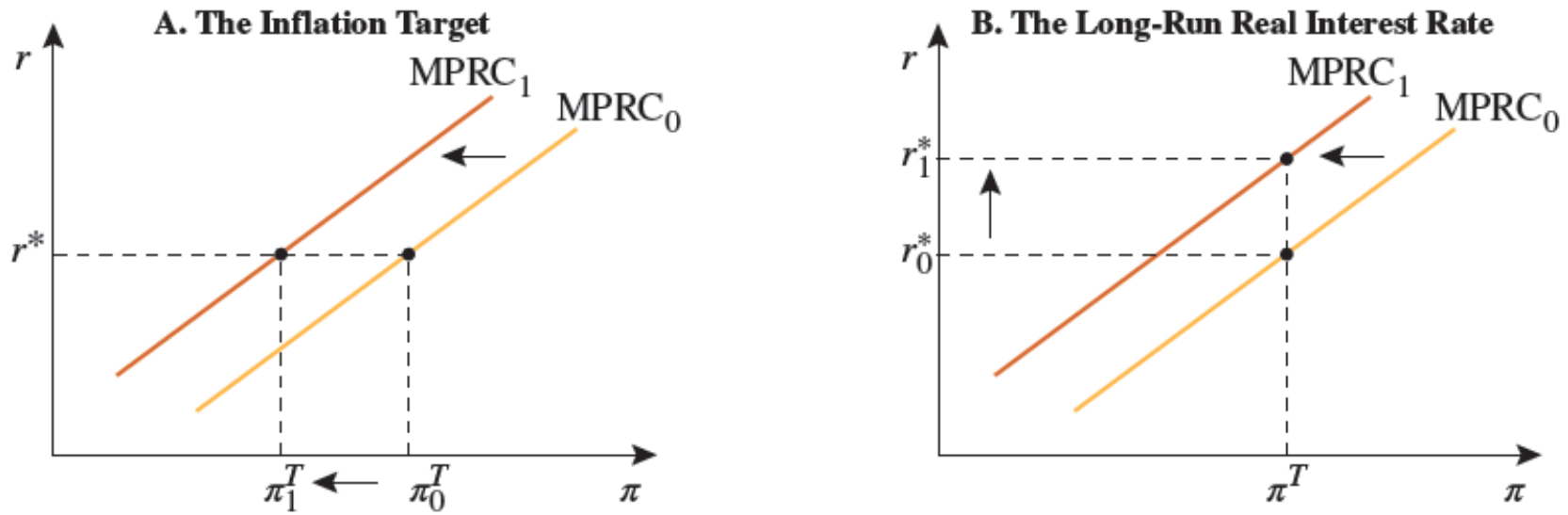
Figure 21.7 The Monetary Policy Reaction Curve



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

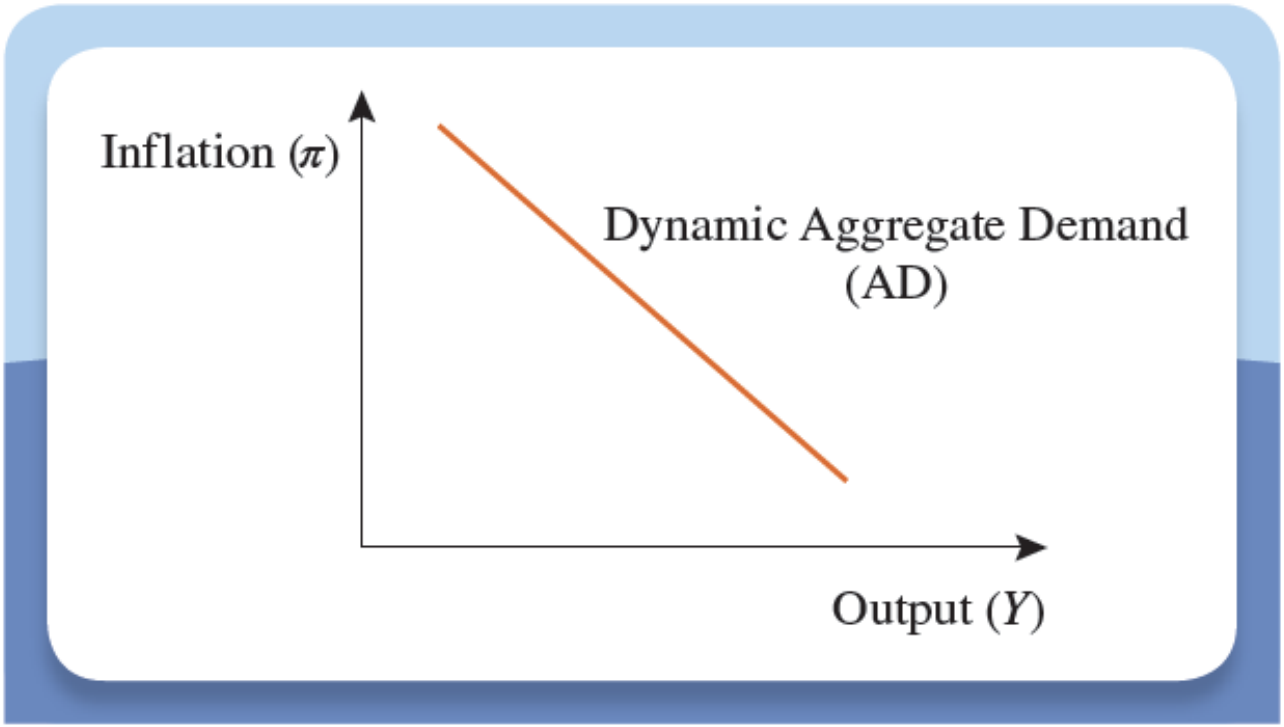
- The **dynamic aggregate demand curve** *relates* **inflation** and the level of **output,**
- Accounting for the fact that *monetary policymakers* ***respond to*** changes in current ***inflation*** by ***changing the interest rate***.

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**

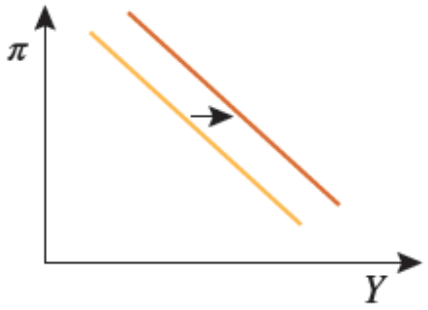
Shifting the Dynamic Aggregate Demand Curve

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*.



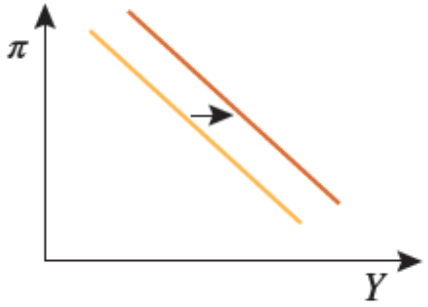
Shifts in the Monetary Policy Reaction Curve

$\pi^T \uparrow$

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

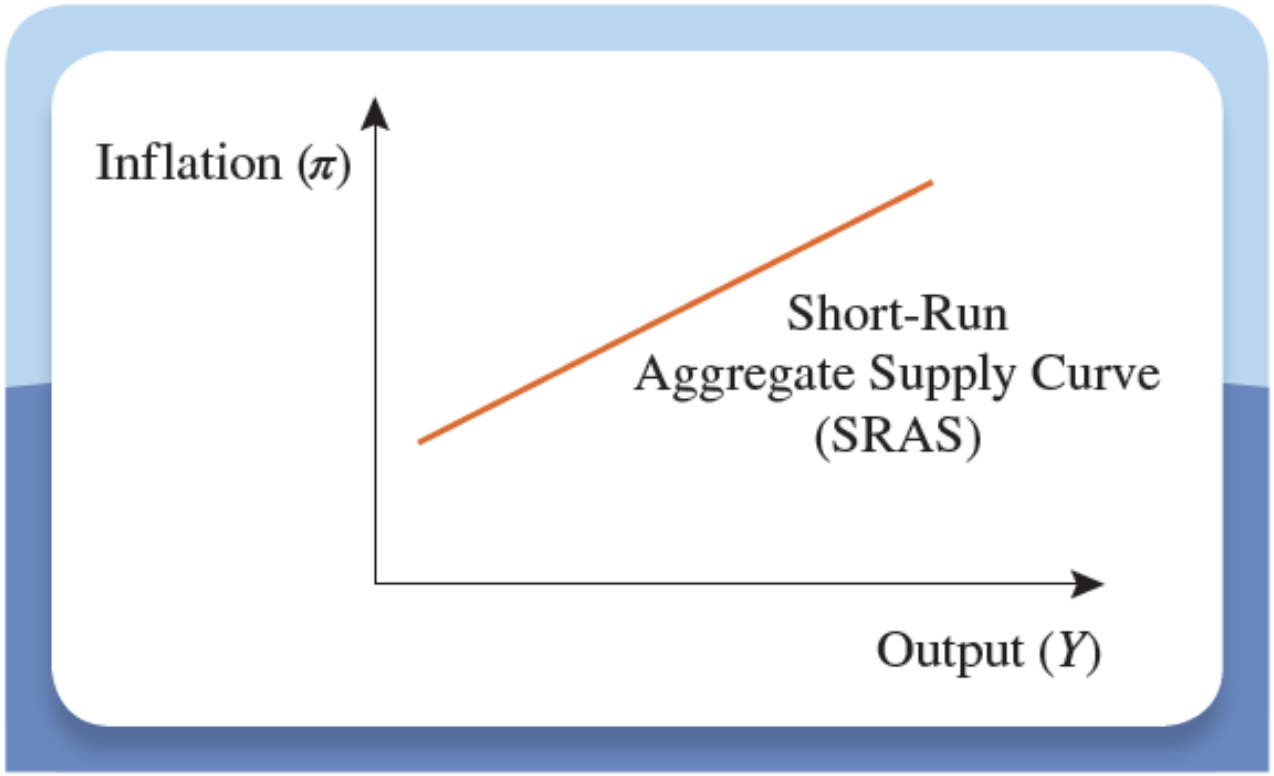
- The **aggregate supply (AS) curve** tells us where along the **dynamic aggregate demand curve** the economy ***ends up***.
- When *combined with* the *dynamic aggregate demand curve*, the ***short-run AS curve*** tells us **where the economy settles** at any particular time.
- The ***long-run AS curve*** 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.

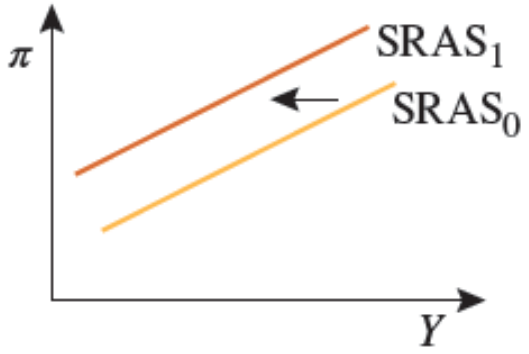
Shifts in the Short Run Aggregate Supply Curve

- 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*.

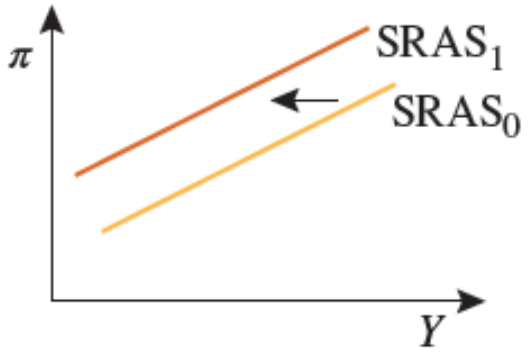
Shifts in the Short Run Aggregate Supply Curve

Figure 21.12 Shifting the Short-Run Aggregate Supply Curve

Expected π ↑
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 ↑
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 $SRAS_1$.

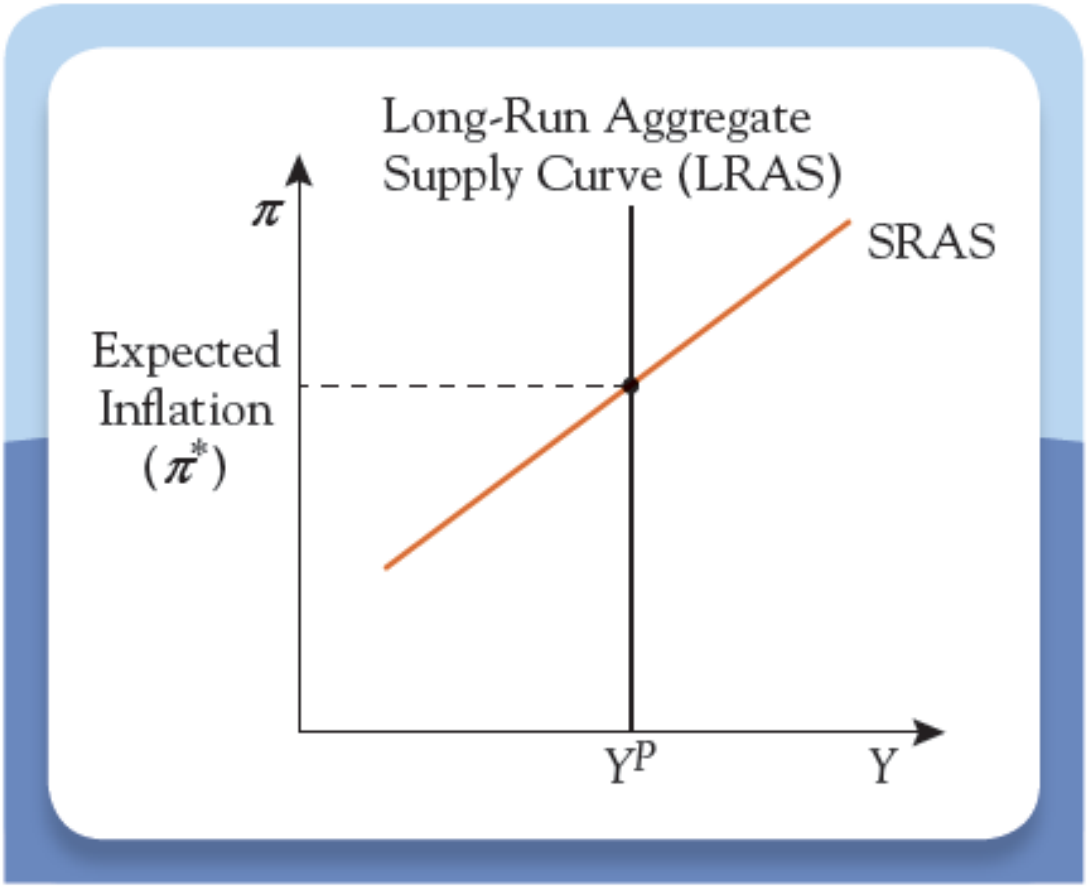


The Long-Run Aggregate Supply Curve

- 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



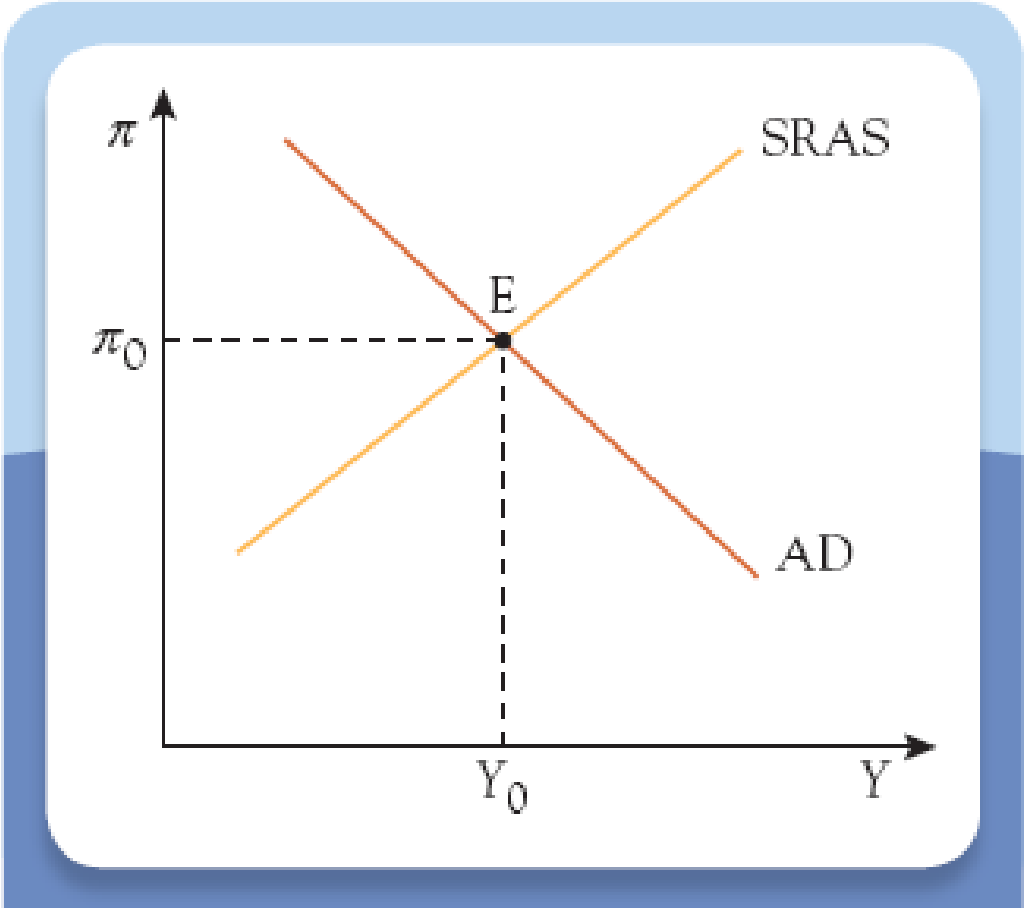
Equilibrium and the Determination of Output and Inflation

Equilibrium and the Determination of Output and Inflation

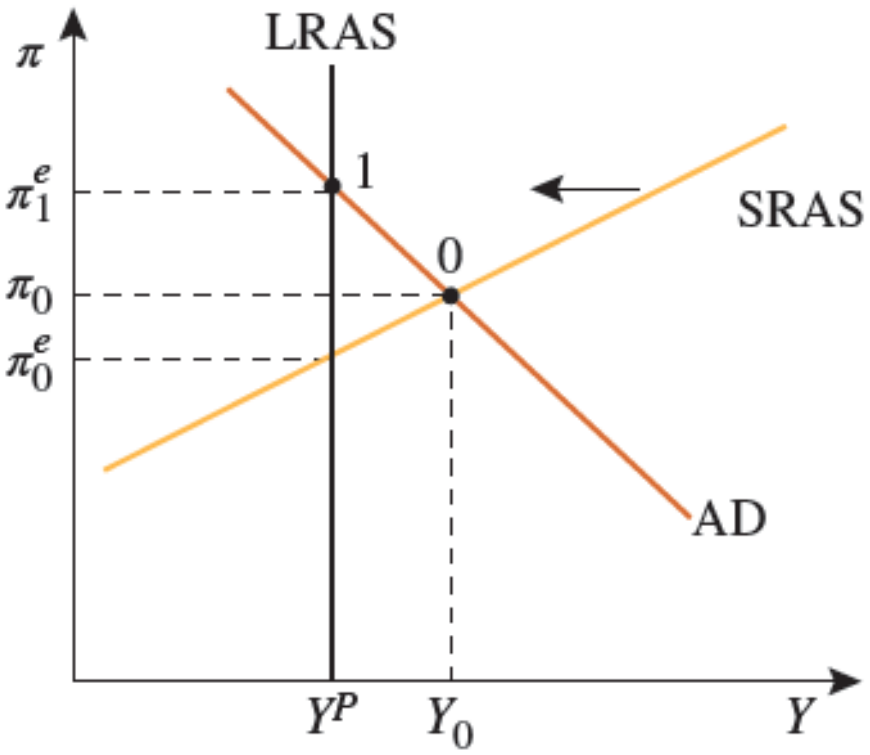
Short Run Equilibrium

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

Figure 21.15 Short-Run Determination of Output and Inflation

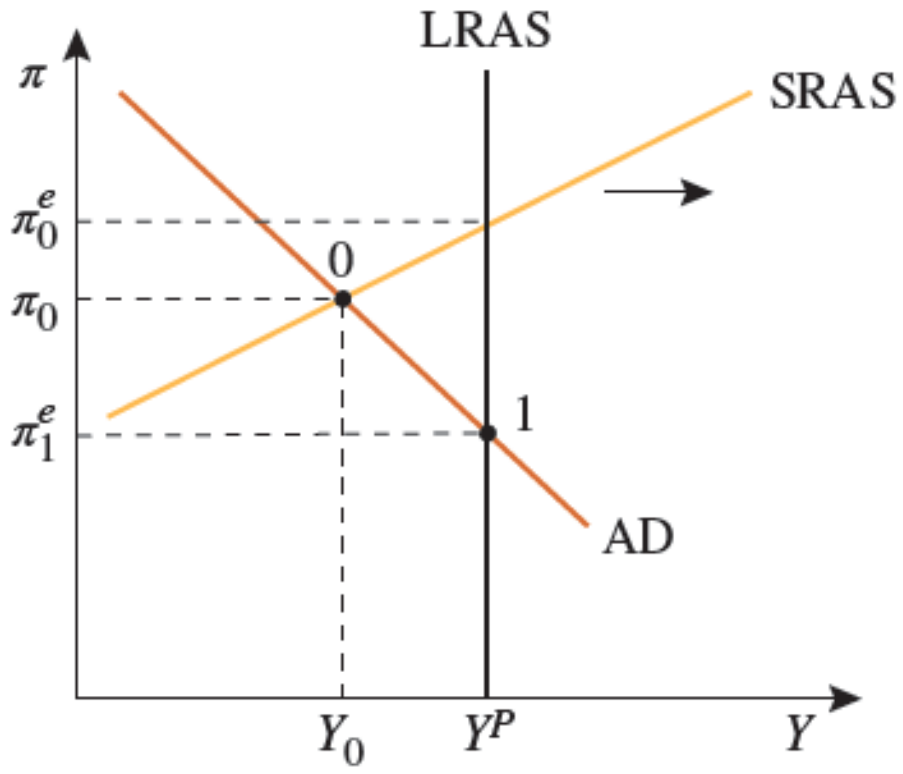


Adjustment to Long-Run Equilibrium



- ***Expansionary output gaps*** push **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***
- **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