Session 11: Macroeconomic Fluctuations

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Course Outline

1. AS-AD Model:
   - 1.1 Aggregate Demand Shock
   - 1.2 Aggregate Supply Shock

Useful information:

- Assessment: MCQ and PS.
- Online Exercise Session: TBD
- OH: after class and via email (Zoom or in person).

AS/AD Model

AS/AD Model: Core Equations

Aggregate Demand (AD):

$$\tilde{Y}_t = \theta_t - \sigma\gamma(\pi_t - \pi) \qquad (1)$$

- **AD:** Higher inflation raises real interest rates $\Rightarrow$ lowers demand.
- Demand shocks (θ_t) shift the AD curve.

Aggregate Supply (AS):

$$\pi_t = \pi^* + \kappa\tilde{Y}_t \qquad (2)$$

- **AS:** Output above potential raises inflation.
- Price rigidities make inflation respond gradually.
- Supply shocks (Y^*) shift the AS curve.

AS/AD Model: Variables and Shocks

- **Key Variables:**
  - $\tilde{Y}_t$: short-run output gap, defined as the log deviation of actual output from potential output:

$$\tilde{Y}_t = \log Y_t - \log Y_t^* \tag{3}$$

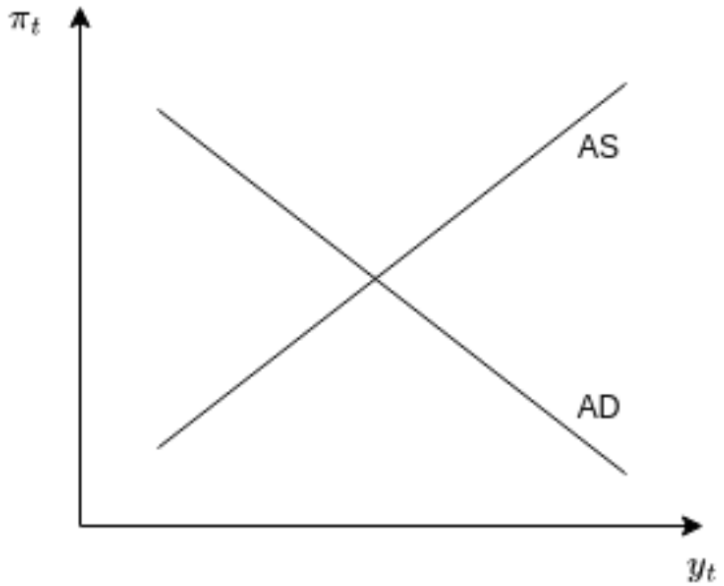
  - π_t: actual inflation and π^*: inflation target.
  - Y_t^*: natural (potential) level of output.

- **Main Shocks:**
  - θ_t: **demand shock** $\Longrightarrow$ changes in consumption, investment, or monetary policy.
  - ΔY_t^*: **supply shock** $\Longrightarrow$ changes in productivity, costs, or markups.

- The AS curve depends on Y_t^* because it is defined in terms of the output gap $\tilde{Y}_t$, which measures deviations from potential output. Therefore, shifts in Y_t^*, defined as ΔY_t^* move the AS curve even if Y_t remains unchanged.

AS/AD Equilibrium: Graphical Intuition

Short-term graphical version:



- The AS and AD curves intersect to determine short-run equilibrium.
- Demand shocks shift the AD curve (e.g. monetary/fiscal policy).
- Supply shocks shift the AS curve (e.g. productivity, costs).
- The adjustment path reflects price and wage rigidities.

AS/AD Equilibrium: Effect of Shocks

- Solving the AS and AD system yields:

$$\tilde{Y}_t = \text{const} + \left(\frac{1}{1+\sigma\gamma\kappa}\right)\theta_t + \left(\frac{\sigma\gamma\kappa}{1+\sigma\gamma\kappa}\right)\Delta Y^* \tag{4}$$

$$\pi_t = \text{const} + \left(\frac{\kappa}{1+\sigma\gamma\kappa}\right)\theta_t - \left(\frac{\kappa}{1+\sigma\gamma\kappa}\right)\Delta Y^* \tag{5}$$

- The terms in brackets are called **multipliers** and they determine the size of the response of $\tilde{Y}_t$ and π_t to each shock.

- Interpretation:
  - A positive demand shock ($\theta_t \uparrow$) $\Rightarrow$ both output and inflation increase.
  - A negative supply shock ($\Delta Y^* \downarrow$) $\Rightarrow$ inflation rises, output falls.

- All effects have the expected sign, consistent with empirical evidence and New Keynesian theory.

Aggregate Demand Shock

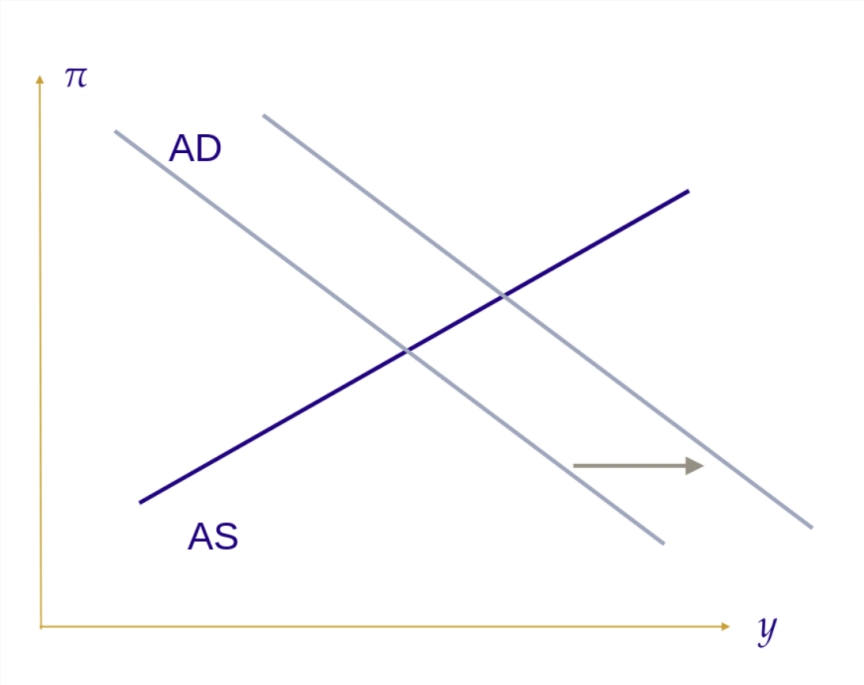
Demand Shock: What Does θ_t Represent?

- θ_t captures **shifts in aggregate demand**, reflecting changes in the willingness or ability of households, firms, and the public sector to spend.

- **Examples of demand shocks:**
  - Decline in consumer confidence for current consumption ($\theta_t < 0$, $\tilde{Y}_t \downarrow$).
  - Increase in uncertainty for households and firms ($\theta_t < 0$, $\tilde{Y}_t \downarrow$).
  - Reduction in taxes, known as expansionary fiscal policy ($\theta_t > 0$, $\tilde{Y}_t \uparrow$).
  - Increase in government spending ($\theta_t > 0$, $\tilde{Y}_t \uparrow$).

- Negative demand shocks generate **leftward** shifts to the AD curve.
- Positive demand shocks generate **rightward** shifts to the AD curve.

Short-Term Impact of Demand Shock



- A positive demand shock ($\theta_t \uparrow$) increases:

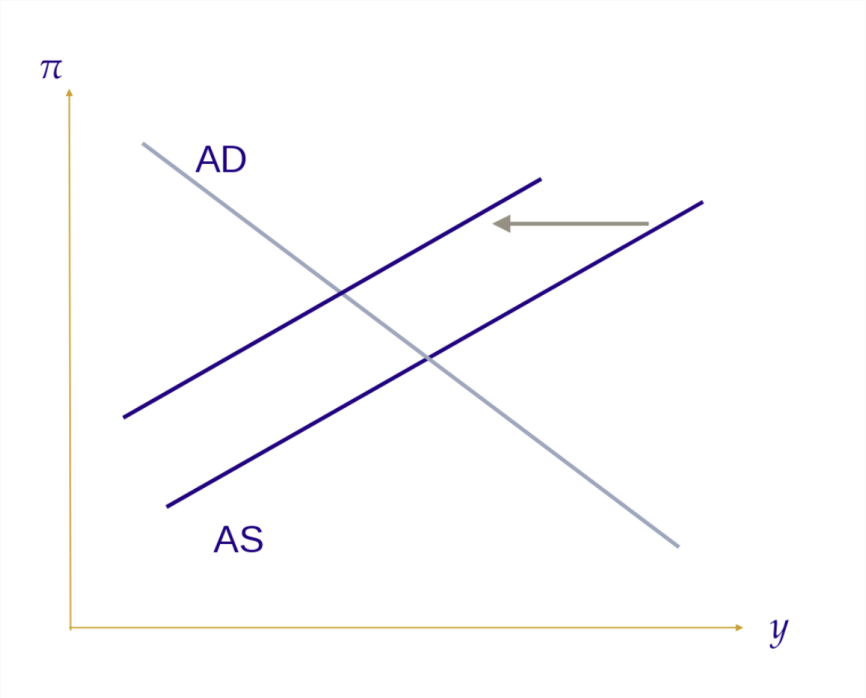
$$\tilde{Y}_t = \left(\frac{1}{1+\sigma\gamma\kappa}\right)\theta_t \qquad (6)$$

$$\pi_t = \left(\frac{\kappa}{1+\sigma\gamma\kappa}\right)\theta_t \qquad (7)$$

- **Key parameters:**
  - σ: responsiveness of output to interest rate (IS elasticity)
  - γ: central bank's sensitivity to inflation
  - κ: slope of the AS curve, price rigidity

Aggregate Supply Shock

Supply Shock: Theoretical Impact



What happens with a negative supply shock ($\Delta Y^* \downarrow$)?

- The AS curve shifts to the **left**.
- Output falls:

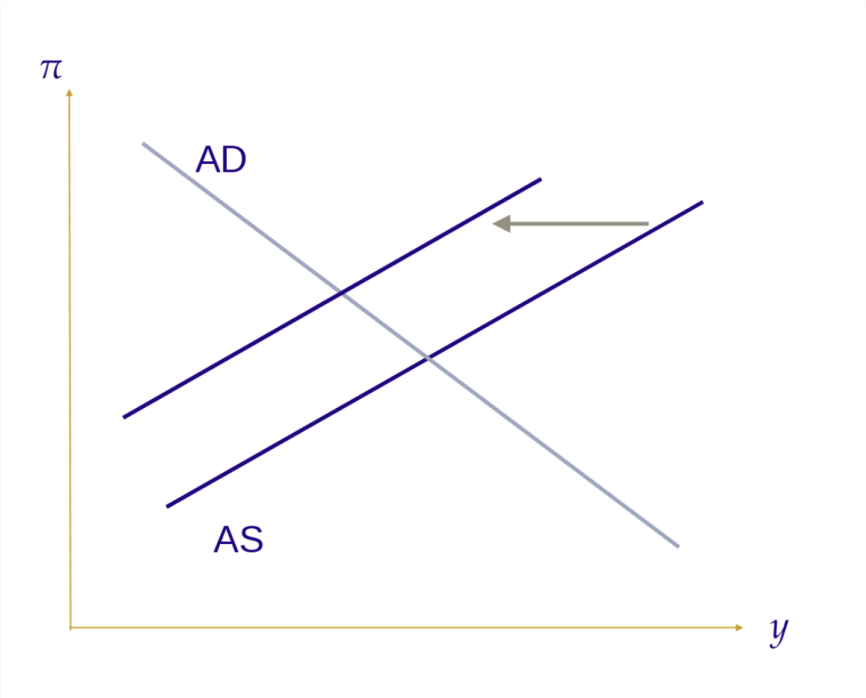
$$\tilde{Y}_t = \left(\frac{\sigma\gamma\kappa}{1 + \sigma\gamma\kappa} \right) \Delta Y^* \quad (8)$$

- Inflation rises:

$$\pi_t = -\left(\frac{\kappa}{1 + \sigma\gamma\kappa} \right) \Delta Y^* \quad (9)$$

- Effects have expected signs: $\downarrow$ output, $\uparrow$ inflation.

Supply Shock: What Does It Represent?



- Affects the position of the AS curve.
- Examples of causes:
  - Changes in the factors of production.
  - Productivity shocks (e.g. tech disruptions).
  - Changes in firm markups or cost structures.
  - Changes in firm expectations (e.g. risk premia).
- These are the same drivers that shape long-run growth — but here they operate in the short run.

Recap: Shock Dynamics

AS/ AD in a Nutshell

- Demand shock:
  - Any shock affecting the level of $\tilde{Y}$ on the AD curve.
  - If the shock is positive ($\theta_t > 0$) then $\tilde{Y}_t \uparrow$ and $\pi_t \uparrow$.
  - If the shock is negative ($\theta_t < 0$) then $\tilde{Y}_t \downarrow$ and $\pi_t \downarrow$.

- Supply shock:
  - Any shock affecting the level of $\tilde{Y}$ on the AS curve.
  - If the shock is positive ($\Delta Y^* > 0$) then $\tilde{Y}_t \uparrow$ and $\pi_t \downarrow$.
  - If the shock is negative ($\Delta Y^* < 0$) then $\tilde{Y}_t \downarrow$ and $\pi_t \uparrow$.