

Session 10: Aggregate Supply

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Course Outline

1. Aggregate Supply

1.1 Sticky Price

1.2 Sticky Wage

1.3 Misperception

Useful information:

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

AS and LRAS Curves

AS and LRAS Curves

- Between two extremes:
 - **Constant prices:** no supply constraint, any demand is met.
 - **Perfectly flexible prices:** vertical supply curve, classical long run.
- What if prices adjust slowly?
- This would result in an upward sloping AS curve.
- We need to model price dynamics to understand it.

Nominal Rigidities

- Departing from the natural equilibrium requires frictions.
- **Nominal rigidity**: the idea that prices and/or wages do not adjust instantaneously to changes in economic conditions.
- Common explanations:
 - **Sticky wages**: labor market is not in equilibrium.
 - **Sticky prices**: firms can't adjust freely.
 - **Misperception**: firms have incorrect inflation information.
- Key insight from New Keynesian models: nominal rigidities have **real** effects.

1. Sticky Prices

Evidence on Sticky Prices

- If prices were fully flexible, they would adjust continuously.
- In reality, price changes are infrequent:
 - Euro area: about 15% of prices change each month (≈ 13 months duration).
 - US: about 21% frequency (≈ 10 months duration).
- Price rigidity varies across sectors:
 - Services $\Rightarrow$ more rigid.
 - Energy and food $\Rightarrow$ more flexible.
- **Conclusion:**
 - Prices adjust slowly $\Rightarrow$ short-run rigidities matter
 - Essential to explain output fluctuations.

Staggered Price Setting (Calvo)

- In each period, only a fraction $\omega \in [0, 1]$ of firms are able to adjust their prices.
- This implies that goods are sold at two different prices:
 - P_{t-1} : the price set in the previous period, used by non-adjusting firms.
 - P_t^* : the newly chosen optimal price, set by adjusting firms.
- The aggregate price level is a weighted average of these two:

$$P_t = P_{t-1}^{1-\omega} (P_t^*)^\omega \quad (1)$$

- This framework allows us to model nominal rigidities and derive the dynamics of price adjustment.
- Also known as **Calvo pricing**, a cornerstone assumption in New Keynesian models.

The New Keynesian Phillips Curve

- With sticky prices (Calvo pricing), inflation depends on economic activity:

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

- **Interpretation:**

- When output is above potential ($\tilde{Y}_t > 0$):
 - Firms face higher demand and rising costs
 - Firms that can adjust prices increase them
 - $\Rightarrow$ inflation rises
- When output is below potential:
 - Inflation decreases

- **Slope of the AS curve:**

$$\kappa = \frac{\omega}{1 - \omega} \cdot \frac{1}{\xi} \quad (3)$$

- Higher ω (more flexible prices) $\Rightarrow$ steeper AS curve
- Lower ω (stickier prices) $\Rightarrow$ flatter AS curve

AS Curve Interpretation

- This expression relates inflation π_t to the output gap ($Y_t - Y^*$).
- The coefficient κ depends on:
 - Price rigidity (e.g. fraction of firms adjusting prices, ω)
 - Labor market elasticity and markups

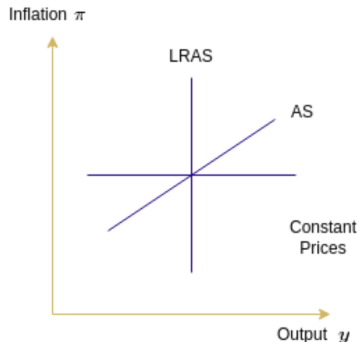


Figure 7: LRAS

- **LRAS (vertical)** when $\omega = 1$: all firms adjust prices instantly.
- **Flat AS (horizontal)** when $\omega = 0$: no firms adjust, prices fully rigid.
- **Upward-sloping AS** for $0 < \omega < 1$: partial adjustment — the realistic case.

Intuition for Upward Sloping AS (Sticky Prices)

1. Assume prices start from their long-run equilibrium level.
2. An expansionary monetary policy increases aggregate demand and creates inflationary pressure.
3. Prices should rise, but many firms cannot adjust immediately due to price stickiness.
4. Firms that do not adjust prices face a higher-than-expected price level, making their goods relatively cheaper.
5. As a result, demand for their goods increases, and they expand production.
6. Output increases temporarily, but then comes back to its potential level, once all firms adjust to the new optimal prices.

2. Sticky Wages

Sticky Wage Theories

- An alternative explanation for an upward sloping AS curve is the **sticky wage theory**.
- In a frictionless labor market, wages would adjust both upward and downward instantly.
- In reality, however, wages are rigid in both directions:
 - **Downward rigidity:** wage cuts are rare, as employers and employees tend to avoid them.
 - **Upward rigidity:** wage increases also adjust slowly due to contracts, negotiation delays, and information frictions.
- Two main explanations:
 - **Unions and wage bargaining:** negotiated contracts fix wages for a period and resist revision.
 - **Efficiency wage theory:** firms pay above-market wages to boost morale and productivity, limiting flexibility.
- Because wages do not adjust immediately, firms face temporarily lower or higher real wages $\implies$ employment and output respond to shocks.

Intuition for Upward Sloping AS (Sticky Wages)

1. Suppose nominal wages are fixed in the short run due to contracts and slow renegotiation.
2. A positive aggregate demand shock (e.g. expansionary fiscal or monetary policy) creates inflationary pressure.
3. Prices rise faster than nominal wages $\implies$ real wages fall.
4. Lower real wages make labor cheaper for firms.
5. Firms increase hiring and expand production.
6. Employment rises $\implies$ unemployment falls.
7. Output increases temporarily because wages are sticky.

3. Misperception

Misperception and the Upward-Sloping AS Curve

Lucas Islands Model (Idea):

- Firms observe their own price but not the overall price level.
- They cannot immediately distinguish:
 - A **relative price increase** (good for them), from
 - An **aggregate inflation increase**.

Mechanism:

- Suppose inflation increases unexpectedly.
- Firms observe higher prices for their goods and interpret this as higher relative demand, thus increasing production.

Implication:

- Higher (unexpected) inflation $\implies$ higher output.

Today:

- Better information and credible central banks reduce misperceptions.