

# AS/AD Model

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# Objectives

In this section you will learn

1. how to put IS/LM and labor market clearing together
2. how to derive aggregate supply and demand curves
3. how to analyze policies and shocks
4. why the economy tends towards potential output in the long run

Aggregate Supply (AS)

# Aggregate Supply

The aggregate supply curve is simply the labor market clearing condition

Recall

$$Y^s = F(W/P^e, z) \quad (1)$$

$$= F\left(\frac{P}{P^e} \frac{1}{1+m}, z\right) \quad (2)$$

$F$  is upward sloping in  $W/P^e$ .

# Properties of AS

Holding constant  $P^e$ :  $Y \uparrow \implies P \uparrow$

Intuition:

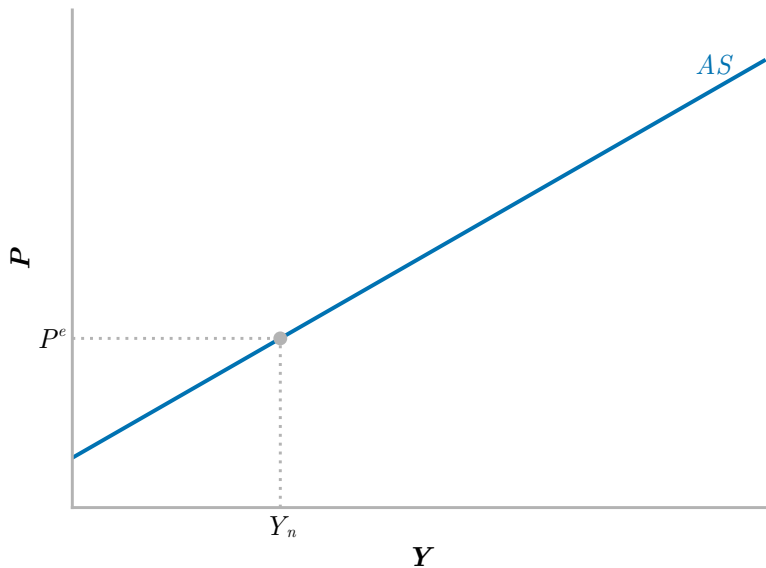
Holding constant  $Y$ :  $P^e \uparrow \implies P \uparrow$

Intuition:

When  $P = P^e$ :  $Y = Y_n$  and  $u = u_n$

these values define  $Y_n, u_n$ .

## Aggregate Supply



AS is upward sloping for **given**  $P^e$

# Shifters of AS

Labor market policies ( $z$ ); e.g., unemployment insurance

Production costs + competition ( $m$ ); e.g., oil prices

Price expectations ( $P^e$ )

Aggregate Demand (AD)



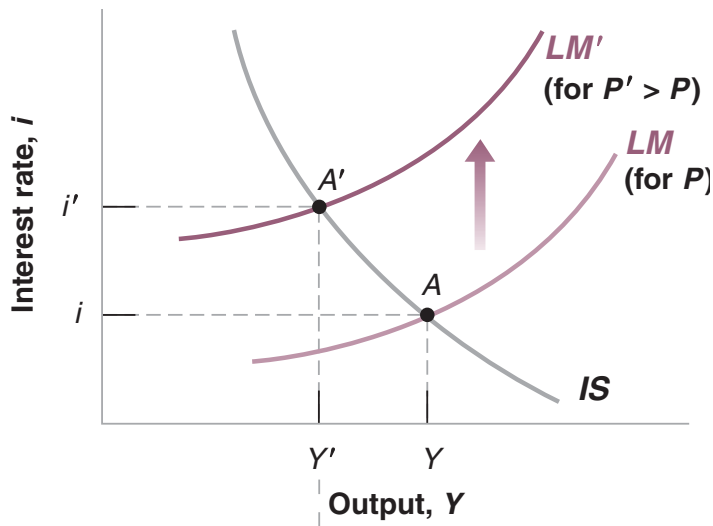
# Aggregate Demand

- ▶ AD combines IS and LM
- ▶ Recall:
  - ▶ IS:  $Y = C(Y - T) + I(Y, i) + G$
  - ▶ LM:  $M/P = YL(i)$
- ▶ Combine the two, so that  $i$  is eliminated

$$\mathbf{AD} : Y = Y(\underset{+}{M/P}, \underset{+}{G}, \underset{-}{T}) \quad (3)$$

- ▶ This is downward sloping:  $P \uparrow \implies Y \downarrow$
- ▶ Intuition: ...

## Deriving AD Graphically



Trace out intersection of IS/LM as  $P \uparrow$ .

# AD Shifters

- ▶ Anything that shifts IS or LM left shifts AD left (towards lower  $Y$ )
- ▶ Examples
  - ▶ IS:  $G \downarrow, T \uparrow, C_0 \downarrow$
  - ▶ LM:  $M \downarrow$
- ▶ These are exactly the shocks that reduce  $Y$  in the short-run model
- ▶ AD really collects all short-run equilibria, one for each  $P$ .

Equilibrium

## Equilibrium summary

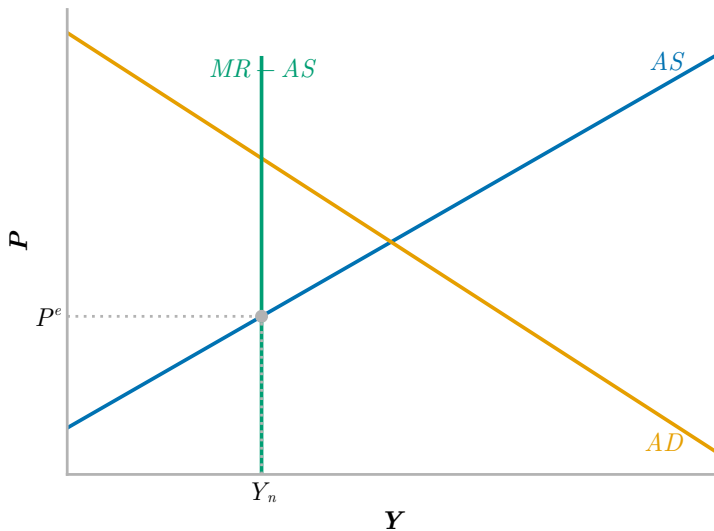
Curve	Equation	Shifters
AS	$Y = F\left(\frac{P}{P^e} \frac{1}{1+m}, z\right)$	$m \uparrow, P^e \uparrow, z$
AD	$Y = C(Y - T) + G + I(Y, i)$ $M/P = YL(i)$	$M/P \uparrow, G \uparrow, T \downarrow$

Short run:  $P^e$  given.

Medium run:

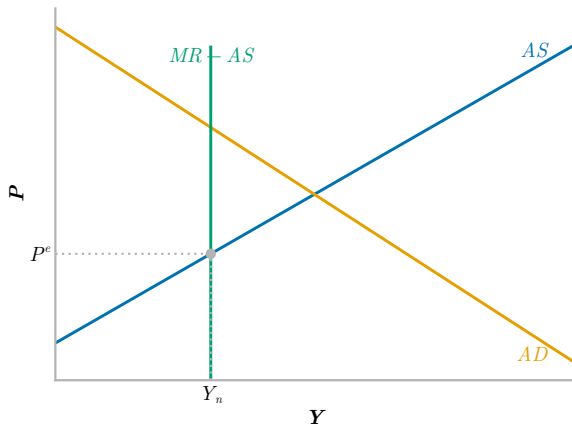
- ▶  $P^e \rightarrow P$ .
- ▶ MR-AS:  $Y_n = F\left(\frac{1}{1+m}, z\right)$  (vertical)
- ▶ full employment

## Short-run Equilibrium



Clear all markets for a given  $P^e$

## Transition Towards Medium-run



Key assumption:  
Price expectations  
move towards current  
prices.

$$P^e \rightarrow P$$

Here:  $P^e \uparrow$   
Shifts  $AS$  up.

# Analyzing the Model

1. Start with the medium run:
  - 1.1 vertical supply:  $Y = Y_n$
  - 1.2 on the point of the AD curve where  $P = P^e$
2. Apply a shock
  - 2.1 find the new medium run ( $P^e = P$ )
  - 2.2  $Y_n$  only changes if  $m$  or  $z$  were shocked
  - 2.3 find the new short-run ( $P^e$  unchanged)
3. Transition
  - 3.1 AS curve shifts towards new medium run equilibrium



# Thinking about Expectations

What we have here is a form of **adaptive expectations**.

- ▶ Workers target  $P^e = P$
- ▶ When they under predict, they revise expectations upwards.

Expectations are **backward looking**.

- ▶ What are the drawbacks of this assumption?

# Thinking about Expectations

What do we want from a model of expectations?

1. Agents understand (to some extent) how the world works.  
Forward looking; not simply backward looking.
2. Expectations get updated when policy changes.  
If the Fed changes the inflation target, expectations should adjust.
3. Agents cannot be fooled all the time.  
With backward looking expectations, the Fed can surprise agents over and over again with higher inflation.

# Rational Expectations

State of the art models assume **Rational expectations**:

- ▶ Agents solve for the equilibrium path (over time).
- ▶ All information is optimally used.
- ▶ Agents make no ex ante predictable mistakes.

When government Policies change: agents update their solutions.

What is the downside of this assumption?

# Summary

The AS/AD model combines:

- ▶  $IS/LM$  for the demand side
  - ▶ each short run equilibrium is now a point on the  $AD$  curve
  - ▶ anything that changes short run  $Y$  is now an  $AD$  shock
- ▶ Labor supply as a function of perceived real wage for the supply side
  - ▶ unanticipated inflation increases supply
- ▶  $MR - AS$  is vertical
  - ▶ output determined by worker preferences and work incentives  $z$

# Recap Questions

## **AD:**

1. Explain why AD is downward sloping.
2. What happens to the interest rate as you move along the AD curve?

## **AS:**

1. What does full employment mean?
2. What does the level of full employment depend on?

## **Equilibrium:**

1. Should the government try to raise output above the full employment level?

## Reading

Blanchard/Johnson, Macroeconomics, 6th ed, ch. 7