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

$$
\begin{aligned}
Y^s &= F\left(W/P^e, z\right) && (1) \\
&= F\left(\frac{P}{P^e}\frac{1}{1+m}, z\right) && (2)
\end{aligned}
$$

F is upward sloping in W/P^e.

Properties of AS

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

Intuition:

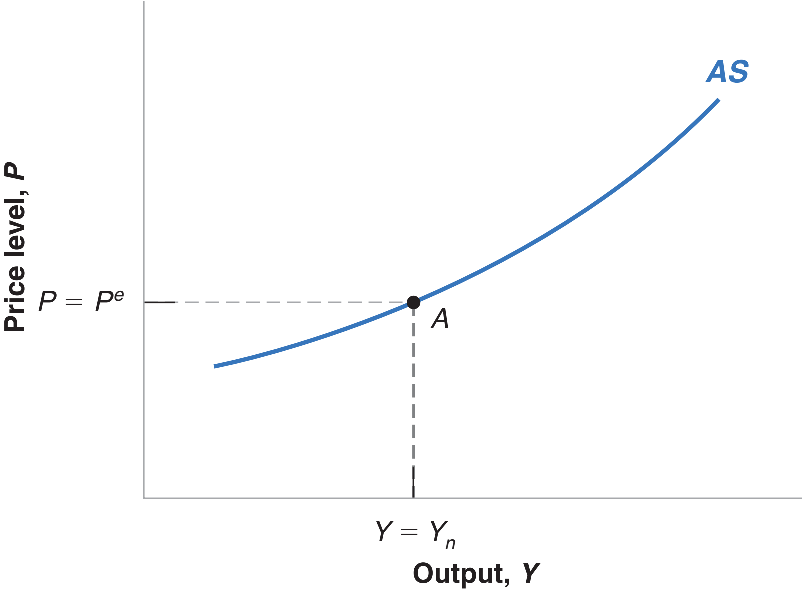
Holding constant Y: $P^e \uparrow \Longrightarrow P \uparrow$

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)

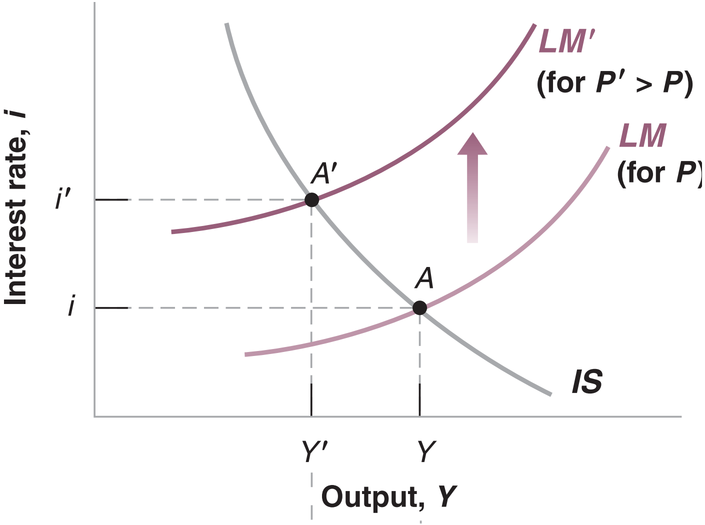
Aggregate Demand

- 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

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

- 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

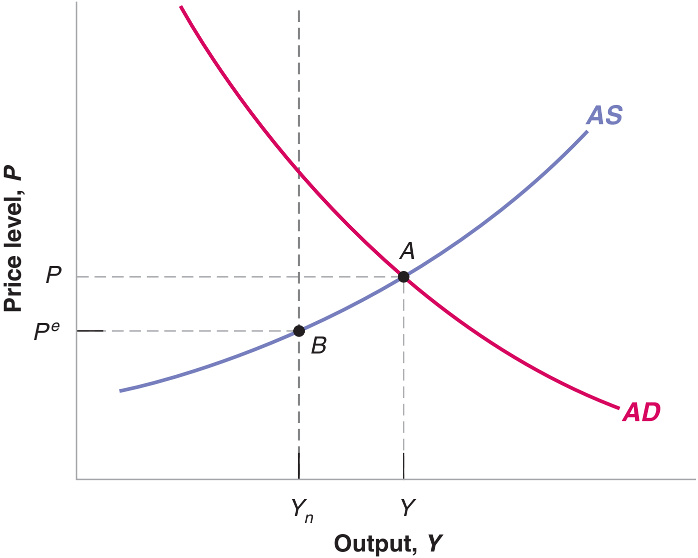
Equilibrium summary

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.

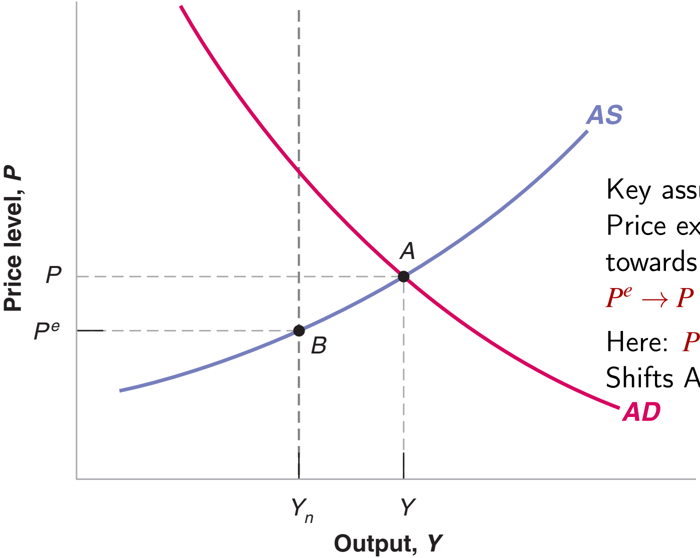
Medium run: $P^e \to P$.

Short-run Equilibrium



Clear all markets for a given P^e

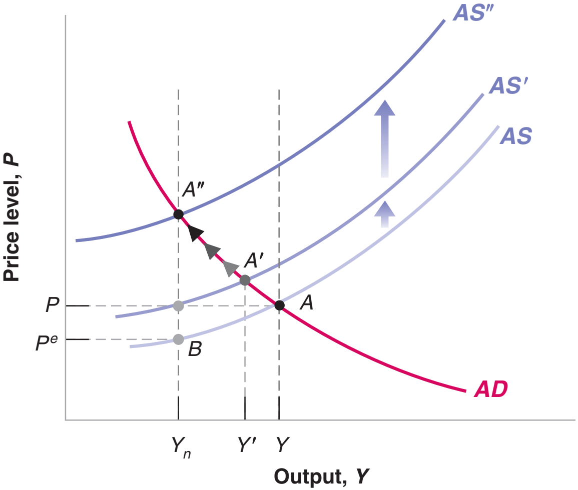
Transition Towards Medium-run



Key assumption:
Price expectations move towards current prices.
$P^e \to P$

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

Transition Towards Medium-run



Expectations adjust towards $P^e = P$

AS shifts up

$Y \to Y_n$

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?

Rational Expectations

What do we want from a model of expectations?

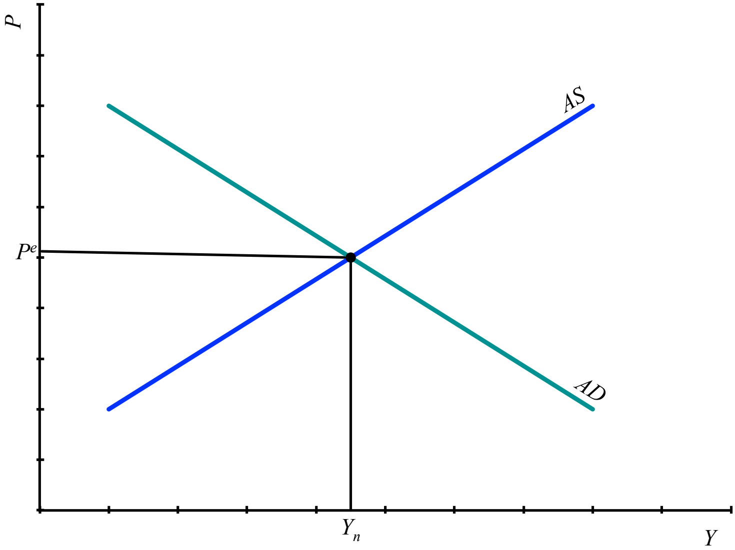
1. Agents understand (to some extent) how the world works.
   Forward looking; not simply backward looking.
2. Expectations get updated when policy changes.
   If the Fed changes the inflation target, expectations should adjust.
3. Agents cannot be fooled all the time.
   With backward looking expectations,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

Rational expectations:

- Agents solve for the equilibrium path (over time).
- Policy changes $\implies$ agents update their solutions.
- This is what modern economics assumes.

Applications

Monetary Expansion: $M\uparrow$



Monetary Expansion

Medium run:

Short run:

Transition:

- AS shifts toward Y_n.

Key points

MR-AS

- determines medium run Y_n
- independent of AD shocks

SR-AS

- not shifted in SR because P^e fixed
- only supply shocks shift SR-AS
- shifts over time as P^e adjusts

AD

- only shifts once (in response to the shock)
- does not shift during SR $\rightarrow$ MR transition

Monetary Expansion

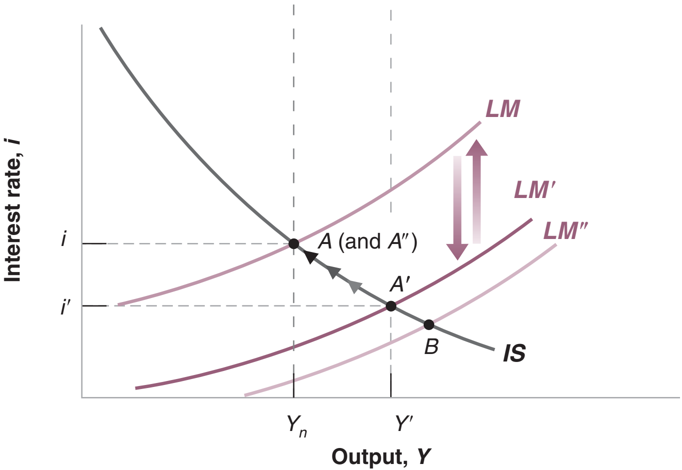
Result

Money is neutral in the medium run:

- M affects prices, but not any real variables
- Doubling M doubles P

This is why we may ignore money in the long-run growth analysis.

Intuition

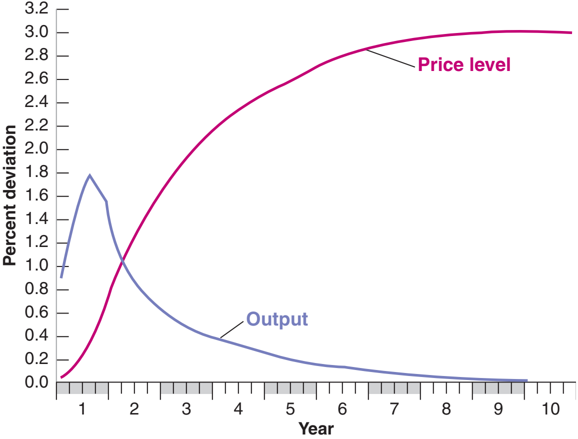


$M \uparrow \Longrightarrow i \downarrow \Longrightarrow I \uparrow$

With fixed P: $A \rightarrow B$ (IS/LM)

$P \uparrow$ dampens the short-run effect

Empirical Evidence



Estimated macro models imply:

- the peak effect of monetary policy hits after nearly 1 year
- it takes several years for the real effects to wear off

Why Monetary Policy Is Hard

Suppose the economy is hit by an adverse AD shock

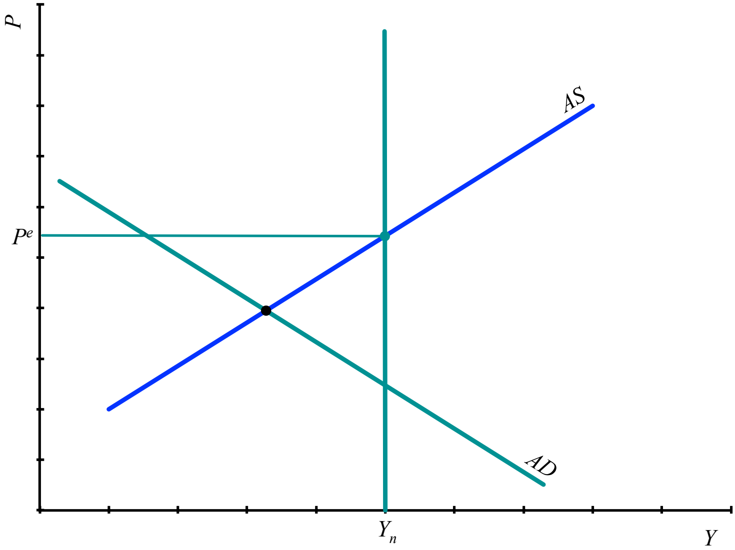
The Fed counters by expanding M

There is a long lag between the increase in M and the shift in AD

Policy options:

1. Do nothing
2. Raise M to shift the short-run equilibrium to Y_n
3. Raise M, but by less

Why Monetary Policy Is Hard

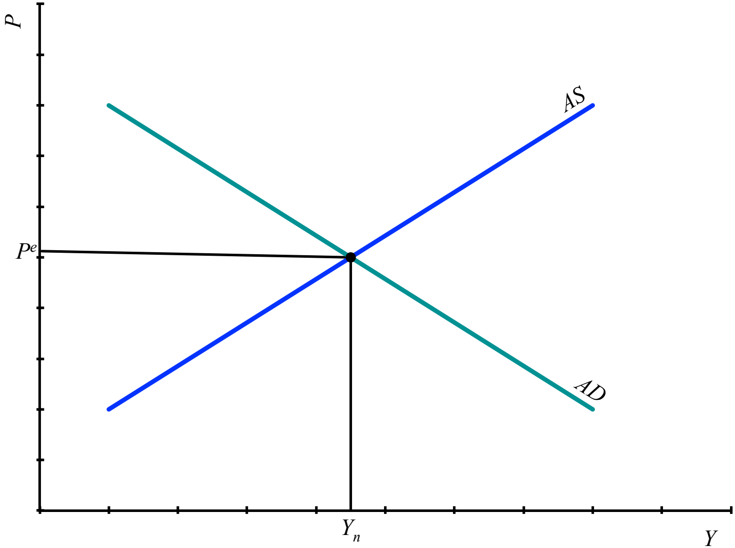


Summary

1. Do nothing
   Slow adjustment towards Y_n
   A period of deflation (might get "entrenched")
2. Raise M to shift the short-run equilibrium to Y_n
   Overshooting
3. Raise M, but by less
   Speedy adjustment to Y_n without inflation
   Hard to implement

The Role of Expectations

What does an anticipated monetary expansion look like?



The Role of Expectations

Key point

Unanticipated monetary policy has real effects.
Anticipated monetary policy just changes prices.

This is an overstatement.

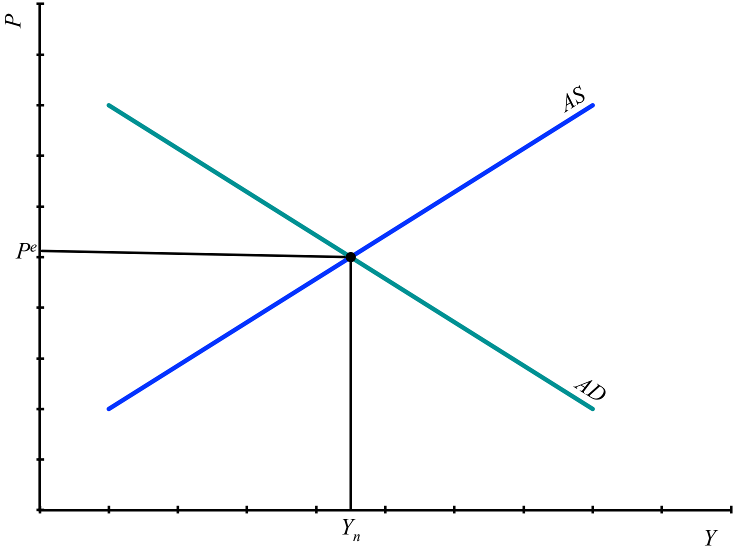
- In reality, not all prices will adjust ahead of time.

But:

- In the long run, monetary policy is neutral.
- Even in the short run, anticipated monetary policy is weak.

Deficit Reduction

The shock: $G \downarrow$.



Deficit Reduction

Medium run:

- AS:
- AD:

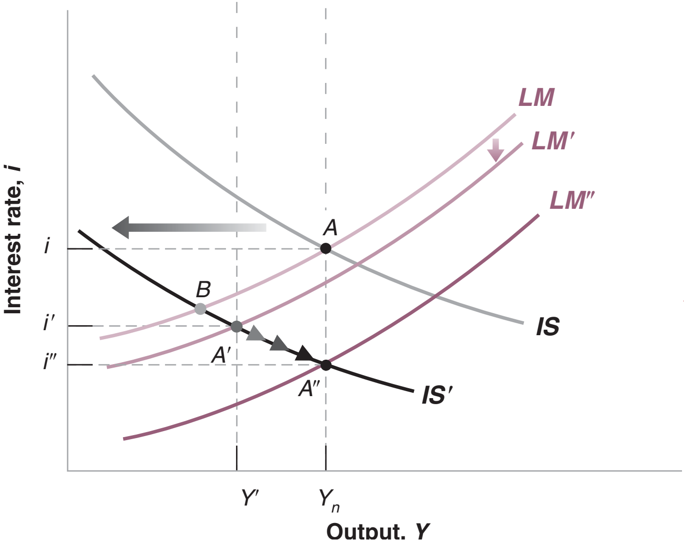
Short run:

- AS:
- AD:

Transition:

- AS shifts towards Y_n

Deficit Reduction



With fixed P: $A \to B$.

Short run:

$G \downarrow \Longrightarrow P \downarrow \Longrightarrow$
$M/P \uparrow \Longrightarrow i \downarrow$

Medium run:

$P \downarrow \Longrightarrow LM \downarrow$

Deficit Reduction

Short run:

- $Y\downarrow$
- I ambiguous ($Y\downarrow$ but $i\downarrow$)

Medium run:

- Y returns to natural level
- $I\uparrow$: crowding in

Long run:

- $K\uparrow \implies Y\uparrow$

This is the source of frequent disagreement: how to trade off the short run pain against the long run gain.

Summary

	Short run			Medium run		
	Y	i	P	Y	i	P
$M\uparrow$	$\uparrow$	$\downarrow$	$\uparrow$	–	–	$\uparrow$
$G\uparrow$	$\uparrow$	$\uparrow$	$\uparrow$	–	$\uparrow$	$\uparrow$

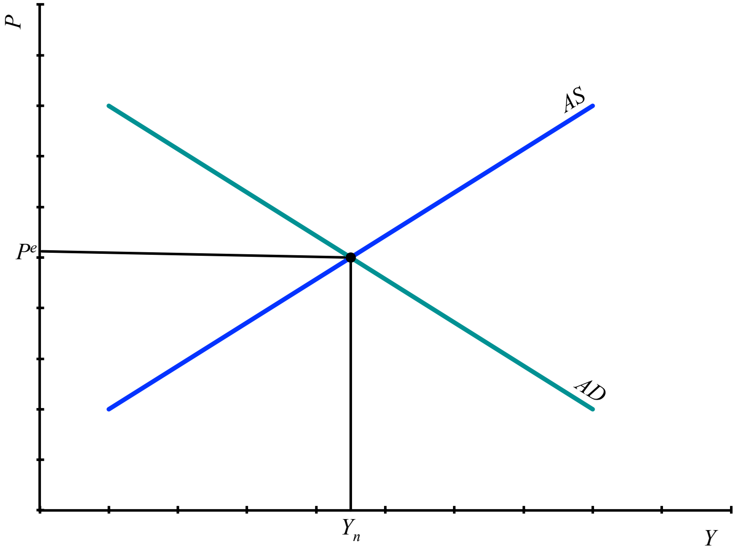
Short-run effects of shocks differ from medium-run effects.

Intuition: In the short run, wages do not fully adjust (b/c P^e is sticky).

Adverse Supply Shock

- Example: permanent increase in the price of oil
- Main effect: given wages, prices must rise
- Model as increase in markup: $m \uparrow$.

Adverse Supply Shock



Adverse Supply Shock

Medium run:

Short run:

Transition: AS shifts towards Y_n.

Stagflation

Demand shocks: output and prices move together.

Supply shocks: output and prices move against each other.

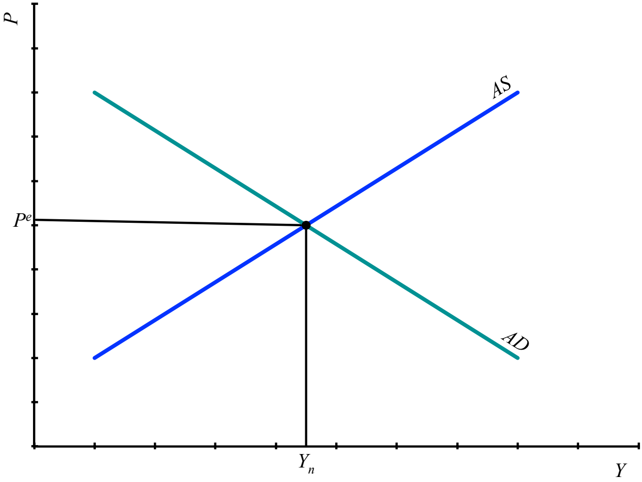
Stagflation:

- adverse supply shock creates **stag**nation and in**flation**.

Stabilization Policy

How should policy respond to recessions?

Case 1: Adverse demand shock



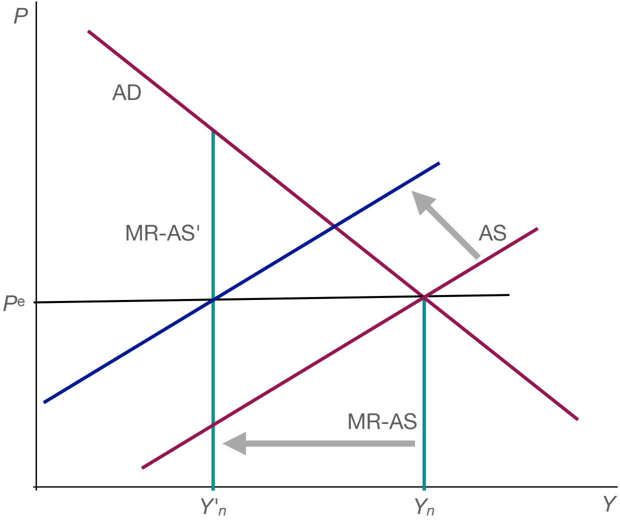
Stabilization Policy

Case 2: Adverse supply shock

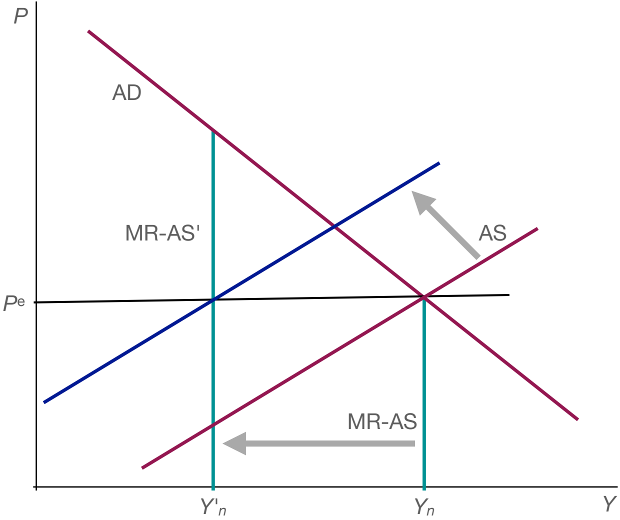
Two policy options:

1. Stabilize prices
2. Stabilize output

Stabilizing Prices



Stabilizing Output



Stabilizing Output

Key point

After a supply shock

- stabilizing output at the original level fails
- the attempt produces ongoing inflation.

Stabilization Policy

What happens if policy makers misdiagnose the source of the shock?

Historical examples?

Reading

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