Introductory Macroeconomics

Lecture 12: AD-AS model, part two

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This Lecture

- Working with the AD-AS model
- Temporary shock
  - investment boom
  - confidence slump } S_D
  - energy price hike } S_S
- Permanent shocks
  - increase in natural output Y^*
  - decrease in inflation target π^{T*}
- BOFAH chapter 11

Recap: Aggregate Demand

- **AD curve:** *downward sloping* relationship between π and Y

$$Y - Y^* = -\alpha\gamma(\pi - \pi^*) + \varepsilon_D \qquad \text{(AD)}$$

output gap; monetary policy; interest elasticity of demand

- Intuition
  - higher inflation π leads central bank to increase real interest rate r ($r - r^* = \alpha(\pi - \pi^*)$)
  - higher real interest rate r reduces output Y

movements along AD-curve

- Shocks to components of aggregate demand ε_D shift AD curve

- AD curve is *flatter* when central bank reaction coefficient α is higher (more aggressive response to inflation)

$\frac{\partial \pi}{\partial Y} = -\frac{1}{\alpha\gamma}$

$\alpha \uparrow$ slope $\downarrow$

Recap: Aggregate Supply

- **SRAS curve:** *upward sloping* relationship between π and Y

$$\pi = \pi^e + \phi\beta(Y - Y^*) + \varepsilon_S \qquad \text{(SRAS)}$$

Phillips curve → Okun's Law

- **LRAS curve:** but in long run *no relationship* between π and Y

$$\pi = \pi + \phi\beta(Y - Y^*) \quad \Rightarrow \quad Y = Y^* \qquad \text{(LRAS)}$$

long run $\pi = \pi^e$, $\varepsilon_S = 0$

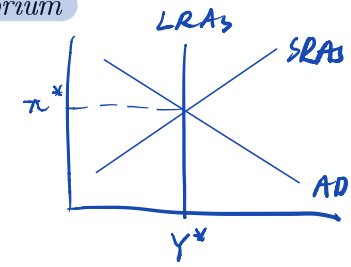
- Intuition
  - short run Phillips Curve tradeoff between inflation π and unemployment u hence output Y → as u↑ weaker condition, wage↓ business cost↓ price↓ inflation↓
  - but in long run inflation expectations consistent $\pi = \pi^e$, natural rate hypothesis holds, $u = u^*$ hence $Y = Y^*$

when u↓ ⇒ less labor ⇒ less output

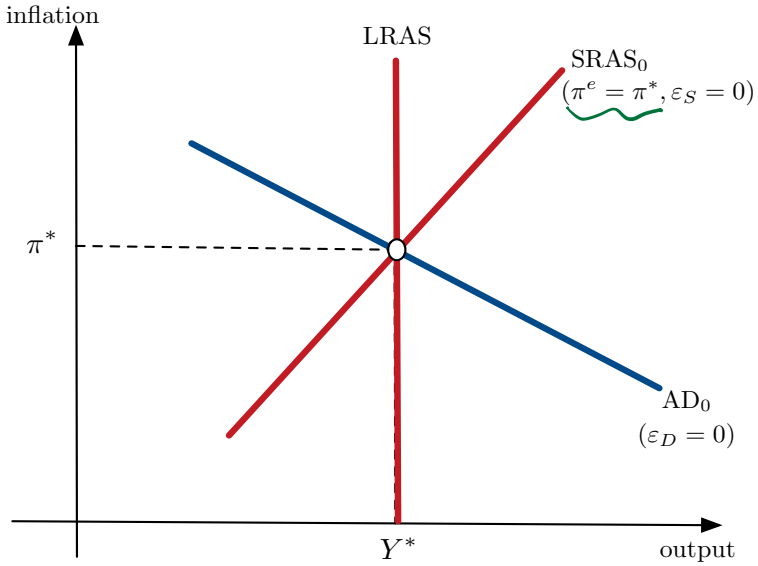
- Shocks ε_S to inflation expectations shift the SRAS curve

Examples

- Now let's see some examples
- Each example will begin in an *initial long run equilibrium*
  - in particular, $\pi^e = \pi^* = \pi$
  - hence in absence of shocks $Y = Y^*$
- We will then consider different kinds of changes
  - *temporary shocks* $\varepsilon_D, \varepsilon_S$, short run effects but no long run effects
  - *permanent shocks*, short run effects and long run effects

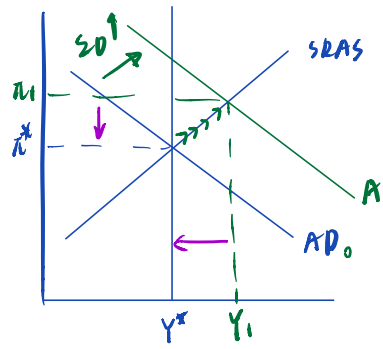


Initial Long Run Equilibrium



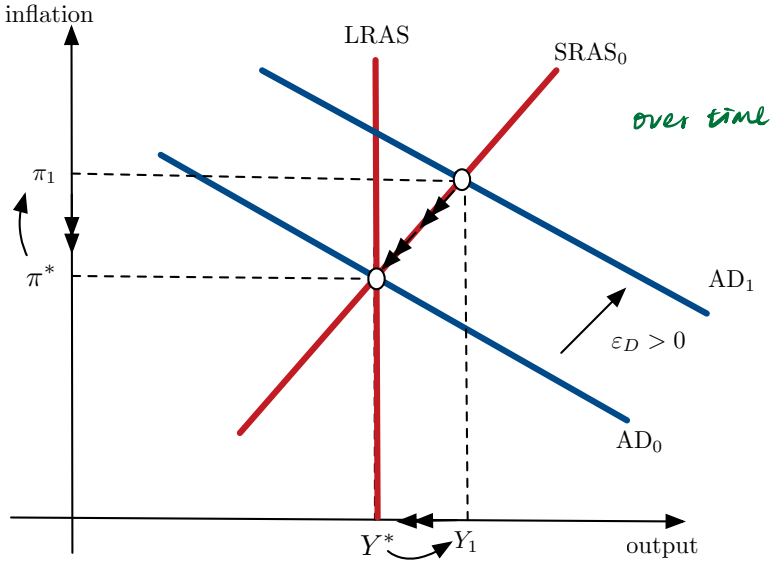
Temporary Shocks

Investment Boom

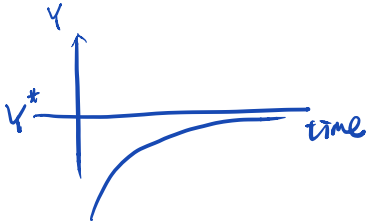


- Suppose investment *temporarily* high, $\varepsilon_D > 0$
- On impact, AD curve shifts out along unchanged AS curve
  - output increases from Y^* to Y_1
  - inflation increases from π^* to π_1
- Intuition
  - increase in investment demand increases output, decreases unemployment, increases wages and business costs, hence increases inflation along SRAS
- Long run equilibrium unchanged, inflation returns to π^* and output returns to Y^*
- Note importance of inflation expectations remaining '*anchored*'. Implicitly assumes central bank is *credible*.

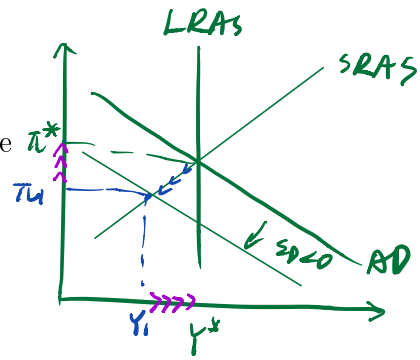
Investment Boom



over time, shock dissipate.

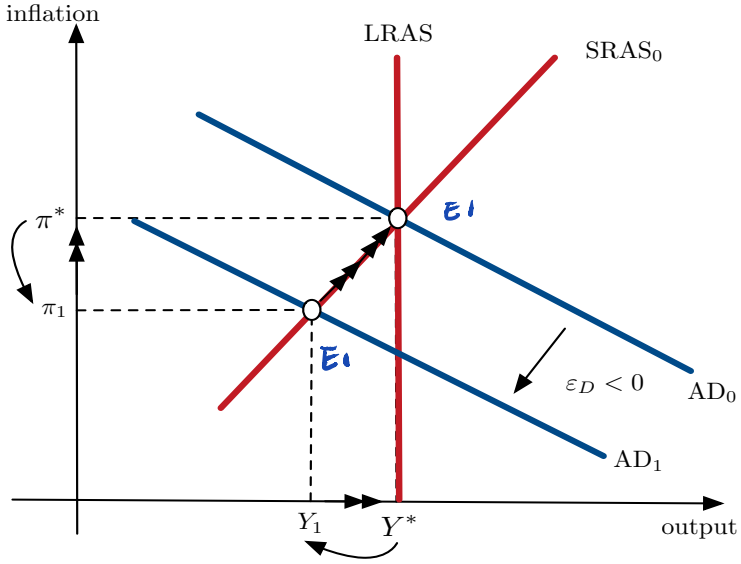


Confidence Slump



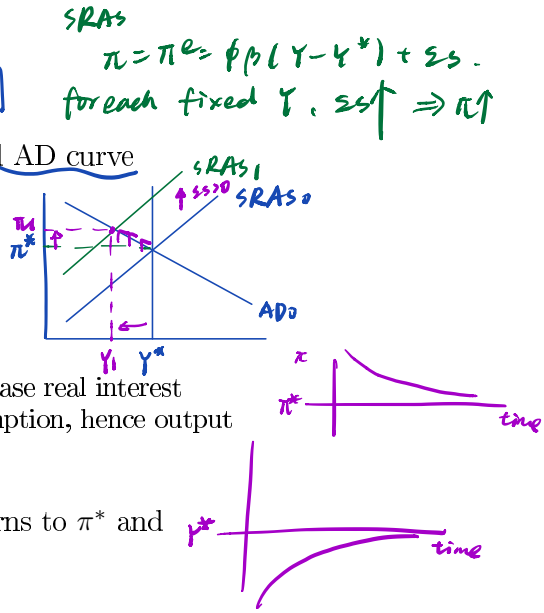
- Suppose consumer confidence *temporarily* low, $\varepsilon_D < 0$
- On impact, AD curve shifts in along unchanged AS curve
  - output decreases from Y^* to Y_1
  - inflation decreases from π^* to π_1
- Intuition
  - decrease in consumption demand decreases output, increases unemployment, decreases wages and business costs, hence decreases inflation along SRAS
- Long run equilibrium unchanged, inflation returns to π^* and output returns to Y^*
- Again note importance of anchored inflation expectations.

Confidence Slump

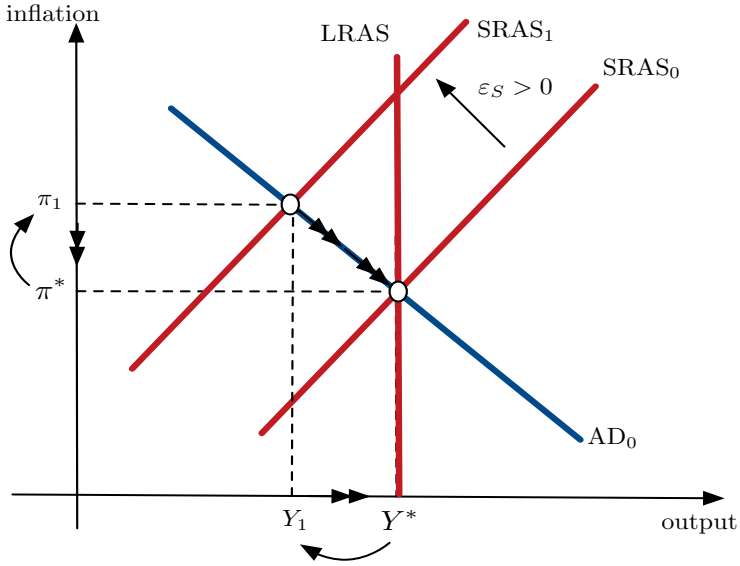


Energy Price Spike

- Suppose energy prices *temporarily* high, $\varepsilon_S > 0$
- On impact, AS curve shifts up along unchanged AD curve
  - output decreases from Y^* to Y_1
  - inflation increases from π^* to π_1
- Intuition
  - increase in inflation leads central bank to increase real interest rates, thereby reducing investment and consumption, hence output decreases along AD
- Long run equilibrium unchanged, inflation returns to π^* and output returns to Y^*



Energy Price Spike



Demand vs. Supply Shocks

- Demand shocks drive inflation and output in *same direction*
  - both rise in response to positive demand shocks
  - both fall in response to negative demand shocks

- Supply shocks drive inflation and output in *opposite directions*
  - inflation rises and output falls in response to positive supply shocks
  - inflation falls and output rises in response to negative supply shocks

COVID-19 recession
demand-driven or supply-driven?
⇒ domained by supply shock
shut down → Y ↓, π ↑
may have demand ↓ because confiden

- By looking at whether inflation and output are moving together or not, we have a *tell-tale sign* of whether demand shocks or supply shocks are dominant

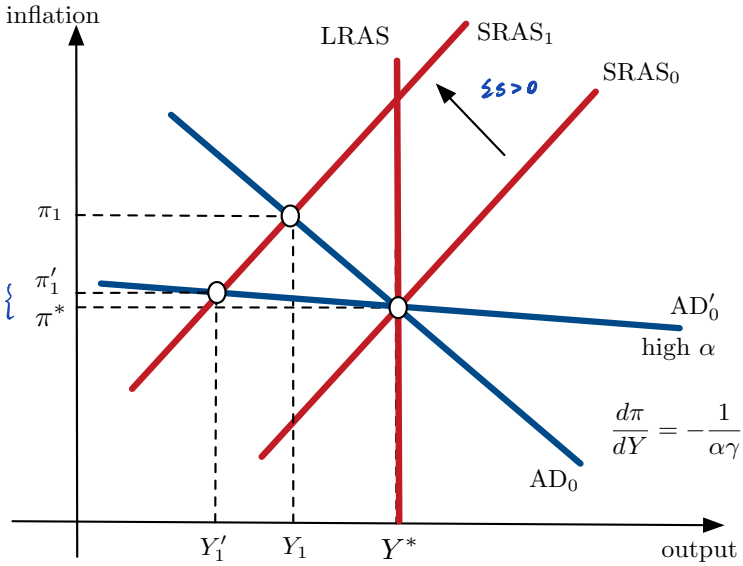
Slopes of Demand and Supply Curves

- For given sized shock, slope of curves determines whether large or small inflation and output responses
- For example, if AD curve is flat, most of the response to supply shock is a change in output with little change in inflation
- Slop of AD curve is

$$\frac{d\pi}{dY} = -\frac{1}{\alpha\gamma}$$

- AD curve is flat if α or γ is high, in particular, *if central bank reacts aggressively to inflation*

Flat AD Curve



modest α
"low α"
high α

Permanent Shocks

Growth in Potential Output

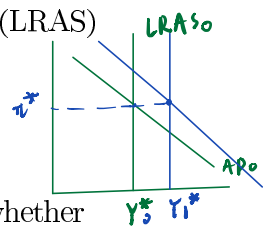
movement in Y^*

- Suppose output *permanently* high, Y^* higher — eg. accumulation of technology productivity
- Shifts *both* LRAS and LRAD curves out

$$Y \uparrow - Y^* \uparrow = -\alpha\gamma(\pi - \pi^*) \qquad \text{(LRAD)}$$

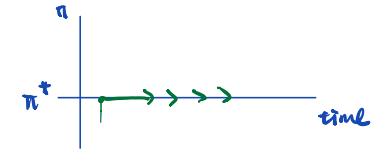
$$\pi = \pi + \phi\beta(Y \uparrow - Y^* \uparrow) \qquad \text{long run } \pi^e = \pi$$

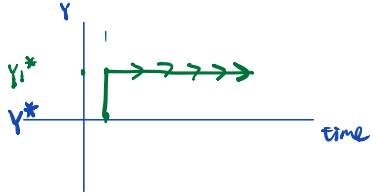
(LRAS)

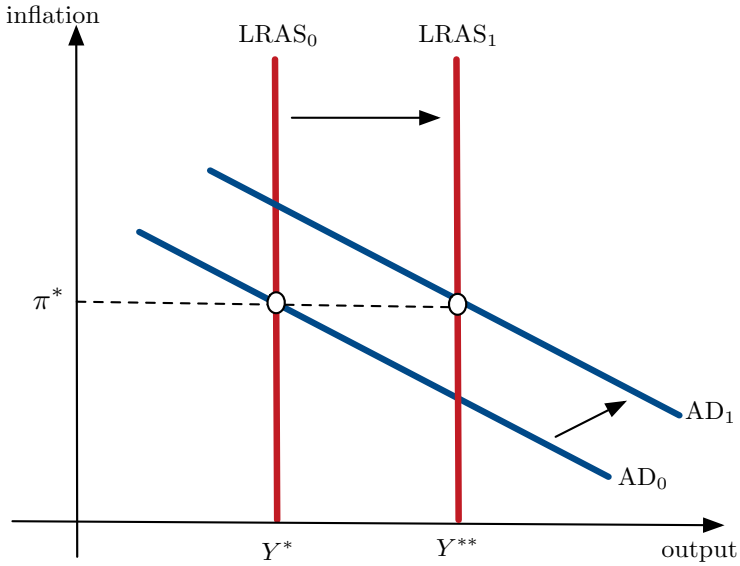


- Output rises, but no effect on inflation, remains at π^*
- Growth in output *need not increase inflation*, depends on whether growth is due to LR increase in Y^* or SR increase in ε_D — π will be influenced

Growth in Potential Output







Disinflation

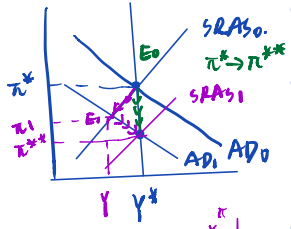
AD
$Y - Y^* = -\alpha\gamma\left(\pi - \pi^*\right) \leftarrow (1)$

- Suppose central bank sets *permanently* lower inflation target
- AD curve shifts down permanently along unchanged AS curve
  - output decreases from Y^* to Y_1
  - inflation decreases from π^* to π_1

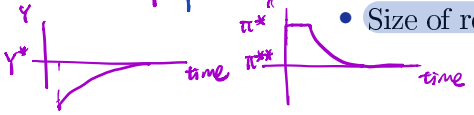
SRAS
$\pi = \pi^e + \phi\gamma\left(Y - Y^*\right) \leftarrow (2)$

change in π^* will affect AD

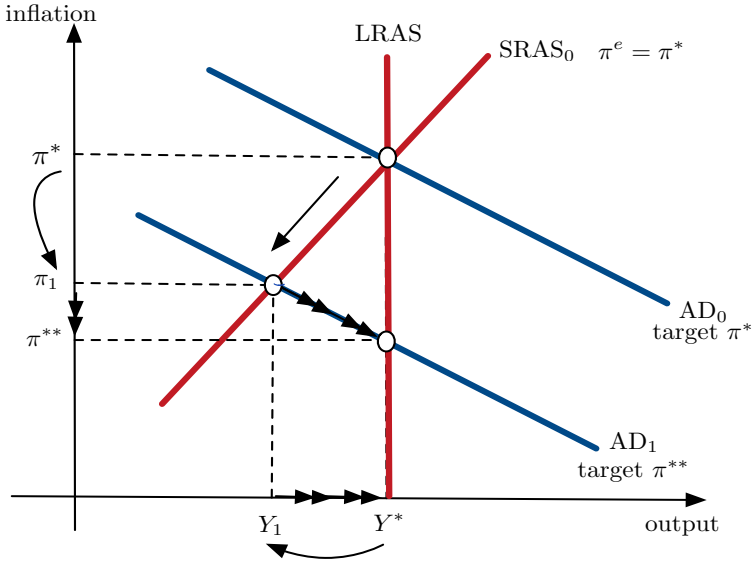
- Over time, inflation expectations fall from $\pi^e = \pi^*$ to new $\pi^e = \pi^{**}$



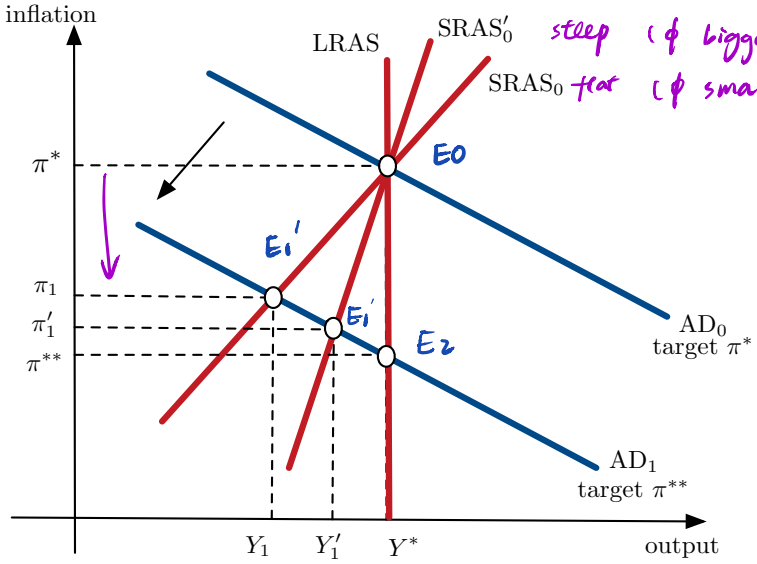
- SRAS shifts down until new long run equilibrium reached
- Disinflation creates recession *that lasts until inflation expectations adjust*. Only when inflation expectations fall in line with new target does economy start to recover
- Size of recession is mild if SRAS is steep, but deep if SRAS is flat



Disinflation



Disinflation



steep (ϕ bigger) → disinflation is less costly, ΔY smaller to bring $\pi^* \to \pi^{**}$

flat (ϕ smaller)

small ϕ in π before π^e adjust

Next Lecture

- Beginning of topics in long run macro [Daeha Cho]
- Saving and capital formation
  - saving and its determinants
  - investment and its determinants
  - equilibrium interest rate, savings, and investment
- BOFAH chapter 4