Macroeconomics A: Review Session II

IS-TR Model

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Outline

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Investment

- Let's return to the class notes
- We can divide output in a closed economy into three components

$$Y = C + G + I$$

- The last component, **investment** (I) is of particular interest
- We can rearrange terms so that

$$I = Y - C - G$$

- **Saving** (S) includes taxes, but has the same accounting identity

$$S = \underbrace{(1-\tau)Y - C}_{\text{household saving}} + \underbrace{\tau Y - G}_{\text{fiscal surplus}}$$

- Let's look at how firms set investment
  - The (real) interest rate $r = i - \pi$ (negative relation)
  - Business sentiment Q (positive relation)

$$I = -b_1(i - \pi) + b_2 Q \quad \Longrightarrow \quad I = I(\overset{-}{i}, \overset{+}{\pi}, \overset{+}{Q})$$

Saving

- On the part of households, saving can be thought of a residual
  - Income that is not consumed is saved
- The marginal propensity to consume out of income h_1 is

$$h_1 = \frac{C - h_2\Omega}{(1-\tau)Y} \quad \Longleftrightarrow \quad C = h_1(1-\tau)Y + h_2\Omega$$

- We can rewrite the expression for saving

$$S = (1 - h_1)(1-\tau)Y + \tau Y - G - h_2\Omega$$

- We assume that $0 < h_1 < 1$ and $0 < \tau < 1$
- If we were to evaluate the change in S for each variable, we would find that

$$S = S(\overset{+}{Y}(i), \overset{-}{G}, \overset{-}{\Omega})$$

Linking the Interest Rate to Output

- Let's rule out the sentiment shocks $h_2 = b_2 = 0$ and write $Y = C + G + I$ as

$$Y = h_1(1-\tau)Y + G - b_1(i-\pi)$$

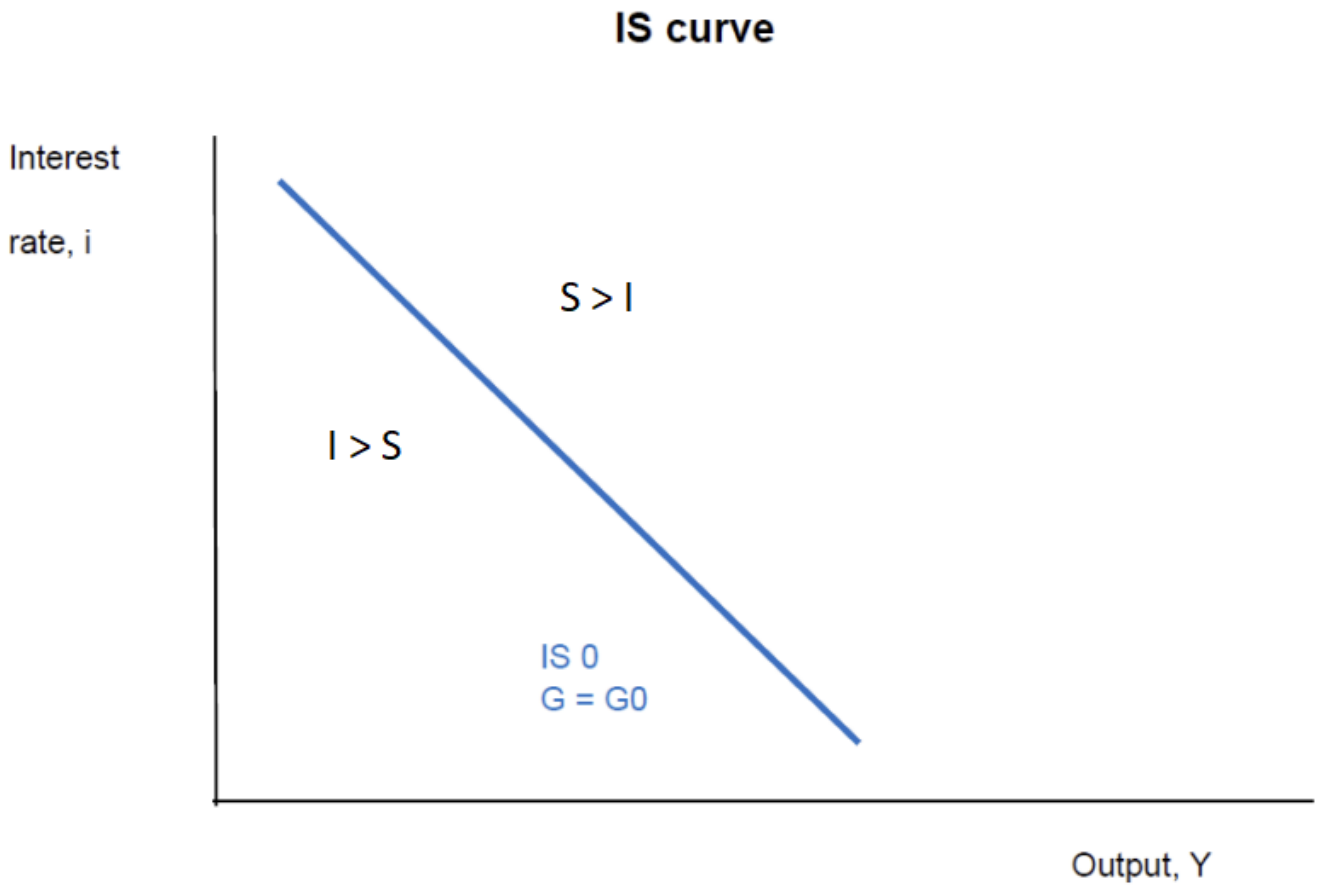
- Rearranging

$$Y = \frac{G - b_1(i-\pi)}{1 - h_1(1-\tau)} \implies Y(\overset{+}{G}, \overset{+}{\pi}, \overset{-}{i})$$

- We know that saving S is a function of Y
  - Y is a direct function of i and $i \uparrow \implies Y \downarrow$
  - S is only a function of i through Y and $Y \downarrow \implies S \downarrow$
  - Therefore, $i \uparrow \implies S \downarrow$
- Investment I (not a function of Y) is also decreasing in i
  - In other words, $i \uparrow \implies I \downarrow$

Asset Market Equilibrium

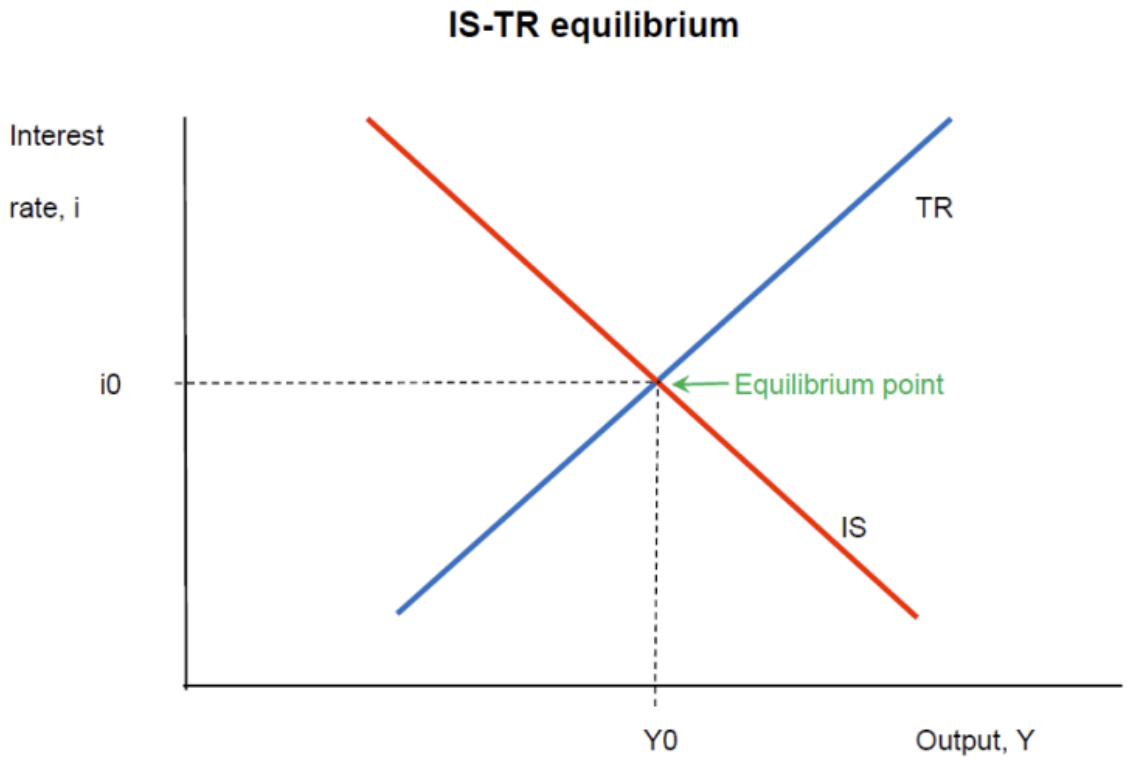
- The IS curve is where saving and investment are equal for a given interest rate and level of output



Monetary Policy

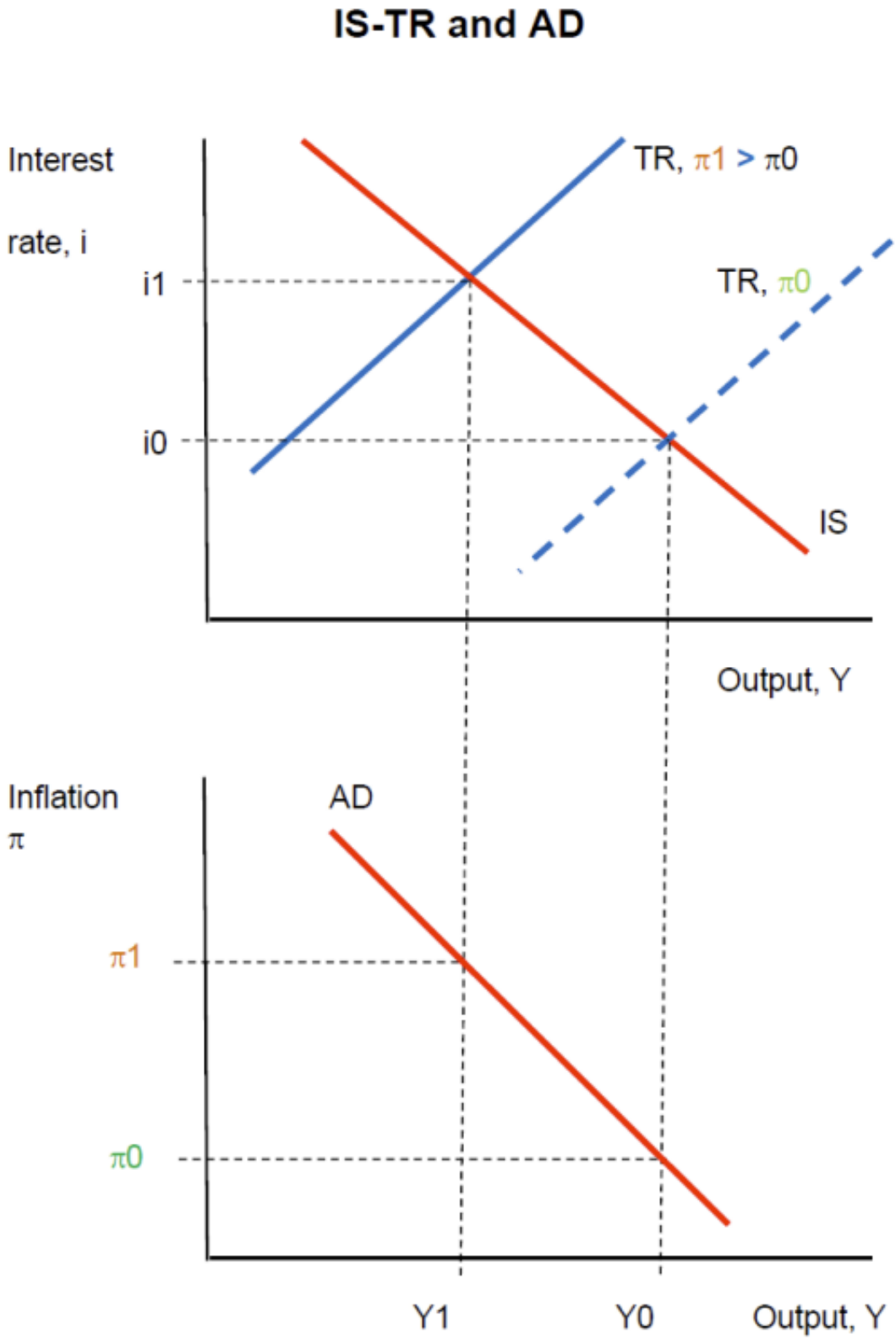
- The interest rate is a function of output and inflation

$$i = i^* + a\pi + b(Y - Y^*) = i(\overset{+}{i^*}, \overset{+}{\pi}, \overset{+}{Y}, \overset{-}{Y^*})$$



Mapping IS-TR to AD

- Different rates of inflation shift in the TR curve



Aggregate Supply and Demand

- Long run aggregate supply is a fixed level of output Y^*
- In the short term, there is a positive relationship between inflation and output
- If the price of final goods increases faster than wages, profitability is high and firms increase supply

$$Y_{AS} = Y^n + \eta\left(\pi_t - \pi_t^e\right) \implies Y_{AS}(\overset{+}{Y^n}, \overset{+}{\pi}, \overset{-}{\pi^e})$$

- Adaptive inflation expectations ensure the economy returns to its long-run equilibrium given an inflation shock

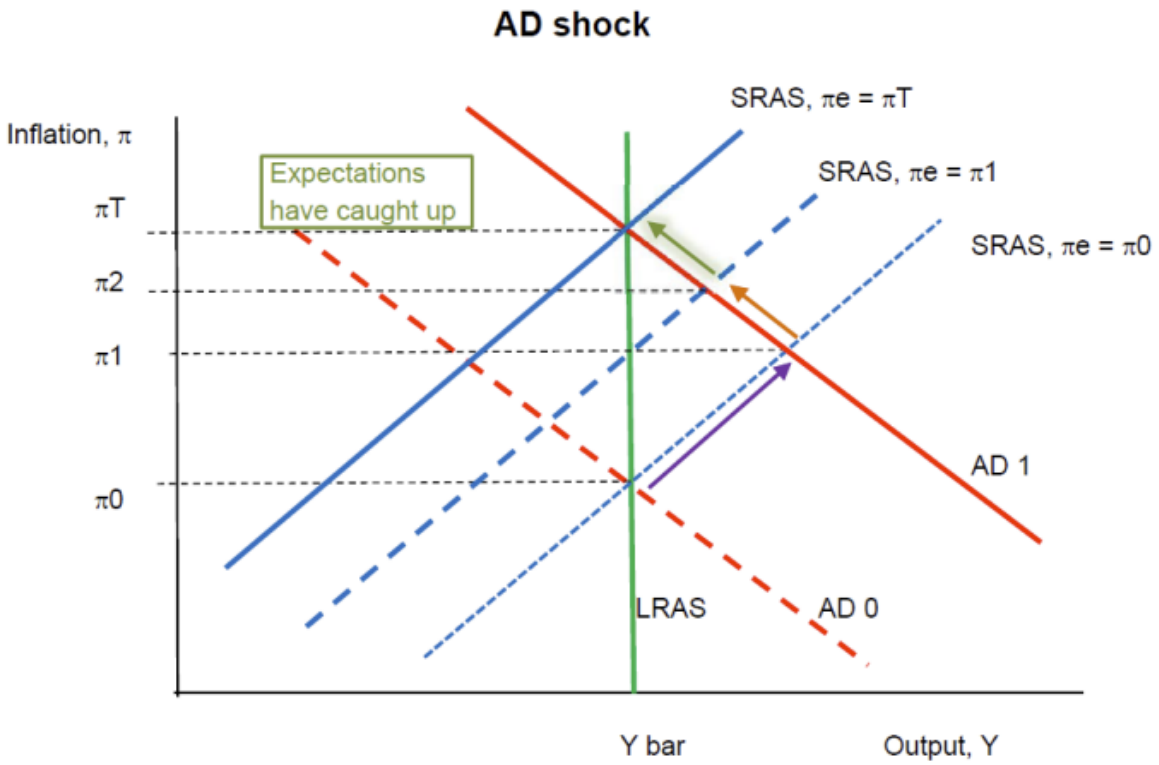
$$\pi_t^e = (1-\theta)\pi_{t-1}^e + \theta(\pi_{t-1} - \pi_{t-1}^e)$$

- Implies that high realized inflation raises inflation expectations :(

$$\pi_t^e \to \pi_t \quad \implies \quad Y_{AS} \to Y^n$$

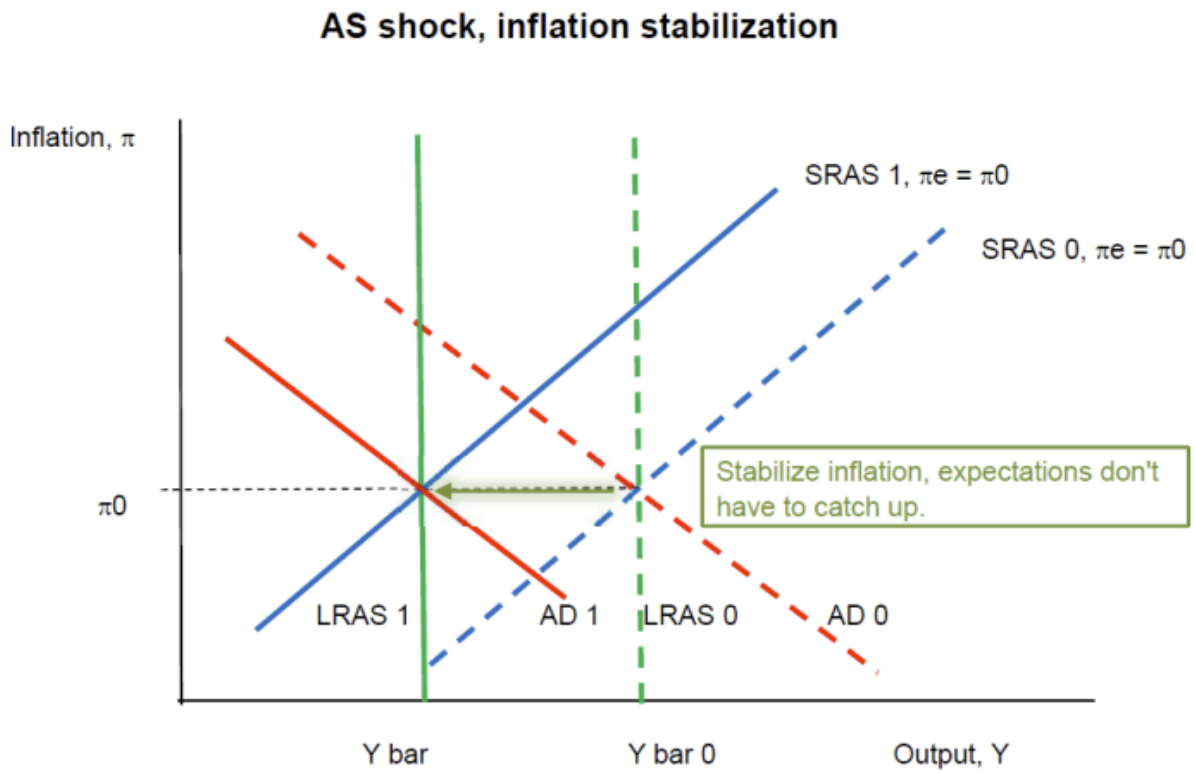
Faustian Bargain

- A demand shock generates higher inflation long-term with no impact on output
- General question: why is inflation costly?



How to Lower Aggregate Demand

- There is a permanent decline in LRAS in the figure below
- Unless aggregate demand falls, higher inflation results
- Question: what policies could lower aggregate demand?



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Question 1:

In class we saw the IS-TR model. IS reflects the good market. Output Y is high when the real interest rate (nominal interest rate i net of expected inflation π^e) is low, or when households' wealth Ω is high (α and β are positive coefficients)

$$Y = -\alpha(i - \pi^e) + \beta\Omega$$

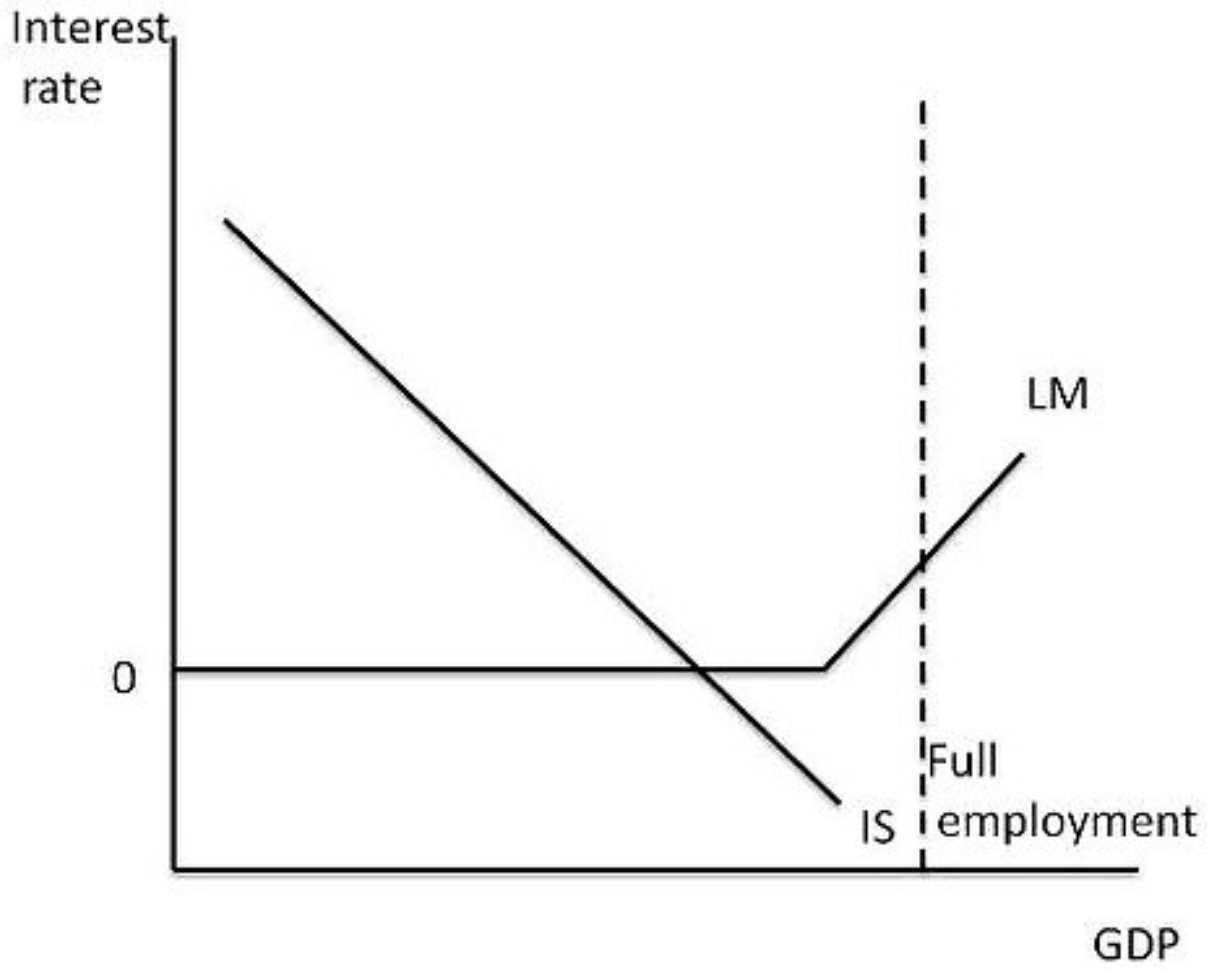
TR reflects the Taylor rule that sets the nominal interest rate as a function of a long run target i^*, current inflation π, and output

$$i = i^* + \delta\pi + \lambda Y$$

Consider that the central bank has driven the interest rate as low as it can, for instance to a value zero (in the IS-TR diagram with Y on the horizontal axis and i on the vertical TR is flat). Faced with this situation, central banks have tried two things:

1. Forward guidance: communicate that you will accept some future inflation.
2. Asset purchases: purchases of assets by the central bank. How would you model these policies in the IS-TR diagram?

Flat TR

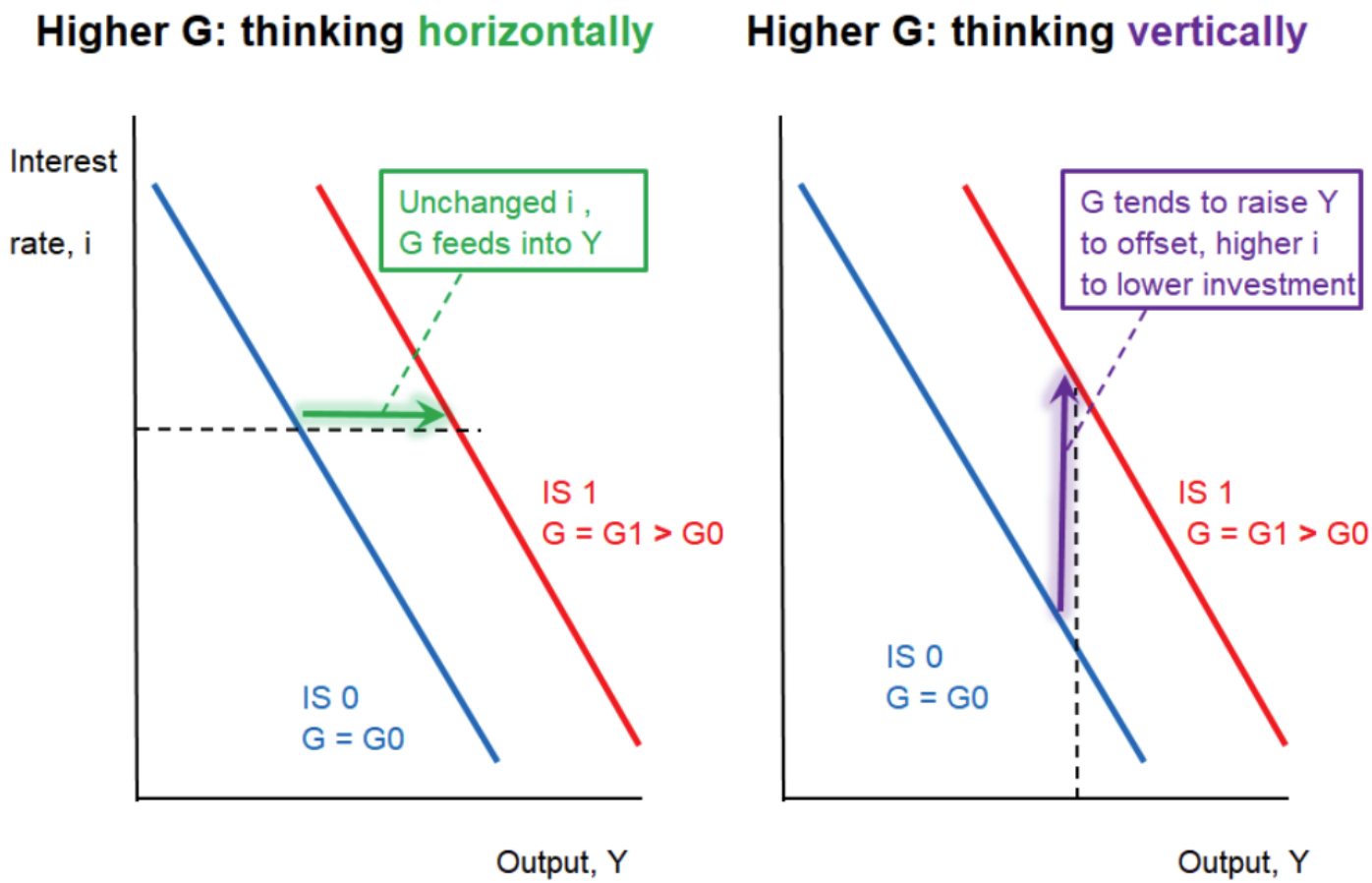


Question 2:

When discussing the AS-AD model we consider backward-looking expectations and rational expectations.

1. How do the two differ?
2. Consider a policy of permanently higher government spending in the AS-AD. What is the impact on output in the short and long run? How does it depend on the way expectations are formed?
3. Developing a complete understanding of the economy is costly for agents (think of the effort involved). With this in mind, would you expect a small increase in government spending to have a different effect than a large one?

Thinking about the IS Curve



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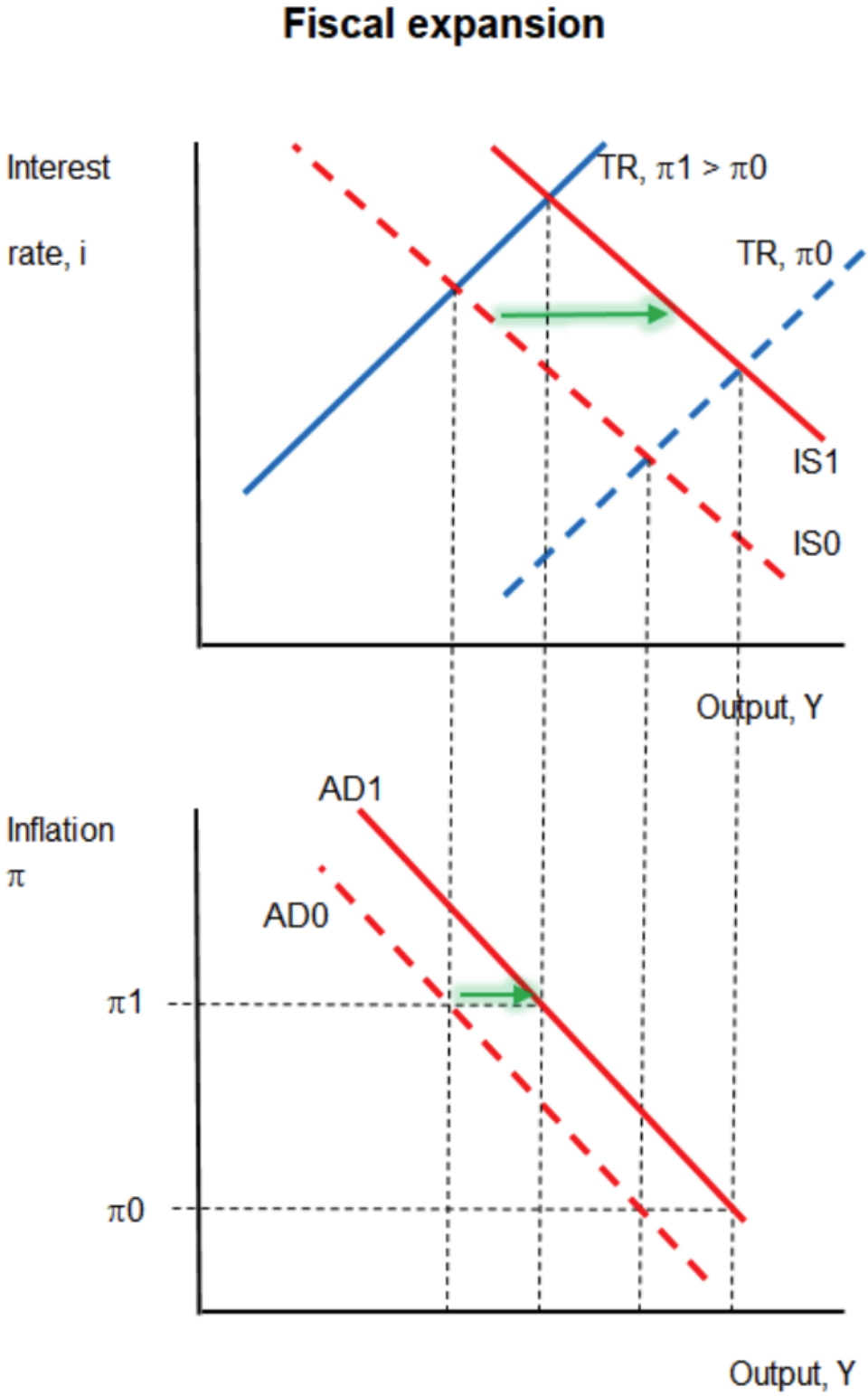
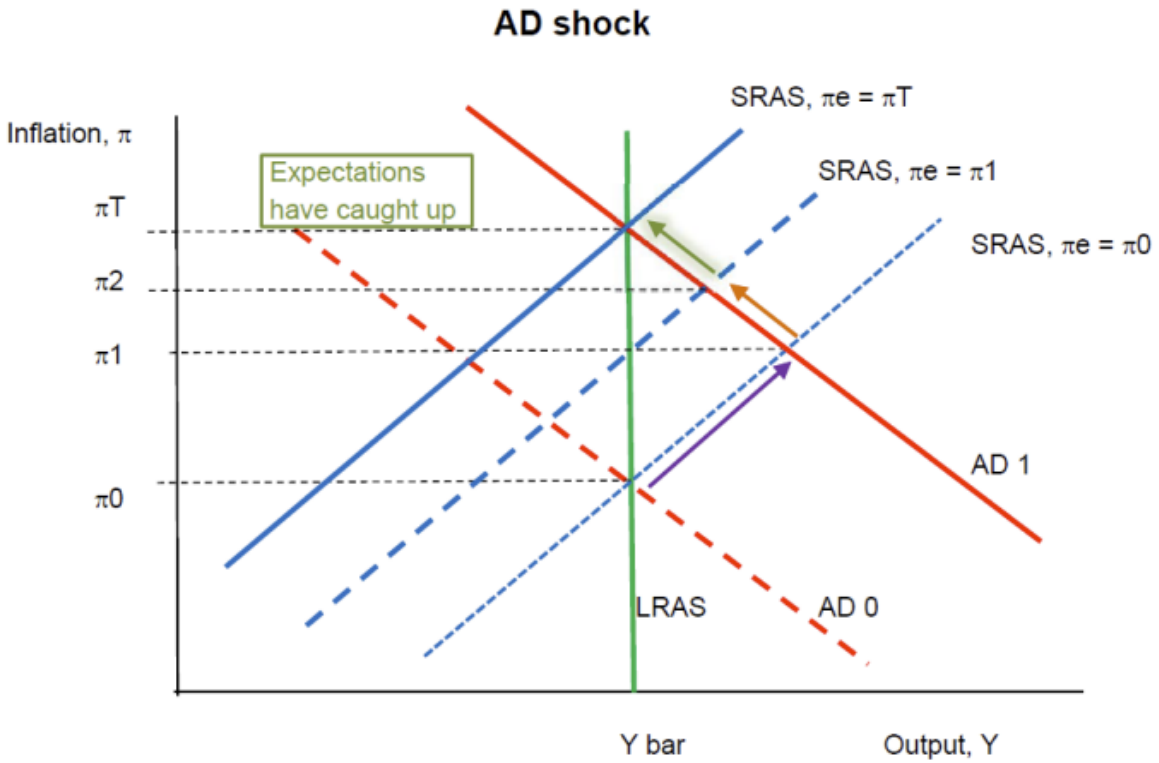


SRAS vs. LRAS


AD shock
Inflation, π
πT
π2
π1
π0
Expectations have caught up
SRAS, πe = πT
SRAS, πe = π1
SRAS, πe = π0
AD 1
AD 0
LRAS
Y bar
Output, Y