

# Macroeconomics

## Week 5

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Undergraduate in Economics

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# **The Monetary Policy and the Aggregate Demand**

# The role of Central Banks

- Historically, it is linked to **money issuing**, preserving the **currency purchasing power**
- But, money supply has lost relevance
- But they still control the access of the financial system to liquidity — **How?**
- Through a very important policy instrument: **nominal interest rates**

# Real vs. nominal interest rates

- We know that economic agents care about **real interest rates**, not nominal
- But they are linked according to **Fisher's Equation**:

$$i = r + \pi$$

- What if inflation does not change in the short run?  $i = r$
- Under the **sticky prices** hypothesis, Central Banks determine real interest rates in the short run

# Should they really care?

- Two goals unfold:
  - Align returns with the *MPK*
  - Diminish the output gap indirectly through **the IS Curve**
- The two goals can be summarized by a **Monetary Policy Curve**, given by:

$$r = \bar{r} + \lambda\pi$$

# What drives interest rates definition?

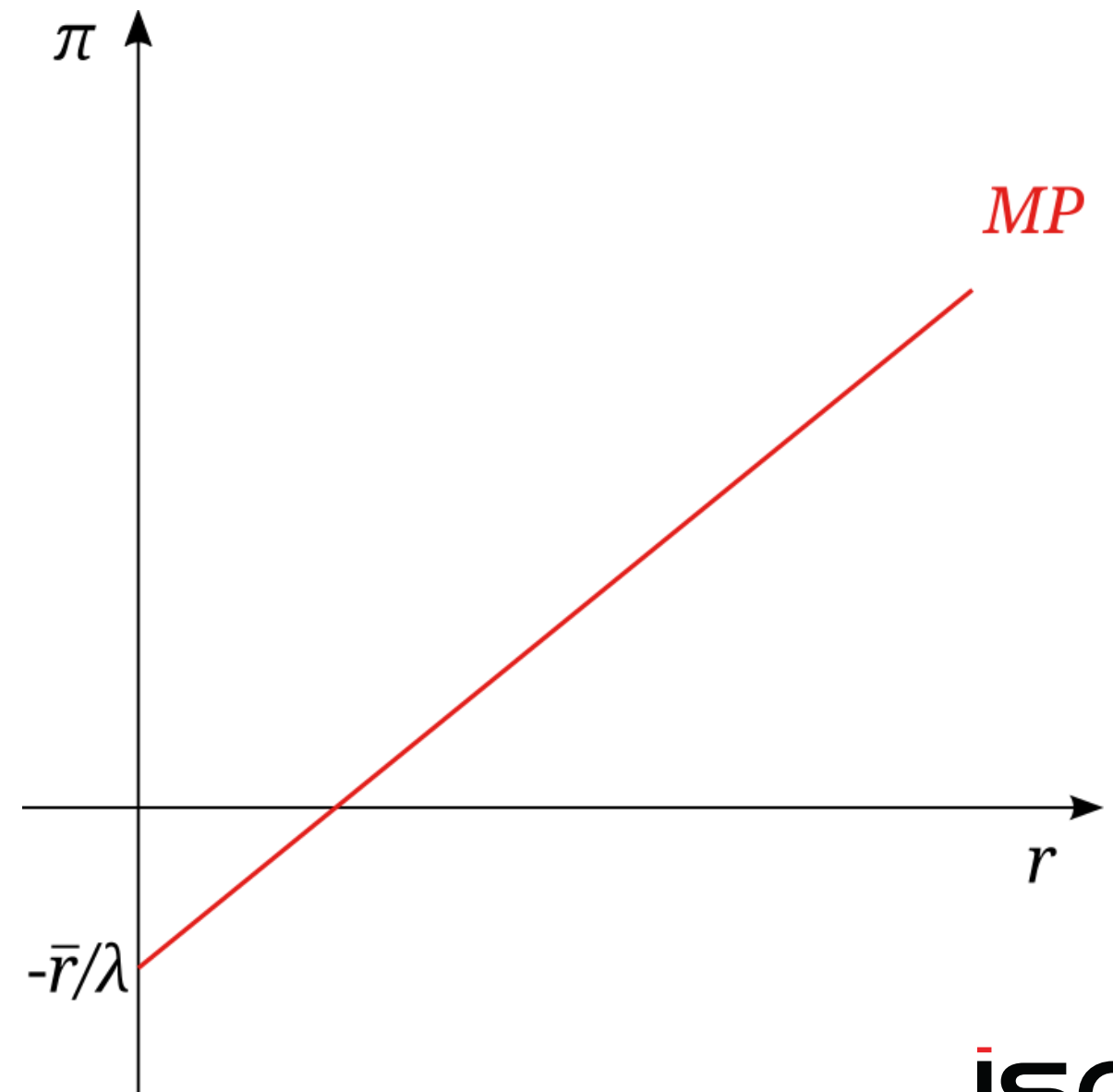
$$r = \bar{r} + \lambda\pi \quad \rightarrow \quad Y = m \times \bar{A} - m \times \phi \times r$$

- What might be the value of  $\lambda$ ?

$$\lambda > 0 \Rightarrow \Delta i > \Delta \pi$$

- Other value than this will cause an **inflationary spiral**:

If  $\lambda < 0$  and  $\pi \uparrow$ , then:  $r \downarrow$ ,  $Y \uparrow$ ,  $\pi \uparrow$ , ...





# From the IS Curve...

Previously we derived the **IS Curve** as a relationship between output  $Y$  and the real interest rate  $r$ :

$$Y = m \times \bar{A} - m \times \phi \times r$$

with:

$$\bar{A} = \bar{C} + \bar{I} - d \times \bar{f} + \bar{G} + \overline{NX} - c \times \bar{T}$$

$$m = 1/(1 - c)$$

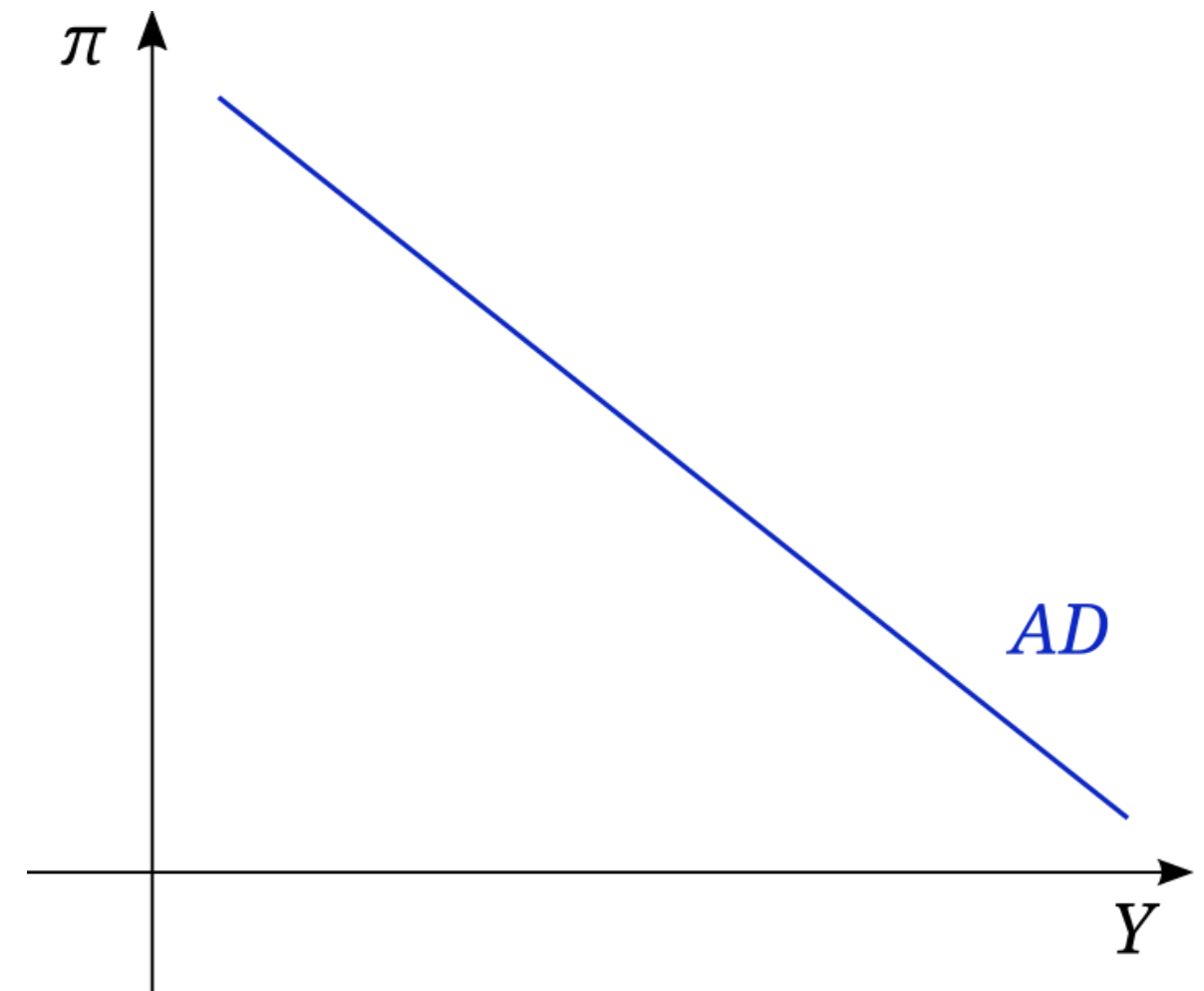
$$\phi = b + d + x$$



# ...to the Aggregate Demand Curve

The **Aggregate Demand Curve** incorporates the impact of the Monetary Policy in the IS Curve:

$$Y = m \times \bar{A} - m \times \phi \times (\bar{r} + \lambda\pi)$$



# Exercises

# Exercise 1. The Monetary Policy curve

Assume the monetary policy curve is given by:  $r = 1.5 + 0.75\pi$ .

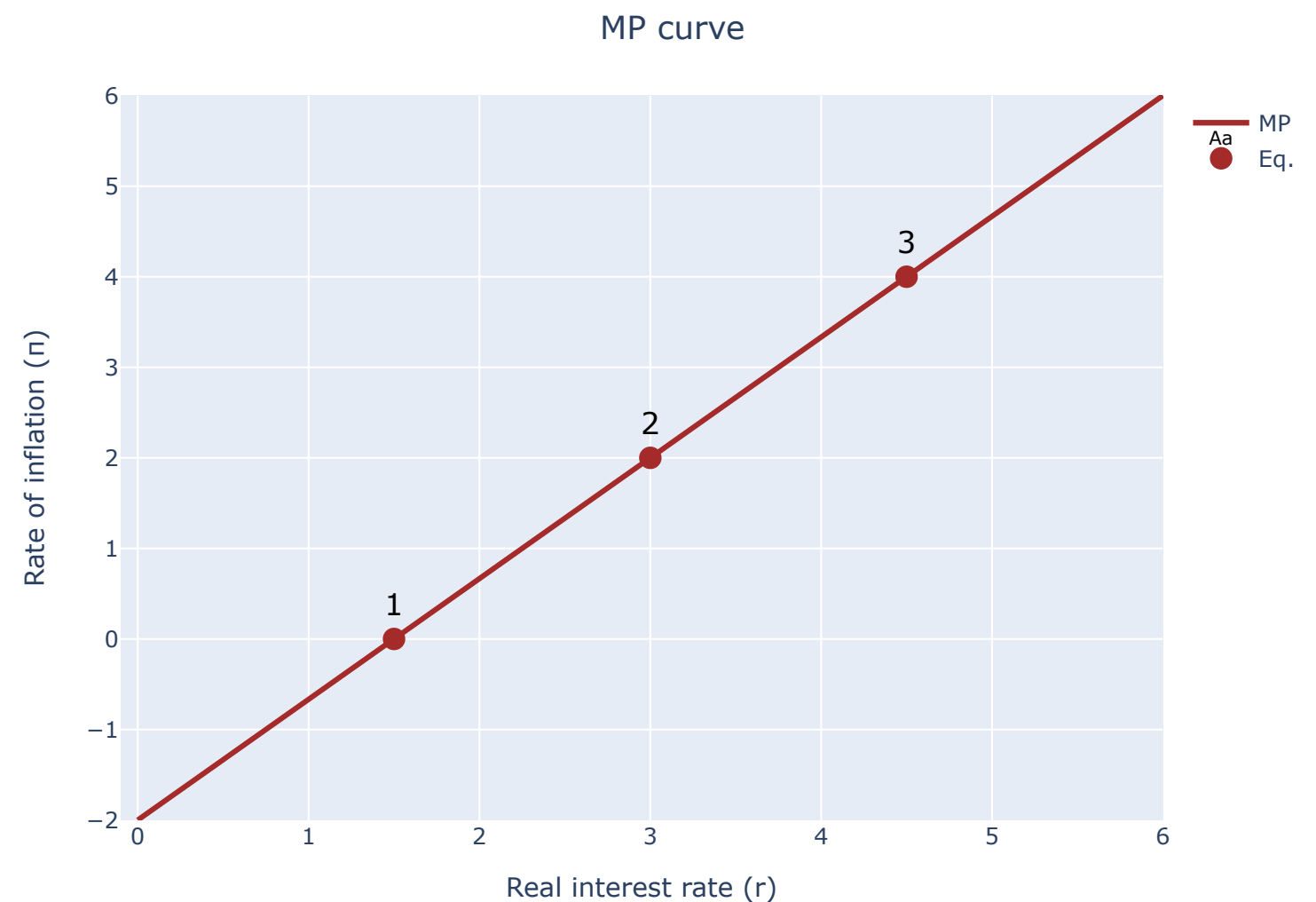
**a.** Calculate the real interest rate when the inflation rate is at 0%, 2%, and 4%.

```

1 begin
2     r^-1 = 1.5
3     λ1 = 0.75
4
5     r(π) = r^-1 .+ λ1 .* π
6     π = [0 2 4]
7     r(π)
8 end

```

**b.** Plot the monetary policy curve and identify the points from part (a).



## Exercise 2. A shift in the MP curve

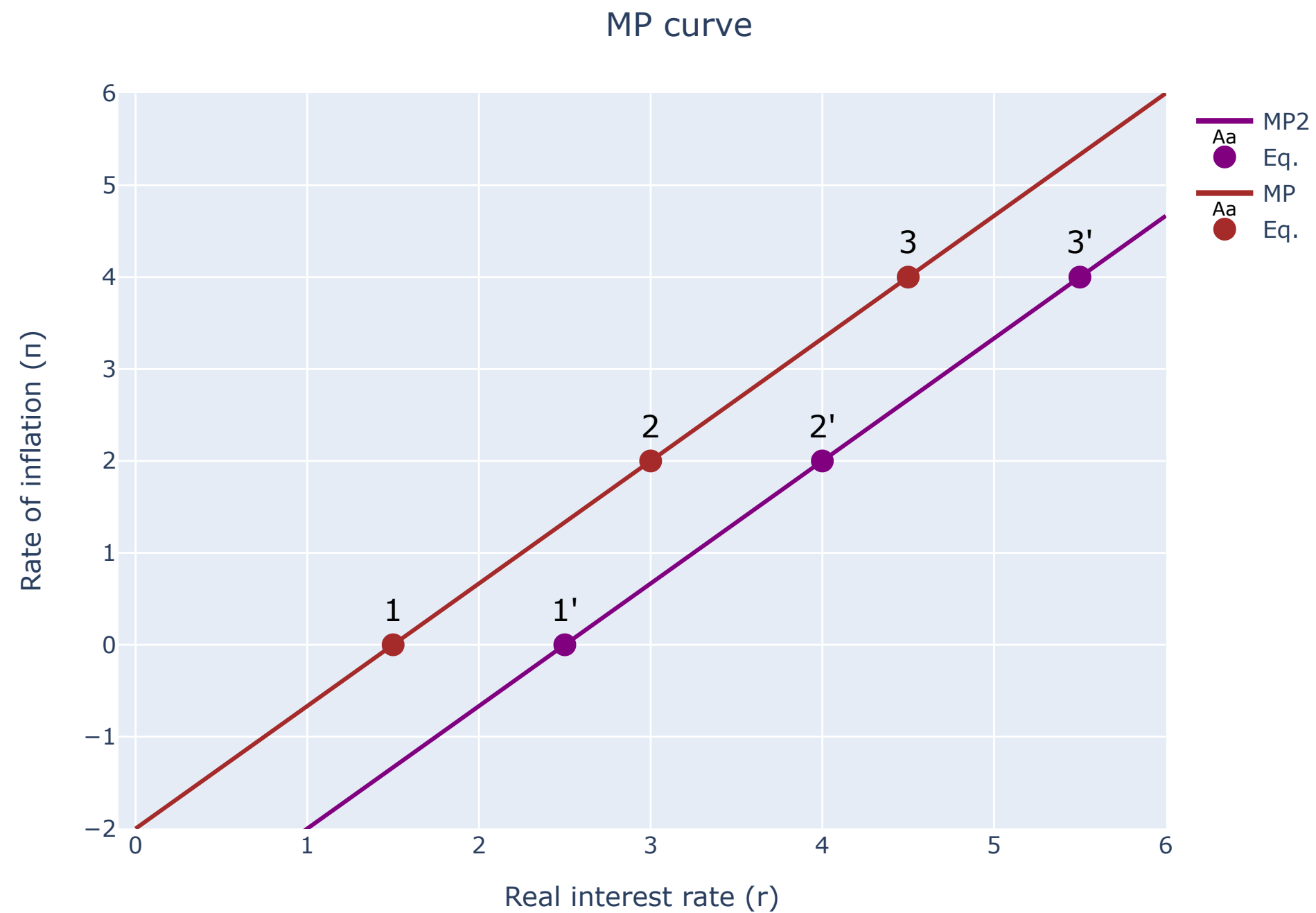
Refer to the monetary policy curve described in Problem 1. Assume now that the monetary policy curve is given by  $r = 2.5 + 0.75\pi$ .

**a.** In the current exercise, does the central bank dislike inflation more or less than in the previous exercise?

- The response of the Central Bank to inflation is given by the parameter  $\lambda$ : the more the aversion to inflation, the higher the  $\lambda$
- In both cases  $\lambda = 0.75$
- Then, the Central Bank seems to dislike inflation the same as before

# Exercise 2. A shift in the MP curve

**b.** Plot the new monetary policy curve on the graph you created in Problem 1.





# Exercise 2. A shift in the MP curve

c. Does the new monetary policy curve represent an autonomous tightening or loosening of monetary policy?

- It is a **tightening policy**
- $\bar{r} \uparrow$  leads to less liquidity in the market

# Exercise 3. A comprehensive exercise

The following information is known about the aggregate demand:

$$\bar{A} = 7.6 \quad m = 2.0 \quad \phi = 0.2$$

The MP function is given by:

$$r = \bar{r} + \lambda\pi$$

with  $\bar{r} = 2\%$  and  $\lambda = 0.5$ .

Take into account that the value  $2\%$  is expressed in percentage points, so that  $2\%$  is just  $2$ .

**a.** In the MP curve above, which macroeconomic variables are endogenous? And exogenous? What is  $\lambda$ ?

- Endogenous variable:  $r$
- Exogenous variables:  $\pi$
- $\lambda$  is a parameter as well as  $\bar{r}$



# Exercise 3. A comprehensive exercise

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with  $\bar{r} = 2\%$  and  $\lambda = 0.5$ .

Take into account that the value  $2\%$  is expressed in percentage points, so that  $2\%$  is just 2.

**b.** Obtain the expression of the AD function.

$$Y = m \times \bar{A} - m \times \phi \times (\bar{r} + \lambda\pi)$$

$$Y = 2 \times 7.6 - 2 \times 0.2 \times (2 + 0.5\pi)$$

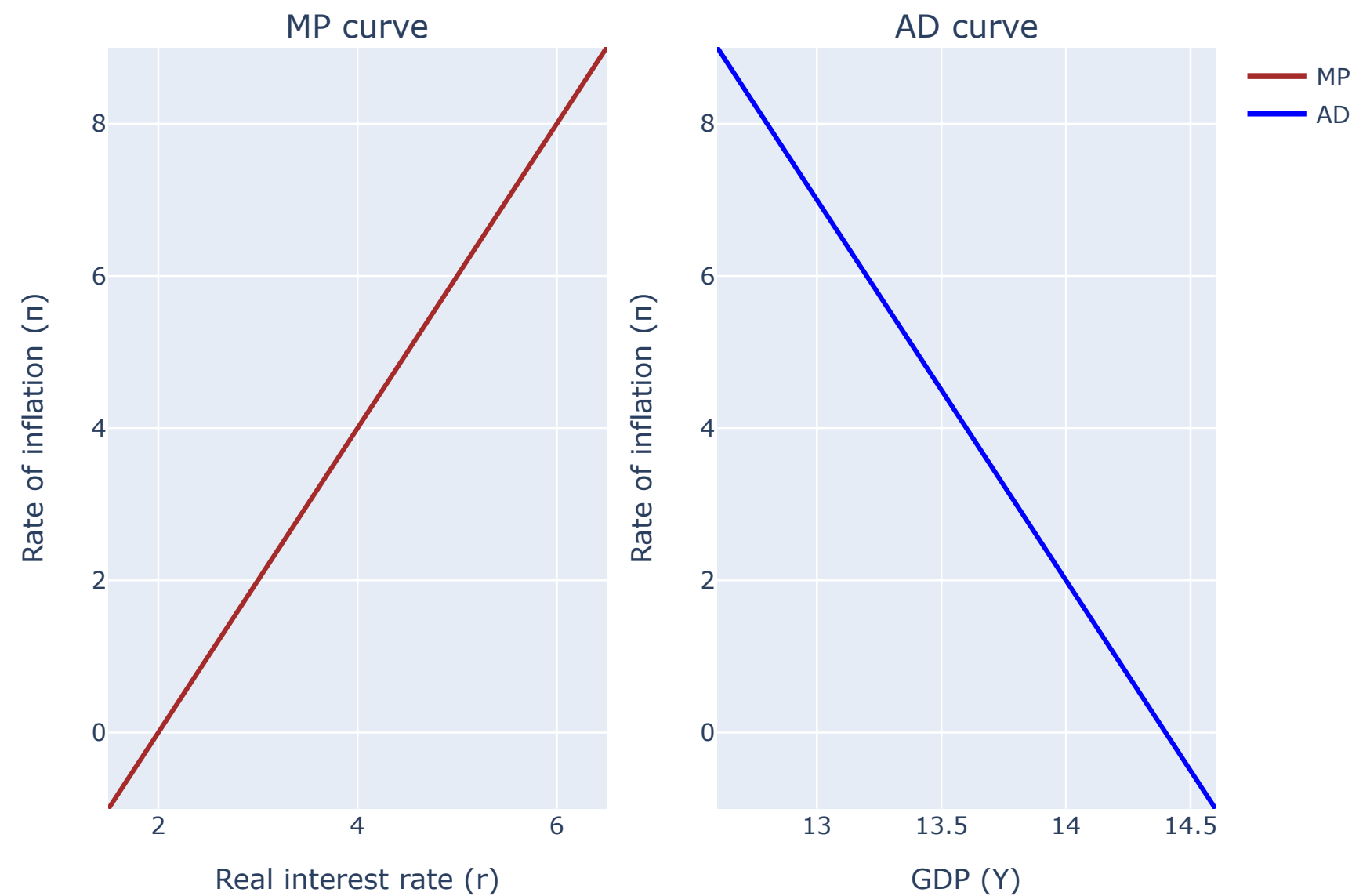
$$\Leftrightarrow Y = 14.4 - 0.2\pi$$

or leaving the multiplier visible:

$$Y = 2 \times 7.6 - 0.8 - 0.2\pi$$

# Exercise 3. A comprehensive exercise

**c.** The MP and the AD curves are represented graphically below. If inflation is 2%, what is the level of aggregate demand and the real interest rate set by the central bank?



# Exercise 3. A comprehensive exercise

**d.** The figure below presents two points: 1 and 2. How do you explain the movement from points 1 to 2?

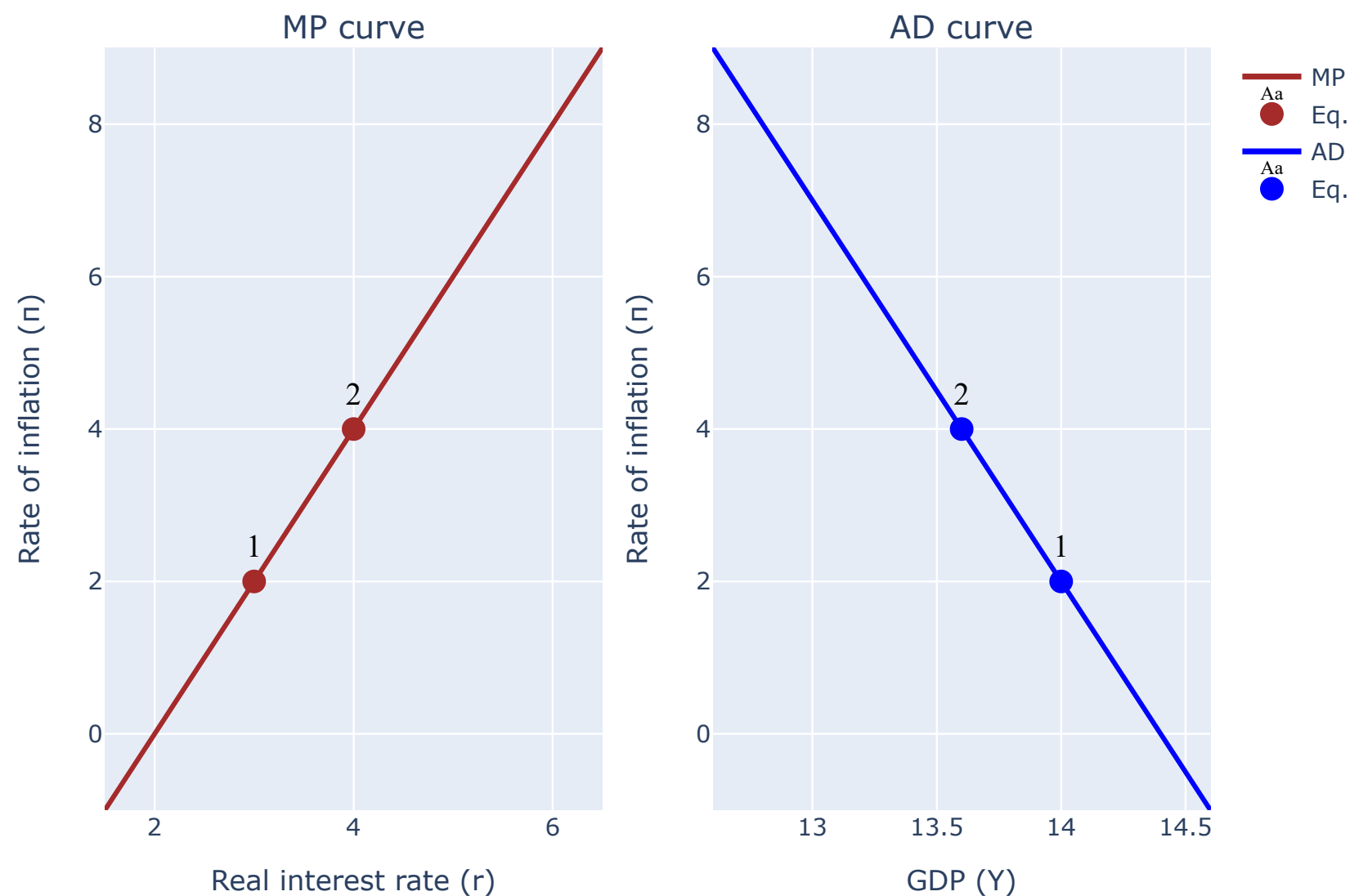
- $\pi = 2\% \rightarrow \pi = 4\%$

- The Central Bank increases the real interest rate:

$$r = 3\% \rightarrow r = 4\%$$

- Aggregate demand will decline:

$$Y = \$14 \rightarrow Y = \$13.6$$





# Exercise 3. A comprehensive exercise

**e.** What is the value of the nominal interest rate in both situations? Is the Taylor principle satisfied in this exercise?

Using Fisher's Equation we can write:  $i = r + \pi$

$$r = 3\%, \pi = 2\% \Rightarrow i = 5\%$$

$$r = 4\%, \pi = 4\% \Rightarrow i = 8\%$$

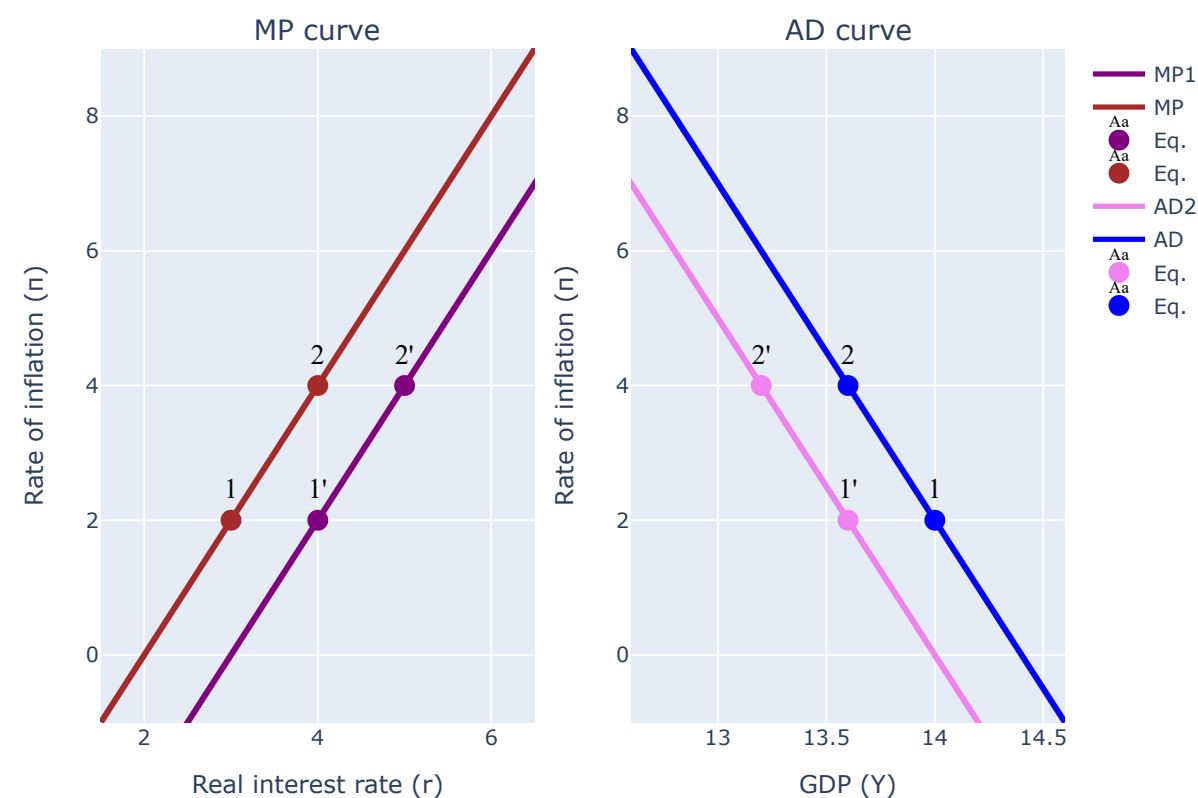
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The Taylor Principle is verified:

$$3\% > 2\% \Rightarrow \Delta i > \Delta \pi$$

# Exercise 3. A comprehensive exercise

**f.** Consider the central bank is losing control of the inflationary pressures in the economy. It takes a drastic measure by increasing  $\bar{r}$  to 3%. What happens to the MP and AD curves? Using the slider  $\Delta\bar{r}3$  below, represent graphically.



- A **shift of the MP curve** (different from a movement along the curve as in part c.)
- Now, for all inflation levels, the real interest rate is higher and the level of aggregate demand is lower

# Exercise 4. Interest rates & the ECB



Below, we can find an extract of the speech by Christine Lagarde (the President of the European Central Bank: ECB), **delivered at a Press Conference on 2 February 2023**, where she announced the decisions made by the Board regarding big increases in short term interest rates.

*“The Governing Council will stay the course in raising interest rates significantly at a steady pace and in keeping them at levels that are sufficiently restrictive to ensure a timely return of inflation to our two per cent medium-term target. Accordingly, the Governing Council today decided to raise the three key ECB interest rates by 50 basis points and we expect to raise them further. In view of the underlying inflation pressures, we intend to raise interest rates by another 50 basis points at our next monetary policy meeting in March and we will then evaluate the subsequent path of our monetary policy.”*

# Exercise 4. Interest rates & the ECB

In your opinion, why is the President of the ECB so committed to raising interest rates by a significant amount?

- Inflation in the Euro Area is very high (currently, close to 9%)
- ECB wants to bring it down to 2%
- High interest rate will cool demand and expected inflation



# Exercise 5. Increases in AD

*From the textbook*

What would be the effect on the aggregate demand curve of a large increase in U.S. net exports, or in public expenditures? Would any of those increases affect the monetary policy curve? Explain why or why not.

- Remember that  $\bar{A} = \bar{C} + \bar{I} - d \times \bar{f} + \bar{G} + \overline{NX} - c \times \bar{T}$
- Then  $\overline{NX} \uparrow \Rightarrow \bar{A} \uparrow$  and  $\bar{G} \uparrow \Rightarrow \bar{A} \uparrow$
- The **AD curve shifts** to the right (or upwards), rising inflation for the same level of GDP

# Exercise 5. Increases in AD

- To control inflation, the Central Bank will rise the interest rate  $r$
- The increase in  $r$  needed strike  $\pi$  might be accommodated in the current monetary policy rule
- However, if any of those increases is large and so is the increase in inflation, the Central Bank may adjust the policy rule itself, responding with a big rise in  $r$
- The effect over the **MP curve depends on the magnitude of the shock**

# Exercise 6. Monetary policy and employment

Suppose U.S. aggregate output is still below potential by 2018, when a new Fed chair is appointed. Suppose his or her approach to monetary policy can be summarized by the following statement:

*“I care only about increasing employment; inflation has been at very low levels for quite some time; my priority is to ease monetary policy to promote employment.”*

**a.** Would you expect the monetary policy curve to shift upward or downward?

- Monetary policy:  $r = \bar{r} + \lambda\pi$
- “to ease monetary policy” means  $r \downarrow$  through  $\bar{r} \downarrow$
- Monetary Policy curve will **shift upwards**

# Exercise 6. Monetary policy and employment

**b.** What would be the effect on the aggregate demand curve?

$$Y = m\bar{A} - m\phi(\bar{r} + \lambda\pi) \Leftrightarrow -\frac{1}{m\phi\lambda}Y + \frac{1}{\lambda}\left(\frac{\bar{A}}{\phi} - \bar{r}\right) = \pi \Leftrightarrow$$

$$\pi = \underbrace{\frac{1}{\lambda}\left(\frac{\bar{A}}{\phi} - \bar{r}\right)}_{\Upsilon} - \frac{1}{m\phi\lambda}Y$$

# Exercise 7. The twin goals of MP

*From the textbook “Macroeconomics”, Fourth Edition, by Charles I. Jones, 2018, Pearson.*

Your day as chair of the Fed (I):

Suppose you are appointed to chair the Federal Reserve. Your twin goals are to maintain low inflation and to stabilize economic activity — that is, to keep GDP at potential. Why are these appropriate goals for monetary policy? (Hint: What happens if the economy booms? Or in a deep recession?)

- Ideal situation: output at potential and inflation stable and low
- If output is higher than its potential level, inflation will rise
- If output is lower than its potential level, deflation will rise

# Exercise 8. Large shocks and monetary policy

*Adapted from the textbook “Macroeconomics”, Fourth Edition, by Charles I. Jones, 2018, Pearson.*

Your day as chair of the Fed (II): With the goal of stabilizing output, explain how and why you would change the real interest rate in response to the following large shocks. Describe what happens in the short run using the AD-MP diagram (no need to use numerical simulations)

- a.** Consumers become extremely pessimistic about the state of the economy and future productivity growth.

**a.**  $\bar{C} \downarrow \Rightarrow \bar{A} \downarrow \Rightarrow r \downarrow$

- AD will shift downwards
- Most probably MP shifts upwards

# Exercise 8. Large shocks and monetary policy

- b.** Improvements in information technology increase productivity and therefore increase the marginal product of capital (MPK).
- c.** A booming economy in Europe leads to an unexpected increase in the demand for U.S. goods by European consumers.
- d.** A housing bubble bursts, so that housing prices fall by 20% and new home sales drop sharply.

**b.**  $\bar{I} \uparrow \Rightarrow \bar{A} \uparrow \Rightarrow r \uparrow$

**c.**  $\overline{NX} \uparrow \Rightarrow \bar{A} \uparrow \Rightarrow r \uparrow$

**d.**  $\bar{I} \downarrow, \bar{f} \uparrow, \bar{C} \downarrow \Rightarrow \bar{A} \downarrow \Rightarrow r \downarrow$

# Exercise 9. UK Mini-Budget & Budget Responsibility



Illustration by Chris Riddell

With an inflation rate of 9.9% (the highest in more than forty years), a long and brutal war in Europe, and energy markets in turmoil, last September the UK government promised “a new approach for a new era”. On 23 September 2022, the government announced the highest unfunded tax cuts and massive increases in public spending in more than half a century. The reaction of markets, international institutions, and commentators was dismayed.



# Exercise 9. UK Mini-Budget & Budget Responsibility



Illustration by Chris Riddell

*“The IMF said fiscal stimulus is inappropriate given the inflation pressures in the UK economy, and the package risks making life harder for the Bank of England. Moody’s forecast that it will lower economic growth – contradicting the view from Chancellor of the Exchequer Kwasi Kwarteng – by pushing up interest rates.”, Bloomberg, 27 September 2022*

# Exercise 9. UK Mini-Budget & Budget Responsibility



Illustration by Chris Riddell

Using the concepts of aggregate demand (AD curve) and the MP curve, why does the plan by the UK government look “on a course of sheer madness”, as Ambrose Evans-Pritchard has put in The Telegraph, 29 September 2022?

# Exercise 9. UK Mini-Budget & Budget Responsibility

- Before the fiscal stimulus package was announced
  - Inflation was very high
  - The Bank of England (BoE) had already aggressively raised interest rates
  - It was expected to continue to do so for the time to come
  - **MP was being moved to the right** to reduce aggregate demand and inflation

# Exercise 9. UK Mini-Budget & Budget Responsibility

- The fiscal package
  - Aim at increasing demand and GDP
  - The **AD curve would take a big jump to the right**
  - More inflation pressure
  - Requires even a strong response of the BoE

# Exercise 9. UK Mini-Budget & Budget Responsibility

- Effect
  - Extremely adverse reaction by the markets
  - Big currency devaluation
  - Yields on the UK public debt increased
  - Instead of GDP growth, a recession should come

# Exercise 10. A very simple problem

*From the textbook.*

Suppose the monetary policy curve is given by  $r = 1.5 + 0.75\pi$ , and the IS curve is given by  $Y = 13 - r$ .

- a.** Find the expression for the aggregate demand curve.
- b.** Calculate aggregate output when the inflation rate is at 2%, 3%, and 4%.

**a.**

$$Y = 11.5 - 0.75\pi$$

**b.**

```

1 begin
2     a = 1.5; b = 0.75
3     Y(π) = a .+ b .* π
4     π10 = [2 3 4]
5     Y(π10)
6 end

```

