

Lecture 5. Goods and Financial Markets; The IS-LM Model

Reading: Blanchard, Chapter 5

In the previous lecture...

- Money supply, M^S , is adjusted by the central bank via open market operations.
- Money demand, M^D , is given by $M^D = PY L(i)$.
- When i is high, the bond becomes more attractive. So, people demand less money.
- i is determined by the money market clearing condition that $M^S = M^D$.
- By changing M^S , the CB can affect i .

An Example: Contractionary MP (Monetary tightening)

- The CB sells bonds. Then, money in circulation decreases.

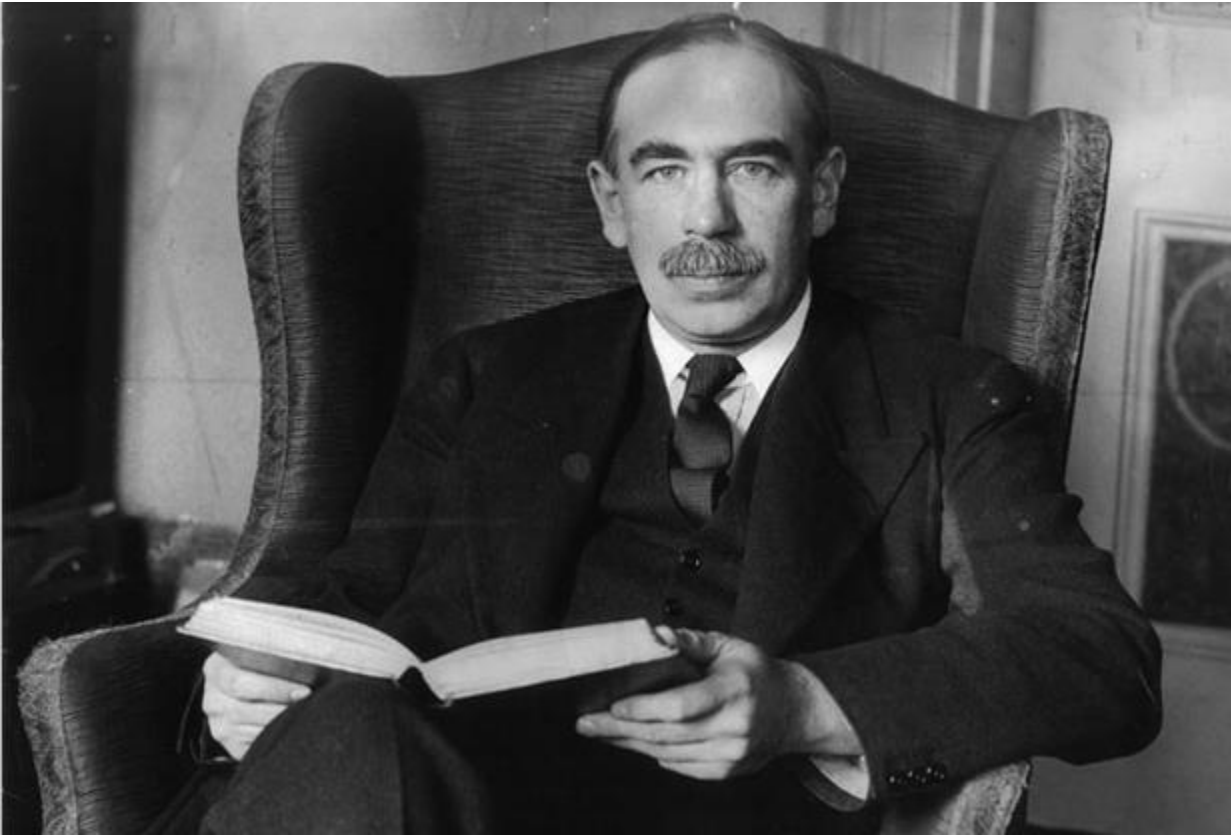
Outline

- Some History of the IS-LM Model / the short run
- Derivation
 - The Goods Market and the IS Relation
 - Financial Markets and the LM Relation
- Applications
 - Fiscal Policy in the IS-LM Model
 - Monetary Policy in the IS-LM Model
 - Monetary-Fiscal Policy Mix

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Keynes and the Great Depression (Ch 27.1)



- His book, *General Theory of Employment, Interest, and Money*, was published in 1936 amid the Great Depression.
- He emphasized the role of aggregate demand in determining output in the short run.
- This is why we call our model the Keynesian cross, where output, Y , is determined by demand, Z .

Hicks, Hansen, and the IS-LM Model

- Keynes' *General Theory* was fundamental but nearly impenetrable.
- According to John Hicks, one of Keynes' main contributions is the joint description of goods and financial markets.
- Hicks' analysis was extended by Alvin Hansen in the early 1940s.
- Hicks and Hansen called their formalization the IS-LM model.
- After more than 70 years since it was developed, is it still a useful model? I personally think the answer is yes.

The Short Run

- The IS-LM model captures much of what happens in the economy in .
- In this course: the short run = does not change.
- Remember that prices are “sticky,” so it does not change very quickly.
- Of course, it is unrealistic to assume that P is constant. However, it may not be a bad assumption when we think about economic events happening in several quarters or at most a few years.
- This assumption will be relaxed when we study the medium run.

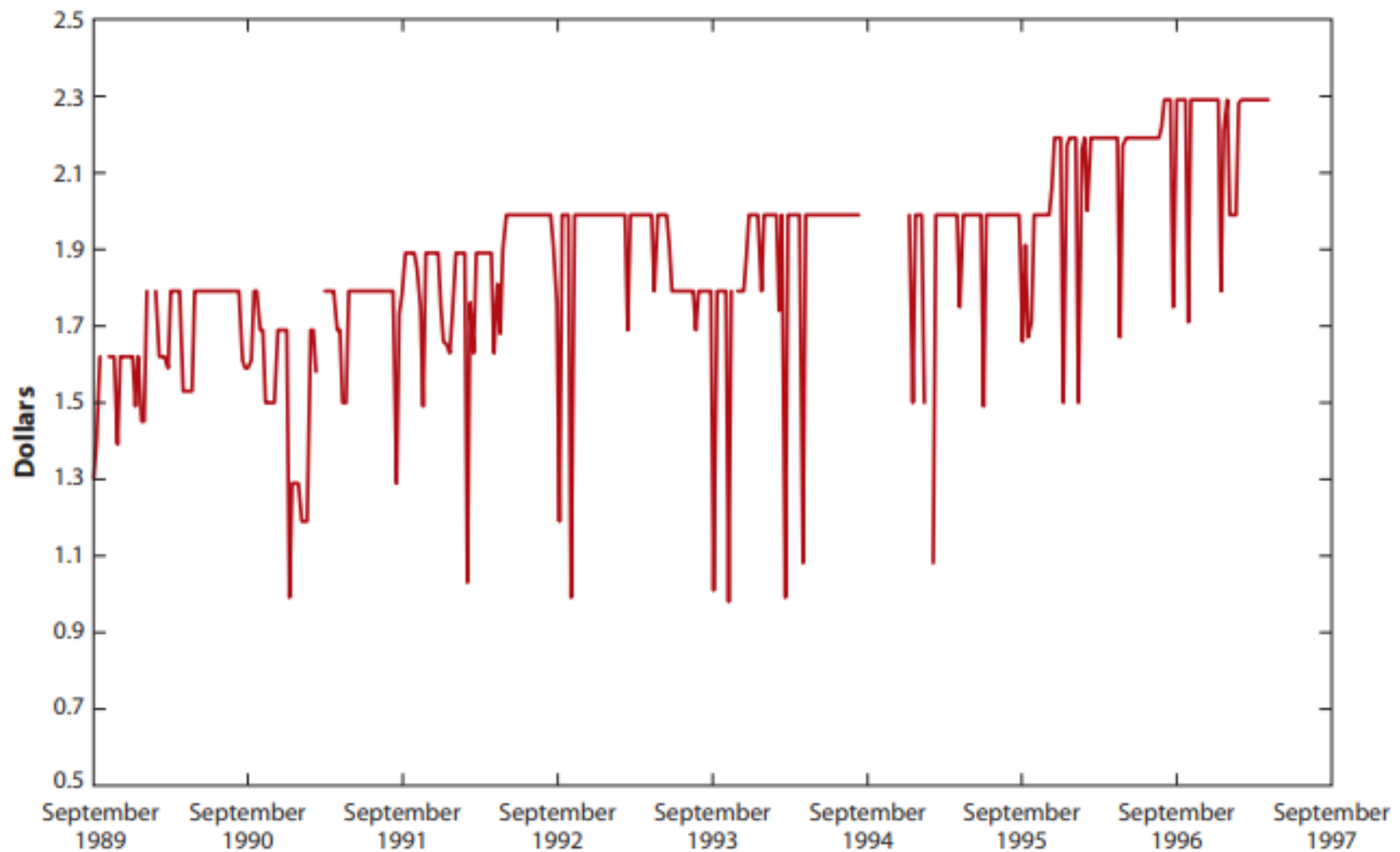


Figure 2

Price series of Nabisco Premium Saltines (16 oz) at a Dominick's Finer Foods store in Chicago.

- Source: Nakamura, E. and J. Steinsson (2014), Price Rigidity: Microeconomic Evidence and Macroeconomic Implications.
- Form Lecture 2.

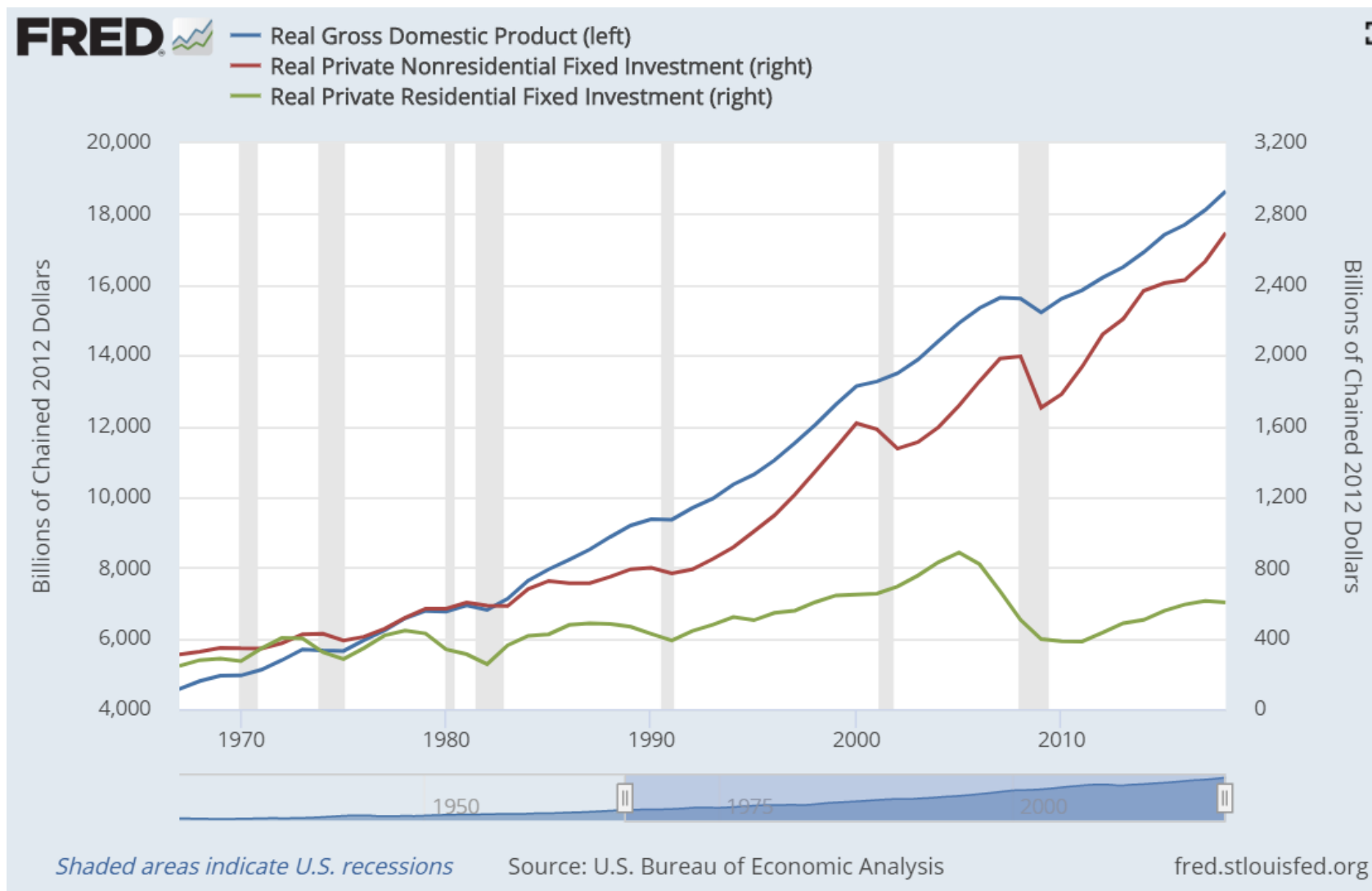
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The Goods Market and the IS Relation

- In Chapter 3, we studied the Keynesian cross.
- Demand $Z = C + I + G = C(Y - T) + \bar{I} + G$
- Supply $Y = \text{Income } Y$.
- It is unrealistic to assume that investment is constant.
- New assumption:
- When volume of business (level of sales) $Y \uparrow$, to produce more, firms buy new machines, build new factory, etc. So, $I \uparrow$.
- To finance new investment, firms usually borrow money. When i is high, the cost of investment is also high.

Real GDP and real Investment in the US



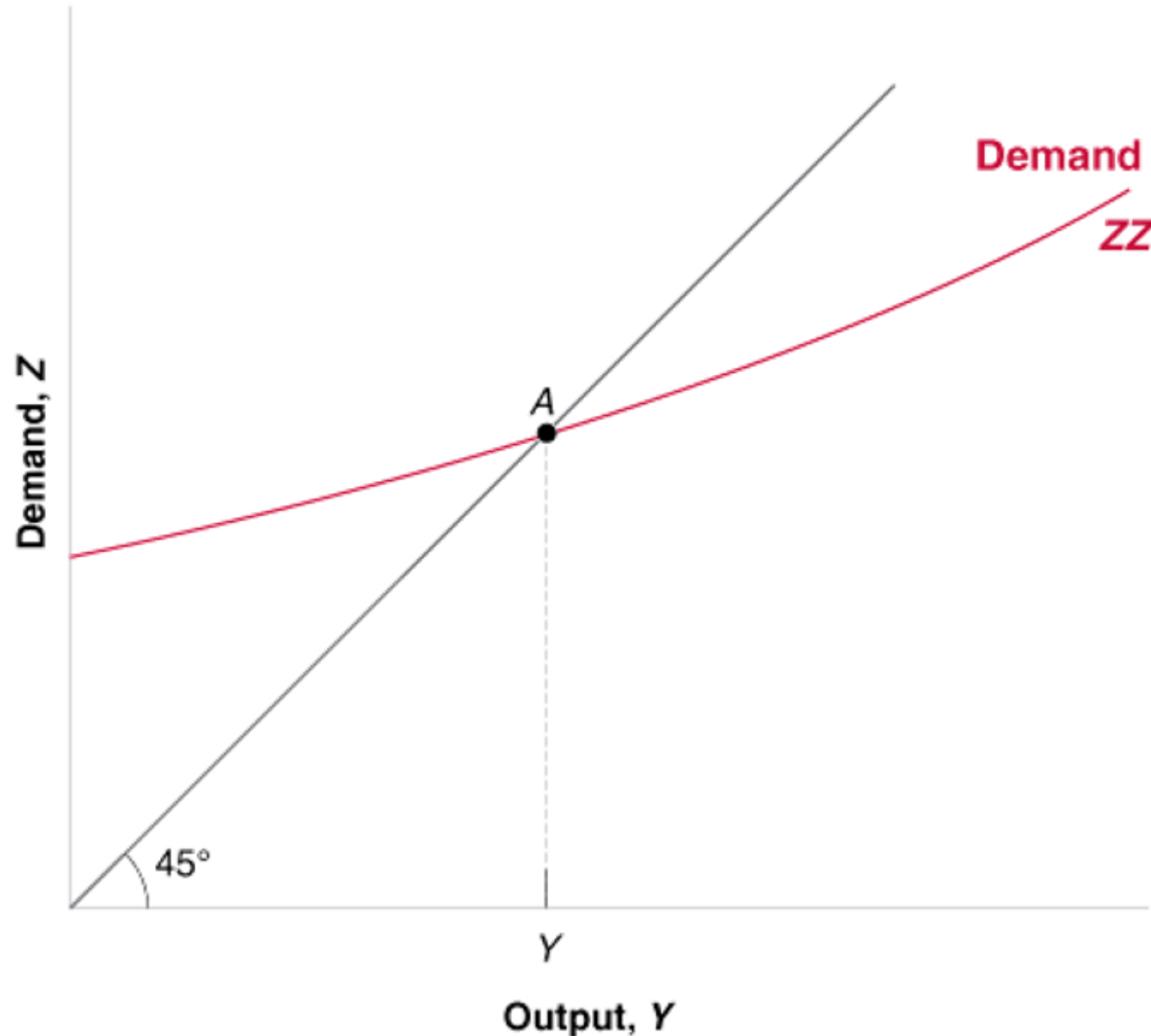
- Y and I tend to move together.
- I is more volatile than Y .

The Goods Market

- $Z =$
- Assumption: $\text{MPC} + \text{“Marginal propensity to invest”} < 1$
- Equilibrium condition for the goods market: $Y = Z$.
- Goal: To characterize the equilibrium output Y in the goods market as a function of the interest rate i

Given i .

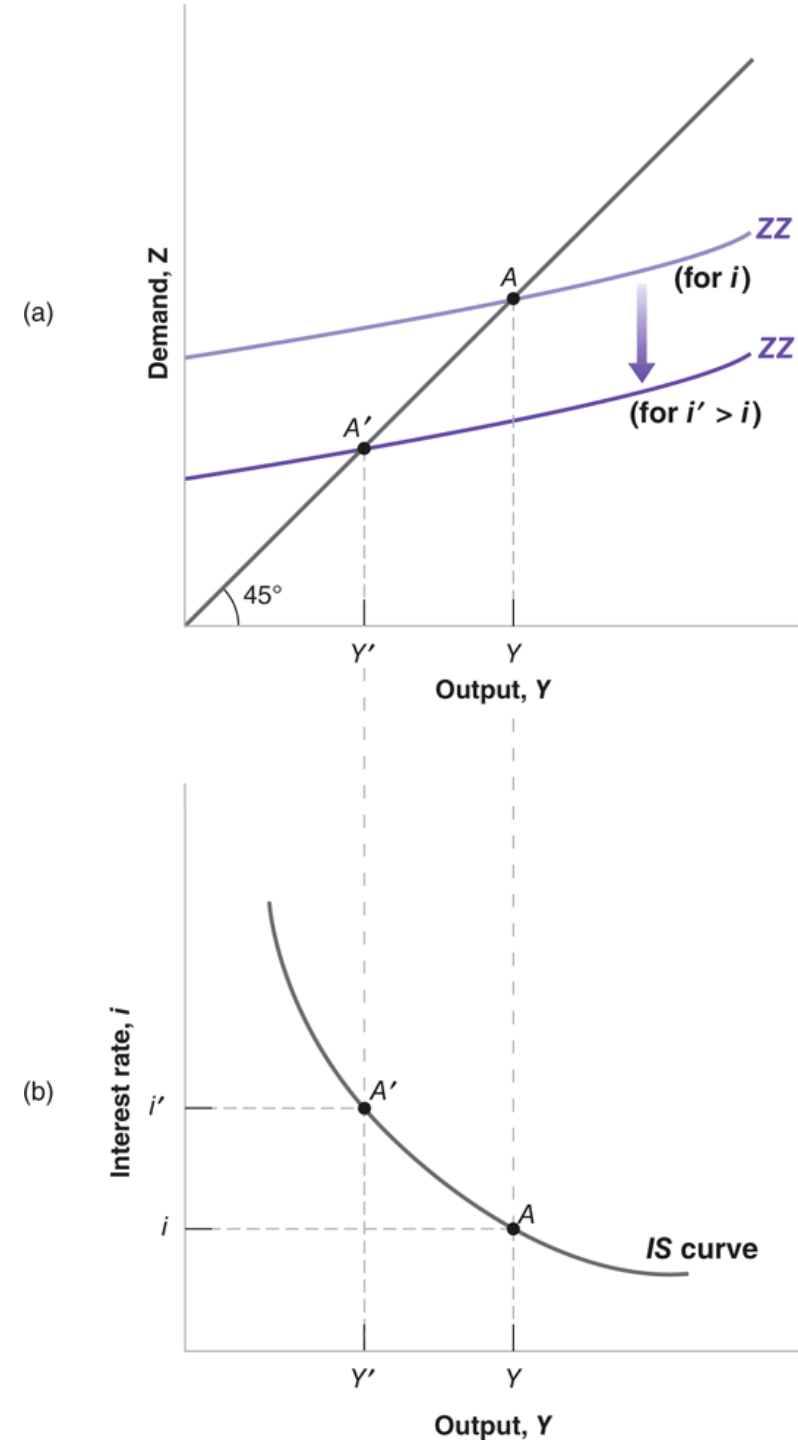
- $Z = C(Y - T) + I(Y, i) + G$
- Assumption:
MPC + “Marginal propensity to invest” < 1
- The ZZ curve above is
(flatter/steeper) than the
curve with $I = \bar{I}$.



What if $i \uparrow$ to i' ?

-

- $Z = C(Y - T) + I(Y, i) + G$
decreases at any level of
output Y
- ZZ curve shifts downward.
- The equilibrium output
 $Y \downarrow$ to Y' .



The IS (Investment-Saving) Curve

- Remember that $Y = Z$ is equivalent to $I = S + (T - G) = \textit{Private Saving} + \textit{Public Saving}$.
- As $i \downarrow$, the equilibrium output in the goods market $Y \uparrow$.

Shifts of the IS Curve

- Suppose that the govt. decided to reduce the budget deficit by collecting more taxes.
-
- For each i , the equilibrium output Y decreases. Thus, the IS curve shifts \leftarrow .
- What if $G \uparrow$? $c_0 \uparrow$?

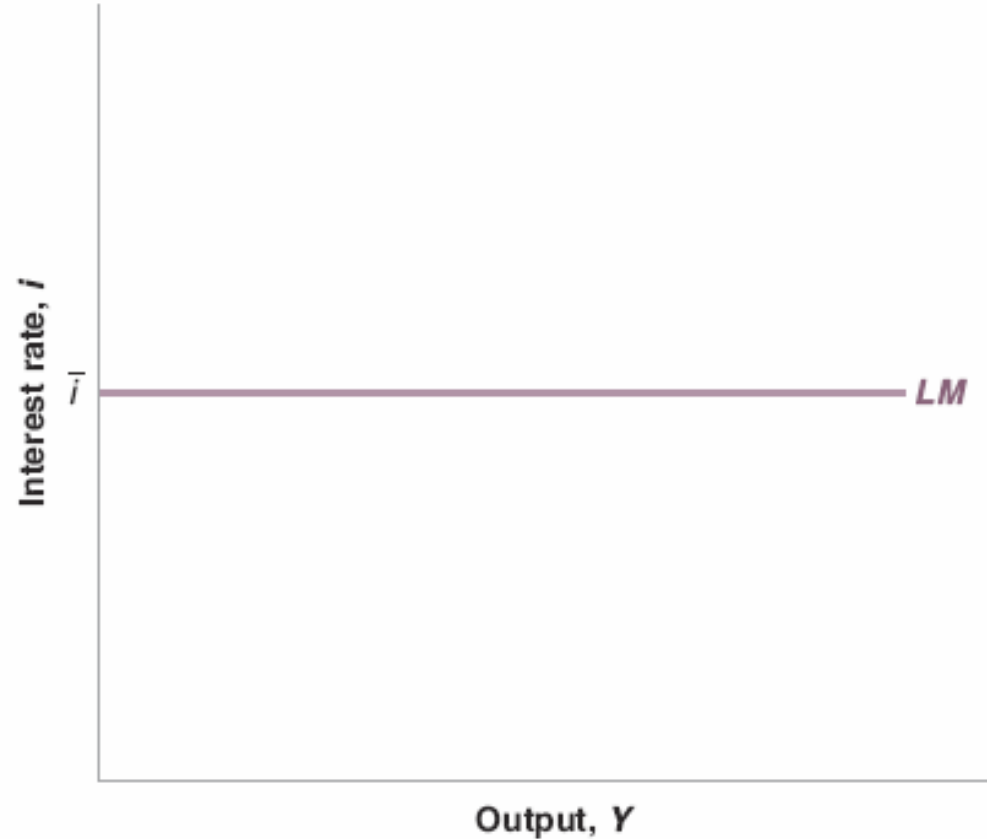
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In the real world, CBs seem to choose i directly.

- “In light of the implications of global developments for the economic outlook as well as muted inflation pressures, the Committee decided to lower the target range for the federal funds rate to 2 to 2-1/4 percent.”-FOMC Statement, July 31, 2019
 - <https://www.federalreserve.gov/monetarypolicy/fomccalendars.htm>
- “Based on our regular economic and monetary analyses, we decided to keep the key ECB interest rates unchanged.”-Lagarde, President of ECB, Jan 23, 2020.
 - <https://www.ecb.europa.eu/press/pressconf/2020/html/ecb.is200123~0bc778277b.en.html>

The LM (Liquidity-Money) Relation



- The CB chooses i . The chosen value is denoted by \bar{i} .
- But, how does the CB pin down i ?

The Money Market and the LM Relation

- M^S : Determined by the central bank. Adjusted via .
Expansionary / Contractionary OMO: CB / bonds.
- M^D : Liquidity for transactions (money) vs. interest rate (bond)

$$M^D =$$

- Equilibrium condition: $M^S = M^D \iff \frac{M^S}{P} = \frac{M^D}{P}.$

$$\frac{M^S}{P} =$$

Real Money Supply = Real Money Demand

- Given that P is constant, the CB can change $\frac{M^S}{P}$ by altering M^S .

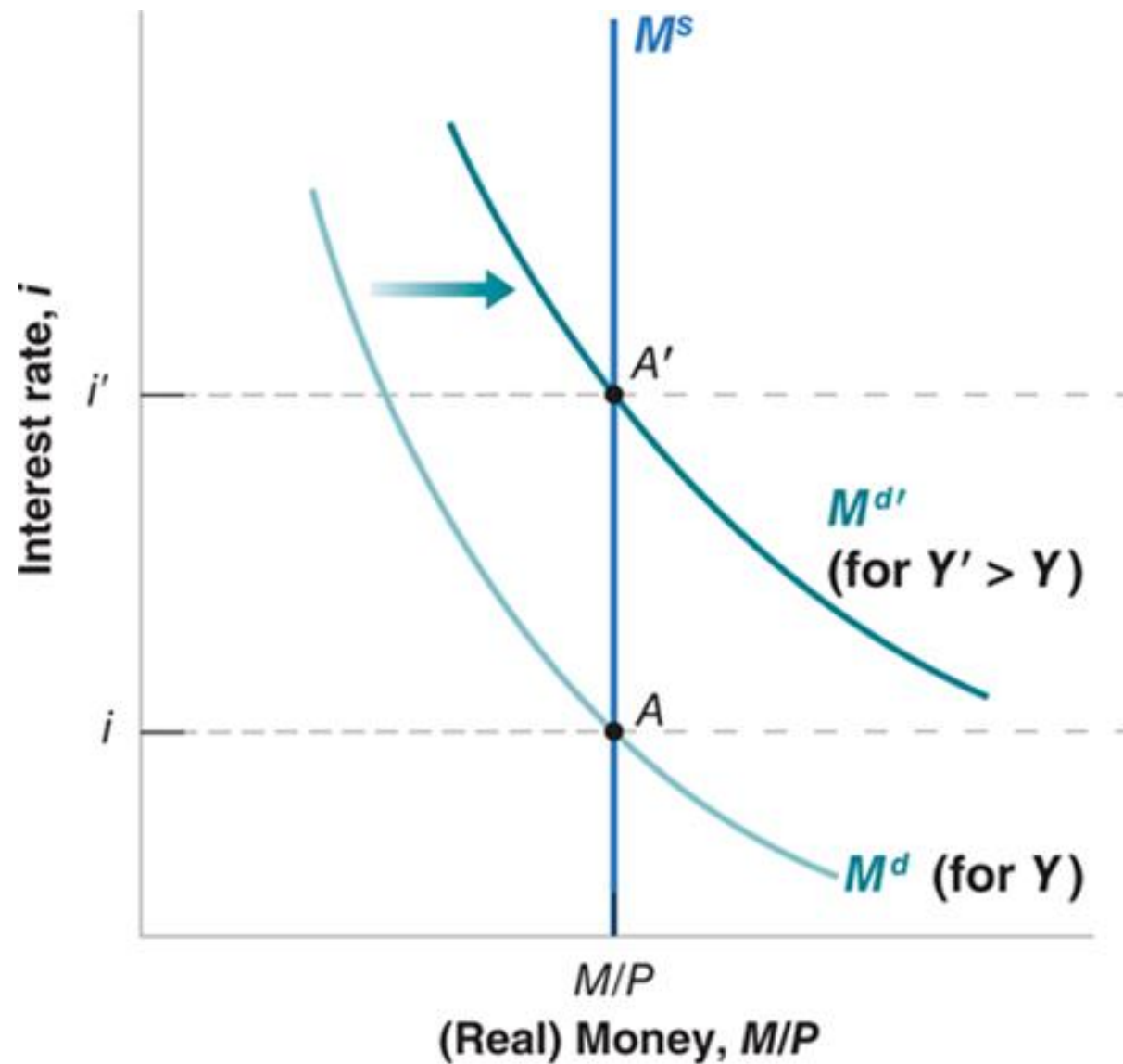
Given Y .

- Real money supply: M^S/P
- Real money demand:
$$M^D/P = Y L(i)$$
- Money market equilibrium condition:

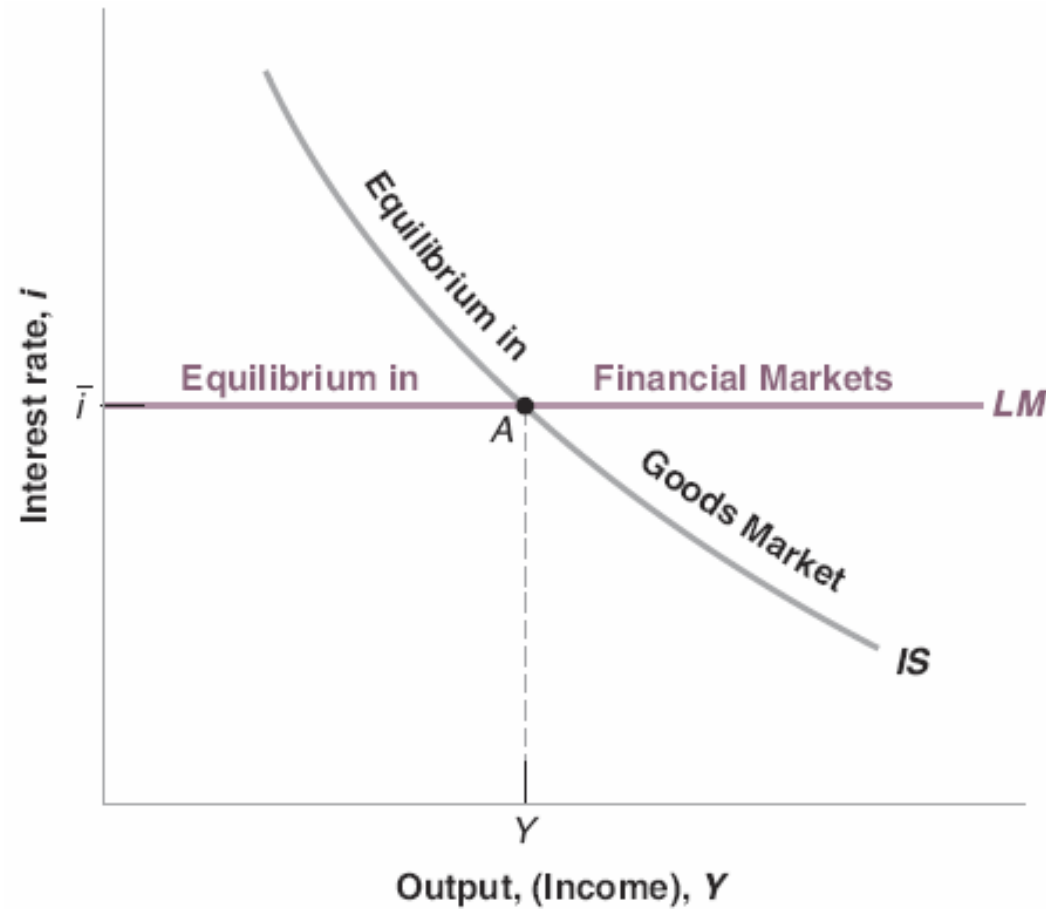
$$\frac{M}{P} = Y L(i)$$

What if $Y \uparrow$ to Y' ?

- $YL(i) \uparrow$ at any value of i
- $\frac{M^D}{P}$ curve shifts to the right.
- To maintain \bar{i} , the CB increases M^S and $\frac{M^S}{P}$ curve shifts to the right.



The IS-LM model



- Each point on the IS curve represents an equilibrium in the goods market.
- Each point on the LM curve represents an equilibrium in the money market.

The General Equilibrium (in the short run)

- Relation: $Y = C(Y - T) + I(Y, i) + G$
⇒ IS Curve: Given T , G , and i , what is the equilibrium output Y in the goods market?
- Relation: $i = \bar{i}$
⇒ LM Curve: i selected by the CB. It is achieved by adjusting M^s to satisfy $\frac{M}{P} = YL(\bar{i})$, given P , Y , and the target interest rate, \bar{i} .
- Where the two curves intersect (point A), both goods and money markets are cleared (i.e., in equilibrium): “ ”

Outline

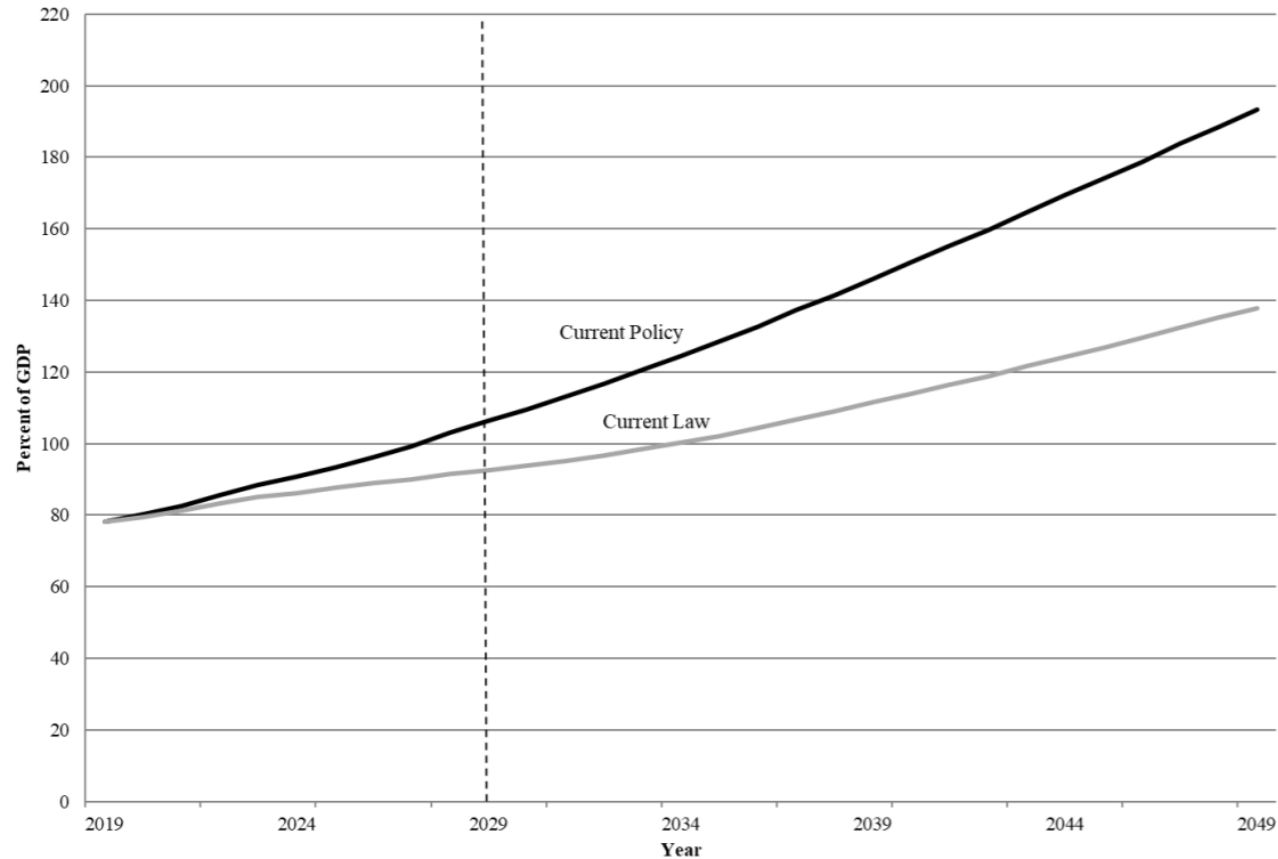
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Fiscal Contraction / Consolidation

- Suppose that the govt. decides to reduce the budget deficit by $T \uparrow$ while G unchanged.
- Fiscal expansion: increase in the deficit, either due to
- Why a fiscal contraction?
 - Short run consideration: when the economy is in a 'too' strong expansion.
 - Long run perspective: sustainability of the govt. debt.
 - Sometimes, these two objectives contradict with each other.

Real world example 1: The US case

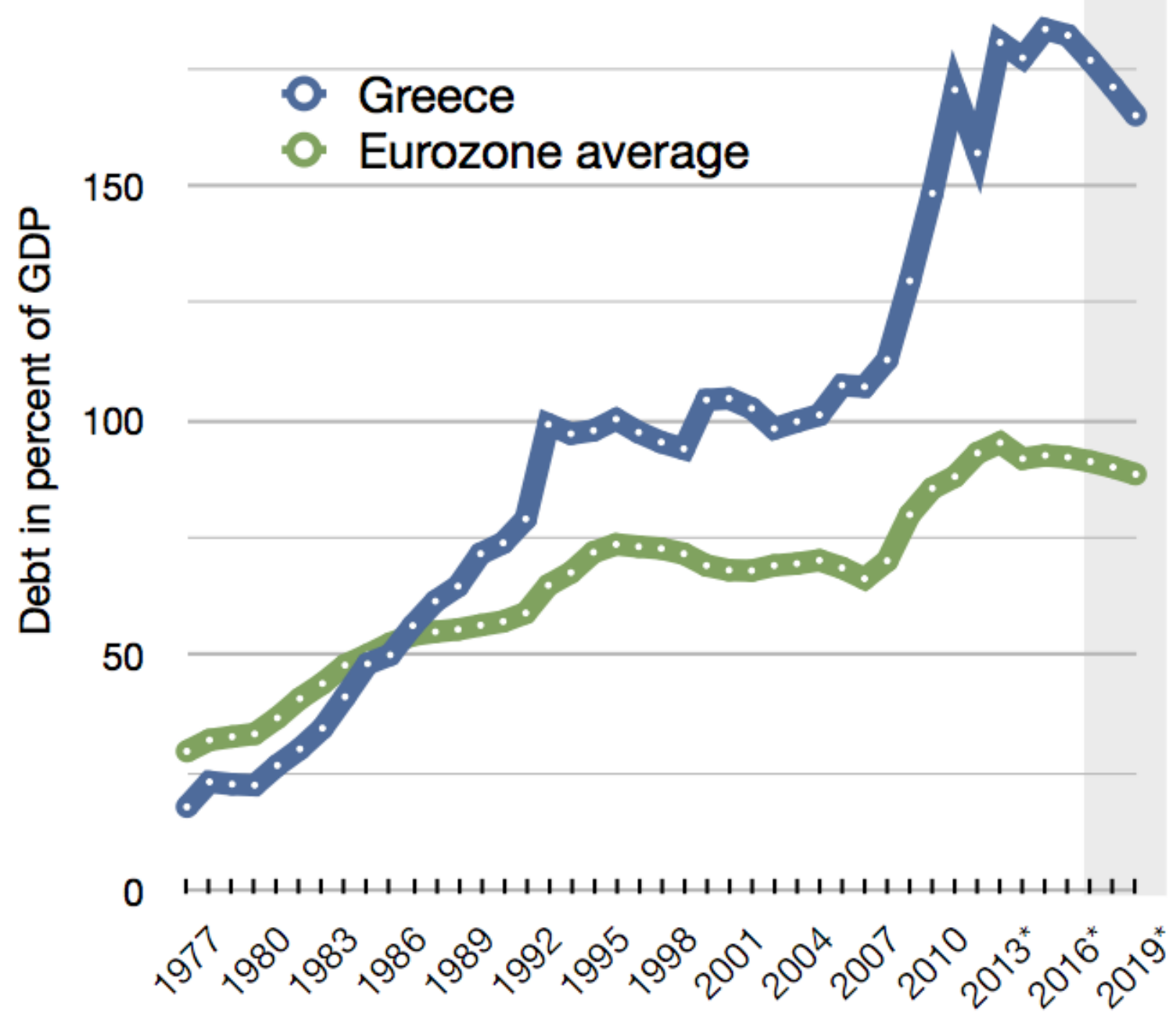
Figure 2. Debt to GDP, 2019-2049



- Source: Auerbach, Gale and Krupkin (2019), If not now, when? New estimates of the federal budget outlook.
- Remember that most govt. are running budget deficit. They borrow to finance their spending; therefore, debt to GDP is expected to rise.

Real world example 2: The Greek crisis

- Source: https://en.wikipedia.org/wiki/Greek_government-debt_crisis
- Around 2009-2010, it became clear that debt-to-GDP ratio in Greece is too high.
- The government enacted 12 rounds of tax increases, spending cuts, etc.



Source: Eurostat

* Source: Ernst & Young using data from Oxford Economics

...and people hated it.

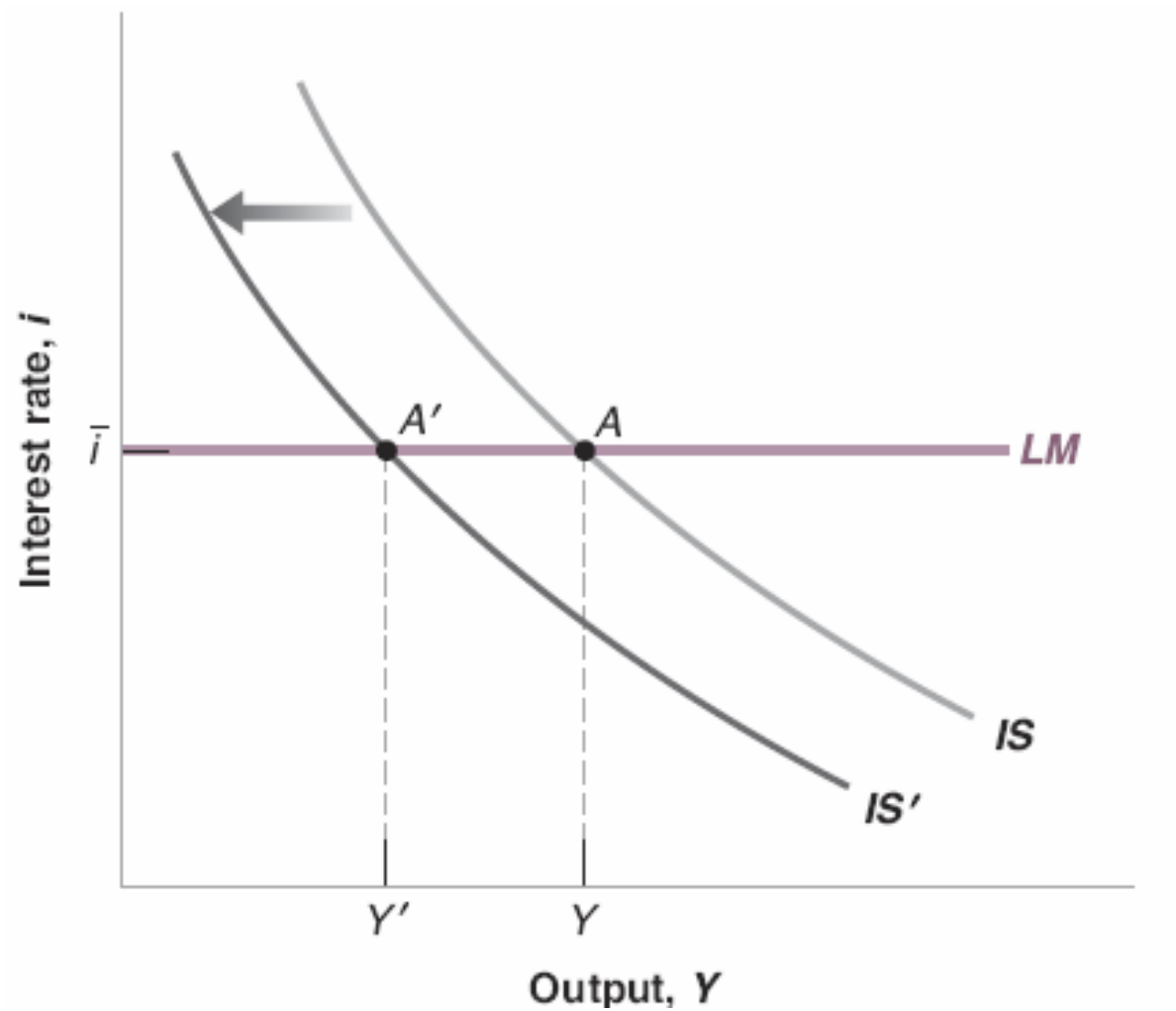


- source: https://en.wikipedia.org/wiki/Greek_government-debt_crisis
- protest against the austerity measures in Athens (29 May 2011).

What happens if $T \uparrow$
(in the short run)?

- Shifts of the IS Curve
- Suppose that the govt. decided to reduce the budget deficit by collecting more taxes.
- $T \uparrow$ to T'
- For each i , the equilibrium output Y decreases. Thus, the IS curve shifts \leftarrow .

When $T \uparrow$ to T' .



- $T \uparrow \rightarrow$ For each i , the goods market equilibrium output $Y \downarrow$
 \rightarrow The IS curve shifts to the left.
- As we move along the LM curve from A to A' :
 $Y \downarrow \rightarrow$ less transaction $\rightarrow M^D \downarrow \rightarrow$ CB reduces M^S to keep i at \bar{i} .
- What if the CB does not respond to $M^D \downarrow$ and keep M^S at the previous level?
 $Y \downarrow \rightarrow$ less transaction $\rightarrow M^D \downarrow \rightarrow$ Bond demand \uparrow
 $\rightarrow P^B \uparrow \rightarrow i \downarrow$. (remember that $P^B = \frac{\$100}{1+i}$)

Behind the scenes

Determine what happens to the following variables.

- C
- I
- G
- T
- Public Saving
- Private Saving

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Monetary expansion / easing

- The CB decreases i by increasing M^S .
- Monetary contraction / tightening: $i \uparrow$, achieved by $M^S \downarrow$.

- US case:

8 regular FOMC (Federal Open Market Committee) meetings in a year. After each meeting, the FRB announces their new target interest rate and adjusts M^S to achieve the new rate.

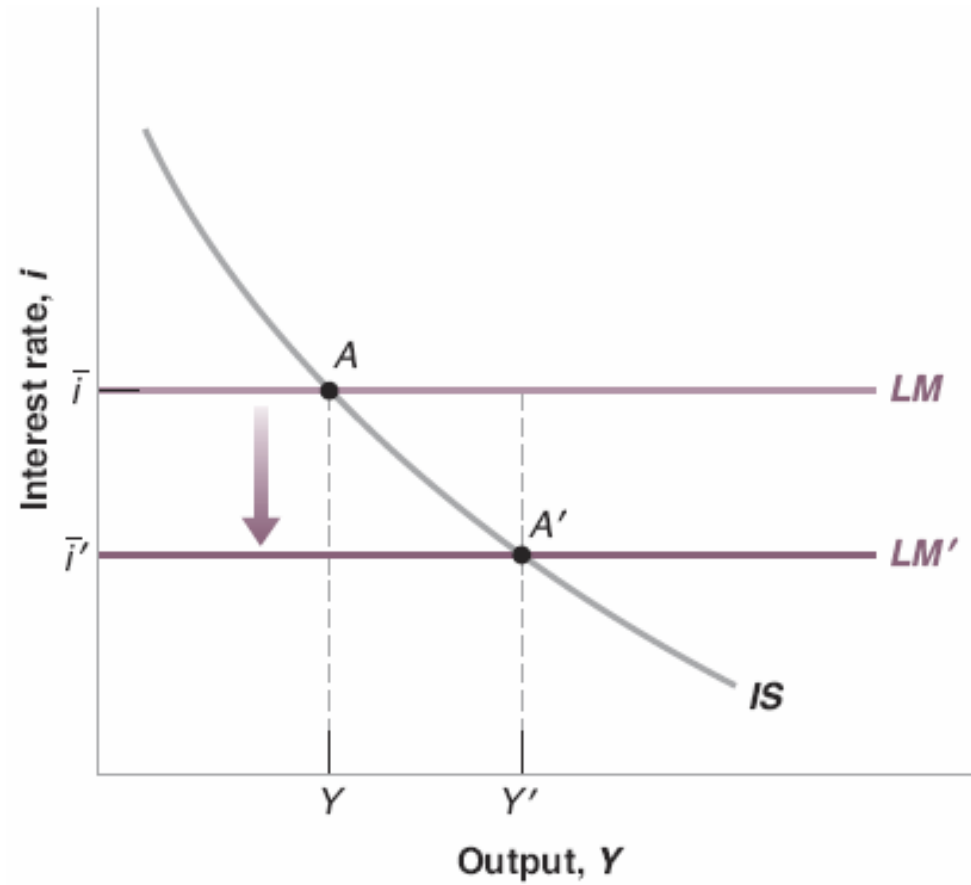
FOMC Statement, March 3, 2020

- The fundamentals of the U.S. economy remain strong. However, the coronavirus poses evolving risks to economic activity. In light of these risks and in support of achieving its maximum employment and price stability goals, **the Federal Open Market Committee decided today to lower the target range for the federal funds rate by 1/2 percentage point, to 1 to 1-1/4 percent.** The Committee is closely monitoring developments and their implications for the economic outlook and will use its tools and act as appropriate to support the economy.
- <https://www.federalreserve.gov/monetarypolicy/fomccalendars.htm>

Shifts of the LM Curve

- Suppose that the CB lowers \bar{i} .
- This is achieved by increasing M^s via expansionary OMOs.

When \bar{i} decreases to \bar{i}' .



- $\frac{M}{P} \uparrow \rightarrow$ For each Y , the money market equilibrium interest rate
 $i \downarrow$
 \rightarrow The LM curve shifts downward.
- As we move along the IS curve from A to A' :
 $i \downarrow \rightarrow I(Y, i) \uparrow \rightarrow Y \uparrow$.
- $M_{A'} > M_A$
- Why? $\frac{M_{A'}}{P} = Y_{A'} L(\bar{i}') > Y_A L(\bar{i}') > Y_A L(\bar{i}) = \frac{M_A}{P}$

Behind the scenes

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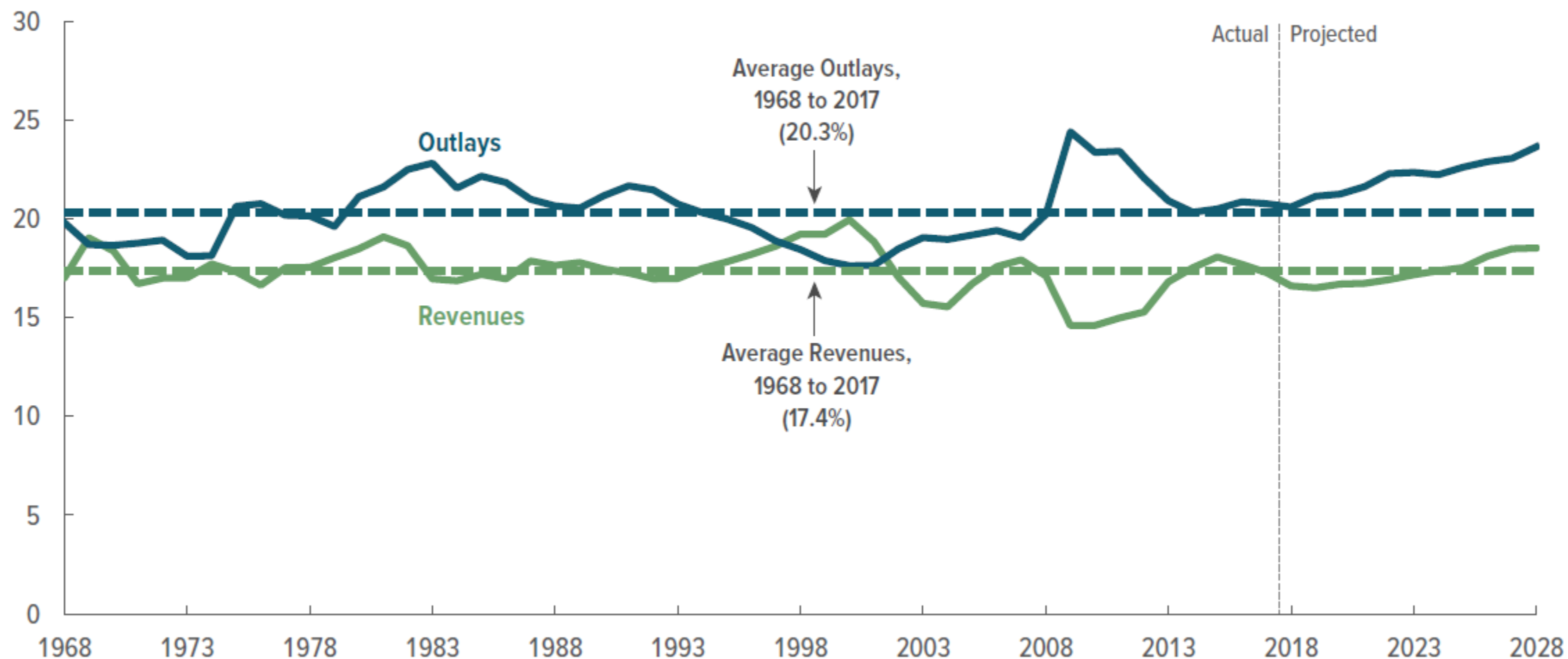
An example

- When Bill Clinton was elected President in 1992, one of his priorities was to reduce the budget deficit using a combination of cuts in spending and increases in taxes.
- Clinton was worried because $T \uparrow$ and $G \downarrow \rightarrow Y \downarrow$
- The right strategy was to combine a fiscal contraction (by the govt) with a monetary expansion (by the CB).

Figure 4-2.

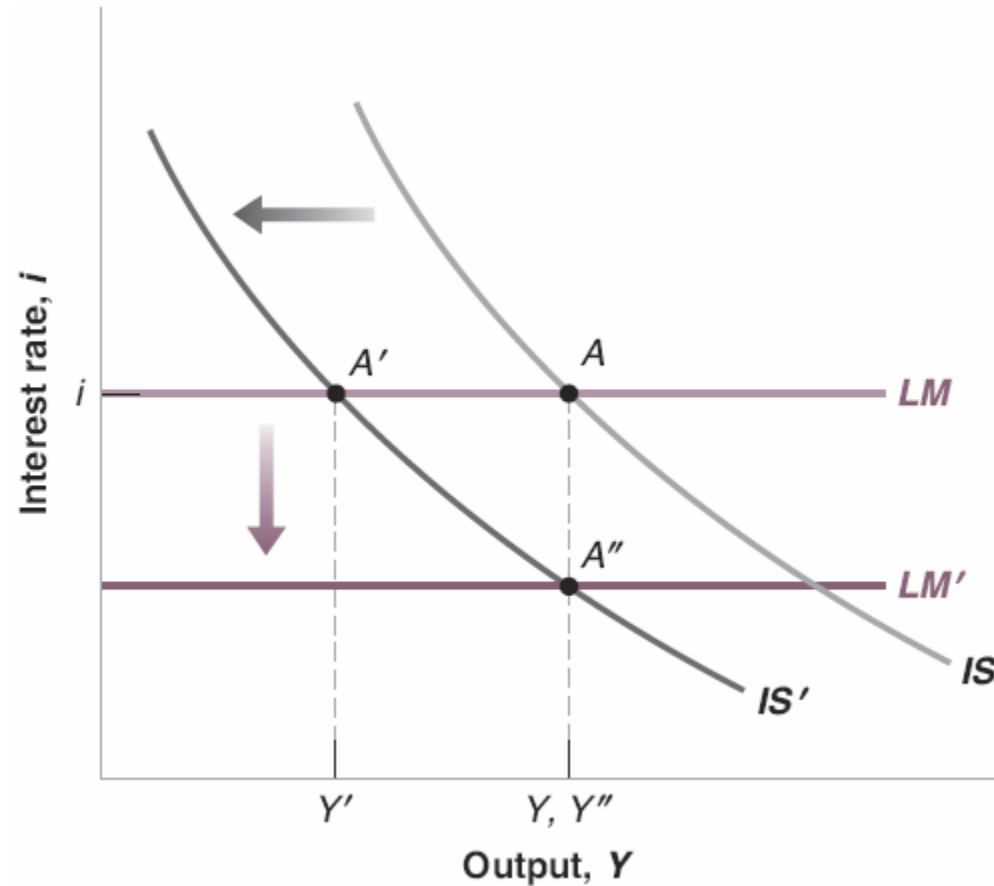
Total Revenues and Outlays

Percentage of Gross Domestic Product



Source: Congressional Budget Office.

A fiscal consolidation + a monetary expansion



In the next class...

- We review the global financial crisis in 2007-08.
- We extend the IS-LM model and study the macroeconomic effects of financial turmoil and policy responses.
- Blanchard, Chapter 6.