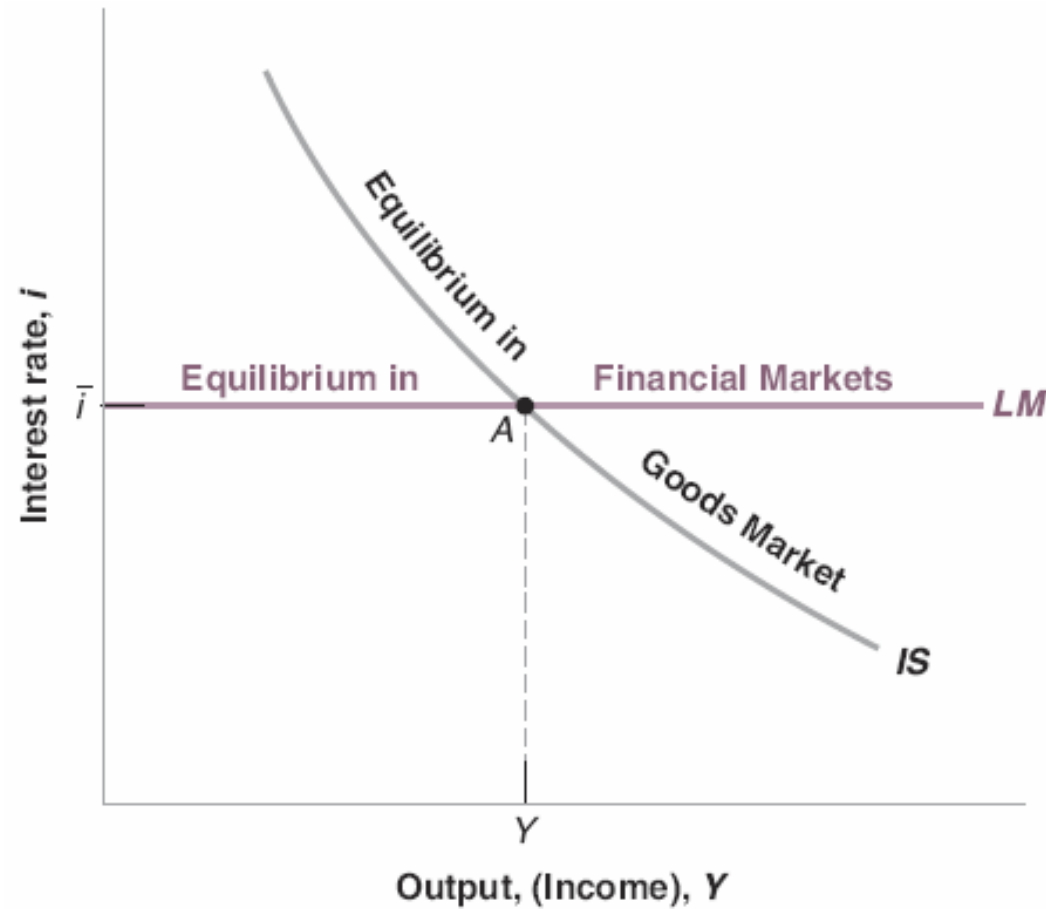# Lecture 6. Financial Markets II: The Extended IS-LM Model (and the Great Recession)

Reading: Blanchard, Chapter 6

In the previous lecture…

- IS Relation: $Y = C(Y - T) + I(Y, i) + G$
- LM Relation: $i = \bar{\imath}$

- Given the stance of the fiscal authority, represented by G and T, and the monetary policy, represented by $\bar{\imath}$, the IS-LM model jointly determines Y and i in the short run.

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.

Outline

- The Consumer Side, C

- The Firm Side, I
    - Real vs. Nominal Interest Rates
    - The Risk Premium

- The Great Recession in the Extended IS-LM Framework

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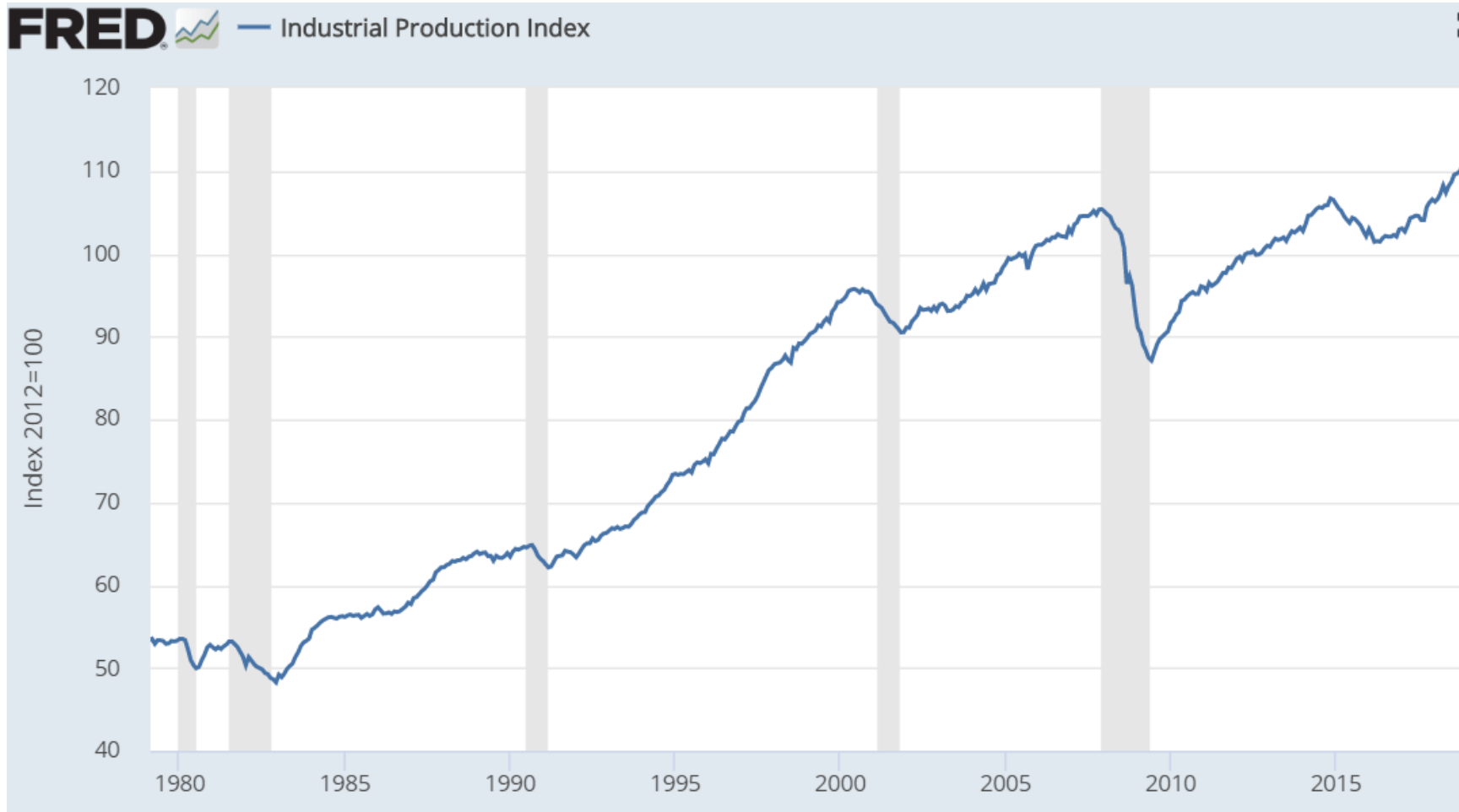
- The Industrial Production Index (INDPRO) is an economic indicator that measures real output for all facilities located in the United States manufacturing, mining, and electric, and gas utilities (excluding those in U.S. territories).

- A large and long-lasting drop occurs around 2007-08: The Great Recession

- Source: https://fred.stlouisfed.org/series/INDPRO#0

What happened?

- I will provide a very very brief narrative. You should read Chapter 6 in our textbook. If you are interested, you may refer the following books:

- Mian, Atif and Amir Sufi (2014), House of Debt: How They (and You) Caused the Great Recession, and How We Can Prevent It From Happening Again.

- Bernanke, Ben S. (2017), The Courage to Act: A Memoir of a Crisis and Its Aftermath.

US Housing Prices (Boom and Bust)

- The increase in housing prices from 2000 to 2006 was followed by a sharp decline thereafter.
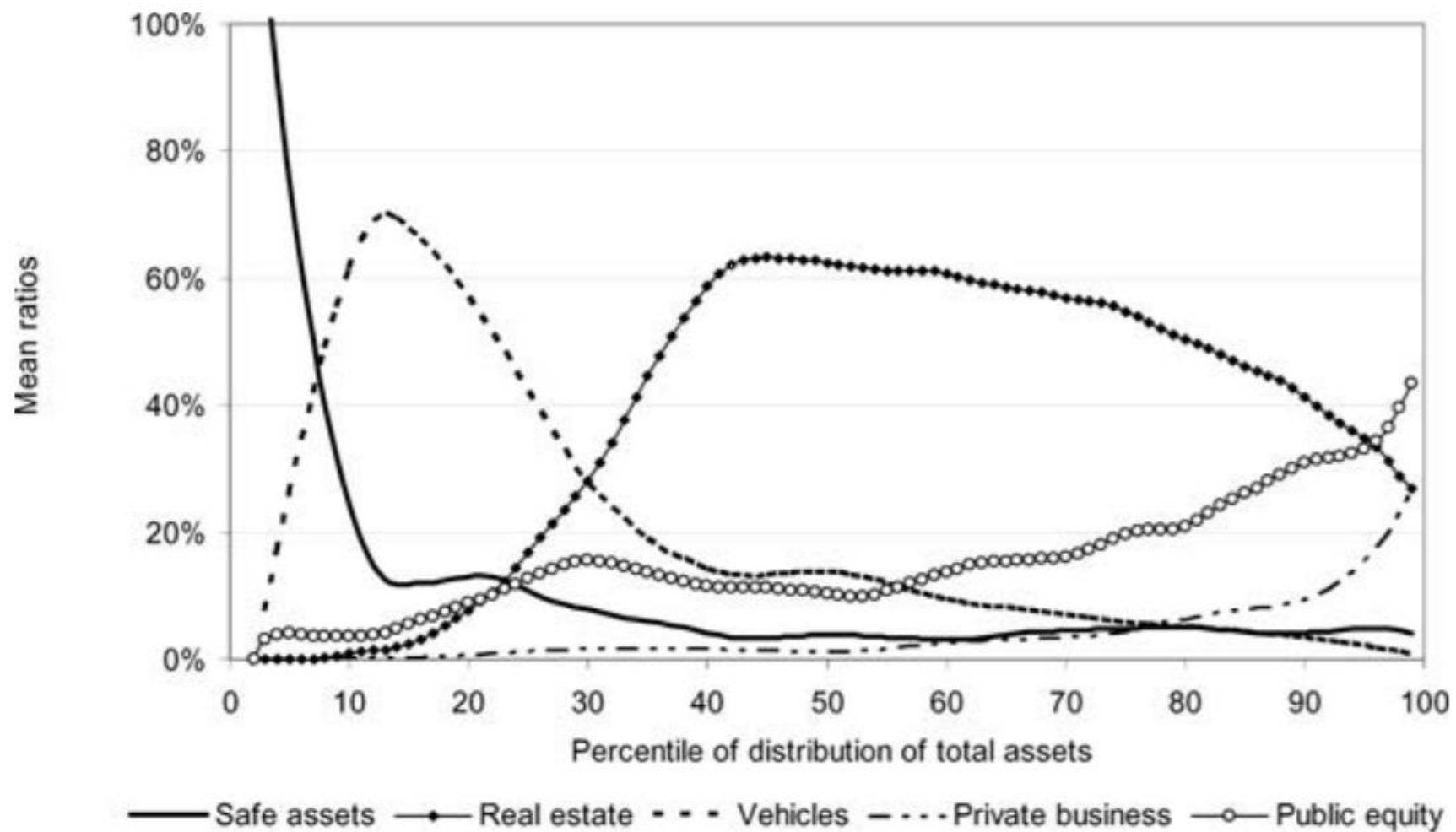- 220 → 150: about 30% decline in the housing prices

Figure 3. Asset class shares in household portfolios. The share of each asset class in the aggregate portfolio of households at each point in the wealth distribution, in the 2001 Survey of Consumer Finances.

- For the majority of people, housing (real estate) is the most important form of wealth.
- Campbell, John Y. (2006), Household Finance, *Journal of Finance* 61(4): 1553-1604.

U.S. Consumer and Business Confidence

- The financial crisis led to a sharp drop in confidence, which bottomed in early 2009.

How did consumers react?

- Let's consider a median household.

- If 60% of your total wealth is in housing and its price ↓ by 30%, you lose about 20% of wealth in addition to the losses from stocks, mutual funds, pensions, etc.

- At the onset of the global financial crisis, housing prices ↓, stock price ↓, and consumer confidence ↓.

- In our modeling framework,

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Nominal vs. Real Interest Rates

- Nominal interest rates (i_t):

    Borrowing HKD 1 today $\rightarrow$ Paying HKD $1 + i_t$ in a year

Ex) $i_t = 1\% = 0.01.$

    If I deposit HKD 1000 today, it will be HKD ___ in the next year.

- Real interest rates (r_t):

    Borrowing one good today $\rightarrow$ Paying $1 + r_t$ goods in a year

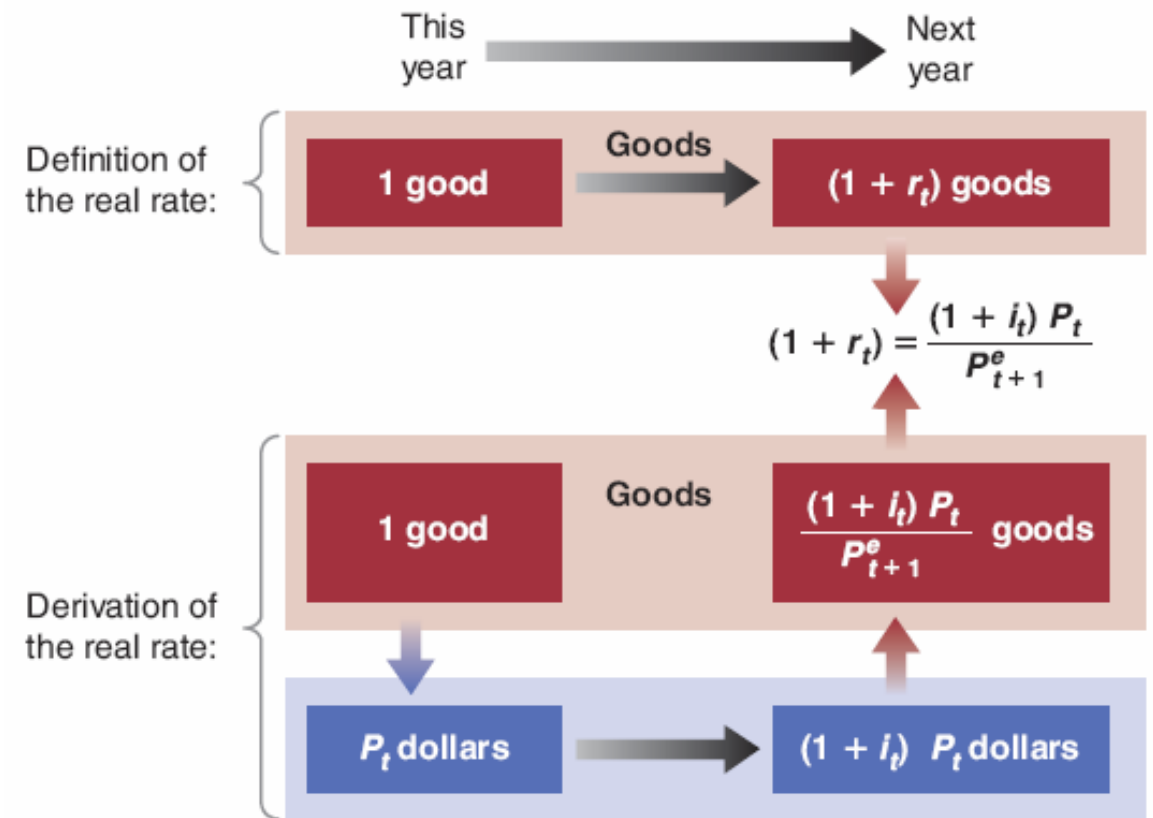- Why r_t? We do not consume dollars. We consume goods.

Derivation of r_t

- If I postpone consumption of one good today…
- Today: 1 good = HKD P_t

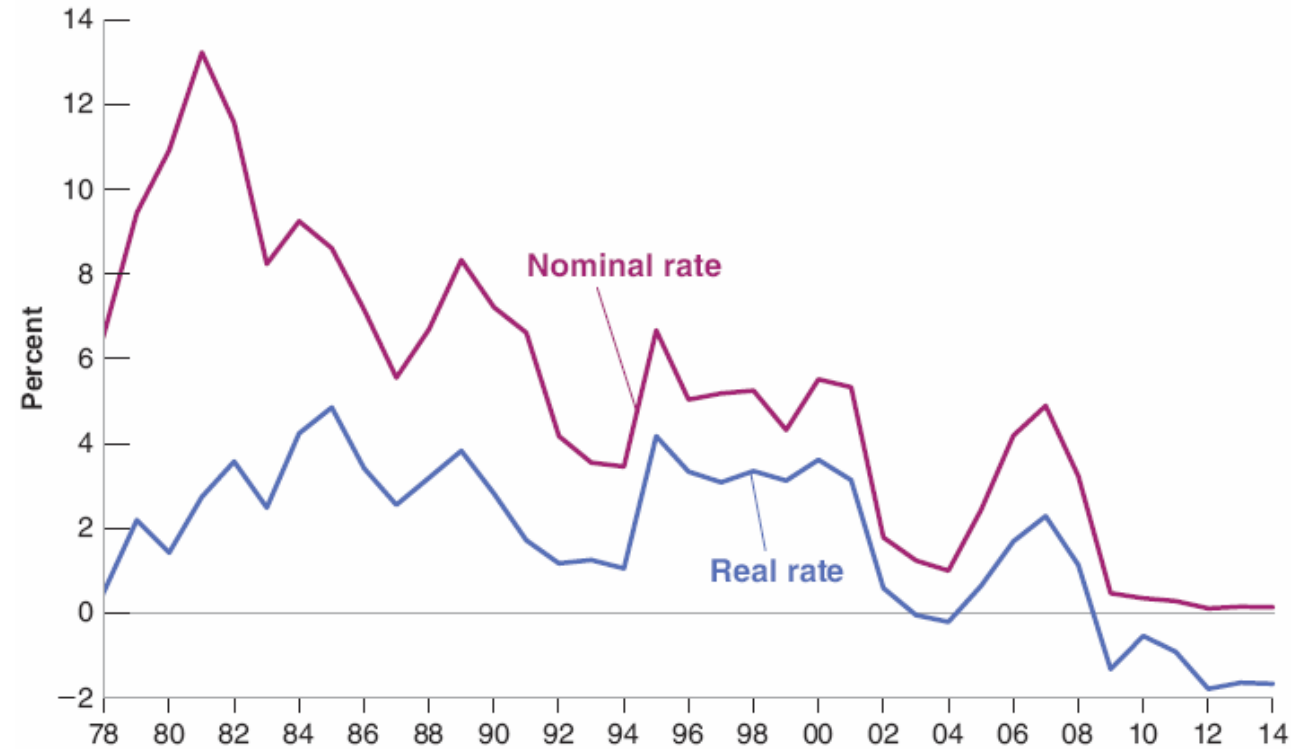- Next year:
  $$\text{goods} = \text{HKD } (1 + i_t)P_t$$

-

The Fisher Equation

- $1 + r_t = \frac{(1+i_t)P_t}{P_{t+1}^e} = (1 + i_t)/\left(\frac{P_{t+1}^e}{P_t}\right) = (1 + i_t)/\left(1 + \frac{P_{t+1}^e - P_t}{P_t}\right)$

$\quad = (1 + i_t)/(1 + \pi_{t+1}^e)$

- Remember that $\ln(1 + x) \approx x$ for $x \approx 0$.

- $r_t \approx \ln(1 + r_t) = \ln(1 + i_t) - \ln(1 + \pi_{t+1}^e) \approx i_t - \pi_{t+1}^e$

- $r_t \approx i_t - \pi_{t+1}^e$: ex-ante real interest rate
- $i_t - \pi_{t+1}$: ex-post real interest rate

i and r in the US

- i ⇓ since the early 1980s
- r ↓ since the early 1980s because π^e (and π) ↓.

- Overall, they move together.

- $r < 0$ recently!

Outline

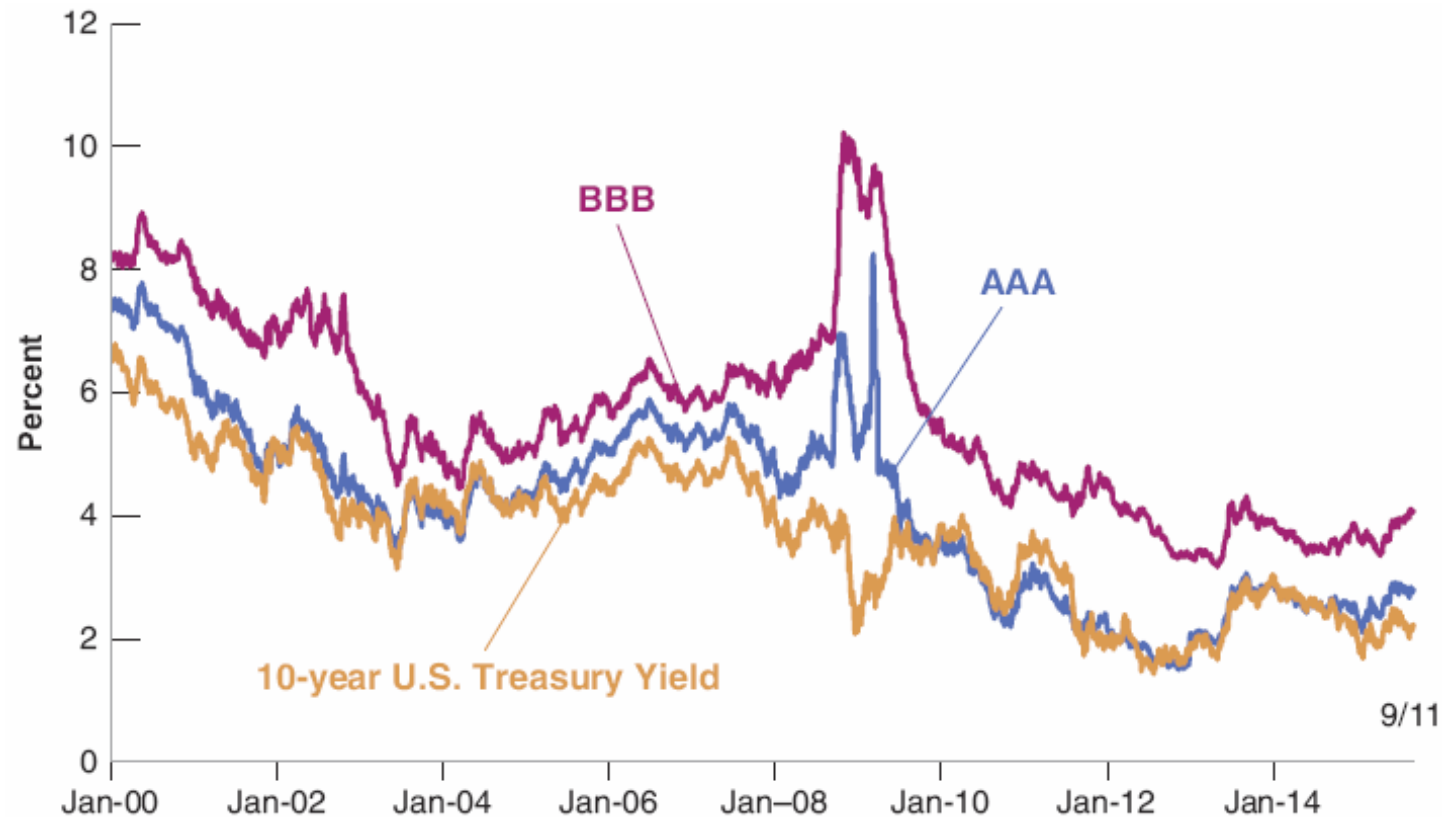- The Consumer Side, C

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The interest rate that matters for firms

- Previously, we assumed that $I = I(Y, i)$.

- However, when firms make an investment decision, what is important for them is the **real** interest rate at which **they** borrow, not the nominal risk-free rate at which the US government borrow.

- Firms cannot borrow at the risk-free rate. When a firm issues a bond, investors (lenders) worry that this firm may default.

- To compensate for the risk, bond holders require a **risk premium**, x.

- A new assumption:

In September 2008, the financial crisis led to a sharp increase in x.

- S&P Credit Rating: AAA > AA > A > BBB > BB > B > CCC > CC > C

safe   risky

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The new LM relation: $r = \bar{r}$

- Although the CB chooses i, they have some control over r at least in the short run.

- In data, i and r move together.
- In models, we assume that P is fixed in the short run because prices are sticky. When P is fixed, $\pi = 0$: therefore, $r = i$.

- In any cases, assuming that the CB chooses r may not be a bad approximation to the reality.
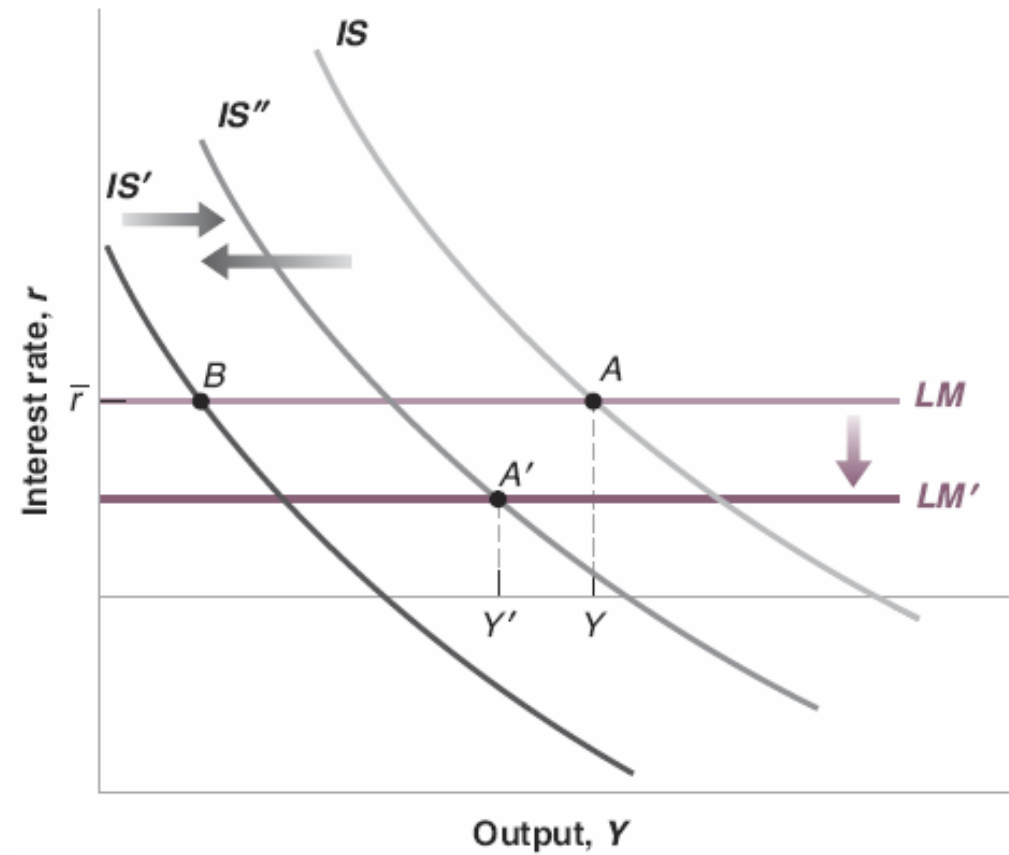
The Extended IS-LM Model

- IS: $Y = C(Y - T) + I(Y, r + x) + G$

- LM: $r = \bar{r}$

- At the onset of the global financial crisis, housing prices ↓, stock price ↓, and consumer confidence ↓: c_0 ↓ $IS \leftarrow$

- The risk premium $x \uparrow \rightarrow I$ ↓ given Y, r, T, and G → $IS \leftarrow$

- Policy responses
  - Fiscal Policy: $G \uparrow, T$ ↓
  - Monetary Policy: i ↓ to 0.

    The CB could not lower r below $0 - \pi^e$

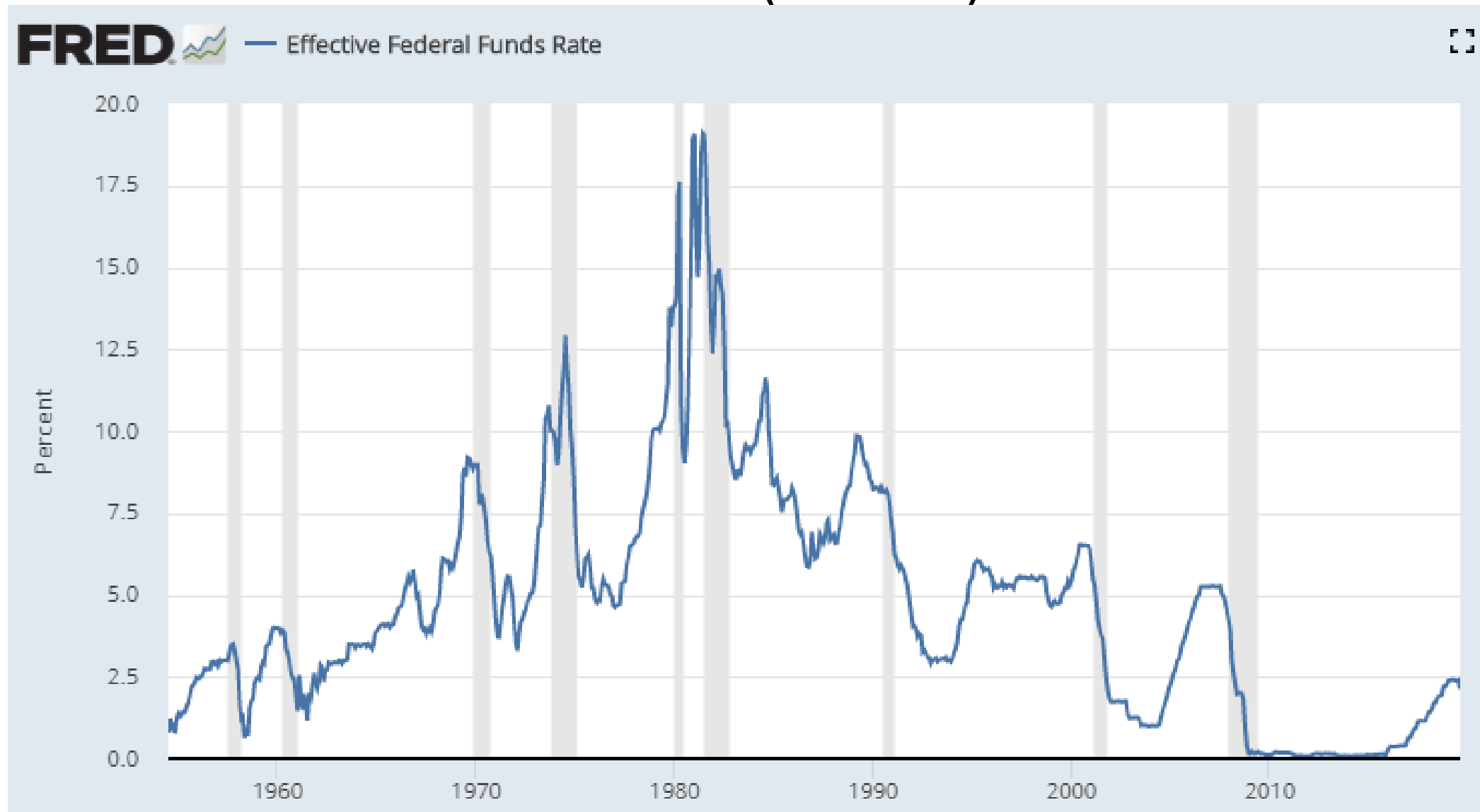# The financial crisis in 2007-08 and policy responses
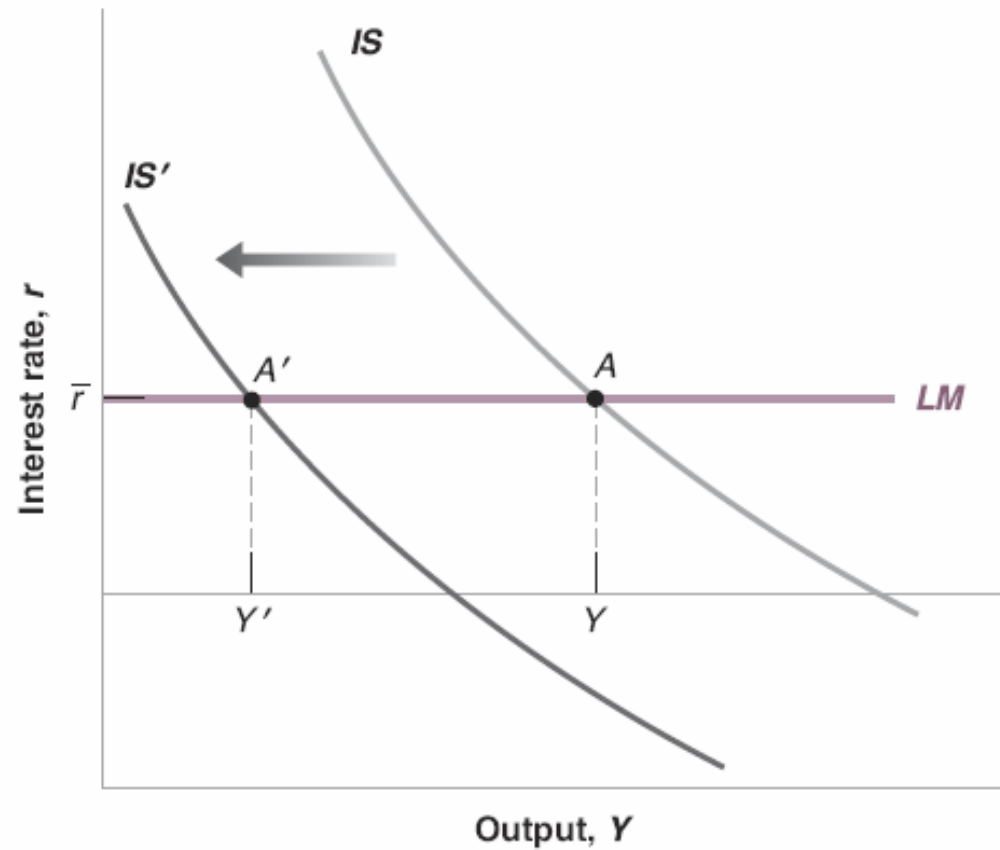
- w/o policy responses

- w/ policy responses
- $\bar{r} \downarrow$ was not sufficient due to the ZLB.

The Zero Lower Bound ($i \geq 0$)

In the next class...

- We investigate the labor market.
- So far, we have studied the demand side of the economy. We now start to think about the supply (production) side of the economy. That is, firms hire workers to produce goods and services.
- We will define the natural rate of unemployment and the natural level of output.

- Blanchard, Chapter 7.