EC313: Intermediate Macroeconomics

Chapter 6

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Chapter 6: Financial Markets II: The Extended

1. Nominal vs. Real Interest Rate
2. Risk Premium
3. Extended IS-LM

Nominal vs. Real Interest Rate

Nominal vs. Real Interest Rate

- You are offered a bond with an interest rate of 10%. Do you buy it?
- The answer partly depends on inflation. If inflation is 10% as well, than the interest you earn on that bond won't allow you to purchase any more goods than you otherwise would have.
- If you knew that inflation would be 10% over the year, then you would have required an interest rate greater than 10%
- No one cares only about the number of dollars. People care about what those dollars can buy
- In other words, everyone cares about **real** interest rates

Nominal vs. Real Interest Rate

- **Nominal interest rate**: interest rate that does not take inflation into account
  - the ones that appear in the newspaper and on bank statements
  - we do observe
- **real interest rate**: is adjusted for changes in inflation
  - it reflects more accurately the true cost of borrowing or benefits of lending
  - we typically do not observe

Nominal vs. Real Interest Rate

- How do we go from nominal interest rates to real interest rates?
- We must adjust the nominal interest rate to take into account expected inflation
- $r_t = i_t - \pi^e_{t+1}$
- the real interest rate r_t is equal to the nominal interest rate i_t minus expected inflation π^e_{t+1}

Nominal vs. Real Interest Rate

$r_t = i_t - \pi^e_{t+1}$

- $\pi^e_{t+1} = 0 : r_t = i_t$
- Because π^e_{t+1} is typically positive, r_t is typically lower than i_t
- for a given i_t, the higher the π^e_{t+1}, the lower the r_t

Nominal vs. Real Interest Rate

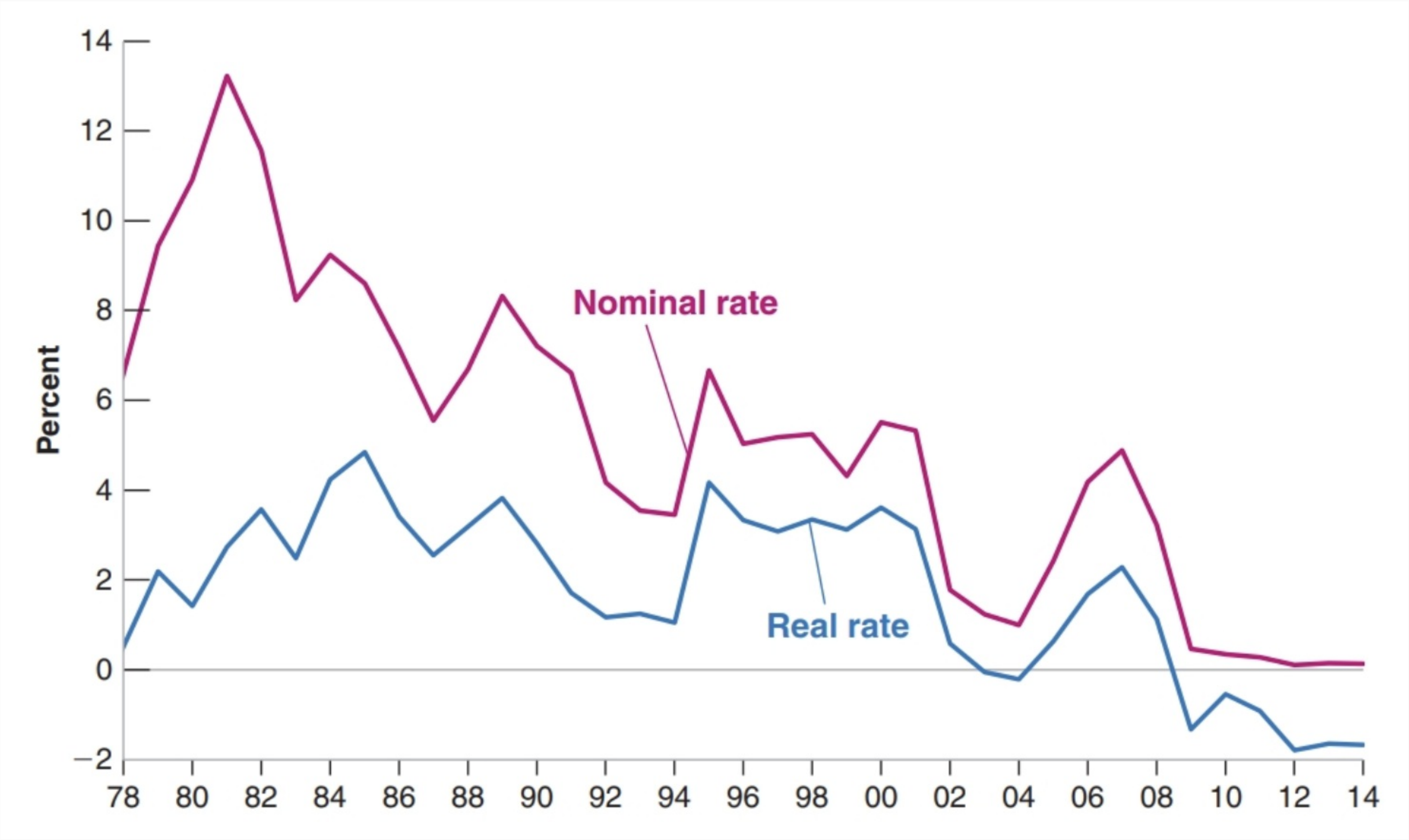
- Suppose the nominal interest rate and expected inflation both equal 10%, and you are the borrower
- For every dollar you borrow this year, you will have to repay 1.10 dollars next year
- This looks expensive. But dollars will be worth 10% less in terms of bread next year
- So, if you borrow the equivalent of one pound of bread, you will have to repay the equivalent of one pound of bread next year
- The real cost of borrowing - the real interest rate - is equal to zero

Nominal vs. Real Interest Rate

- Now suppose you are the lender: For every dollar you lend this year, you will receive 1.10 dollars next year
- This looks attractive, but dollars next year will be worth 10% less in terms of bread
- If you lend the equivalent of one pound of bread this year, you will get the equivalent of one pound of bread next year
- Despite the 10 percent nominal interest rate, the real interest rate is equal to zero.

Nominal vs. Real Interest Rate

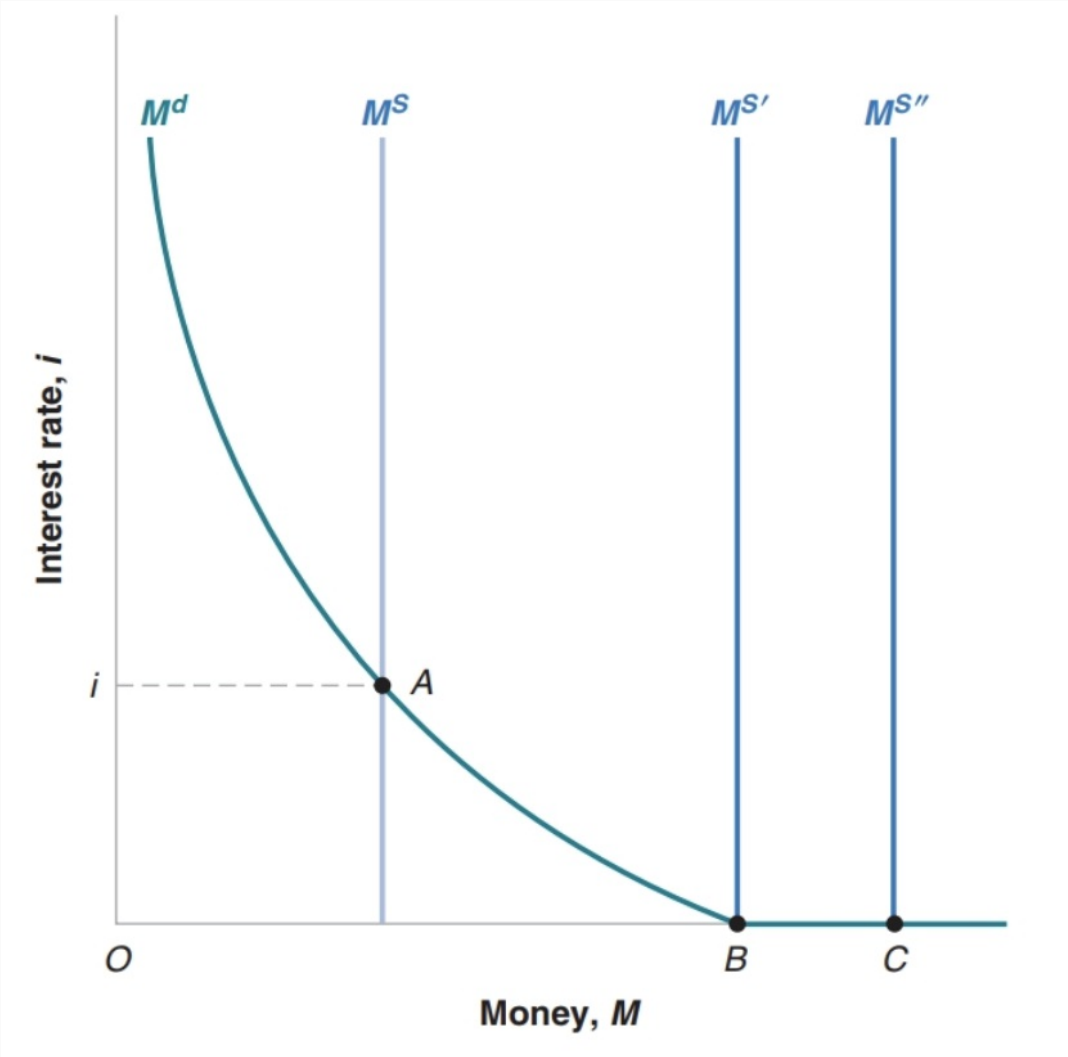
Although the nominal interest was much lower in 2006 than it was in 1981, the real interest rate was actually higher in 2006 than it was in 1981



Zero Lower bound

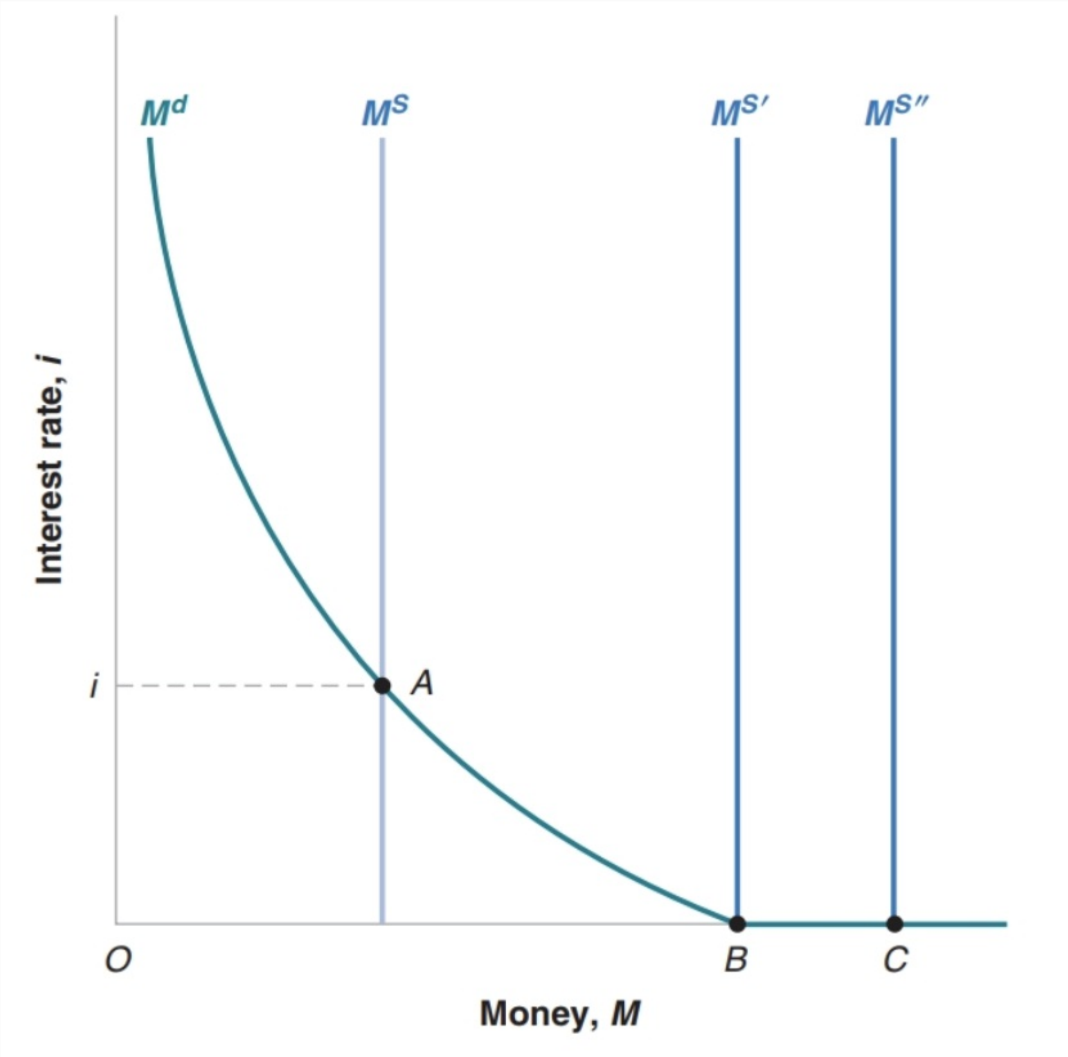
- If the nominal interest rate was negative, would people hold bonds?
- No! That means that their wealth would be losing value over time. They would be better off holding money because it has a nominal return of 0%
- **zero lower bound**: the **nominal** interest rate cannot go below zero
- When the interest rate is zero, people are indifferent between money and bonds.
- **liquidity trap**: Monetary policy cannot decrease the (target) interest rates below 0%

Zero Lower bound



- expansionary monetary policy: an increase in the money supply - a shift of the M^s line to the right - leads to a decrease in the interest rate

Zero Lower bound



- Now consider the case where the money supply is $M^{S}{'}$, so the equilibrium is at point B
- The money supply increases, but with no effect on the interest rate - which remains equal to zero

Zero Lower bound

- Although the central bank chooses the nominal (target) rate interest, it cares about the real interest rate, and thus has to take into account expected inflation
- For example, if it wants to set the real interest rate equal to r, it must choose the (target) nominal rate i so that, given expected inflation, π^e, the real interest rate, $r = i - \pi^e$, is at the level it desires
- For example, if it wants the real interest rate to be 4%, and expected inflation is 2%, it will set the nominal (target) interest rate at 6%
- so, we can think of the central bank as targeting at the real interest rate, rather than the nominal rate interest

Zero Lower bound

- Does the real interest rate have a zero lower bound like nominal interest rates do?
- No, but real interest rates are bounded below based on the zero lower bound and the level of expected inflation: $r_t = i_t - \pi^t_{t+1}$, and $i_t \geq 0 \implies r_t \geq -\pi^e_{t+1}$
- So if inflation is 2%, then the real interest rate cannot fall below -2%

Risk Premium

Risk Premium

Up until now we have assumed that everyone is able to borrow at the same interest rate, the target nominal interest rate decided by the central bank

- In the real world, this is not the case.
- the U.S. federal government borrow funds by issuing federal government bonds
  - this can be considered as risk-free
  - because the federal government can always repay debt (how?)
- firms borrow funds by issung corporate bonds, and they might fail to repay the debt or pay the interest payment to their bonds holders
- households borrow from banks by taking loans, and they might fail to repay too

Risk Premium

- To compensate for this risk of default, firms and households who borrow have to pay a slightly higher interest rate than risk-free borrowing like U.S. federal government bonds
- This difference in interst rates is called the **risk premium**
- x: risk premium
- i: interest rate on risk-free borrowing
- p: probability of default
- How large should x be?

Risk Premium

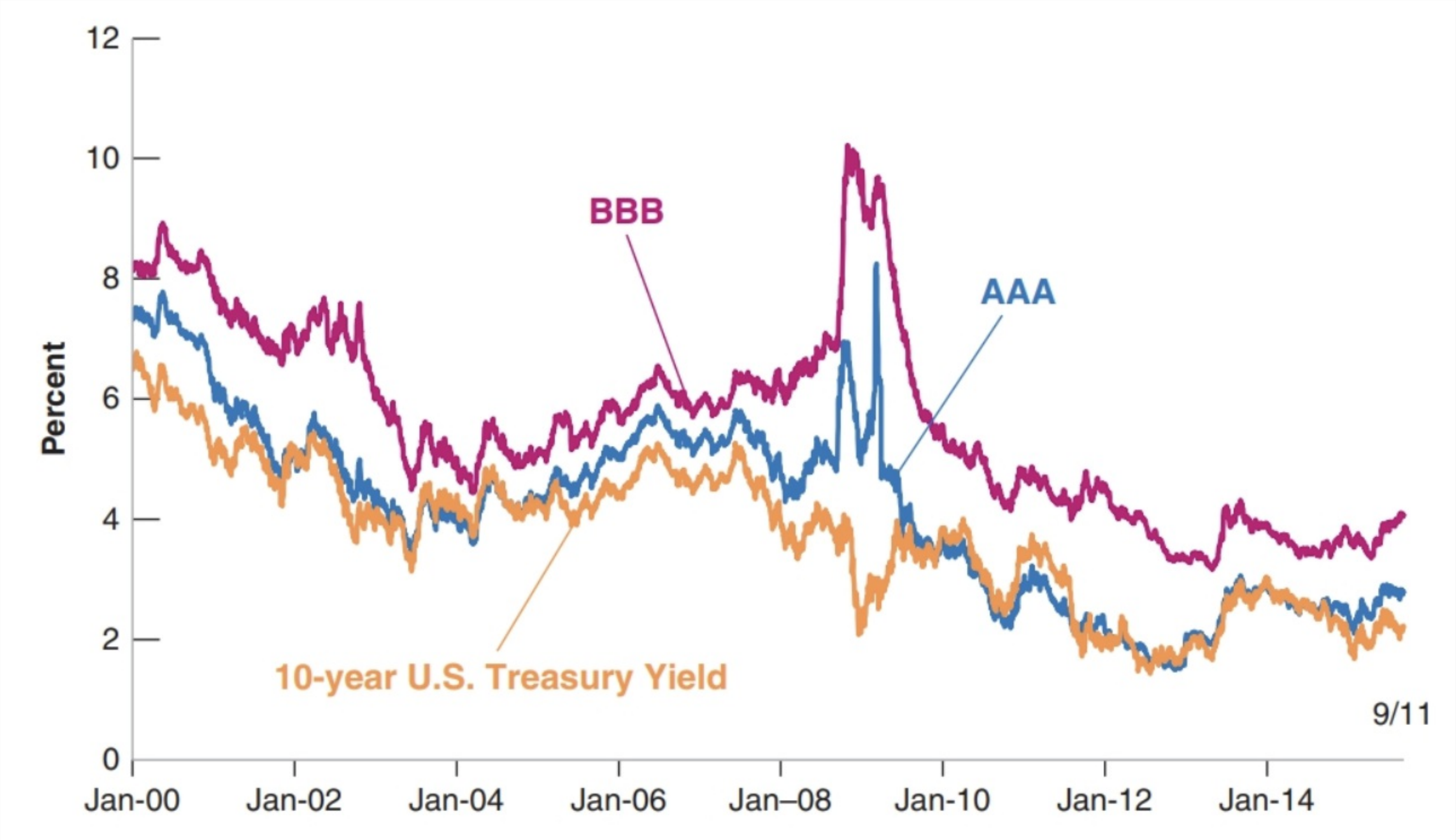
- The risk premium needs to be at least large enough to make the risky bond pay at least as much as a risk free bond in expectation
- mathematically, expected return on riskless asset = Expected return on risky asset
- $1 + i = (1 - p) \times (1 + i + x) + p \times 0$
- solve for x: $x = (1 + i)\frac{p}{1-p}$
- As the probability of default p rises, the risk premium x increases

Risk Premium

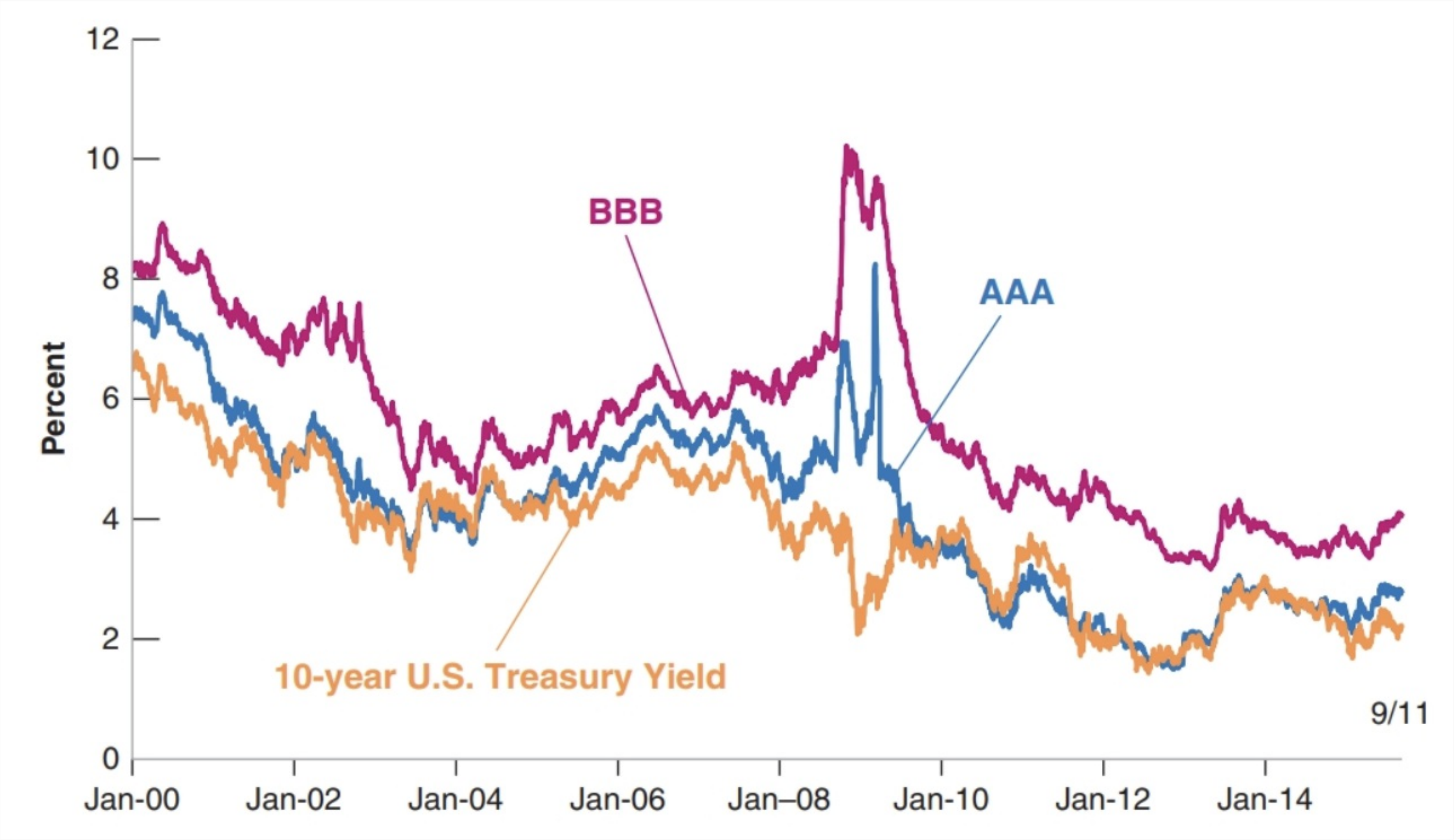
- The risk premium tends to be larger than necessary to equate the expected return of a risky and a riskless asset. This is because economic agents tend to be **risk averse**
- If given a choice between an asset with a sure return of 5% and an asset that pays 10% half the time and 0% half the time, people tend to pick the sure thing
- The more risk averse the lender is, the higher the risk premium will be to compensate them for the risk that they are taking on by issuing the debt

Risk Premium

- U.S. government bonds: nearly riskless
- corporate bonds rated respectively as safe (AAA) and less safe (BBB) by ratings agencies

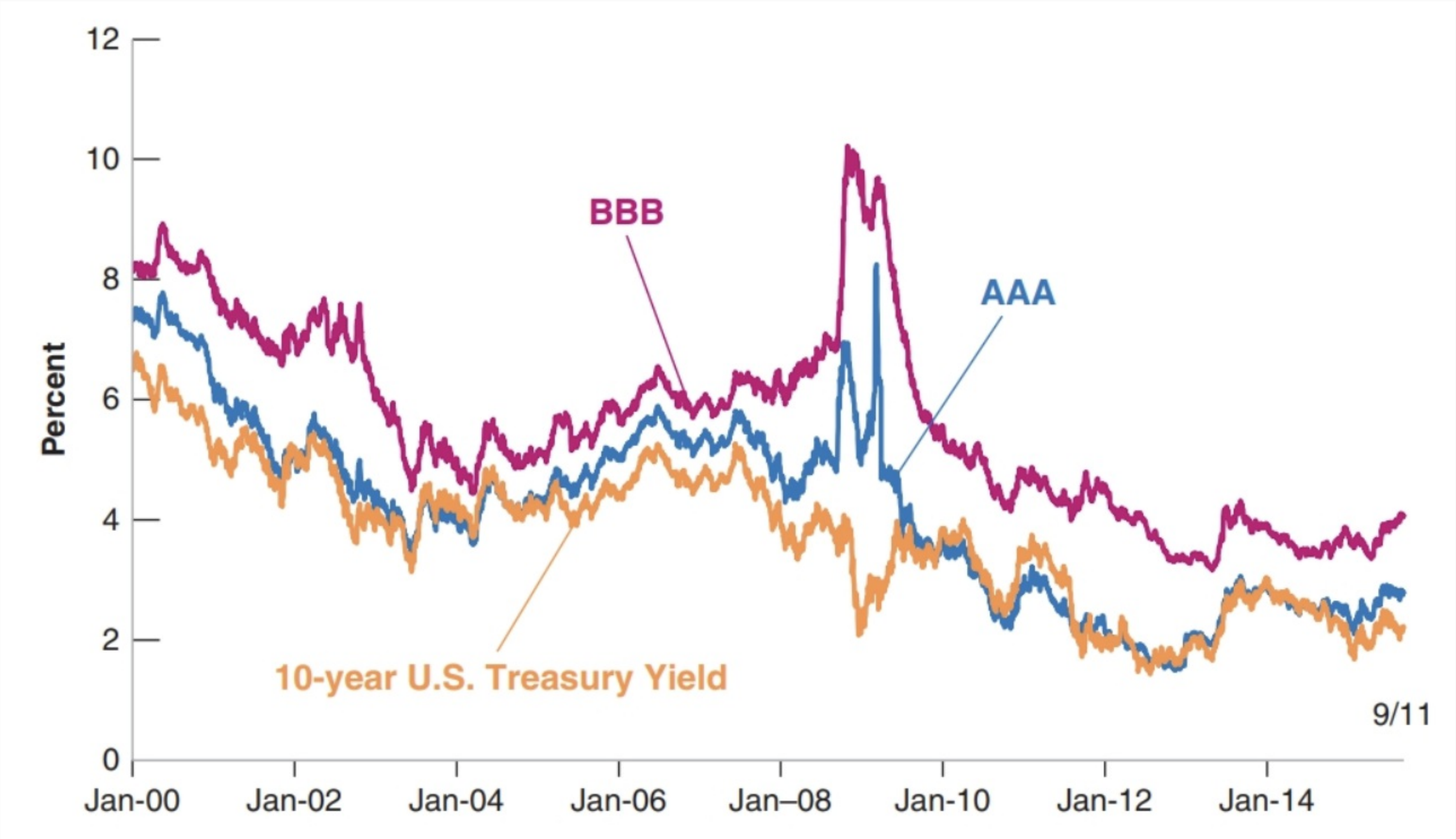


Risk Premium



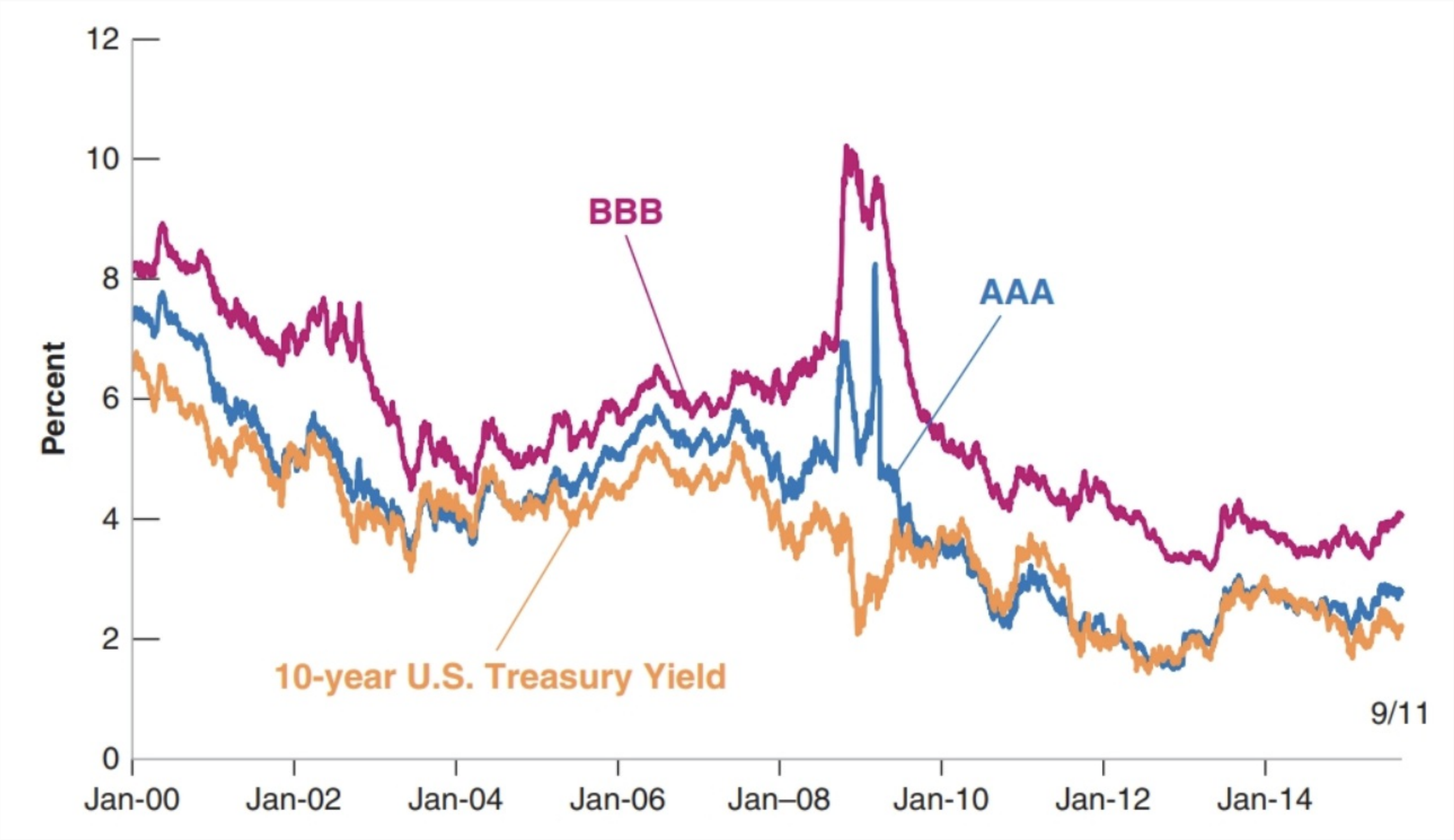
- the rate on AAA corporate bonds is higher than the rate on U.S. government bonds
- the rate on BBB corporate bonds is higher than the rate on AAA bonds

Risk Premium



- 2008-2009 financial crisis: the rate on government bonds decreased, reflecting the decision of the Fed to decrease the policy rate
- the interest rate on AAA or BBB bonds increased sharply

Risk Premium



- we have to relax our assumption that it is the policy rate that enters the IS-LM relations
- The rate at which many borrowers can borrow may be much higher than the policy rate

Extended IS-LM

Extended IS-LM

We now incorporate the ideas of a real interest rate and risk premiums into the IS-LM model we developed earlier

- We assume that investment I responds to the real interest rate r plus the risk premium x
- $r + x$: **borrowing rate**
- We assume that the central bank targets a real interest rate $\bar{r}$ by taking into account expected inflation
- $\bar{r}$: **policy rate**

Extended IS-LM

Our two equilibrium conditions are now:

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

$$r = \bar{r}$$

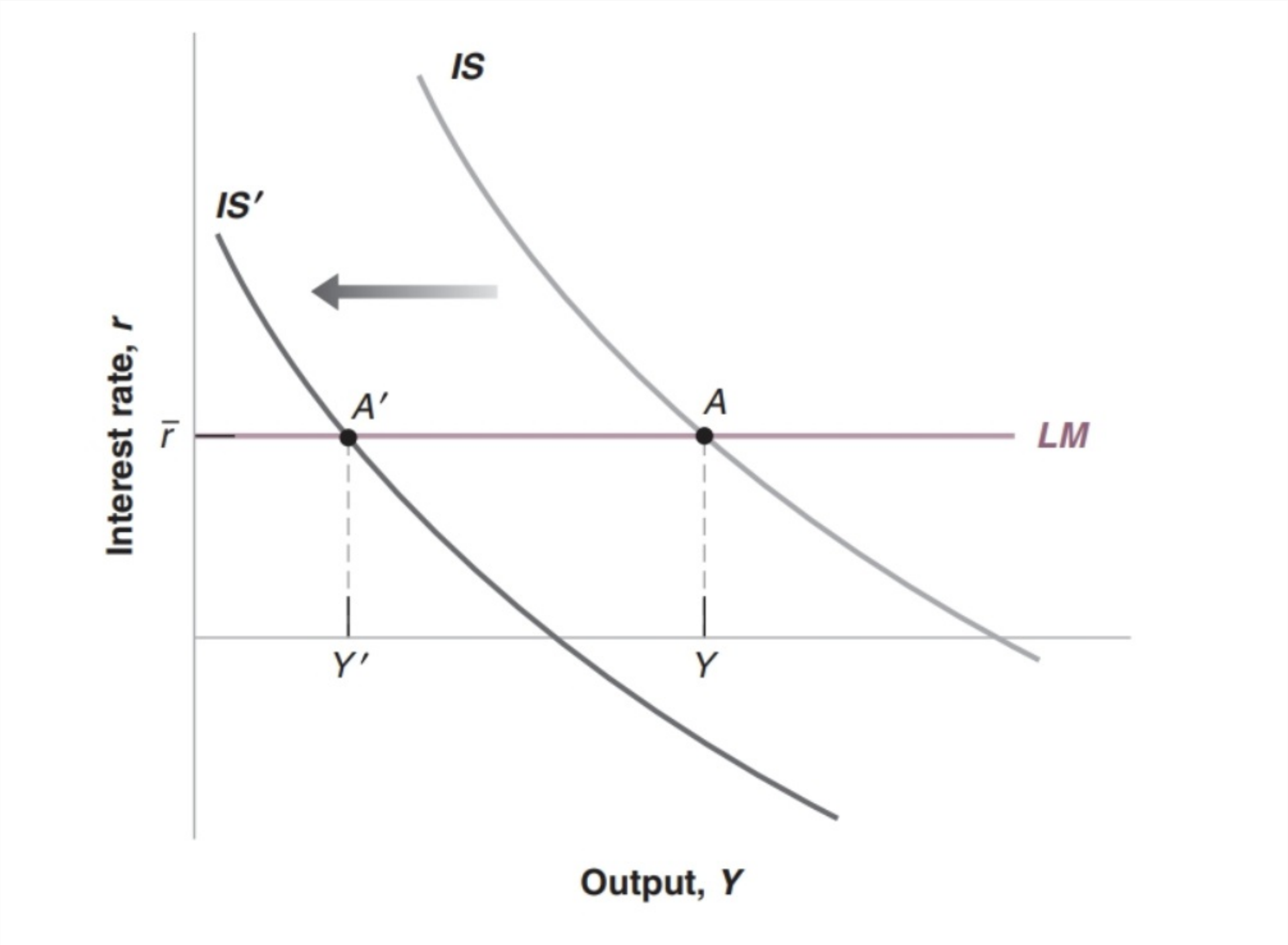
- In drawing the IS-LM model, we now have the real interest rate r on the **vertical** axis

Group Work V

- What happens when the probability of default increases?
- The risk premium increases!
- What happens to the IS and LM curves when the risk premium increases?
- The IS curve shifts to the left because higher borrowing rates leads to less investment demand at any real interest rate r

Group Work V

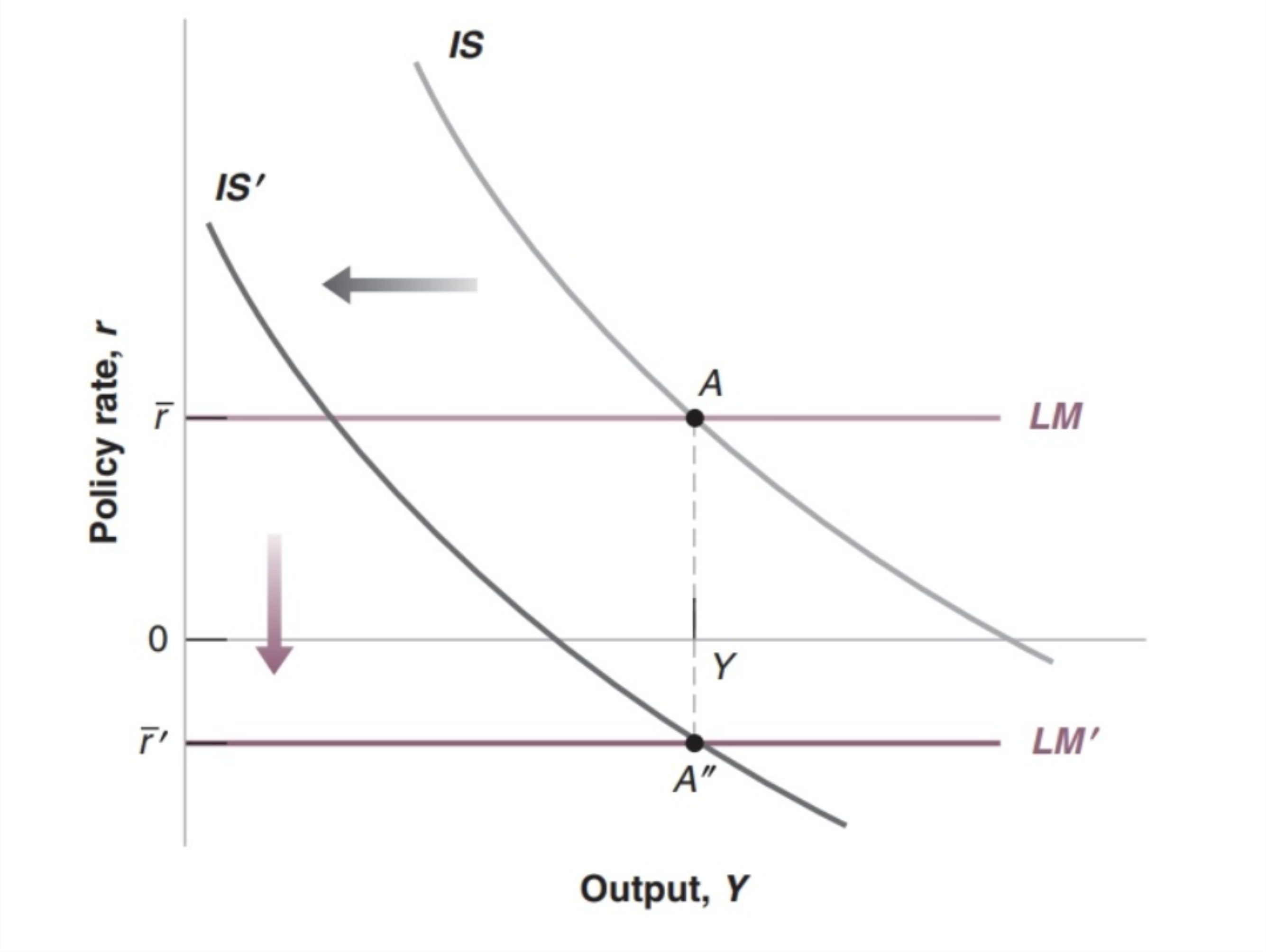
- Higher probability of default leads to lower equilibrium output Y



- What can policy do to cope with the lower output?

Group Work V

- Option 1: Monetary policy
- A sufficient decrease in the policy rate can in principle be enough to take the economy to its initial level



https://fred.stlouisfed.org/series/FEDFUNDS

Group Work V

- Option 2: fiscal policy
- What fiscal policies would you suggest to return the output to its original level?
- an increase in G, or a decrease in T
- will shift the IS curve to the right and increase output
- But a large increase in spending or a cut in taxes may imply a large increase in the budget deficit