

# Elements of Macroeconomics

March 2023

## 14 Money, Banks, and the Federal Reserve System Part 2

### 14.1 Taylor Equation

Central banks do not target money supply, but interest rates. One way to think about it is through the Taylor equation:

$$i_f = \pi + \alpha(\pi - \pi^*) + \beta(U^* - U) + r_f^* \quad (1)$$

With:

- $i_f$ : Nominal Fed Funds rate
- $\pi$ : Inflation
- $\pi^*$ : Inflation target
- $U$ : Unemployment rate
- $U^*$ : Natural rate of unemployment
- $r_f^*$ : Neutral Real Fed Funds rate
- $\alpha, \beta$ : Loading factors: Importance of inflation vs unemployment rate deviation

We can split it up into three parts:

#### 1. Fisher Equation:

$$i_f = \pi + r_f^*$$

2. **Inflation response:** If inflation is higher than we want it to be, increase interest rates to slow the economy down.

$$\alpha(\pi - \pi^*)$$

3. **Unemployment response:** If the unemployment rate is higher than we want it to be, decrease interest rates to boost the economy.

$$\beta(U^* - U)$$

Why is it not a rule?

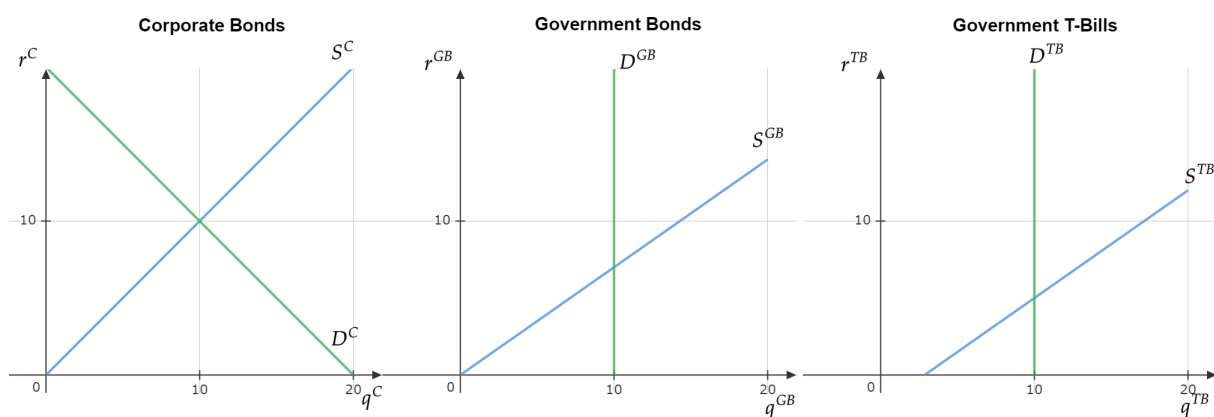
- What is  $U^*$ ?
- What is  $r_f^*$ ?
- Which measures for  $\pi$  and  $U$  should we use?
- What is the effect on the government bonds and corporate bonds market?

## 14.2 Expanded Loanable Funds Model

The expanded loanable funds model adds a third market: Government T-Bills. Why? Because that's where the FED operates in normal times.

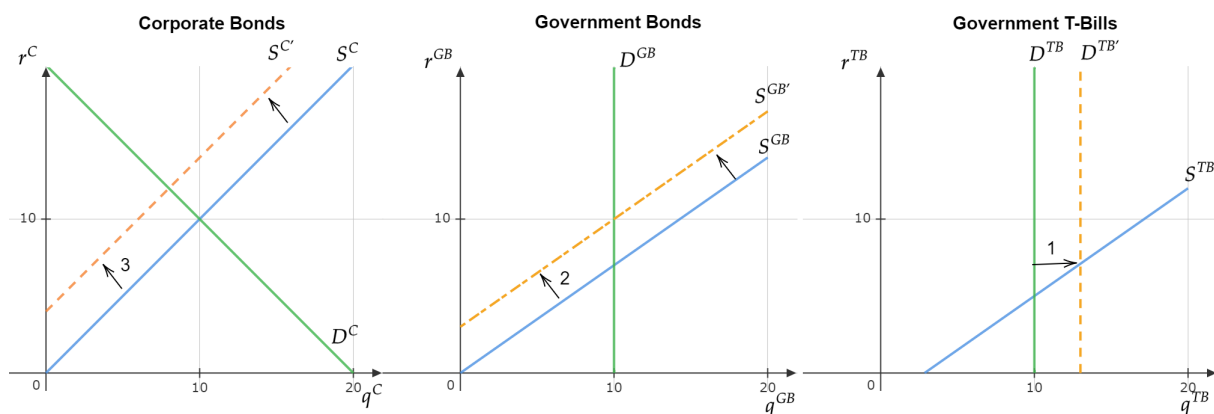
We can characterize the markets like this:

	Risk	Duration	Interest rate
<b>Corporate Bonds</b>	<b>High</b>	Long Term	Highest
<b>Government Bonds</b>	Low	Long Term	Middle
<b>Government T-Bills</b>	Low	<b>Short Term</b>	Lowest



When the Fed wants to increase interest rates:

1. Fed sells T-Bills  $\Rightarrow$  Higher  $r^{TB}$
2. Long term/Short term spread got reduced  $\Rightarrow$  Investors want to have a higher interest rate for long-term bonds  $\Rightarrow$  Higher  $r^{GB}$
3. Risk free/risky spread reduced  $\Rightarrow$  Investors want to have a higher interest rate for risky corporate bonds  $\Rightarrow$  Higher  $r^C$  AND Lower  $q^C$



### 14.3 Exercises

**Q1: Stagflation:** Now assume we are in a stagflation situation where:

- $\pi = 4\%$
- $\pi^* = 2\%$
- $U = 6\%$
- $U^* = 4\%$
- $r^* = 2\%$
- $\alpha = 0.5$

1. Why is it called stagflation?
2. How should the fed respond to the unemployment gap and inflation gap?
3. Which level of  $i_f$  would the Fed target if  $\alpha = 0.5$  and  $\beta = 1$ ?

**Q2: Quantitative Easing** Answer the following questions:

1. What is the problem when  $i_f$  is below 0?
2. What is the lowest level the fed can set  $r_f$ ? Why?

If the fed wants to reduce interest rates further, they can buy bonds in the long term market as well.

3. Draw the loanable funds model when  $i_f$  is at 0.
4. Show how QE works, eg show what happens when the fed sells government bonds.
5. Draw the effects on the corporate bonds market

### 14.4 How to prepare for the Midterm?

#### Topics

- Basics:
  - Vocabulary
  - If bond prices go up, yields go down
  - Fisher Equation
  - Expectations theory of the term structure
  - Loanable Funds Model
  - Paradox of Thrift
- Money, Banks, and the Fed System
  - Quantity Theory of Money
  - Taylor Equation
  - Extended Loanable Funds Model
  - How does monetary policy affect inflation (6 Relationships)

#### General Advice

- Read carefully: There are a lot of stupid mistakes you can make
- Always explain what you are doing! State assumptions you are making and explain the shifts in graphs briefly.
- Write a formula before you plug in numbers.