Elements of Macroeconomics

March 2023

13 Money, Banks, and the Federal Reserve System

In this section, we look at the financial side again. This means:
If Bond prices go up, yields go down!

13.1 Money Creation

Money is created by banks! How do they do it? By creating loans. How much they can create depends on the amount of required reserves.

A simple example

- Person A goes to the bank and deposits \$1,000.
- Firm B wants a loan. With required reserves of 20%, the bank can give a loan up to \$800.
- The balance sheet of the Bank grew from \$1,000 to \$1,800

The money multiplier How much money can the banking system create out of their deposits?

- In our example, the bank can create loans from all deposits it has. The only restriction is the required reserve ratio.
- The maximum level of money the bank can create is the money multiplier (MMP) times the original deposit:

$\Longrightarrow$

$$MMP * \$1,000 = \$1,000 + 0.8 * \$1,000 + 0.8^2 * \$1,000 + 0.8^3 * \$1,000 + ...$$
$$MMP * \$1,000 = \sum_{i=0}^{\infty} 0.8^i * \$1,000 = \frac{1}{1-0.8} * \$1,000 = \frac{1}{0.2} * \$1,000$$
$$MMP = 5 = \frac{1}{0.2}$$

- Or, the money multiplier is the inverse of the required reserve ratio.

$$\text{Money multiplier} = \frac{1}{\text{Required reserve ratio}}$$

13.2 The Quantity Theory of Money

The quantity theory of money can be summarized with the following equation:

$$\underbrace{P}_{PriceLevel} * \underbrace{Y}_{Output} = \underbrace{V}_{Velocity} * \underbrace{M}_{MoneySupply} \tag{1}$$

The left hand side tells us the total monetary value of the economy. The right hand side tells us how much money is needed for all the transactions.

We can also look the equation in growth rates:

$$\%\Delta P + \%\Delta Y = \%\Delta M + \%\Delta V \tag{2}$$

Assuming that velocity does not change, the role of the central bank is trivial! Change the money supply and you can control output and inflation.

Problems with this Theory

1. Assumption that velocity (V) is not stable
   This is not true. Velocity is extremely volatile. For instance, when the price level increases exogenous (oil price shock), output and money supply cannot adjust as quickly, hence, velocity has to increase. This is what we see in the data.

2. How to control money supply (M)?
   We have seen that banks create money. By changing the interest rate or required reserves, the central bank can somehow change the money supply, BUT this is only indirect.

3. Which definition of M do we care about?
   There are different definitions of money supply (M). Do we care about the banknotes in the system or also bonds?

13.3 Monetary Policy

The alternative is to manage the **real interest rate**. This is what the FED is doing. How? For this, we can look at our federal funds model:

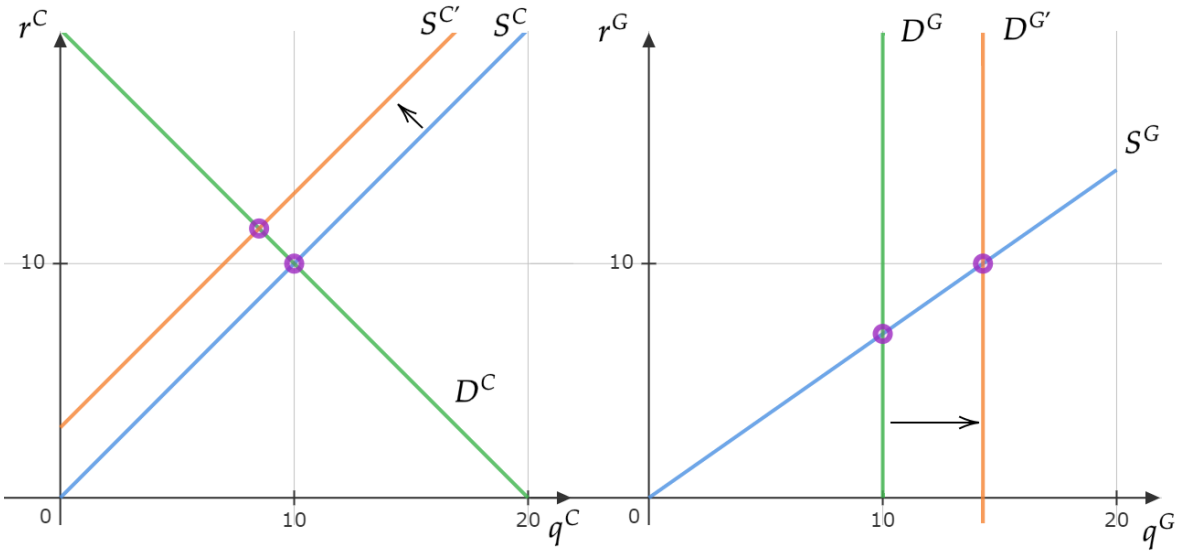

Figure 1: Loanable Funds Model with monetary tightening

Assume the fed wants to fight inflation and step on the break.

- The fed wants to increase real interest rates
- Loanable Funds model: increase the demand in government bonds
- Fed can sell government bonds, meaning the government demand just increased

$\Longrightarrow$ If the FED sells government bonds, the price goes **down**

$\Longrightarrow$ Therefore, the yields go **up!**

What happens on the corporate market?

- If the risk free real interest rate goes up, the outside option of investors in the in the corporate market just got better.
- Investors are willing to lend to firms for a higher interest rate only!

$\Longrightarrow$ Therefore, the interest rate r^C goes **up!**

- Remember: Firm bonds are still more risky
- Remember: If investors do not get a high interest rate from firms, they are happy to buy more treasuries. They are **substitutes**.

What happens to the Economy? AD/AS Model

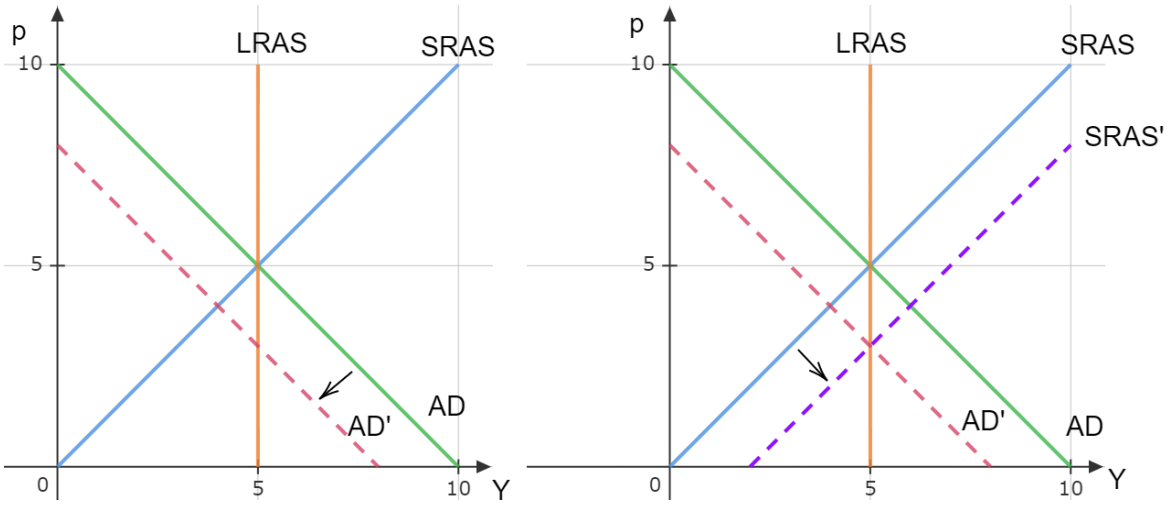

Figure 2: AD/AS Model with monetary tightening

- When firms do not invest as much in projects due to the higher interest rate, the aggregate demand falls.
- As the long run aggregate supply did not change, the short run aggregate supply adjusts. They do it by lowering wages and prices

6 Relationships

1. If the central bank sells t-bills $\Longrightarrow$ fed funds rate increases *(Loanable funds model)*
2. If fed funds rate increases $\Longrightarrow$ real interest rate faced by corporations and households increases *(Loanable funds model)*
3. If real interest rate faced by corporations and households increases $\Longrightarrow$ firms and households reduce investment *(Diminishing returns)*
4. If firms and households reduce investment $\Longrightarrow$ growth rates decrease $\%\Delta Y$ *(AE or AD/AS Model)*
5. If growth rates decrease $\Longrightarrow$ Output gap increases *(AE or AD/AS Model)*
6. If Output gap increases $\Longrightarrow$ unemployment falls and prices decrease *(AD/AS Model)*