Elements of Macroeconomics

Week 11

14   Finance II

14.1   Quantity Equation vs Taylor Rule

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

$$\underbrace{P}_{\text{Price Level}} * \underbrace{Y}_{\text{Output}} = \underbrace{V}_{\text{Velocity}} * \underbrace{M}_{\text{Money Supply}} \tag{1}$$

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?

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

$$i_f = \pi + \alpha(\pi - \pi^*) + \beta(U^* - U) + r_f^* \tag{3}$$

With:

- i_f: Nominal Fed Funds rate
- π: Inflation
- π^*: Inflation target
- U: Unemployment rate

- U^*: Natural rate of unemployment
- r_f^*: Neutral Real Fed Funds rate
- α, β: 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 our target, we increase interest rates to slow the economy down.

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

3. **Unemployment response**: If the unemployment rate is higher than our target, decrease interest rates to boost the economy.

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

Why is it not a rule?

- What is U^* and is it constant?
- What is r_f^* and is it constant?
- Which measures for π and U should we use?
- What is the effect on the government bonds and corporate bonds market?

14.2   Monetary Policy in the Extended Loanable Funds model

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

We can characterize the markets like this:

	Risk	**Duration**	**Interest rate**
Corporate Bonds	**High**	Long Term	Highest
Government Bonds	Low	Long Term	Middle
Government T-Bills	Low	**Short Term**	Lowest
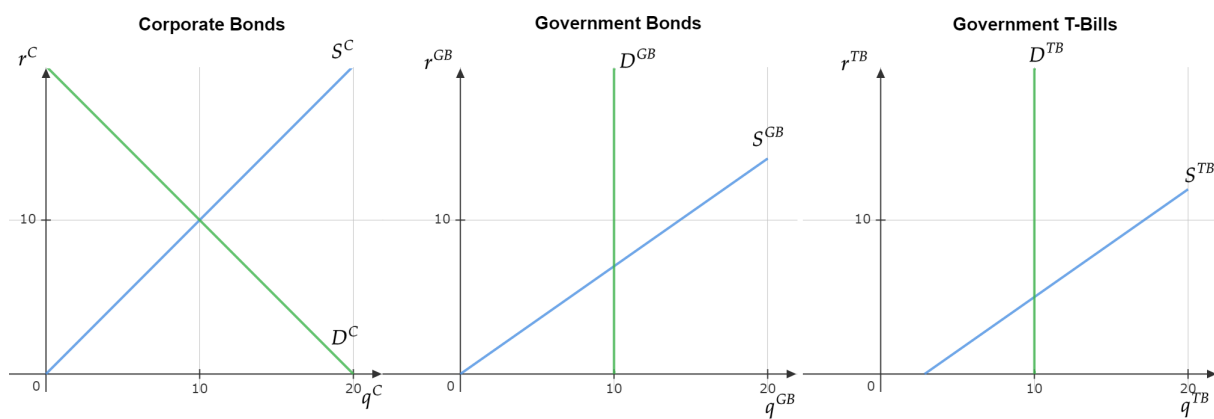
Basics we need to know:

1. Why are the supply curve upward sloping?

2. Why is the D^C downward sloping?

3. Why are D^{GB} and D^{TB} vertical?

4. Why do we have $r^{TB} < r^{GB} < r^C$?

When the Fed wants to increase interest rates:

1. Fed sells T-Bills $\implies$ Lower price $\implies$ Higher r^{TB}

2. Long term/Short term spread got reduced $\implies$ Investors want to have a higher interest rate for long-term bonds $\implies$ Higher r^{GB}

3. Risk free/risky spread reduced $\implies$ Investors want to have a higher interest rate for risky corporate bonds $\implies$ Higher r^C AND Lower q^C

What happens to the Economy? AD/AS Model

1. With Higher r^C AND Lower q^C $\implies$ firms do not invest as much in projects $\implies$ Lower I $\implies$ Lower AD

2. As the long run aggregate supply did not change, the short run aggregate supply adjusts. They do it by lowering wages and prices
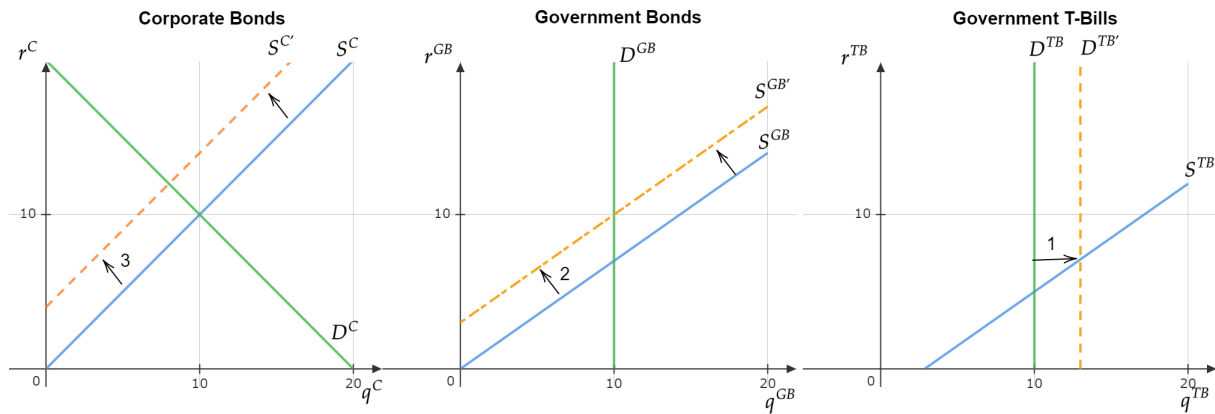
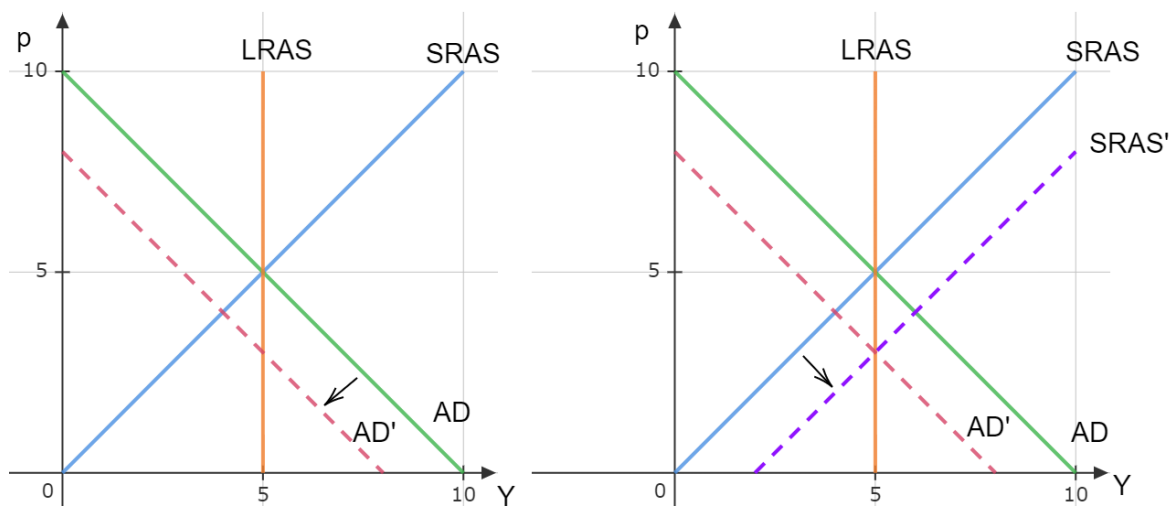Figure 1: Extended Loanable Funds model with monetary tightening

Figure 2: AD/AS Model with monetary tightening

6 Relationships

1. If the central bank sells t-bills $\implies$ fed funds rate increases *(Loanable funds model)*

2. If fed funds rate increases $\implies$ real interest rate faced by corporations and households increases *(Loanable funds model)*

3. If real interest rate faced by corporations and households increases $\implies$ firms and households reduce investment *(Diminishing returns)*

4. If firms and households reduce investment $\implies$ growth rates decrease $\%\Delta Y$ *(AE or AD/AS Model)*

5. If growth rates decrease $\implies$ Output gap increases *(AE or AD/AS Model)*

6. If Output gap increases $\implies$ unemployment falls and prices decrease *(AD/AS Model)*

Exercises: What happens to the interest rates and quantities in the extended loanable funds model?

1. Savers become more risk averse

   - Corporate bonds become less attractive, because they are riskier than gov't bonds $\rightarrow$ S^C shifts left/up
   - Government bonds become more attractive $\rightarrow S^G$ shifts right/down

2. Increased MPS (marginal propensity to save)

   - Corporate bonds become more attractive $\rightarrow S^C$ shifts right/down
   - Government bond becomes more attractive $\rightarrow S^G$ shifts right/down

3. Economic crisis/recession

   - Corporate bonds become less attractive $\rightarrow S^C$ shifts left/up
   - Government bonds become more attractive $\rightarrow S^G$ shifts right/down

4. Corporate expectation get worse

   - Corporate demand gets reduced $\rightarrow D^C$ shifts left
   - Less funds are supplied in corporate market which increases supply in the government market (markets are substitutes) $\rightarrow S^G$ shifts right/down

5. Decreased profitability of investment projects

   - Corporate demand gets reduced $\rightarrow D^C$ shifts left
   - Less funds are supplied in corporate market which increases supply in the government market (markets are substitutes) $\rightarrow S^G$ shifts right/down

6. Expanded budget deficit (war, increased social security spending/pensions, etc.)

   - Government demand increases $\rightarrow D^G$ shifts right
   - More funds are supplied in government market which decreases supply in the government market $\rightarrow S^C$ shifts left