

LSE EC1B5

Macroeconomics

Handout 12

Monetary Systems

Key Ideas

1. Most central banks have the object of lowering inflation and unemployment.
2. Central bank holds the reserves of private banks, which allows it to do three things: (i) set a key short-term interest rate; (ii) influence the money supply and the inflation rate, and (iii) influence long-term real interest rates.

The central bank is the government institution that:

- Monitors financial institutions
- Controls certain key interest rates
- Indirectly controls the money supply

These activities are known as **monetary policy**.

Example: The Federal Reserve

The Fed uses monetary policy to pursue two key goals:

1. Low and predictable levels of inflation
2. Maximum (sustainable) levels of employment

What does the Fed do?

- Influences **short-term interest rates**, especially the federal funds rate
- Influences the money supply and the inflation rate
- Influences long-term real interest rates

To understand these three objectives, we will discuss the following, in order:

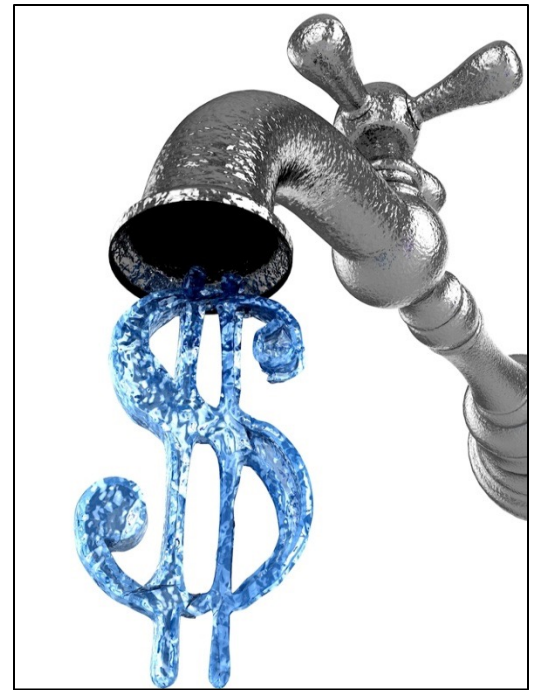
1. The role of bank reserves in the economy
2. The equilibrium in the market for bank reserves
3. The Fed's influence on the money supply and inflation
4. The impact of short-term interest rates on long-term interest rates

Bank Reserves

Bank reserves are the combination of deposits that private banks hold at the central bank and cash in their vaults.

Bank reserves provide **liquidity** to private banks.

Liquidity refers to funds (and assets) that can be used *immediately* to conduct transactions.



Federal funds market

The market where banks borrow and lend reserves to one another.

Federal funds rate

The overnight (24-hour) interest rate charged in this market.

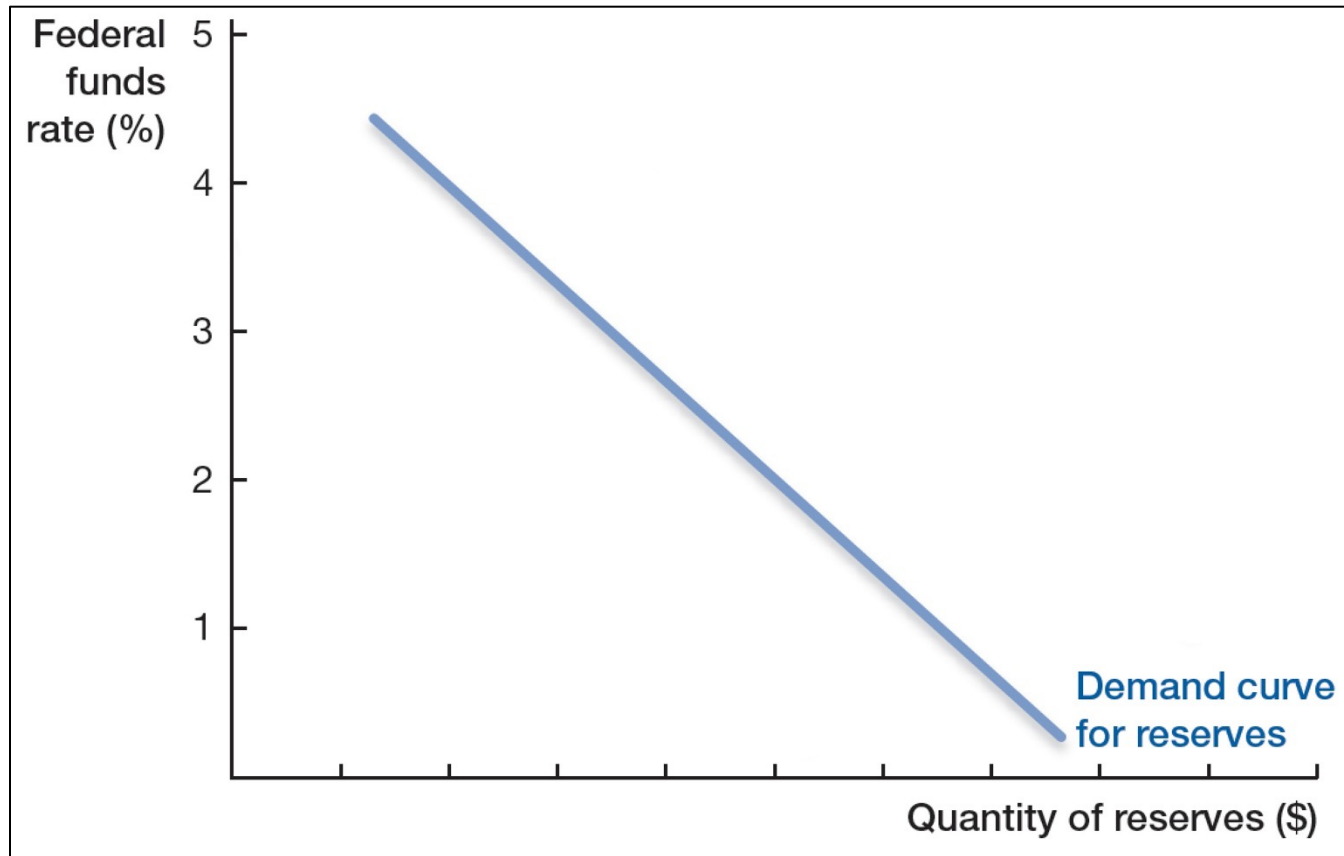
We will use the supply and demand model to see how the federal funds rate is determined.

The Demand Curve for Reserves

The **demand curve for reserves** plots the total quantity of reserves demanded by private banks for each level of the federal funds rate.

The demand curve slopes downward because optimizing banks choose to hold more reserves as the cost of those reserves—the federal funds rate—falls.

The Demand Curve for Reserves



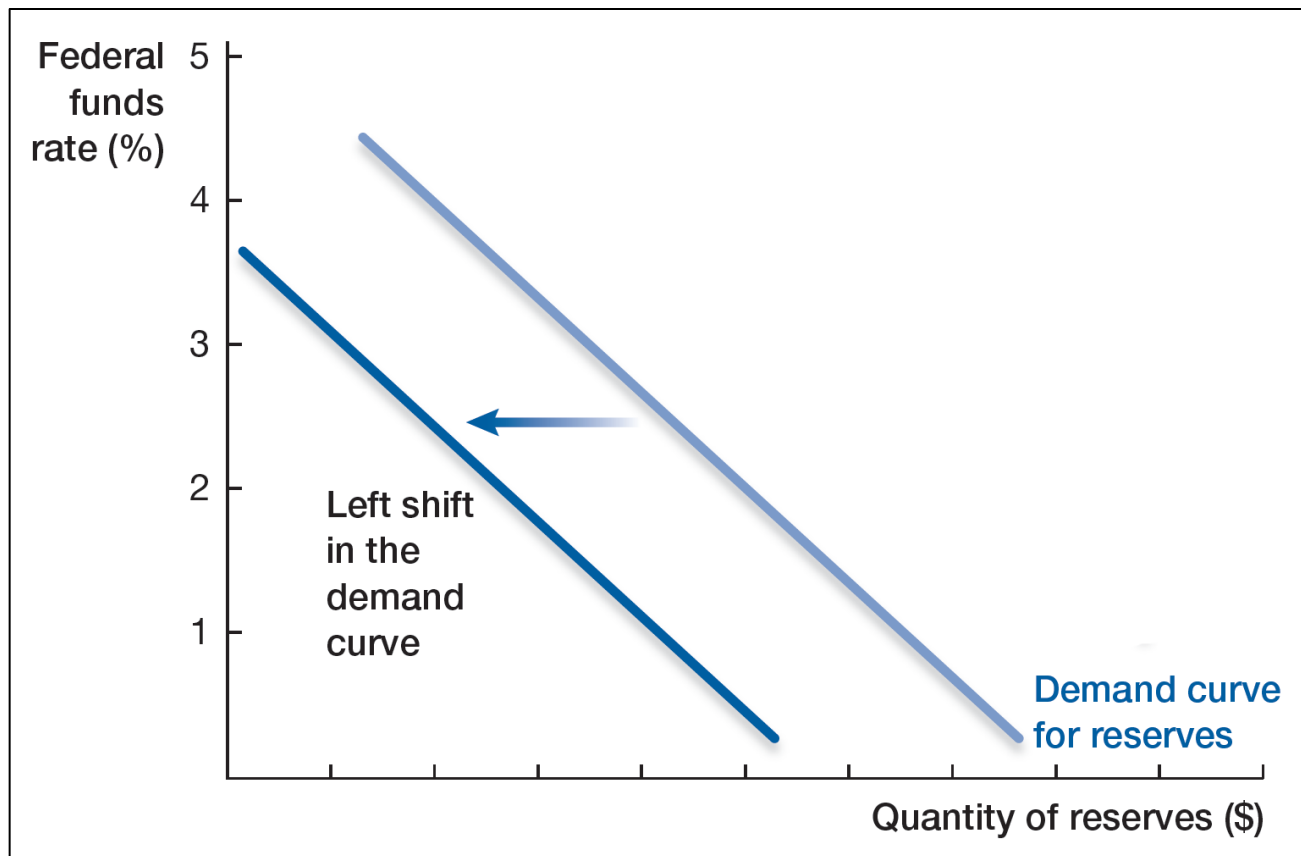
The Demand Curve for Reserves

The demand curve for bank reserves *shifts* when one of the following changes occurs:

1. Economic expansion or contraction
2. Changing liquidity needs
3. Changing deposit base given the reserve requirement
4. When the **Fed changes reserve requirement** (currently at 10%)
5. When the **Fed changes interest rate paid to the deposit** at the Fed.

The Demand Curve for Reserves

An economic contraction decreases bank lending.

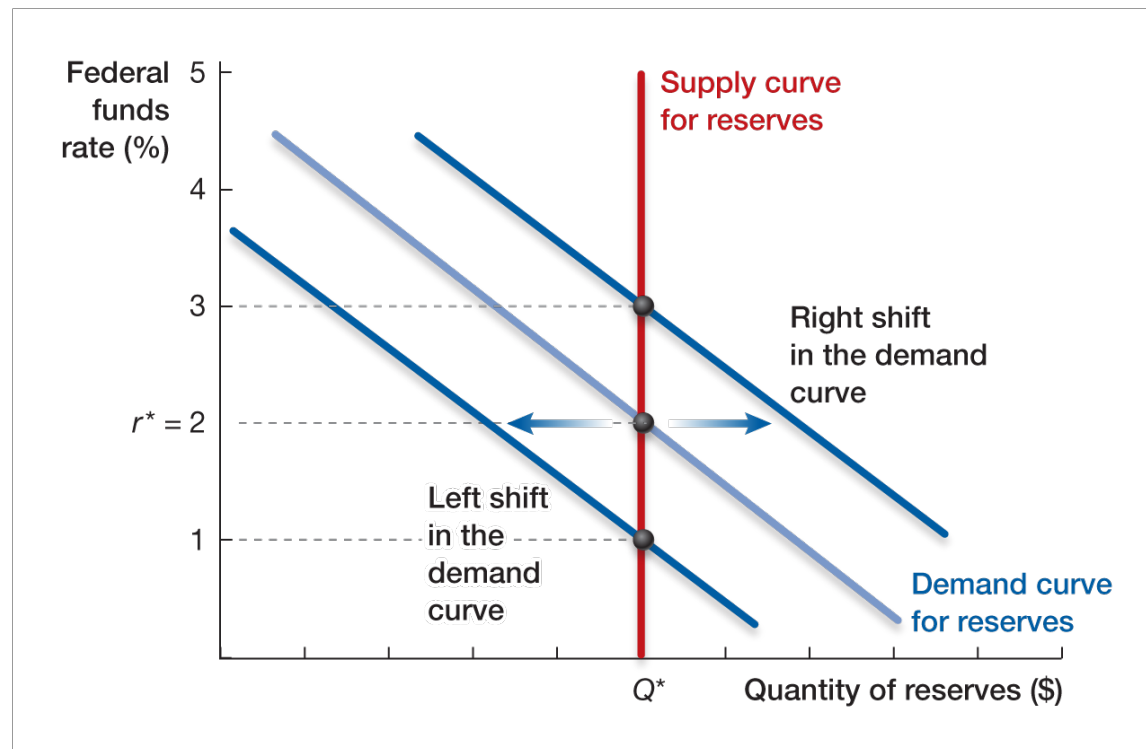


The Supply Curve for Reserves

The **supply curve for reserves** plots the quantity of reserves supplied by the Federal Reserve through open market operations.

- In an **open market purchase**, the Fed buys government bonds from private banks and in return gives the private banks more reserves.
- In an **open market sale**, the Fed sells government bonds to private banks, and in return the private banks give up some of their reserves

The Federal fund market



Equilibrium in the Federal Funds Market

The Fed has three policy tools for influencing the federal fund rate:

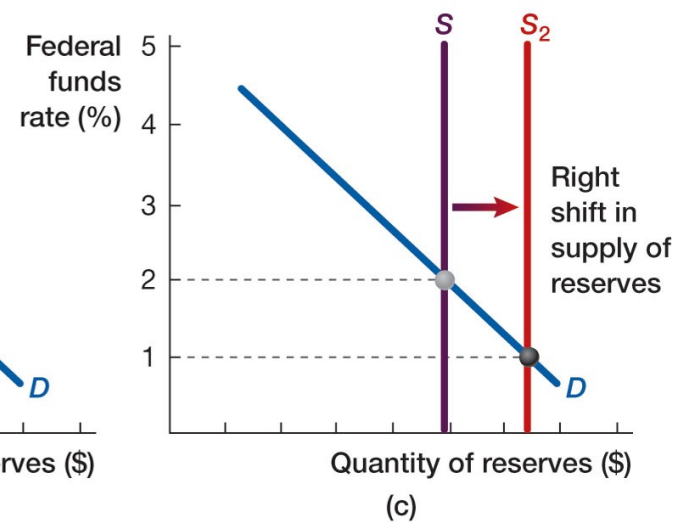
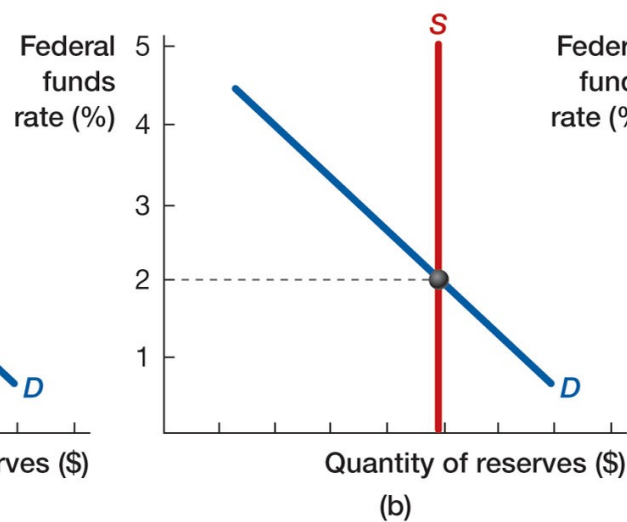
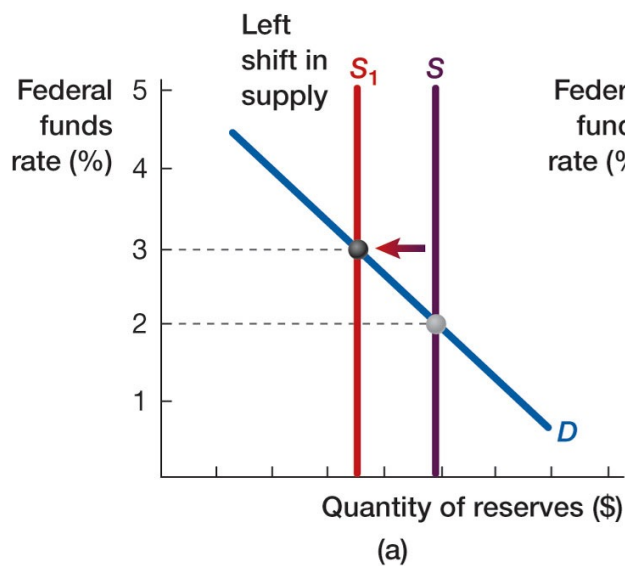
1. Changing the quantity of reserves supplied through open market operations
2. Changing the reserve requirement
3. Changing the interest rate paid on reserves

2, 3 is about changing the demand side;
The Fed focuses primarily on 1, the supply side.

- For the past 30 years, the monetary policy implemented by the Fed is to influence the federal funds rate by supplying more or less reserves.

Monetary Policy

Influences the Federal Funds Rate by shifting the Supply of Reserves

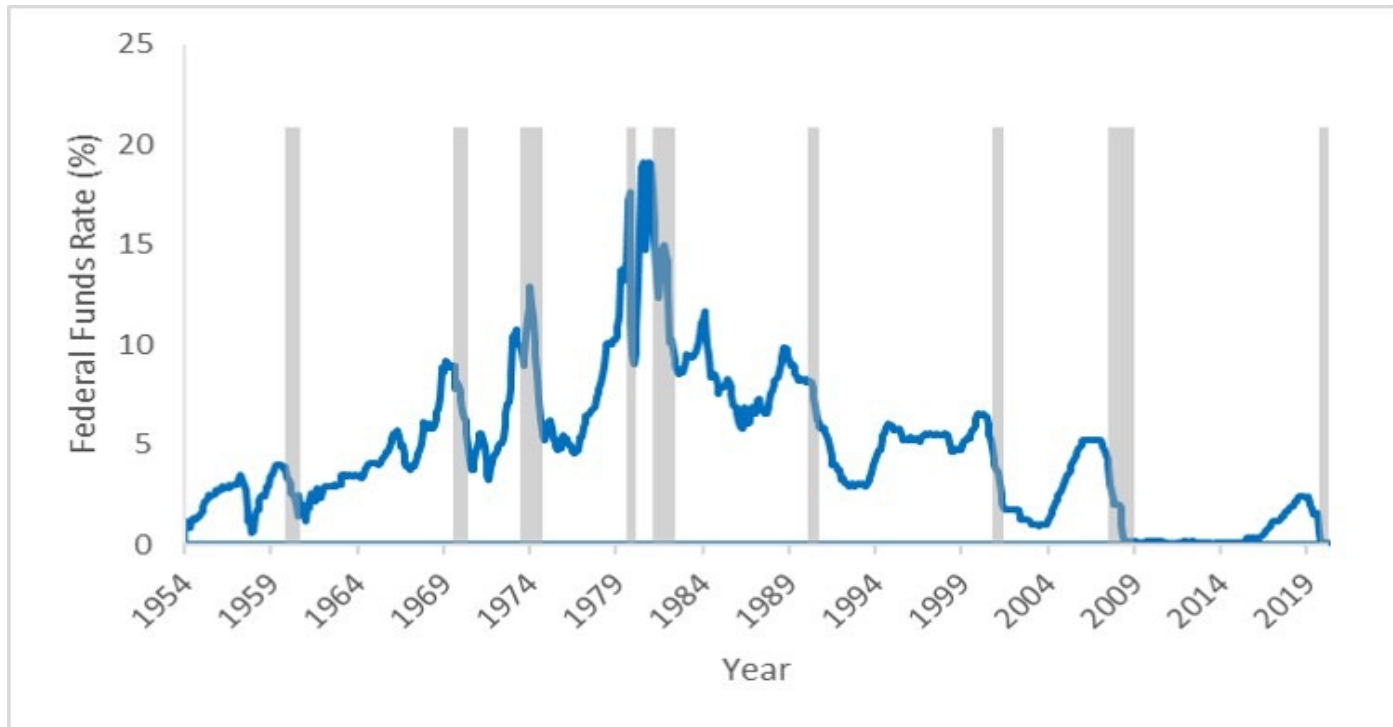


The Fed as “Lender of last resort”

- During normal times, banks that need extra reserves borrow from the federal funds market
- But some time it doesn't work (federal fund market break down), the Fed can step in as “lender of last resort”.
- The Fed lends to banks directly at the “discount window” but at a higher interest rate (“discount rate”) than the federal fund market rate.

Bank Reserves and the Plumbing of the Monetary System

The Federal Funds Rate Between July 1954 and September 2020



We said earlier that the second part of the Fed's management of bank reserves is to influence the money supply and the inflation rate.

Question: Why can't the Fed directly control either the money supply or the inflation rate?

Answer: The money supply is the sum of currency in circulation plus deposits at banks by households and firms. It does *not* include bank reserves.

In the long run, inflation is related to the growth rate of money (recall the quantity theory of money).

However, the Fed can use its three tools—open market operations, reserve requirements, and interest on reserves—to influence the money supply and the inflation rate.

To reduce the growth rate of money and the inflation rate: open market sales, increase reserve requirements, and pay higher interest on reserves

The third consequence of the Fed's management of bank reserves is its influence over long-term interest rates by altering inflationary expectations:

Real interest rate = Nominal interest rate –
Inflation rate

Investment decisions depend on **long-term expected real interest rates**.

Long-term indicates 10 years or more.

The expected real interest rate is the nominal interest rate minus expected inflation.

The Federal Reserve and Long-term Interest Rate

Monetary policy in the form of open market operations can impact long-term interest rates.

Think of a 10-year loan rate as 10 one-year loans lined up one after the other:



The Federal Reserve and Long-term Interest Rate

Suppose the Fed were to lower the fed rate by 1% from 4% to 3% for two years. How does this affect the nominal 10-year interest rate?

Approximately,

Before the reduction:

$$\frac{10 \times 4\%}{10} = 4\%$$

After the reduction:

$$\frac{2 \times 3\% + 8 \times 4\%}{10} = 3.8\%$$

The Federal Reserve and Long-term Interest Rate

The exact formula uses the compound rates (recall Handout on Economic Growth)

Before the reduction:

$$(1 + i)^{10} = (1 + 4\%)^{10} \Rightarrow i = 4\%$$

After the reduction:

$$(1 + i)^{10} = (1 + 3\%)^2 (1 + 4\%)^8$$

$$(1 + i)^{10} = 1.45 \Rightarrow i = 3.8\%$$

The approximation works well for small rates.

The Federal Reserve and Long-term Interest Rate

What would be the real 10-year interest rate if inflationary expectations remained at 2%?

Before the reduction:

$$10\text{-year real interest rate} = 4.0\% - 2.0\% = 2.0\%$$

After the reduction:

$$10\text{-year real interest rate} = 3.8\% - 2.0\% = 1.8\%$$

The Federal Reserve and Long-term Interest Rate

The Fed can reduce the short-term federal funds rate to lower long-term expected real interest rates.

A 1% reduction in the federal funds rate target translates into a less than 1% reduction in long-term expected real interest rates.

In most cases, inflationary expectations stay about the same.

How do people form inflation expectations?

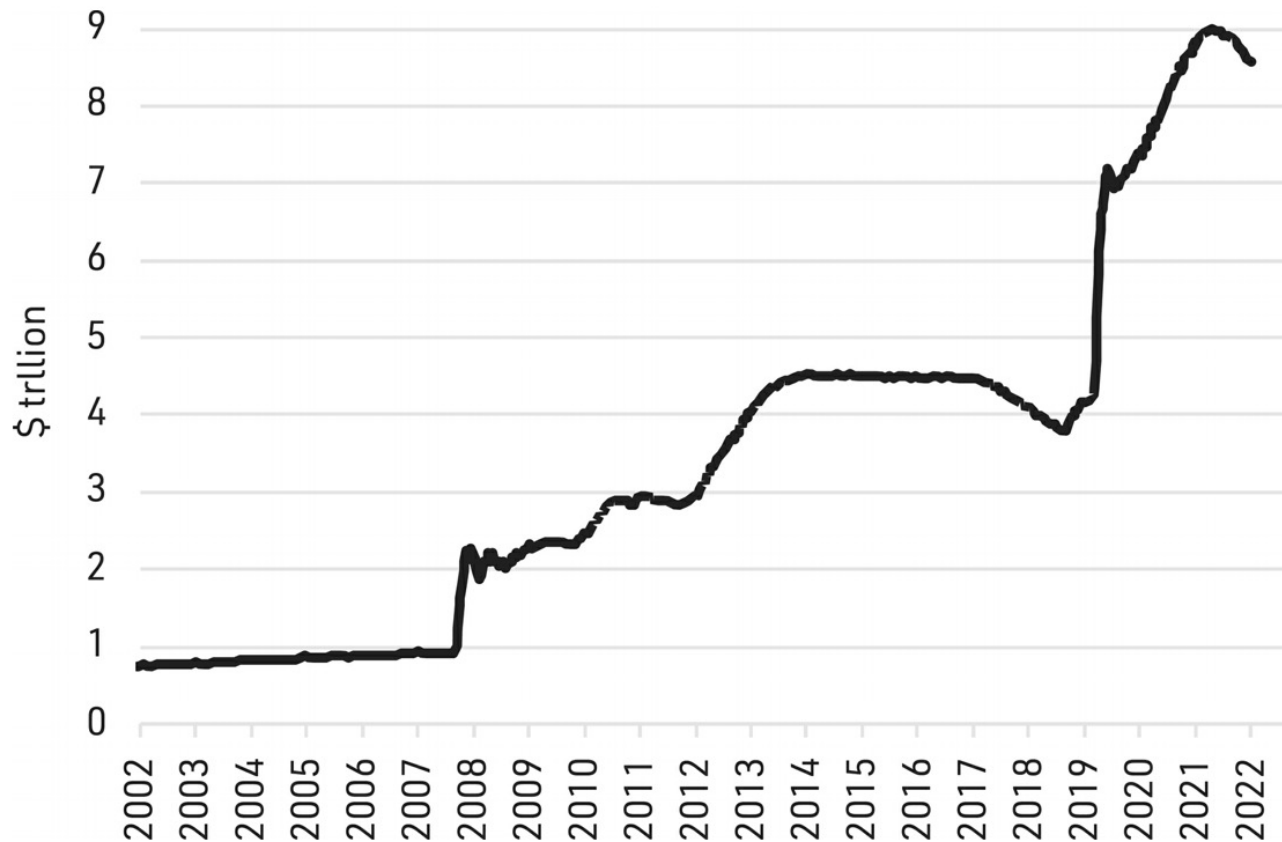
There are two well-known models

- Adaptive expectations (backward looking): determined by inflation rate observed in recent years
- Rational expectations (forward looking): incorporate all the information that is available including those about the future---this information includes macro condition, central bank's target...

Unconventional Monetary Policy

- Sometimes, conventional monetary policy doesn't work so well
 - When policy interest rates hit 0 (e.g. GFC and Covid)
- They can start to buy up assets (such as mortgage backed securities, long term government bonds) financed by the creation of central bank money.
- These purchases can lower a range of interest rates (other than the policy interest rate)

Quantitative Easing: Fed's Balance Sheet



Board of Governors of the Federal Reserve System, retrieved from FRED, Federal Reserve Bank of St. Louis; weekly data.

Source: Sheard, Paul. The Power of Money (pp. 85-86)