

CHAPTER 4

Financial Markets

## Deriving the demand for money

Let's move from this discussion to an equation describing the demand for money.

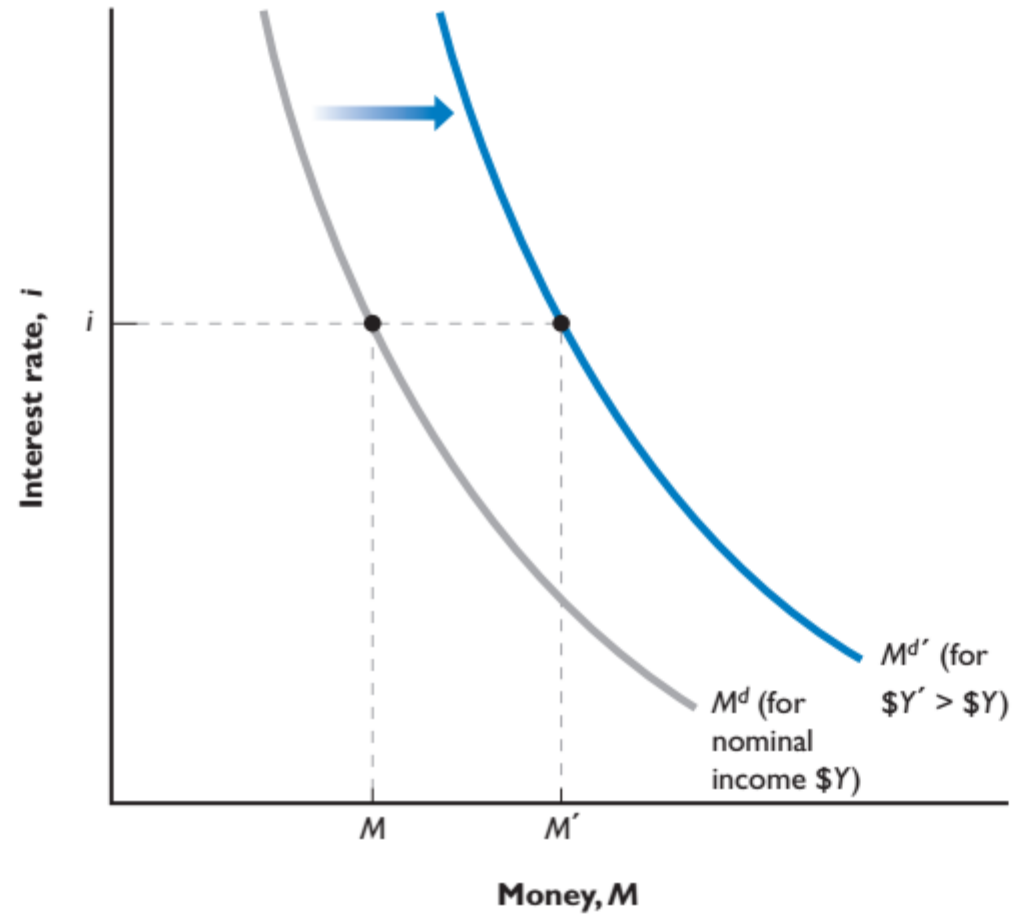
Denote the amount of money people want to hold—their *demand for money*—by  $M^d$  (the superscript  $d$  stands for *demand*). The demand for money in the economy as a whole is just the sum of all the individual demands for money by the people in the economy. Therefore, it depends on the overall level of transactions in the economy and on the interest rate. The overall level of transactions in the economy is hard to measure, but it is likely to be roughly proportional to nominal income (income measured in dollars). If nominal income were to increase by 10 per cent, it is reasonable to think that the dollar value of transactions in the economy would also increase by roughly 10 per cent. So we can write the relation between the demand for money, nominal income and the interest rate as:

$$M^d = \$YL(i) \quad (4.1)$$

(–)

where  $\$Y$  denotes nominal income. Read this equation in the following way: *The demand for money  $M^d$  is equal to nominal income  $\$Y$  times a function of the interest rate  $i$ , with the function denoted by  $L(i)$ . The minus sign under  $i$  in  $L(i)$  captures the fact that the interest rate has a negative effect on money demand: an increase in the interest rate *decreases* the demand for money, as people put more of their wealth into bonds.*

**Figure 4.1**  
The demand for money



*For a given level of nominal income, a lower interest rate increases the demand for money. At a given interest rate, an increase in nominal income shifts the demand for money to the right.*

## 4.2 DETERMINING THE INTEREST RATE: I

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Having looked at the demand for money, we now look at the supply of money and then at the equilibrium.

In the real world, there are two types of money: current account deposits, which are supplied by banks, and currency, which is supplied by the central bank. In this section, we will assume that checkable deposits do not exist—that the only money in the economy is currency. In the next section, we will reintroduce checkable deposits, and look at the role banks play. Introducing banks makes the discussion more realistic, but it also makes the mechanics of money supply more complicated. It is better to build up the discussion in two steps.

### Money demand, money supply and the equilibrium interest rate

Suppose the central bank decides to supply an amount of money equal to  $M$ , so

$$M^s = M$$

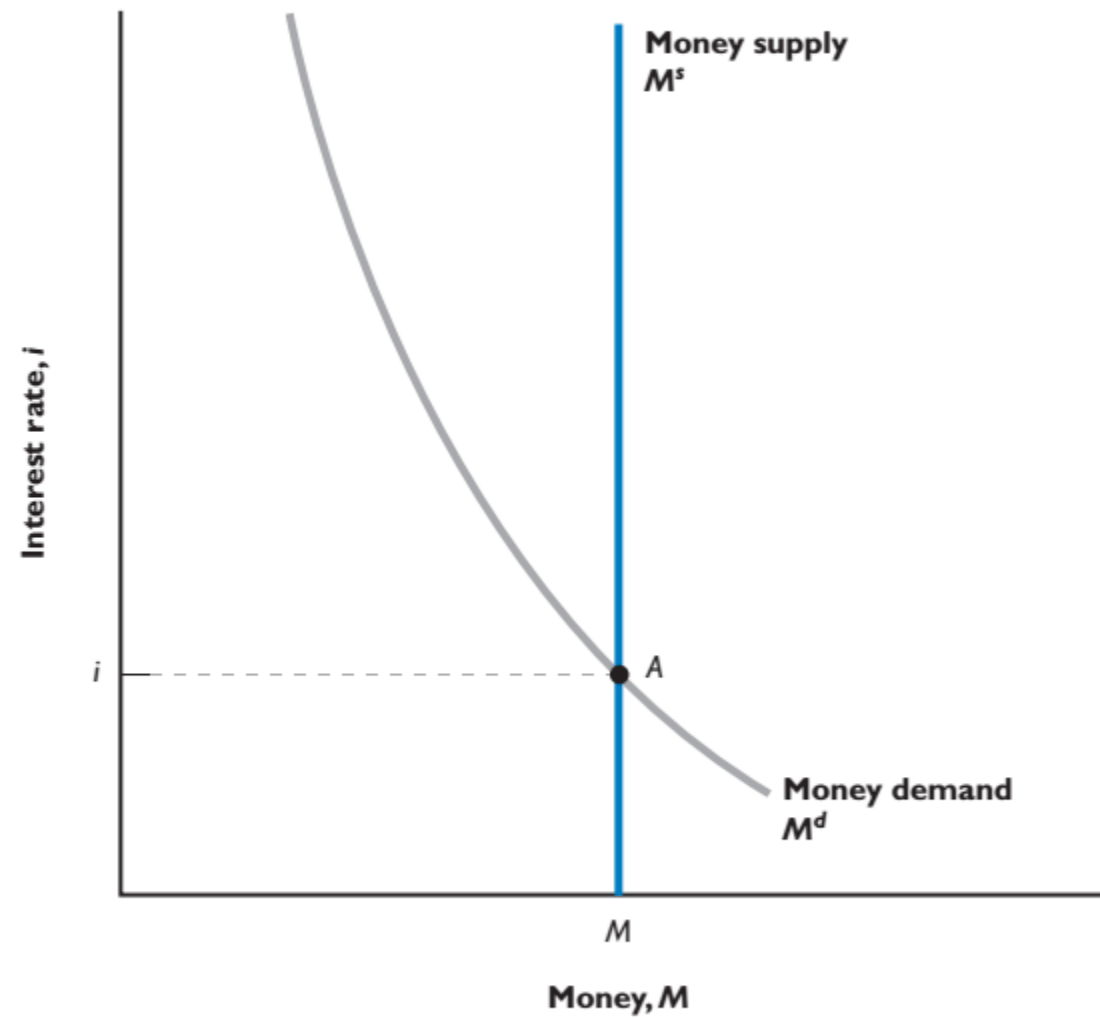
The superscript  $s$  stands for *supply*. (Let's disregard, for the moment, the issue of how exactly the central bank supplies this amount of money. We will return to it shortly.)

Equilibrium in financial markets requires that money supply be equal to money demand, that  $M^s = M^d$ . Then, using  $M^s = M$ , and equation (4.1) for money demand, the equilibrium condition is

$$\begin{aligned} \text{Money supply} &= \text{Money demand} \\ M &= \$YL(i) \end{aligned} \tag{4.2}$$

**Figure 4.2**

The determination  
of the interest  
rate



*The interest rate must be such that the supply of money (which is independent of the interest rate) is equal to the demand for money (which does depend on the interest rate).*

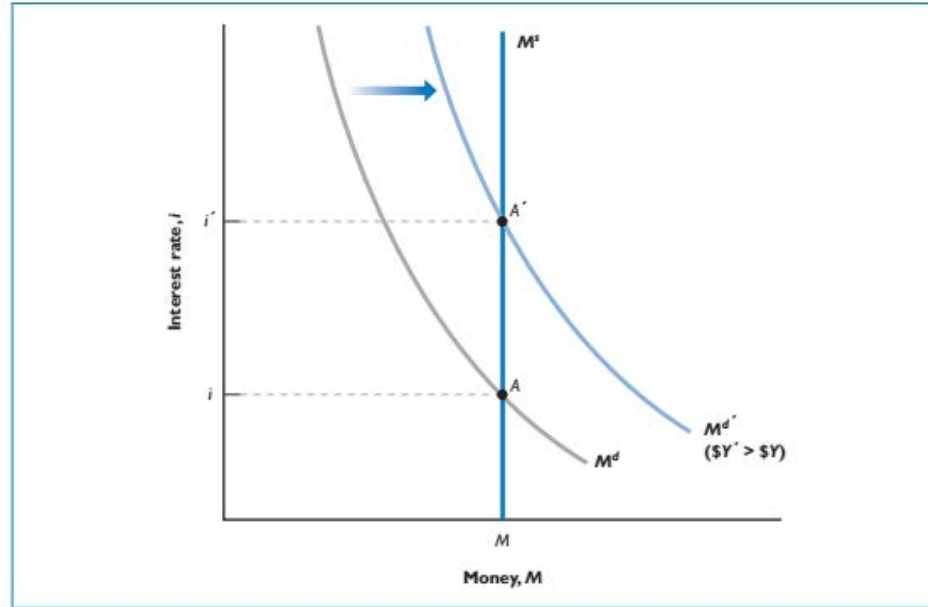


Figure 4.3  
The effects of  
an increase in  
nominal income  
on the interest  
rate

An increase in nominal income leads to an increase in the interest rate.

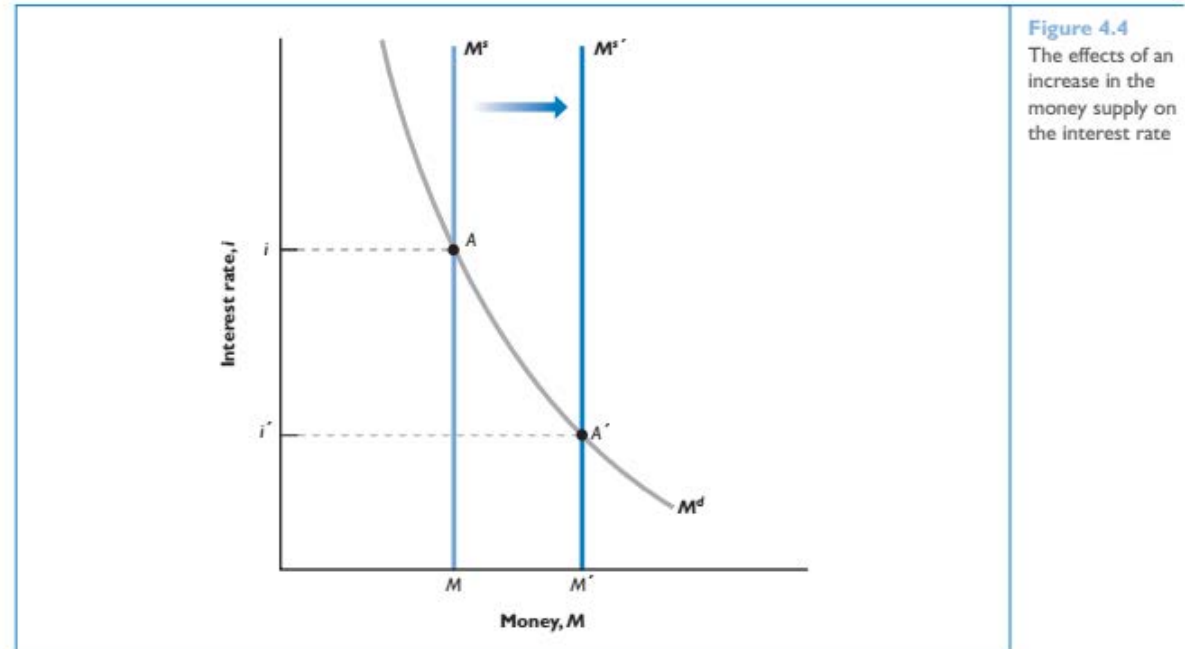


Figure 4.4  
The effects of an  
increase in the  
money supply on  
the interest rate

An increase in the supply of money leads to a decrease in the interest rate.

**Figure 4.5**

The balance sheet of the central bank and the effects of an expansionary open market operation

(a) **Balance sheet**

<b>Assets</b>	<b>Liabilities</b>
Bonds	Money (currency)

(b) **The effects of an expansionary open-market operation**

<b>Assets</b>	<b>Liabilities</b>
Change in bond holdings: +\$1 million	Change in money stock: +\$1 million

*The assets of the central bank are the bonds it holds. The liabilities are the stock of money in the economy. An open market operation in which the central bank buys bonds and issues money increases both assets and liabilities by the same amount.*

Let's summarise what we have learned in the first two sections:

- The interest rate is determined by the equality of the supply of money and the demand for money.
- By changing the supply of money, the central bank can affect the interest rate.
- The central bank changes the supply of money through open market operations, which are purchases or sales of bonds for money.
- Open market operations in which the central bank increases the money supply by buying bonds lead to an increase in the price of bonds and a decrease in the interest rate. In Figure 4.2, the purchase of bonds by the central bank shifts the money supply to the right.
- Open market operations in which the central bank decreases the money supply by selling bonds lead to a decrease in the price of bonds and an increase in the interest rate. In Figure 4.2, the purchase of bonds by the central bank shifts the money supply to the left.

Let's take up two more issues before moving on.



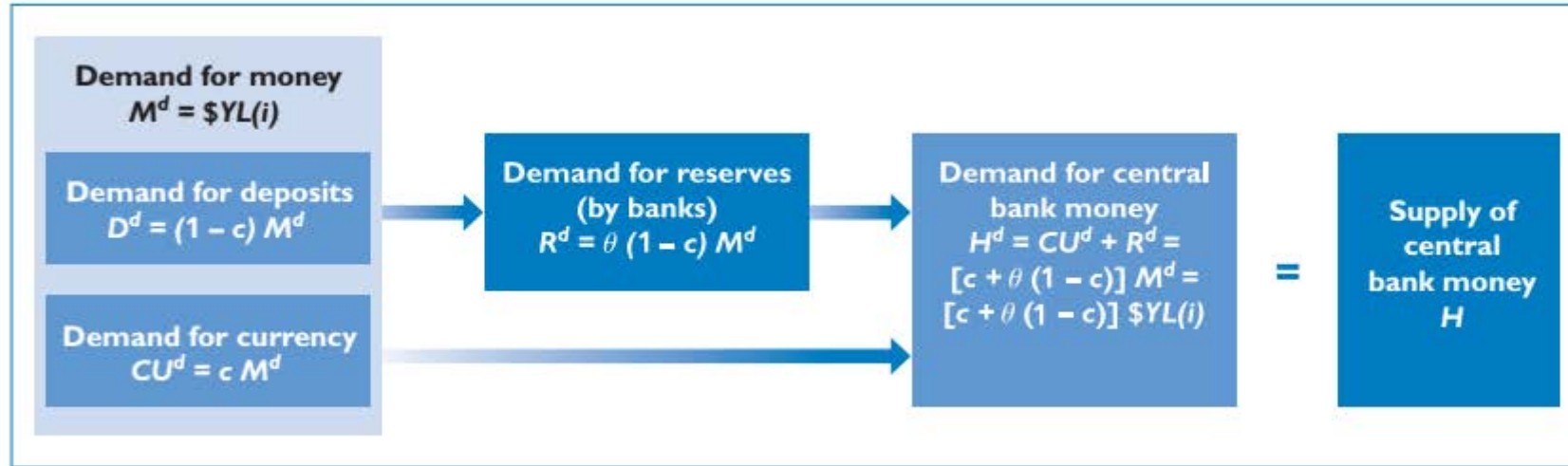
**Figure 4.6**

The balance sheet of banks, and the balance sheet of the central bank revisited

<b>Central bank</b>	
<b>Assets</b>	<b>Liabilities</b>
Bonds	Central bank money = Reserves + Currency

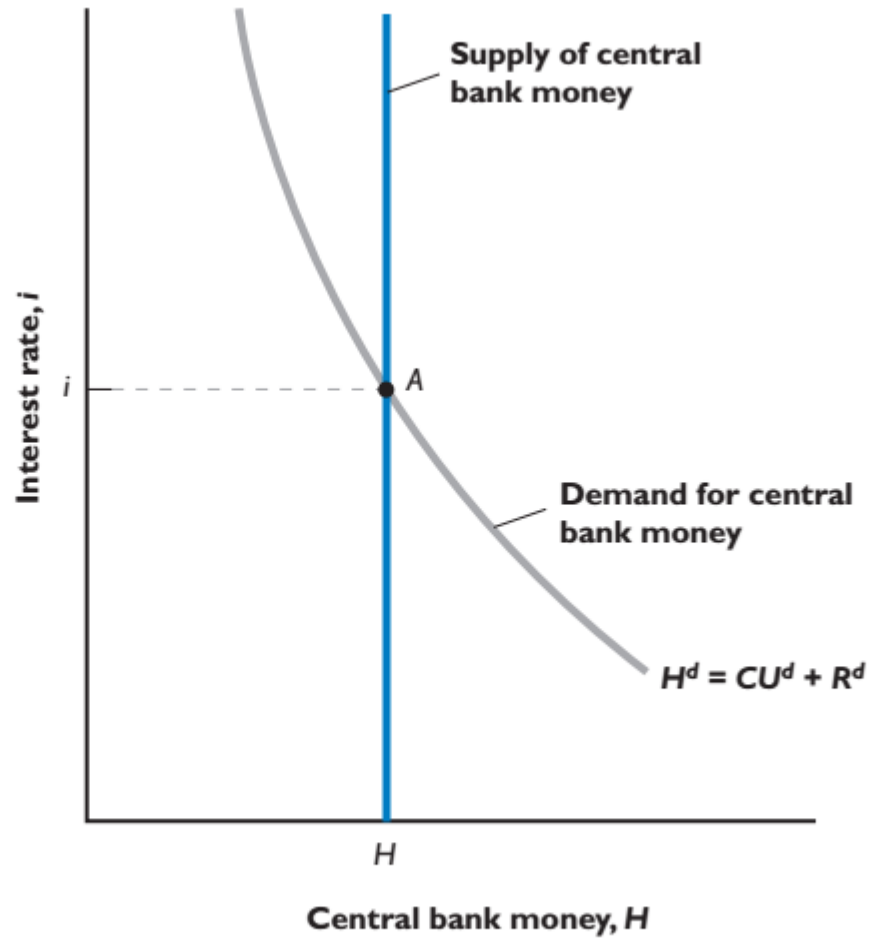
<b>Banks</b>	
<b>Assets</b>	<b>Liabilities</b>
Reserves Loans Bonds	Current account deposits



**Figure 4.7**  
Determinants of the demand for and the supply of central bank money

**Figure 4.8**

Equilibrium in the market for central bank money and the determination of the interest rate



*The equilibrium interest rate is such that the supply of central bank money is equal to the demand for central bank money.*

To derive an equilibrium condition in terms of the overall supply and the overall demand for money, start with the equilibrium condition (4.11) (which states that the supply of central bank money must equal the demand for central bank money) and divide both sides by  $[c + \theta(1 - c)]$ :

$$\frac{1}{[c + \theta(1 - c)]} H = \$YL(i) \quad (4.12)$$

Supply of money = Demand for money

## SUMMARY

- The demand for money depends positively on the level of transactions in the economy and negatively on the interest rate.
- The interest rate is determined by the equilibrium condition that the supply of money be equal to the demand for money.
- For a given supply of money, an increase in income leads to an increase in the demand for money and an increase in the interest rate. An increase in the supply of money leads to a decrease in the interest rate.
- The way the central bank changes the supply of money is through open market operations.
- Expansionary open market operations, in which the central bank increases the money supply by buying bonds, lead to an increase in the price of bonds and a decrease in the interest rate.
- Contractionary open market operations, in which the central bank decreases the money supply by selling bonds, lead to a decrease in the price of bonds and an increase in the interest rate.

2. Suppose that a person's wealth is \$50 000 and that her yearly income is \$60 000. Also, suppose that her money demand function is given by:

$$M^d = \$Y(0.35 - i)$$

- What is her demand for money and her demand for bonds when the interest rate is 5 per cent? 10 per cent?
  - Explain how the interest rate affects money demand.
  - Suppose that the interest rate is 10 per cent. In percentage terms, what happens to her demand for money if her yearly income is reduced by 50 per cent?
  - Suppose that the interest rate is 5 per cent. In percentage terms, what happens to her demand for money if her yearly income is reduced by 50 per cent?
  - Summarise the effect of income on money demand. How does it depend on the interest rate?
3. Consider a bond that promises to pay \$100 in one year.
- What is the interest rate on the bond if its price today is \$75? \$85? \$95?
  - What is the relation between the price of the bond and the interest rate?
  - If the interest rate is 8 per cent, what is the price of the bond today?
4. Suppose that money demand is given by

$$M^d = \$Y(0.25 - i)$$

where  $\$Y$  is \$100. Also, suppose that the supply of money is \$20. Assume equilibrium in financial markets.

- What is the equilibrium interest rate?
- If the Reserve Bank wants to increase  $i$  by 10 per cent (that is, from, say, 2 per cent to 12 per cent), at what level should it set the supply of money?

## Dig deeper

5. Suppose that a person's wealth is \$50 000 and that her yearly income is \$60 000. Also suppose that her money demand function is given by

$$M^d = \$Y(0.35 - i)$$

- Derive the demand for bonds. What is the effect of an increase in the interest rate by 10 per cent on the demand for bonds?
  - What are the effects of an increase in wealth on money and on bond demand? Explain in words.
  - What are the effects of an increase in income on money and on bond demand? Explain in words.
  - 'When people earn more money, they obviously will hold more bonds.' What is wrong with this sentence?
6. *The money multiplier*

Suppose the following assumptions hold:

- The public holds no currency.
- The ratio of reserves to deposits is 0.1.
- The demand for money is given by:

$$M^d = \$Y(0.8 - 4i)$$

Initially, the monetary base is \$100 billion and nominal income is \$5 trillion.

- What is the demand for central bank money?
- Find the equilibrium interest rate by setting the demand for central bank money equal to the supply of central bank money.
- What is the overall supply of money? Is it equal to the overall demand for money at the interest rate you found in (b)?