



Financial Markets

4-1 The Demand for Money

- Money, which you can use for transactions, pays no interest. There are two types of money: **currency**, coins and bills, and **checkable deposits**, the bank deposits on which you can write checks.
- **Bonds** pay a positive interest rate, i , but they cannot be used for transactions.

The proportions of money and bonds you wish to hold depend mainly on two variables:

- *Your level of transactions*
- *The interest rate on bonds*

Money market funds pool together the funds of many people. The funds are then used to buy bonds—typically government bonds.

Semantic Traps: Money, Income, and Wealth



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Income is what you earn from working plus what you receive in interest and dividends. It is a **flow**—that is, it is expressed per unit of time.

Saving is that part of after-tax income that is not spent. It is also a flow. **Savings** is sometimes used as a synonym for wealth (a term we will not use in this book).

Your **financial wealth**, or simply **wealth**, is the value of all your financial assets minus all your financial liabilities. In contrast to income or saving, which are flow variables, financial wealth is a **stock** variable.

Investment is a term economists reserve for the purchase of new capital goods, from machines to plants to office buildings. When you want to talk about the purchase of shares or other financial assets, you should refer them as a financial investment.

4-1 The Demand for Money

Deriving the Demand for Money

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

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

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 demand for money:

- increases in proportion to nominal income ($\$Y$), and
- depends negatively on the interest rate ($L(i)$ and the negative sign underneath).

4-1 The Demand for Money

Deriving the Demand for Money

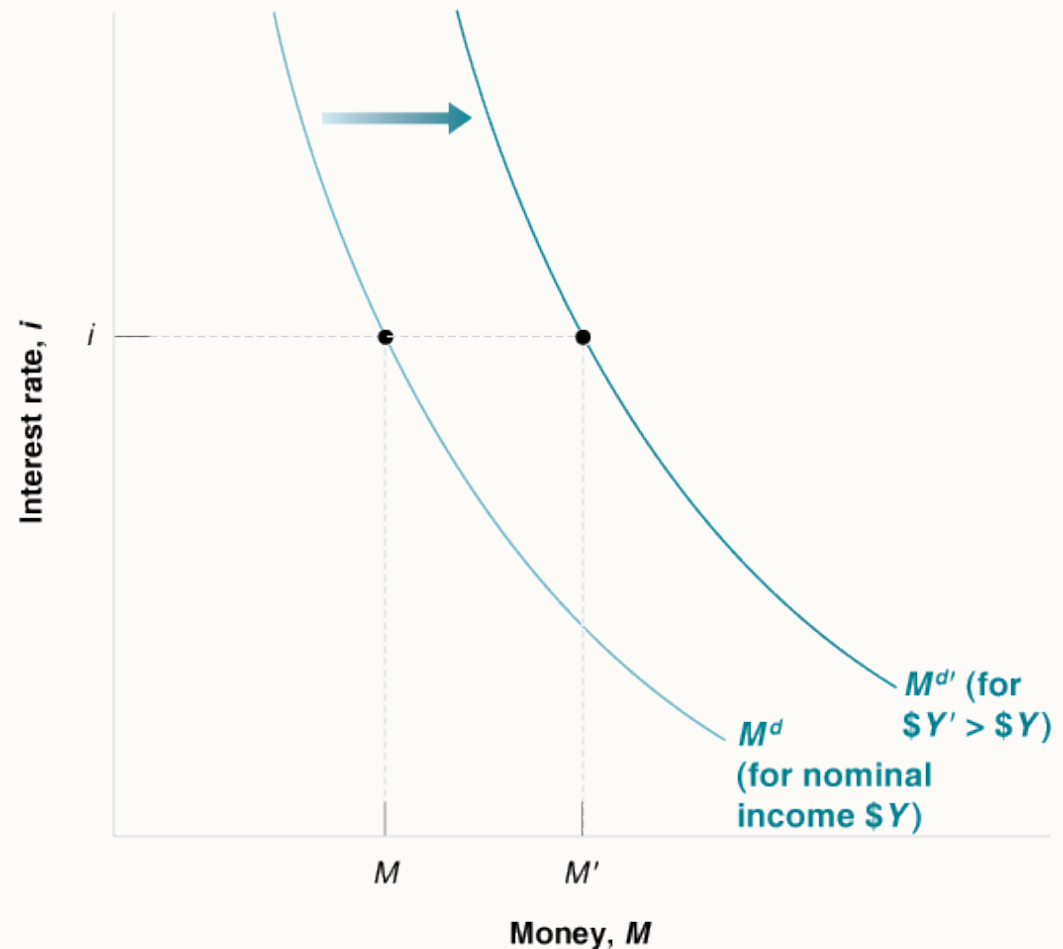
$$M^d = \$YL(i)$$

(–)

■ 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.



Who Holds U.S. Currency?



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According to household surveys, in 2006, the average U.S. household held \$1,600 in currency. If multiplied by the number of households in the U.S. the total would come to around \$170 billion. However, the Federal Reserve Board knows the amount of currency in circulation was much higher, \$750 billion.

Clearly some currency was held by firms rather than by households. And some was held by those involved in the underground economy or in illegal activities. However, this leaves 66% of the total unaccounted for. The balance of which is abroad and held by foreigners.

The fact that foreigners hold such a high proportion of the dollar bills in circulation has two main macroeconomic implications.

First, the rest of the world, by being willing to hold U.S. currency, is making in effect an interest-free loan to the United States of \$500 billion.

Second, while we shall think of money demand as being determined by the interest rate and the level of transactions in the country, it is clear that U.S. money demand also depends on other factors.

4-2 The Determination of the Interest Rate, I

Money Demand, Money Supply, and the Equilibrium Interest Rate

Equilibrium in financial markets requires that money supply be equal to money demand, or that $M^s = M^d$. Then using this equation, the equilibrium condition is:

Money Supply = Money demand

$$M = PY L(i)$$

This equilibrium relation is called the **LM relation**.

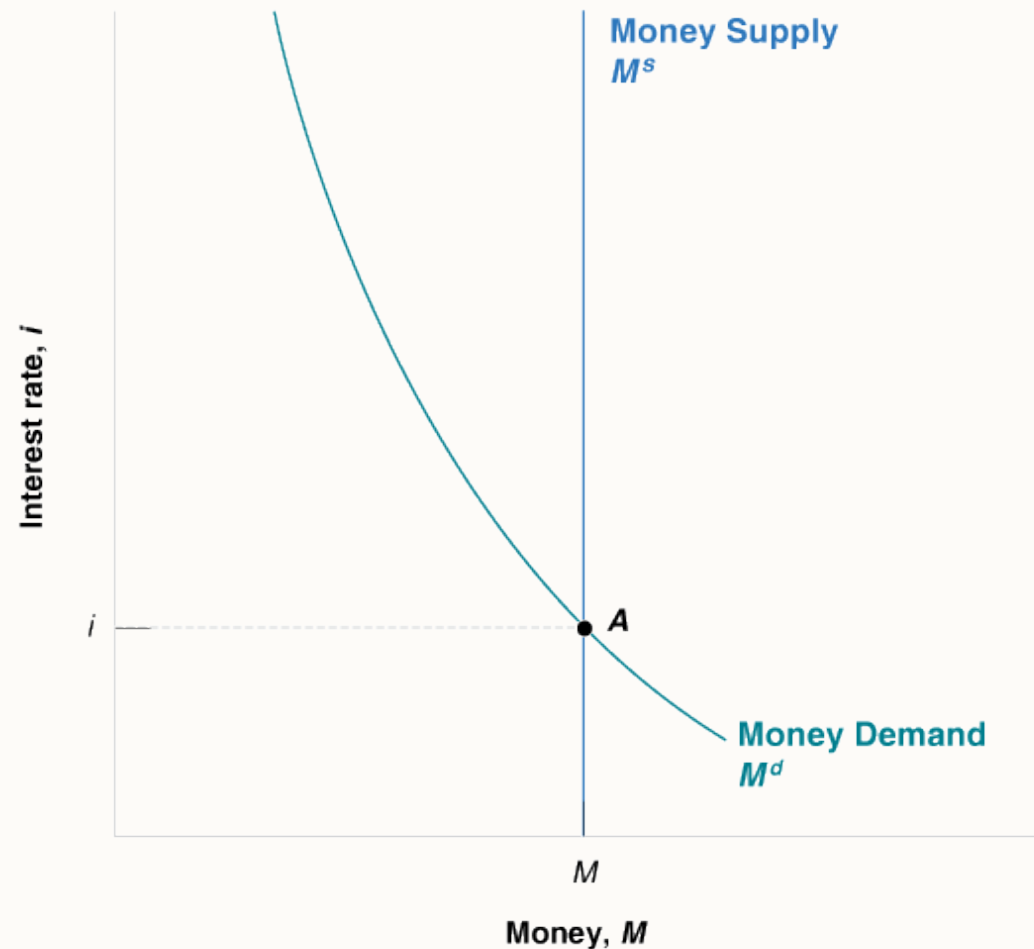
4-2 The Determination of the Interest Rate, I

Money Demand, Money Supply, and the Equilibrium Interest Rate

■ 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).



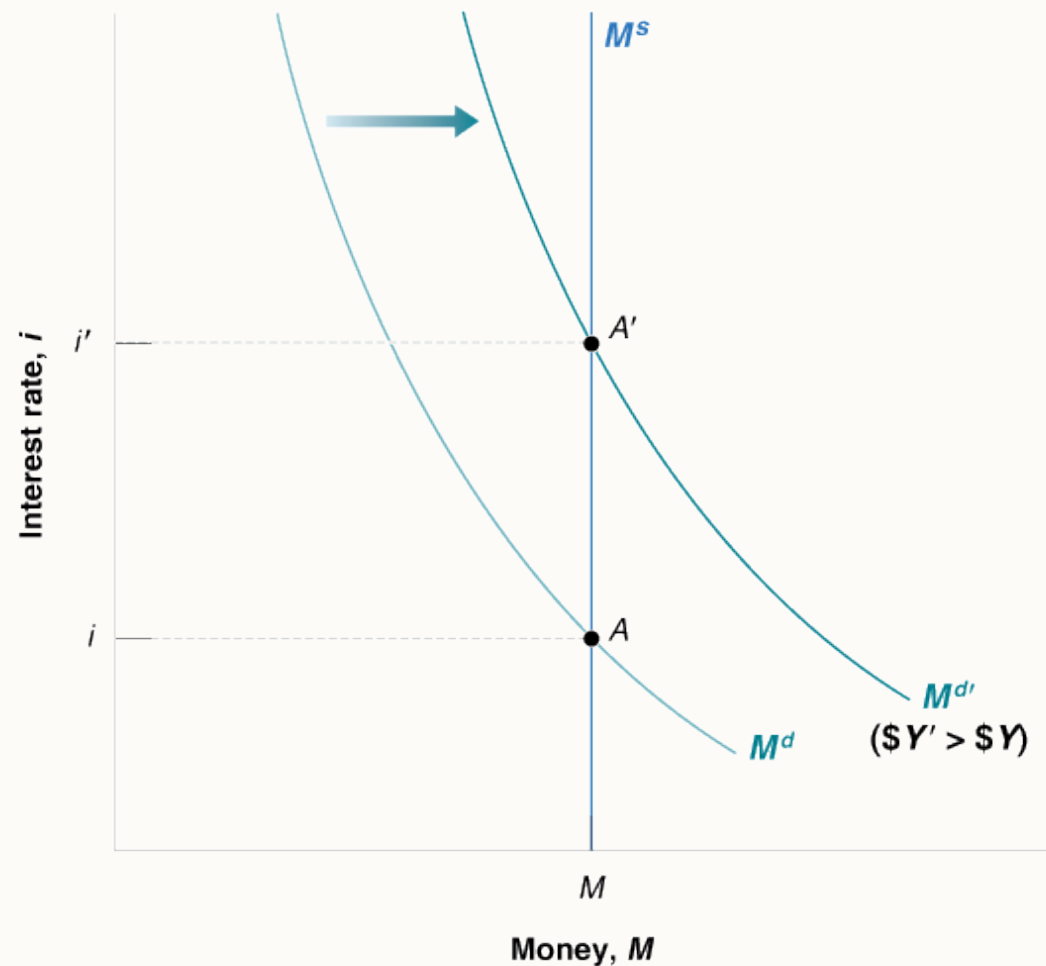
4-2 The Determination of the Interest Rate, I

Money Demand, Money Supply, and the Equilibrium 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.



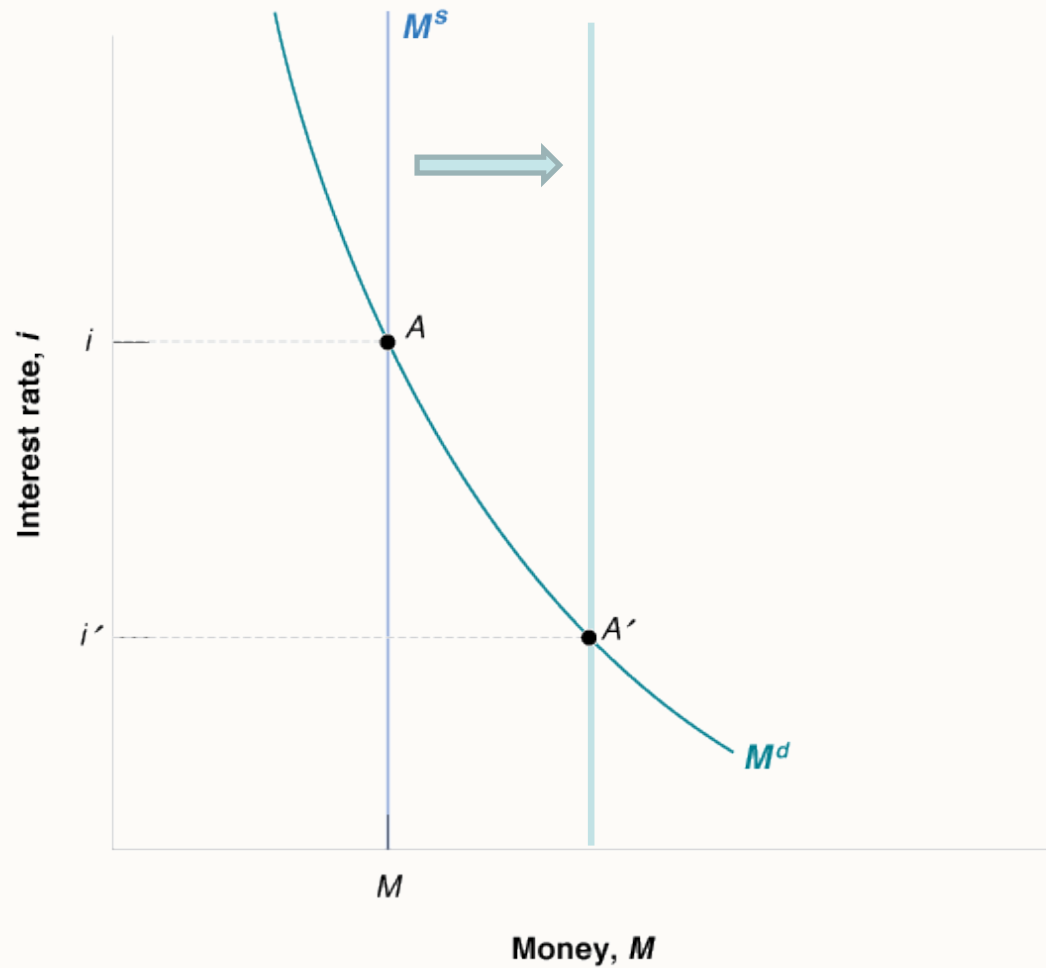
4-2 The Determination of the Interest Rate, I

Money Demand, Money Supply, and the Equilibrium 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.



4-2 The Determination of the Interest Rate, I

Monetary Policy and Open Market Operations

Open market operations

Open-market operations, which take place in the “open market” for bonds, are the standard method central banks use to change the money stock in modern economies.

If the central bank buys bonds, this operation is called an **expansionary open market operation** because the central bank increases (*expands*) the supply of money.

If the central bank sells bonds, this operation is called a **contractionary open market operation** because the central bank decreases (*contracts*) the supply of money.

4-2 The Determination of the Interest Rate, I

Monetary Policy and Open Market Operations

Open market operations

■ Figure 4 - 5

The Balance Sheet of the Central Bank and the Effects of an Expansionary Open Market Operation

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.

(a)

Balance Sheet

Assets

Liabilities

Bonds	Money (currency)
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(b)

The Effects of an Expansionary Open-Market Operation

Assets

Liabilities

Change in bond holdings: +\$1 million	Change in money stock: +\$1 million
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4-2 The Determination of the Interest Rate, I

Monetary Policy and Open Market Operations

Bond Prices and Bond Yields

Understanding the relation between the interest rate and bond prices will prove useful both here and later in this book:

- **Treasury bills**, or **T-bills** are issued by the U.S. government promising payment in a year or less. If you buy the bond today and hold it for a year, the rate of return (or interest) on holding a \$100 bond for a year is $(\$100 - \$P_B)/\$P_B$.
- If we are given the interest rate, we can figure out the price of the bond using the same formula.

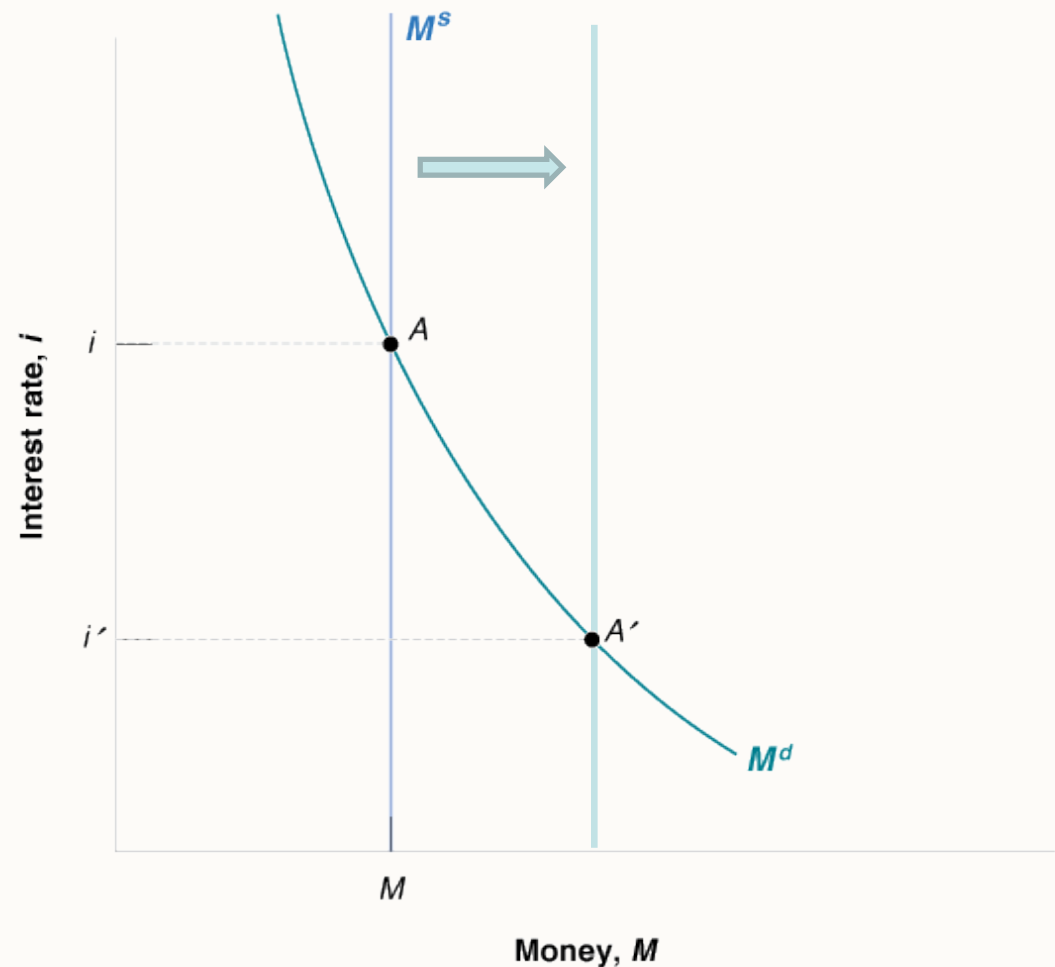
$$i = \frac{\$100 - \$P_B}{\$P_B} \Rightarrow \$P_B = \frac{\$100}{1 + i}$$

4-2 The Determination of the Interest Rate, I

Choosing Money or Choosing the Interest Rate?

A decision by the central bank to lower the interest rate from i to i' is equivalent to increasing the money supply.

■ Figure 4 - 4



4-2 The Determination of the Interest Rate, I

Money, Bonds, and Other Assets

We have been looking at an economy with only two assets: money and bonds. This is obviously a much simplified version of actual economies, with their many financial assets and many financial markets.

There is one dimension, however, to which our model must be extended. We have assumed that all money in the economy consists of currency supplied by the central bank. In the real world, money includes not only currency but also checkable deposits.

4-3 The Determination of Interest Rate, II*

What Banks Do

Financial intermediaries are institutions that receive funds from people and firms, and use these funds to buy bonds or stocks, or to make loans to other people and firms.

- Banks receive funds from people and firms who either deposit funds directly or have funds sent to their checking accounts. The liabilities of the banks are therefore equal to the value of these *checkable deposits*.
- Banks keep as **reserves** some of the funds they receive.

4-3 The Determination of Interest Rate, II*

What Banks Do

Banks hold reserves for three reasons:

1. On any given day, some depositors withdraw cash from their checking accounts, while others deposit cash into their accounts.
2. In the same way, on any given day, people with accounts at the bank write checks to people with accounts at other banks, and people with accounts at other banks write checks to people with accounts at the bank.
3. Banks are subject to reserve requirements. The actual **reserve ratio** – the ratio of bank reserves to bank checkable deposits – is about 10% in the United States today.

4-3 The Determination of Interest Rate, II*

What Banks Do

- Loans represent roughly 70% of banks' non-reserve assets. Bonds count for the rest, 30%.

The assets of the central bank are the bonds it holds. The liabilities of the central bank are the money it has issued, **central bank money**. The new feature is that not all of central bank money is held as currency by the public. Some of it is held as reserves by banks.

4-3 The Determination of Interest Rate, II*

What Banks Do

■ Figure 4 - 6

The Balance Sheet of Banks and the Balance Sheet of the Central Bank, Revisited

(a)

Central Bank

Assets

Liabilities

Bonds	Central Bank Money = Reserves + Currency
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(b)

Banks

Assets

Liabilities

Reserves Loans Bonds	Checkable deposits
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4-3 The Determination of Interest Rate, II*

The Supply and the Demand for Central Bank Money

Let's think in terms of the supply and the demand for *central bank money*.

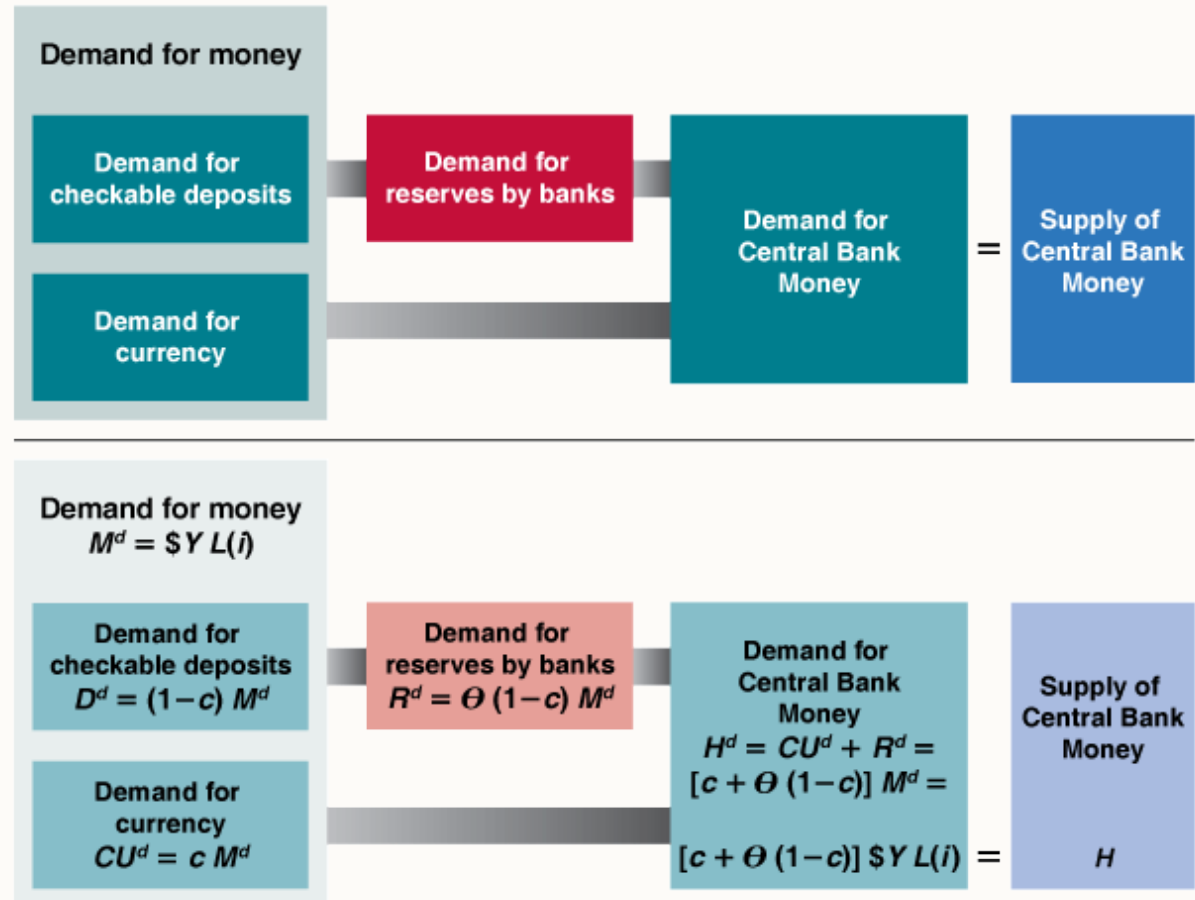
- The demand for central bank money is equal to the demand for currency by people plus the demand for reserves by banks.
- The supply of central bank money is under the direct control of the central bank.
- The equilibrium interest rate is such that the demand and the supply for central bank money are equal.

4-3 The Determination of Interest Rate, II*

The Supply and the Demand for Central Bank Money

Figure 4 - 7

Determinants of the Demand and the Supply of Central Bank Money



Bank Runs



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Rumors that a bank is not doing well and some loans will not be repaid, will lead people to close their accounts at that bank. If enough people do so, the bank will run out of reserves—a **bank run**.

To avoid bank runs, the U.S. government provides **federal deposit insurance**.

An alternative solution is **narrow banking**, which would restrict banks to holding liquid, safe, government bonds, such as T-bills.

4-3 The Determination of Interest Rate, II*

The Supply and the Demand for Central Bank Money

The Demand for Money

When people can hold both currency and checkable deposits, the demand for money involves *two* decisions.

First, people must decide how much money to hold. Second, they must decide how much of this money to hold in currency and how much to hold in checkable deposits.

We can assume that overall money demand is given by the same equation as before: $M^d = \$Y L(i)$
(-)

The demands for currency and checkable deposits are given by:

$$CU^d = c M^d$$
$$D^d = (1 - c) M^d$$

4-3 The Determination of Interest Rate, II*

The Supply and the Demand for Central Bank Money

The Demand for Reserves

The larger the amount of checkable deposits, the larger the amount of reserves the banks must hold, for both precautionary and regulatory reasons.

The relation between reserves (R) and deposits (D):

$$R = \theta D$$

The demand for reserves by banks is given by:

$$R^d = \theta(1 - c)M^d$$

4-3 The Determination of Interest Rate, II*

The Supply and the Demand for Central Bank Money

The Demand for Central Bank Money

The demand for central bank money is equal to the sum of the demand for currency and the demand for reserves.

$$H^d = CU^d + R^d$$

Replace CU^d and R^d with their expressions from equations (4.4) and (4.7) to get:

$$H^d = cM^d + \theta(1 - c)M^d = [c + \theta(1 - c)]M^d$$

Finally, replace the overall demand for money, M^d , with its expression from equation (4.3) to get:

$$H^d = [c + \theta(1 - c)] \$Y L(i)$$

4-3 The Determination of Interest Rate, II*

The Supply and the Demand for Central Bank Money

The Determination of the Interest Rate

In equilibrium, the supply of central bank money (H) is equal to the demand for central bank money (H^d):

$$H = H^d$$

Or restated as:

$$H^d = [c + \theta(1 - c)] \$Y L(i)$$

4-3 The Determination of Interest Rate, II*

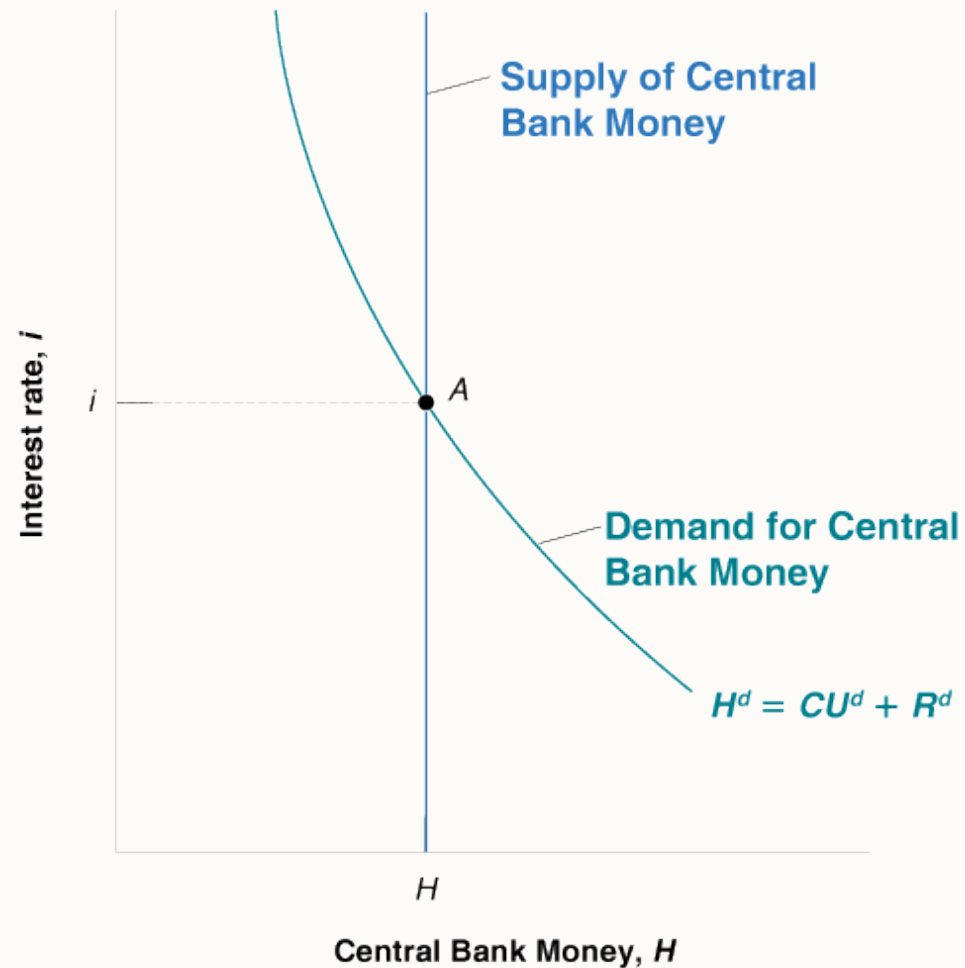
The Supply and the Demand for Central Bank Money

The Determination of the Interest Rate

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.



4-4 Two Alternative Ways of Looking at the Equilibrium*

The Federal Funds Market and the Federal Funds Rate

The equilibrium condition that the supply and the demand for bank reserves be equal is given by:

$$H - CU^d = R^d$$

The **federal funds market** is a market for bank reserves. In equilibrium, demand (R^d) must equal supply ($H - CU^d$). The interest rate determined in the market is called the **federal funds rate**.

4-4 Two Alternative Ways of Looking at the Equilibrium*

The Supply of Money, the Demand for Money, and the Money Multiplier

$$\frac{1}{[c + \theta(1 - c)]} H = \$Y L(i)$$

Supply of money = Demand for money

- The overall supply of money is equal to central bank money times the **money multiplier**:

$$1 / (c + \theta(1 - c))$$

- **High-powered money** is the term used to reflect the fact that the overall supply of money depends in the end on the amount of central bank money (H), or **monetary base**.

4-4 Two Alternative Ways of Looking at the Equilibrium*

The Supply of Money, the Demand for Money, and the Money Multiplier

Understanding the Money Multiplier

We can think of the ultimate increase in the money supply as the result of *successive rounds of purchases of bonds*—the first started by the Fed in its open market operation, the following rounds by banks.