

Economics 302 (Sec. 001)  
Intermediate Macroeconomic  
Theory and Policy (Spring 2012)  
2/8/2012

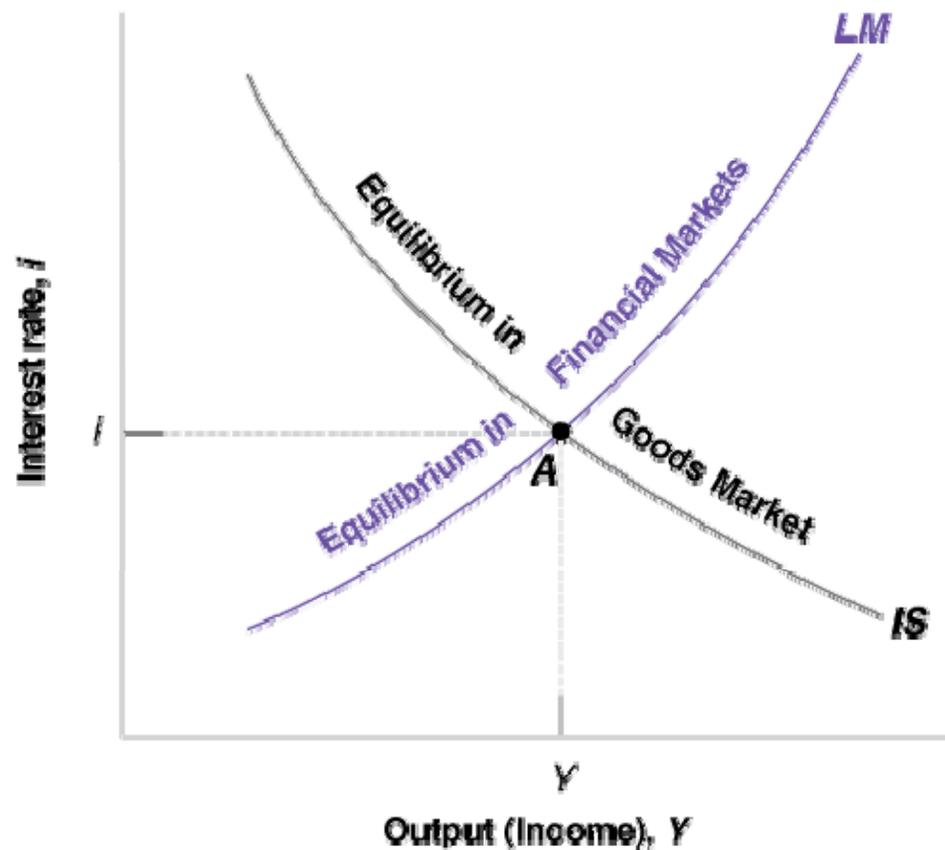
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UW Madison

# An integrated model of equilibrium in goods and money

■ Figure 5 - 6

## *The IS–LM Model*

Equilibrium in the goods market implies that an increase in the interest rate leads to a decrease in output. This is represented by the IS curve. Equilibrium in financial markets implies that an increase in output leads to an increase in the interest rate. This is represented by the LM curve. Only at point A, which is on both curves, are both goods and financial markets in equilibrium.



# 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.

# 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

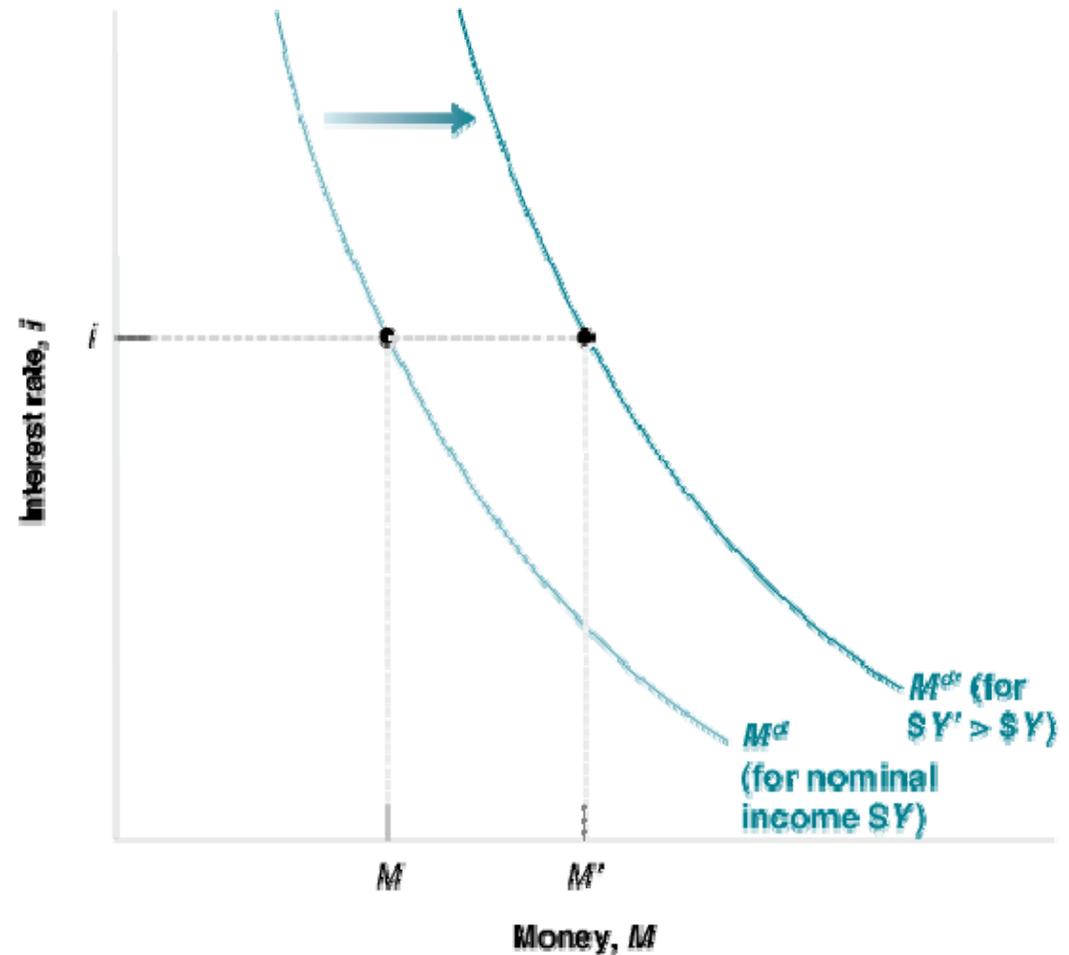
$$M^d = \$YL(i)$$

(-)

■ 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.



# 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**.

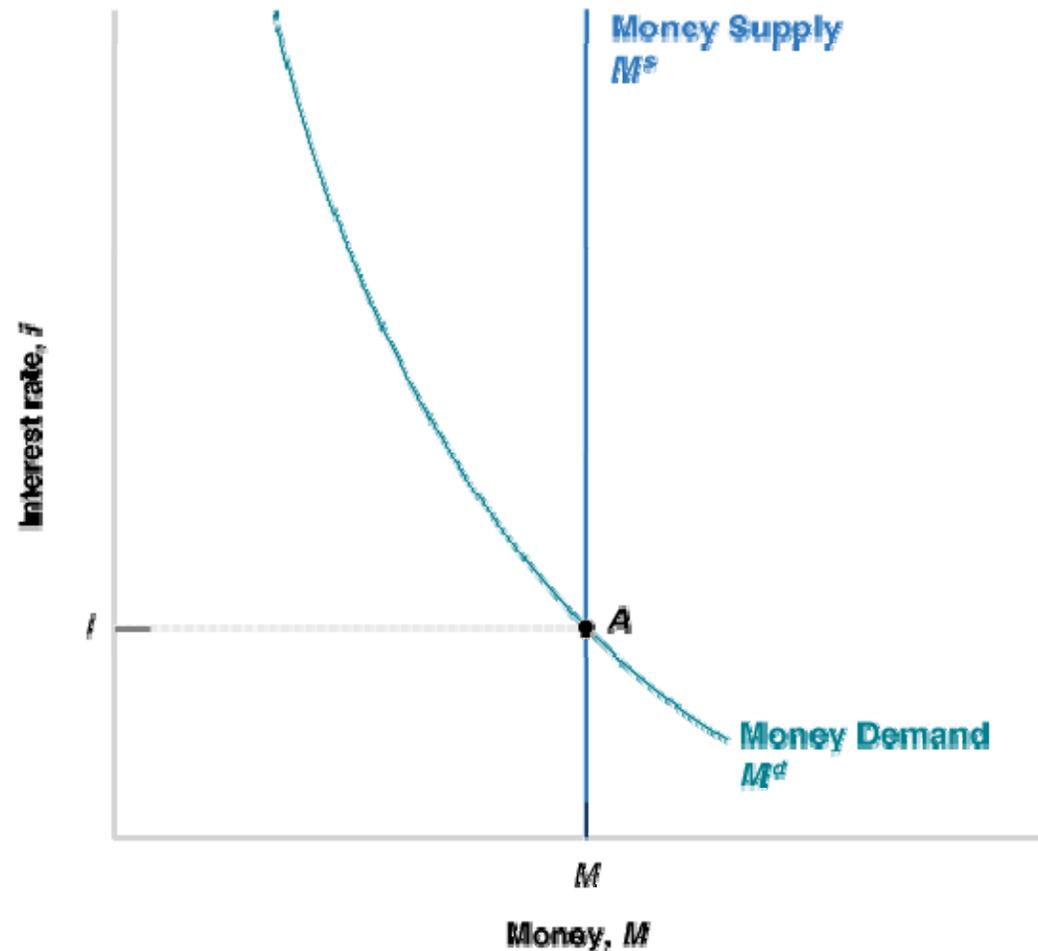
# 4-2 Determination of Interest Rate

## 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).



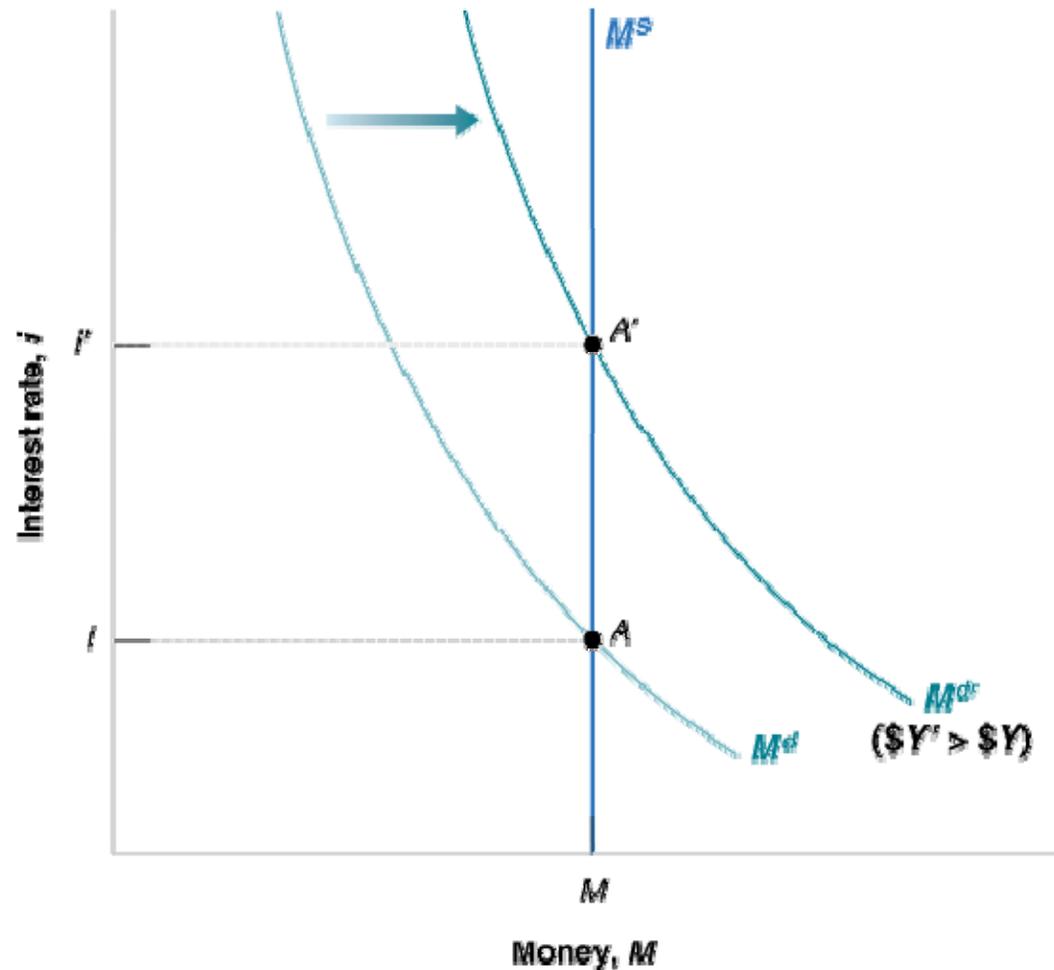
# 4-2 Determination of Interest Rate

## 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.



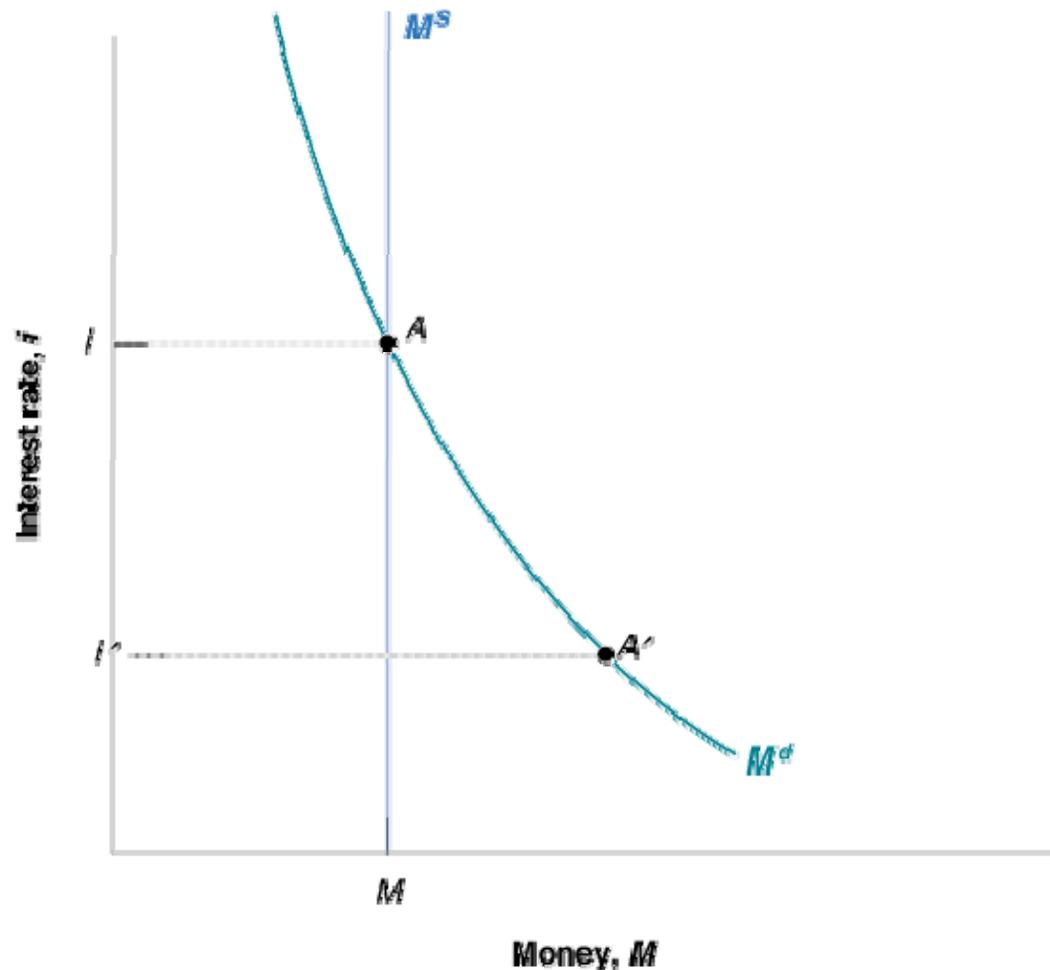
# 4-2 Determination of Interest Rate

## 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 Determination of Interest Rate

## 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)

(b)

The Effects of an Expansionary Open-Market Operation	
Assets	Liabilities
Change in bond holdings: +\$1 million	Change in money stock: +\$1 million

# 4-2 Determination of Interest Rate

## 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 Determination of Interest Rate

## Monetary Policy and Open Market Operations

### Bond Prices and Bond Yields

Let's summarize what we have learned so far in this chapter:

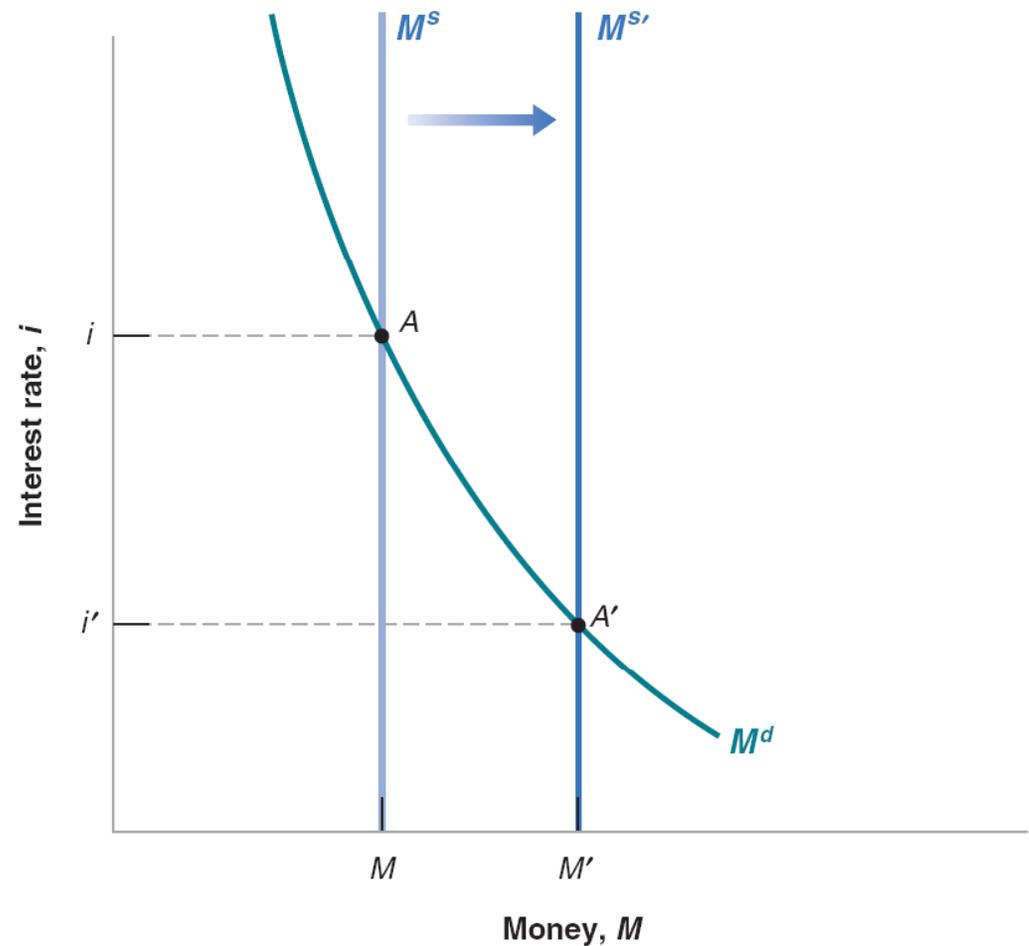
- The interest rate is determined by the equality of the supply of money and the demand for money.
- By changing the supply of money, the central bank can affect the interest rate.
- The central bank changes the supply of money through open market operations, which are purchases or sales of bonds for 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.
- 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.

# 4-2 Determination of Interest Rate

## 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 Determination of Interest Rate

## 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.

We will deal with these additional complications after working through the IS-LM model.