

# Economics II

## Lecture 17



School of Economics  
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TECHNICAL UNIVERSITY OF LISBON

SINCE 1911

# Lecture 17

## Summary:

### 9. Money and Monetary Policy

9.1. Money demand

9.2. Money supply and monetary market equilibrium

## Bibliography:

Frank and Bernanke (2011), chapter. 12

## **Lecture Goals:**

**At the end of this lesson the student should be able to understand:**

**the concept of money and its functions.**

**and apply the money demand function.**

**and apply the functions of money supply.**

**the functioning of the money market equilibrium.**

**the effect of monetary policy on the interest rate and**

**the amount of money supply.**

# 9. MONEY AND MONETARY POLICY

## 9.1. Money Demand

### Monetary policy:

- can be changed rapidly;
- is more flexible than fiscal policy;
- tends to be more used than fiscal policy to stabilize the economy.
- Induces changes in the interest rate..
  - The nominal interest rate is the "price of money," ie, ...
  - Is ... the opportunity cost of holding wealth in the form of currency.

# But ... what is "money"?

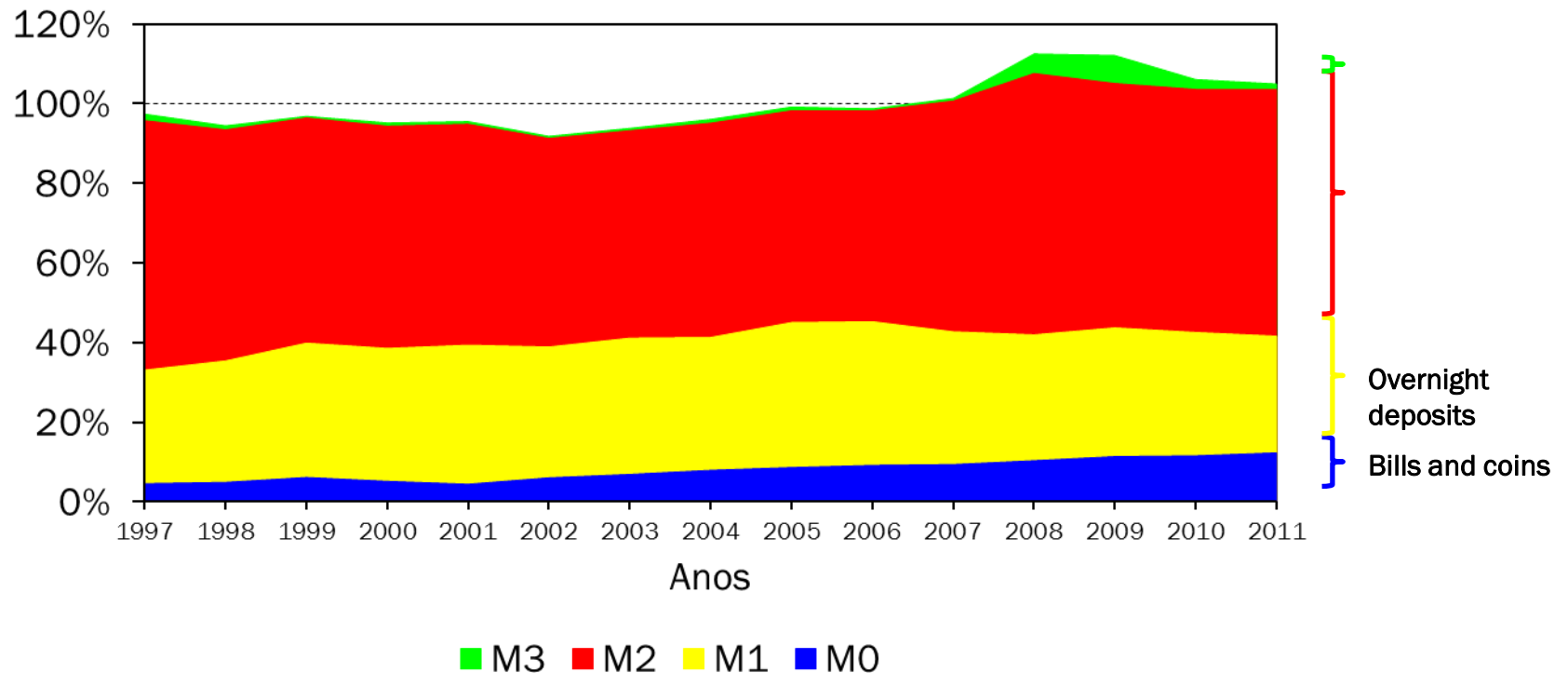
## Functional definition of money

- *Money is what money does.*
- Currency "are the assets that fulfill the functions of money.
- **What are those functions?**
  - Intermediate of exchange:
    - used to make transactions because it has general acceptance.
  - Store of value:
    - is one way of holding wealth.
  - Unit of account - standard unit:
    - all values are expressed in monetary units (m.u.)

## Assets that constitute currency:

- Currency in circulation M0
  - coins;
  - bills.
- Overnight deposits + M0 = M1
- **There are broader concepts of currency:**
  - Term deposits (up to 2 years + Deposits with notification up to 3 months + M1 = M2
  - Repurchase agreements + Funds and money market securities+ debt bonds up to 2 years+ M2 = M3
- **Not part of the currency:**
  - credit card or debit card;
  - checks;
  - stocks;
  - gold (it was in the past).

## Monetary Aggregates in Portugal as a Proportion of GDP (current prices): 1997-2011



Source: [Banco de Portugal \(2012\)](#).



## Money demand:

Part of the wealth that an individual chooses to hold in the form of currency.

A cost-benefit criterion tells us that an individual should increase money holdings if the benefits exceed the additional cost.

### Advantages in holding money:

the currency is useful to perform transactions;

the capital risk of the coin is null (true?).

### Costs of holding currency:

opportunity cost ...

... interest that could have been earned if, alternatively, had chosen to hold

financial assets that earn interest;

bonds and stock receive a special positive nominal income;

interest earned by currency are zero or minimal.

# Main factors affecting the choice between holding money or other assets:

## Nominal Interest Rate ( $i$ ):

- Affects the cost of holding money.
- The higher the interest rate, the lower the intentions of holding money
  - ... in other words, greater intentions to hold securities that earn interest.
- This "nominal interest rate" is an average of the different nominal interest rates.
- There is a large number of assets with different yields.
- Interest rates tend to vary together (assets are close substitutes).

- **Real Product ( $Y$ ):**
  - Affects the benefits of holding cash.
  - The larger the product, the greater the volume of transactions ...
  - ... the greater the volume of transactions, the greater the intention of holding money.
- **Price Level ( $P$ ):**
  - Affects the benefits of holding cash.
  - The higher the price, the greater the intention of holding money
  - ... to make the same amount of transactions.

The money demand function has the following characteristics:

- Aims to modelize the intentions of holding money (at current prices).
- Assumes that the nominal interest rate, the real product and price index are the main determinants of this behavior (other can be ignored).

Imposes restrictions on the reaction of  $M^d$ ,  $i$ ,  $Y$  and  $P$ .

## Assumptions about the behavior:

1. It is a continuous and differentiable function

$$M^d = M^d (i, Y, P)$$

2. This function only makes economic sense to a positive value of money demand:

$$M^d (i, Y, P) > 0$$

3. The higher the nominal interest rate (output and price level assumed as given), the smaller the intentions of holding wealth in the form of currency:

$$\frac{\partial M^d}{\partial i} < 0$$

4. The higher the real product (nominal interest rate the price level assumed as given), the greater the intentions of holding wealth in the form of currency:

$$\frac{\partial M^d}{\partial Y} > 0$$

5. The higher the price level (given the nominal interest rate and the product), the greater the intentions of holding wealth in the form of currency:

$$\frac{\partial M^d}{\partial P} > 0$$

Frequently it is assumed that the demand for money is multiplicative (homogeneous of degree 1) on the general price level:

$$M^d = P.L(i, Y)$$

- For example, a the doubling of prices leads to a doubling of the intentions of money demand.
- The ratio between demand for Money and price level ( $L = M^d/P$ ) is :
  - Liquidity demand or ...
  - ... real money demand.
  - This is a demand for purchasing power of the currency.

For the 1st year, we use an approximation to the general function that is:

- linear on  $i$  and  $Y$ , and ...
- ... multiplicative on  $P$  :

$$M^d = P.(k.Y - h.i) \quad k, h \geq 0$$

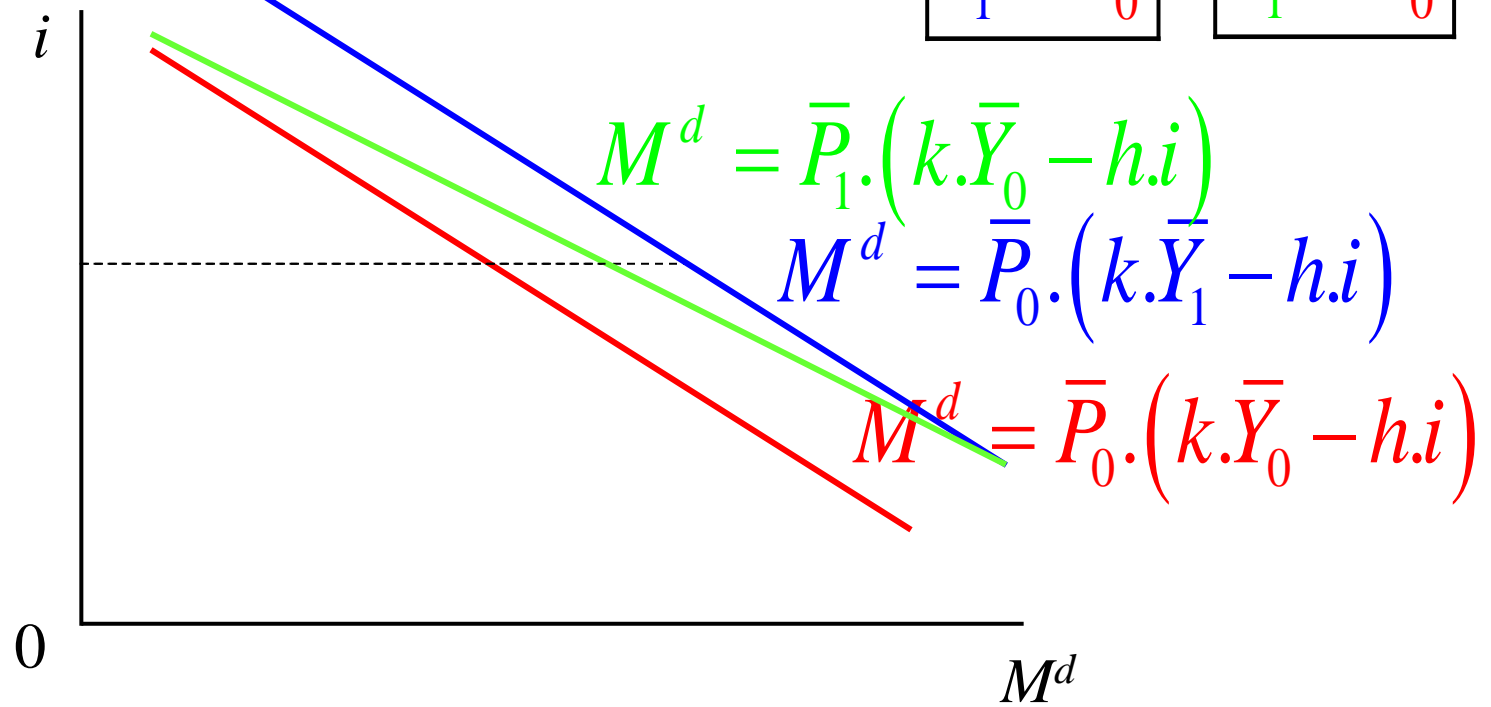
- $M^d$  – intentions of holding money – it is a stock.
- $i$  – nominal interest rate
- $Y$  – real product
- $P$  – price level
- $k$  – sensitivity of money demand to the product
- $h$  – sensitivity of money demand to interest rate



# Graphic representation of money demand function in the space $(M^d, i)$

$$\bar{Y}_1 > \bar{Y}_0$$

$$\bar{P}_1 > \bar{P}_0$$



## 9.2. Money supply and monetary market equilibrium

A function of money supply is the intentions of placing money in circulation by the agents who provide it.

Who are those agents?

- Central Bank(M0).
- Commercial Banks (deposits).

The Central Bank can influence the behavior of commercial banks through:

- Legal rules (e.g. reserve requirements).
- Loan conditions (e.g. reference interest rate).

Suppose that the central bank controls the money supply of intentions (directly and indirectly):

-Controlling the amount (stock) of money in circulation ( $M$ ).

-Controlling the "price" of money ( $i$ ).

It is impossible to control price and quantity simultaneously.

## Assumption 1 – Central Bank controls the quantity of Money

In this case the function of the central bank behavior is given by:

$$M^s = \bar{M}$$

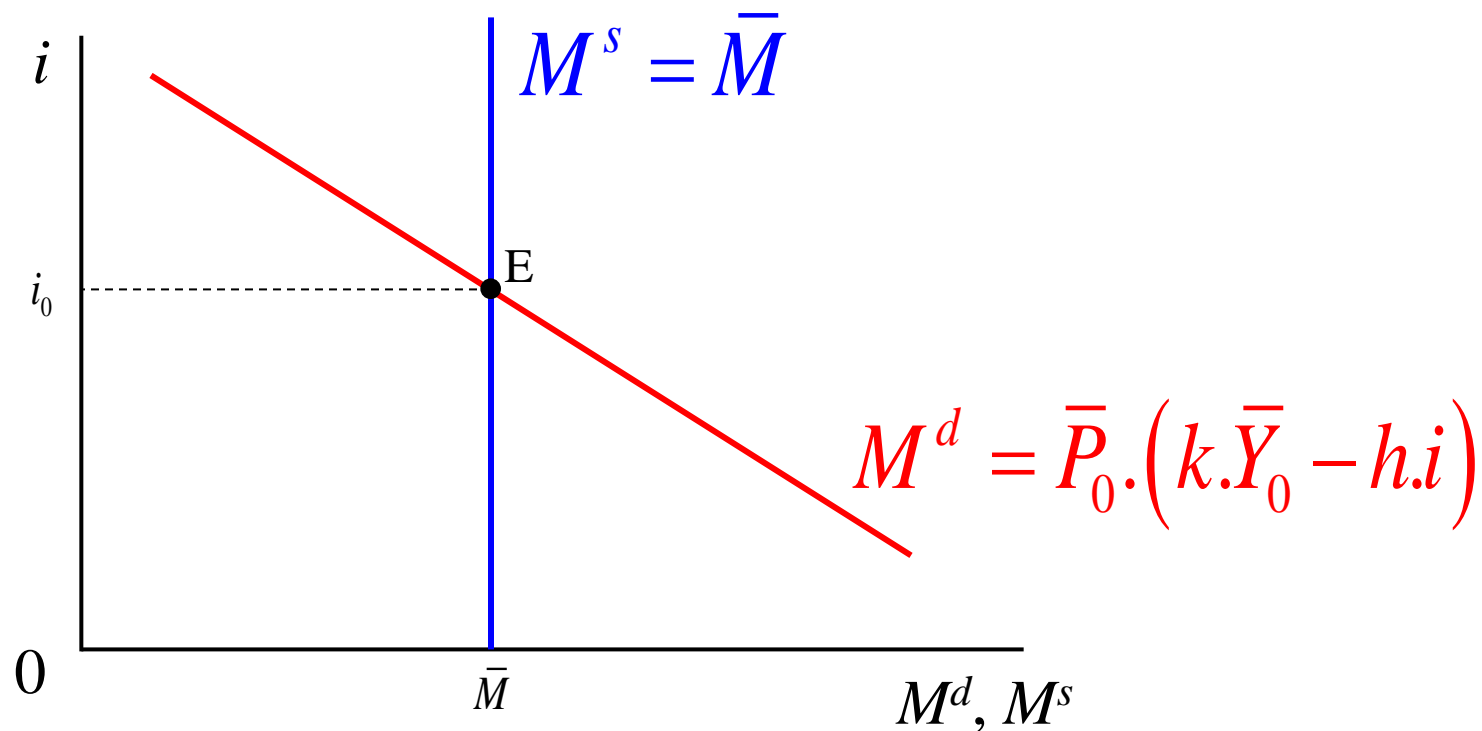
- $M^s$  – intentions of placing money in circulation, measured at current prices - is a stock.
- It is an equation behavior.
- Do not depend on other variables in the model, so are explained by factors exogenous to the model.
- Being controlled by the Central Bank, this variable can be used as an instrument of economic policy.

The equilibrium in the money market occurs when demand intentions equal the intentions of the money supply:

$$M^d = M^s$$

- In this case the quantity of money is determined by the behavior of the Central Bank and ...
- ... "price" (i) is determined by the agents who wish to hold currency.

# Graphical representation of equilibrium in the money market space ( $M^d, i$ )



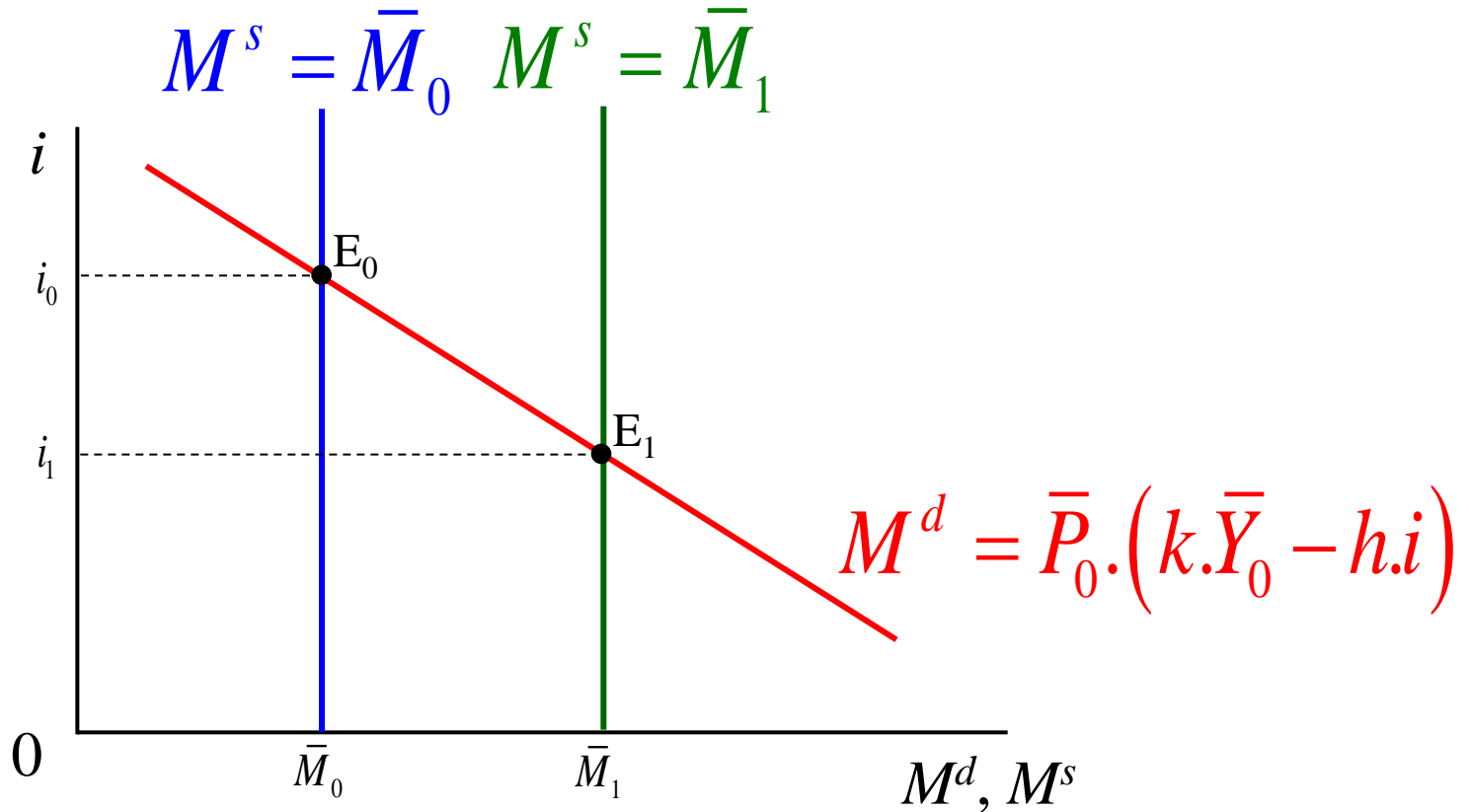
**When the Central Bank (eg European Central Bank) varies the money supply ....  
Changes ... the equilibrium nominal interest rate.**

**Main instrument of the ECB:**

**Open Market Operations :**

**Purchases securities (and gives currency exchange) -  
increases the money supply.**

**Sells securities (and receive money in return) -  
decreases the money supply.**



- A monetary expansion causes a reduction of the nominal interest rate.
- A monetary contraction causes an increase in the nominal interest rate.

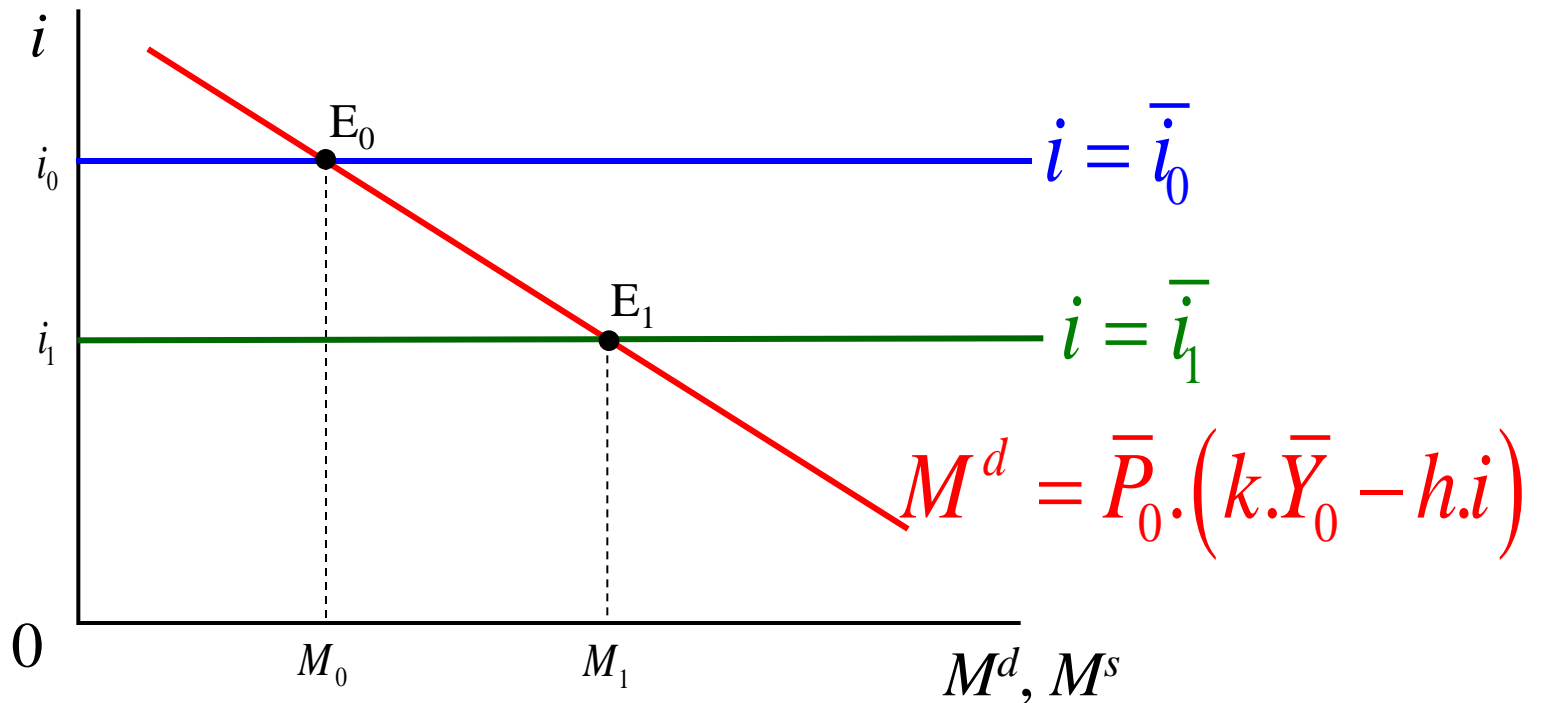


**Assumption 2 – Central Bank controls the nominal interest rate**

In this case the function of the behavior of the central bank is given by:

$$i = \bar{i}$$

- $i$  – nominal interest rate
- it is an behavior equation.
- It does not depend on other variables in the model, and it is explained by factors exogenous to the model.
- being controlled by the Central Bank, this variable can be used as an instrument of economic policy.



- A reduction in the interest rate causes an increase in the quantity of money in circulation.
- An increase in interest rates causes a reduction in the quantity of money in circulation.

**In reality the Central Bank does not directly control:  
the money supply ( $M^s$ )**

**in case 1 ...**

- **Because ... deposits in commercial banks are the most important part of M.**

**the market interest rate ( $i$ )**

**in case 2 ...**

- **Because ... there are more agents who buy and sell government bonds.**

**The control is done indirectly through the instruments at its disposal:**

- **circulation ( $M0$ );**
- **open market operations;**
- **Reference interest rate; marginal lending rate;**
- **reserve requirements.**