Money and Inflation (Part 2)

EVROPSKÁ UNIE
Evropské strukturální a investiční fondy
Operační program Výzkum, vývoj a vzdělávání

MINISTERSTVO ŠKOLSTVÍ,
MLÁDEŽE A TĚLOVÝCHOVY

Demand for Money and QTM

- In equilibrium, the demand for real money balances $(M/P)_d = kY$ must equal the supply M_S/P:

$$\underline{M_S/P = kY}$$

M(1/k) = PY

- which can be written as:

MV = PY, **where V = 1/k.**

- It shows the link between the demand for money and the velocity of of circulation of money.
- When people hold a large fraction of their income in the form of money (k is high), money changes hands less frequently (V is small).
- When people want to hold only a little money (k is small), money changes hands more often (V is large).

Inflation and interest rates

- Suppose you deposit $100 in a bank account that pays i=8 % interest annually. Assume that the price of beer this year is P_1=$2.
- Next year, you withdraw your savings and the accumulated interest: $100×(1+i)= $108
- Assume that the price of beer next year is P_2=$2.04
- Are you 8 percent richer than you were when you made the deposit a year earlier?
- In the first year, you could buy: $100/$2 = 50 bottles
- In the second year, you can buy: $108/$2.04 = 53 bottles.
- => Y /P -1 = 0.06 = 6 % more

What is the inflation rate in this economy?

Inflation and interest rates

$$1+0.06=\frac{\dfrac{100\times(1+i)}{P_2}}{\dfrac{100}{P_1}}$$

Number of bottles next year = 53

Number of bottles this year = 50

$$1+0.06=\frac{\dfrac{100\times(1+0.08)}{2.04}}{\dfrac{100}{2}}=\frac{53}{50}$$

Inflation and interest rates

$$1 + 0.06 = \frac{\dfrac{100 \times (1+i)}{P_2}}{\dfrac{100}{P_1}}$$

$$1 + 0.06 = \frac{\dfrac{(1+i)}{P_2}}{\dfrac{1}{P_1}}$$

$$1 + 0.06 = \frac{(1+i)}{\dfrac{P_2}{P_1}}$$

r … real interest rate

$$1 + r = \frac{(1+i)}{1+\pi}$$

$$1 + \pi = \frac{P_2}{P_1}$$

Inflation and interest rates

- Nominal interest rate, **i** … the interest rate that the bank pays:
  - is not adjusted for inflation
- Real interest rate, **r** … the interest rate that reflects the true increase in the purchasing power (6 % in our example):
  - is adjusted for inflation.

Inflation and interest rates

$$1 + r = \frac{(1 + i)}{1 + \pi}$$

$$(1 + r) \times (1 + \pi) = (1 + i)$$

$$1 + r + \pi + \pi \times r = 1 + i$$

If we neglect $\pi \times r = 0.02 \times 0.06 = 0.0012$

$$i = r + \pi$$

Fisher equation

$$r = i - \pi$$

Fisher equation and the **Fisher effect**

- $i = r + \pi$

According to the Fisher equation, a 1-percent increase in the rate of inflation in turn causes

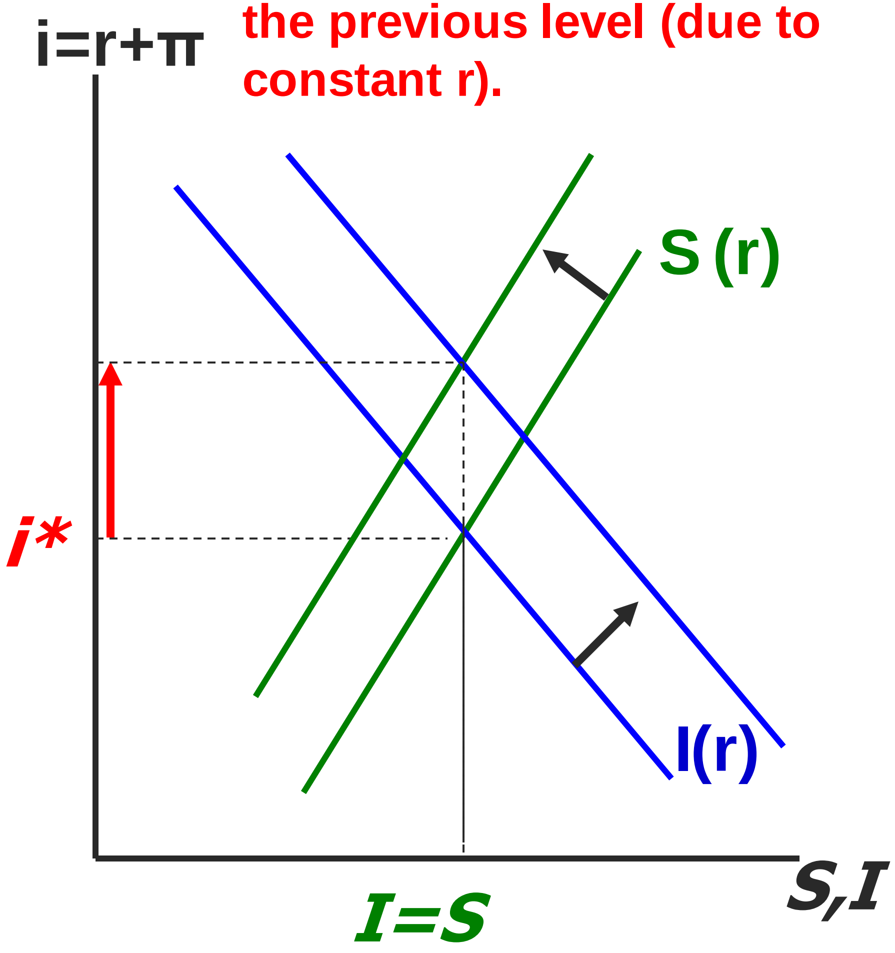
Hence, in the classical (long-run) theory, changes in money growth or inflation do not affect the real interest rate.

rate of money growth of 1 percent causes a 1-percent increase in the rate of inflation.

- The one-for-one relation between the inflation rate and the nominal interest rate is called the **Fisher effect**.

Fisher effect *

Nominal interest rate rises keeping the real S and I at the previous level (due to constant r).



Higher inflation rate decreases the willingness of savers to save at the given nominal interest rate i (their loan will be repaid with money with lower purchasing power).

… Higher inflation increases the willingness of investing firms to (borrow and) invest more at the given nominal interest rate i (their debts will be repaid with money with lower purchasing power).

Two Real Interest Rates: *Ex Ante* and *Ex Post*

- When a borrower and lender agree on a nominal interest rate, they do not know what the inflation rate over the term of the loan will be.
- Suppose that they expect $\pi^e = 3\ \%$. If the agreed **r** is 4 %, then:
  $i = r + \pi^e = 7\ \%$
  - If the realised inflation differs, e.g. $\pi = 5\ \%$, then the **<u>ex post real interest rate</u>** will be:
    - $r^{ex\ post} = 7\ \% - 5\ \% = 2\ \%$

Who lost and who gained when $\pi > \pi^e$?

- Hence, we must distinguish between two conc… of the real interest rate:
  - The real interest rate the borrower and lende… xpect when the loan is made:
    - … ***ex ante*** **real interest rate = i – π^e = 4 %**
  - and the real interest rate actually realized:
    - … ***ex post*** **real interest rate = i – π = 2 %**

Two Real Interest Rates: *Ex Ante* and *Ex Post*

- Because the nominal interest rate agreed by lender and borrower can adjust only to expected inflation (not to the realized inflation), the Fisher effect is more precisely written as:

  $i = r + \pi^e$

- The ex ante real interest rate ***r*** is determined by equilibrium in the market for goods and services (or I=S).
- The nominal interest rate ***i*** moves one-for-one with changes in expected inflation π^e.

Money demand and the nominal interest rate

- In the quantity theory of money, the demand for real money balances depends only on real income ***Y***.
- Money demand refers to the fraction of wealth the representative agent would like to hold in the form of money.
- **Wealth** consists of many assets:
  - Bonds, stocks, physical capital (e.g.houses), human capital…

Money demand and the nominal interest rate

- The other assets typically generate some type of income (e.g. **interest** income in the case of bonds), but are much **less liquid** than money.
  - The more money the consumer holds in his portfolio, the more interest income he foregoes.
  - The less money he holds, the more interest income he makes, but the less liquid is his portfolio.

Money demand and the nominal interest rate

- The higher the nominal interest rate (e.g. on bonds) the higher is the opportunity cost of holding money.
- Hence, $\uparrow \boldsymbol{i} \Rightarrow \downarrow$ in money demand.

$$(\boldsymbol{M}/\boldsymbol{P})^{d} = \boldsymbol{L}(\boldsymbol{i}, \boldsymbol{Y})$$

$$L_Y > 0 \qquad L_i < 0$$

Money demand and the nominal interest rate

- Why does the **real** demand for money **L(i,Y)** deper **al** interest rate?

Notice that during deflation ($\pi<0$), the real return on money is positive.

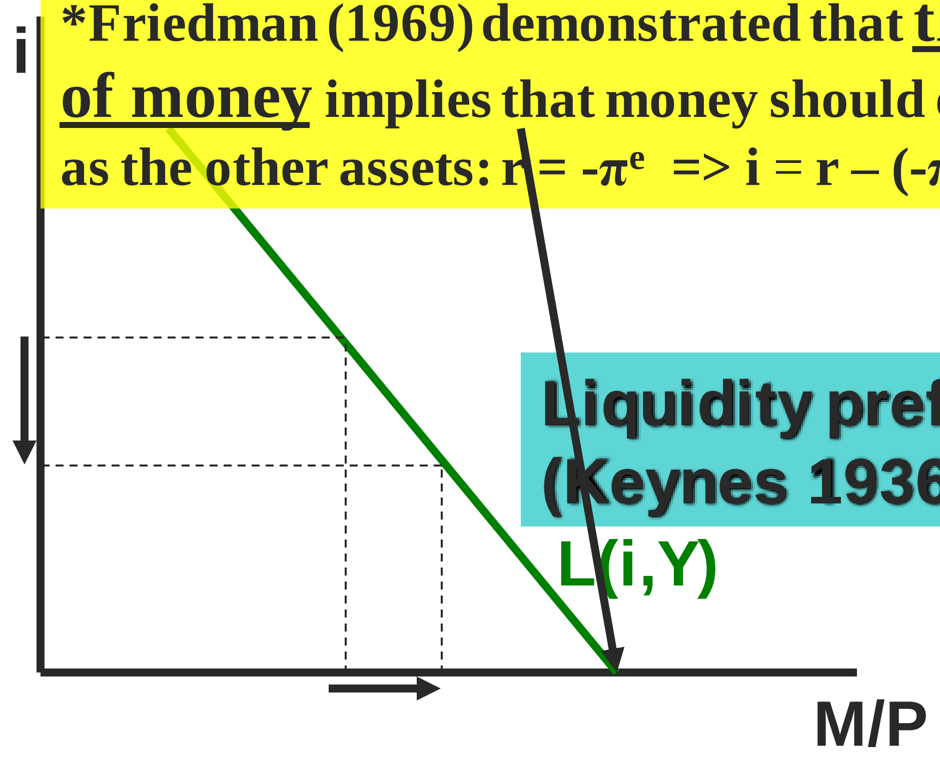
- Money earns an expected real return of ($-\pi^e$), because its real value declines at the rate of inflati

What is the nominal return on money?

- Asse he real return *r*.
- Thus, the cost of holding money is $r - (-\pi^e)$, which (as the Fisher equation tells us) is the nominal interest rate **i**.

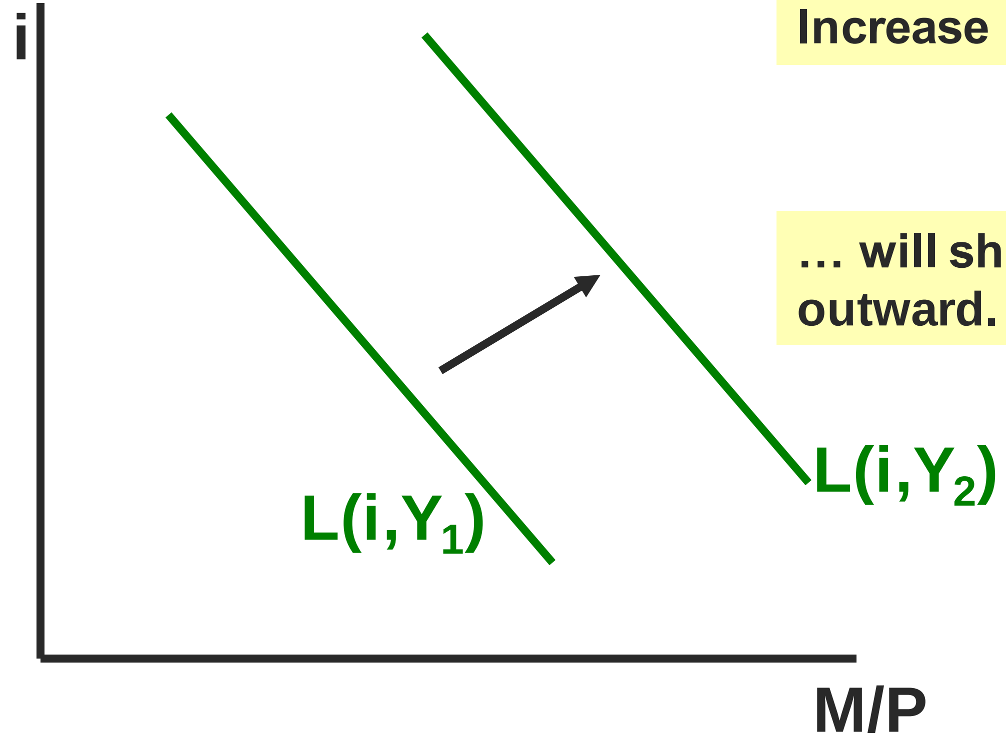
Money demand and the nominal interest rate

*Friedman (1969) demonstrated that **the optimum quantity of money** implies that money should earn the same real return as the other assets: $r = -\pi^e$ => $i = r - (-\pi^e) = 0$ %



Liquidity preference theory (Keynes 1936)

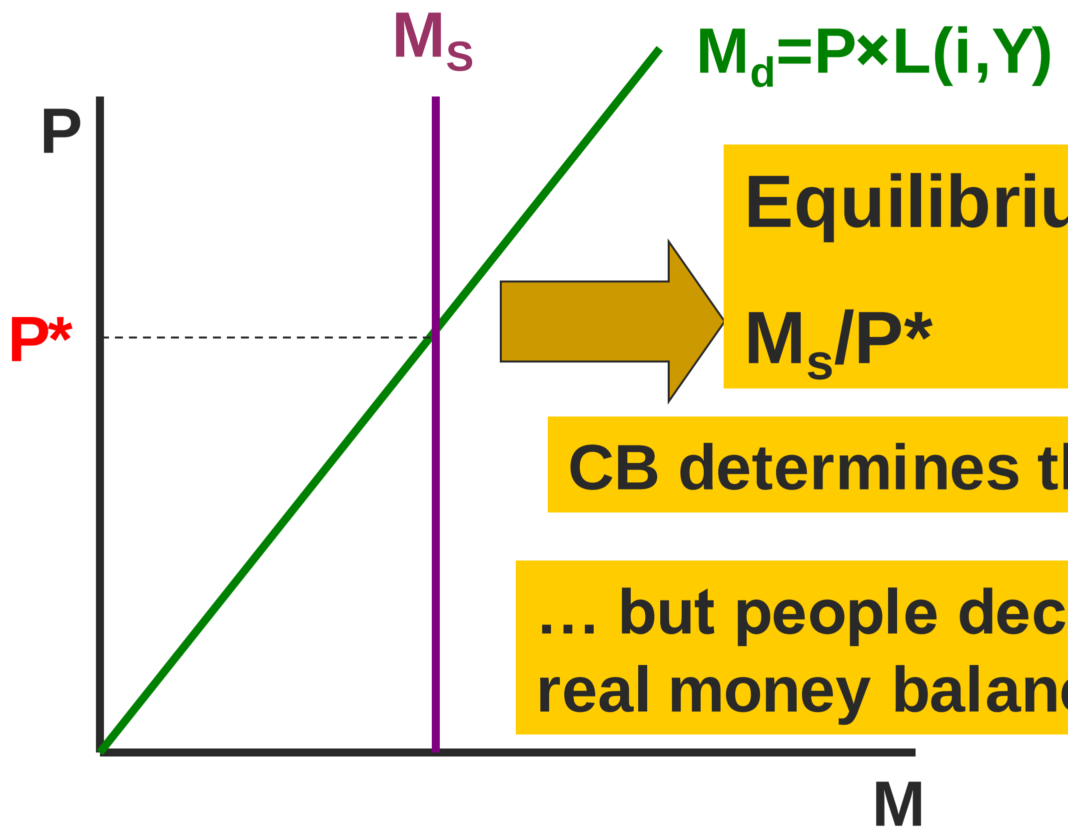
Money demand and the nominal interest rate



Increase in real income…

… will shift the entire curve outward.

The equlibrium Price level



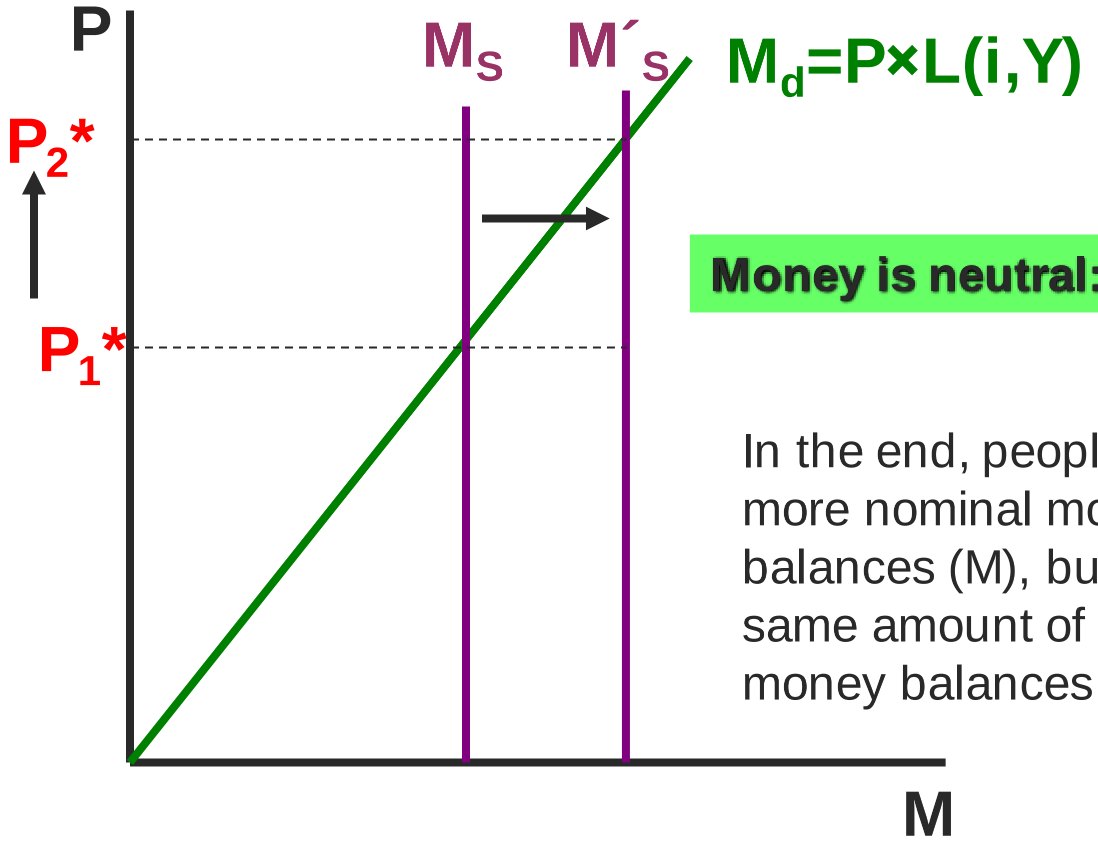
Equilibrium M/P:

M_s/P*

CB determines the nominal M_s …

… but people decide about the real money balances M/P

Neutrality of money



Money is neutral: ↑M→↑P

In the end, people hold more nominal money balances (M), but the same amount of real money balances (M/P)

EVROPSKÁ UNIE
Evropské strukturální a investiční fondy
Operační program Výzkum, vývoj a vzdělávání

MINISTERSTVO ŠKOLSTVÍ, MLÁDEŽE A TĚLOVÝCHOVY