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Macroeconomics 1

Inflation and the interest rates

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Whatis money about?

- Money:
  - a certain commonly accepted commodity (although not necessarily) with which we make payments for delivered goods and services or fulfill obligations (e.g. repayment of debt)
  - *Medium of exchange*

Functions of money

- A means of storing value (hoarding) that allows you to make purchases in the future
- Accounting unit :
  - In the short term - enabling the expression of prices and settlements
  - In the longer term - Deferred payments meter

What types of money can there be?

- **Commodity -** the role of money is played by goods that have other uses at the same time (gold, shells, beads, goats, enemies' teeth...) - the so-called barter trade / "barter trade"

- **Symbolic -** a means of payment whose purchasing value significantly exceeds the cost of producing this money (modern banknotes, coins)
- **Non-cash (IOU - I owe you)** - a means of exchange based on a receivable of an enterprise or an individual. The most dynamically developing form of money. (deposits, bank checks, payment cards)

What does inflation mean?

- An increase in the average price level of goods, services (and factors of production) over a certain period of time.
- The inflation rate is an increase expressed as a percentage over a period of time.
- In other words, it is the phenomenon of the decline in the value of money, sometimes called the phenomenon of money illusion.

What does inflation mean?

- Pure inflation - prices of all goods increase at the same rate
- Deflation – a decline in the average price level of goods and services
- Disinflation - a decrease in the rate of price growth (a decrease in inflation, not a decrease in the price level)

Inflation problems.

- In the case of goods other than money, we can observe changes in their prices expressed in money.
- You cannot measure changes in the value of money in other money → it can also gain or lose value.
- However, it is possible to track the prices of other goods because only their presence makes money exist.
- Difficulty forecasting inflation.

Measure of inflation

Price index

- Laspeyers (CPI)

$$PI_L = \frac{\sum_i p_{it} q_{i0}}{\sum_i p_{i0} q_{i0}}$$

- Paasche (Deflator)

$$PI_P = \frac{\sum_i p_{it} q_{it}}{\sum_i p_{i0} q_{it}}$$

- Fisher

$$PI_F = \sqrt{PI_L \times PI_P}$$

Quantity index

- Laspeyers

$$Y_L = \frac{\sum_i p_{i0} q_{it}}{\sum_i p_{i0} q_{i0}}$$

- Paasche

$$Y_P = \frac{\sum_i p_{it} q_{it}}{\sum_i p_{it} q_{i0}}$$

- Fisher

$$Y_F = \sqrt{Y_L \times Y_P}$$

Inflation basket is it?

Price indices of consumer goods and services (common: inflation)

- It is calculated based on the results:
  - research on prices of consumer goods and services in the retail market
  - household budget surveys, providing data on average expenditure on consumer goods and services; this data is used to develop a weighting system.

Real value vs nominal one.

- The increase in GDP does not necessarily mean that production has increased.
- GDP change = Production change +price effect.
- An increase in wages does not necessarily mean that we have become richer -> We earn more, but prices have also increased.
- In order to correctly assess the scale of changes in macroeconomic values (how many more goods and services were produced during the year, how much richer we actually are), it is necessary to eliminate the effects of price increases.

Real value vs nominal one.

- GDP and other values should be calculated at constant prices and valued in the next year as if the prices had not changed.
- $GDP_{Nominal}$ – calculated in current prices (with inflation);
- GDP_{Real} – constant/common prices (without inflation)
- Inflation deflator = $GDP_{Nominal/}$ GDP_{Real}

Real value vs nominal one

- Real price = the price of some good expressed in relation to average prices, e.g. real wage = nominal wage / average price level (price index)

- Real interest rate: $$r = \frac{i + 1}{\text{Price index}},$$

where (i) – nominal interest rate

Central bank interest rate

- **Reference rate**
- profitability of money bills issued by the National Bank of Poland during basic open market operations. These operations involve the purchase or sale of short-term, usually 7-day, money bills on the interbank market in order to restore liquidity balance in the banking sector. The level of the reference rate affects the WIBOR level, which in turn constitutes the basis for the interest rate on external capital.
- In Poland, the NBP reference rate is one of the basic interest rates set since February 6, 1998 by the Monetary Policy Council.

- **Lombard rate**
- determines the price at which the central bank grants loans secured by securities to commercial banks. The loan amount cannot exceed the equivalent of 100%-X% of the value of the pledged securities (the so-called haircut in this case is X% and is determined separately for different groups of securities).

Central bank interest rate

- **Deposit rate**
- one of the basic interest rates, determines the interest rate on one-day deposits placed by commercial banks at the central bank. In Poland, the NBP deposit rate has been set by the Monetary Policy Council since December 1, 2001. In 2014, the ECB introduced a negative deposit rate (June: -0.10%), similarly to the Swiss National Bank (December: -0.25%).
- **Rediscount rate**
- is used to calculate the price the central bank accepts for rediscount bills of exchange from commercial banks that meet certain conditions. From May 1, 2004, the interest rate on commercial banks' reserves held at the National Bank of Poland is 0.9 of the bill rediscount rate – therefore, this rate is of great importance in the banking system.
- **Impact on the money supply:**
  - increasing the rediscount rate – reduces money creation,
  - lowering the rediscount rate – increases money creation in the economy.

Inflation on money market

- Markings:
  - π – Inflation
  - ΔM – Nominal money supply change
  - ΔL – Nominal money demand change

$$\pi = \Delta M - \Delta L$$

Real value vs nominal one

- Using simplified Fisher equation:

$$r = i - \pi \ ,$$

$$\pi = \Delta P/P = (P_1 - P_0)/P_0$$

where:

r – real interest rate

i – nominal intrest rate,

- Δ GDPdeflator ≈ Δnomin.GDP – Δreal.GDP
- Δ real wages ≈ Δnominal wages – inflation

Real exchangerate

- The relative price of goods from different countries expressed in one currency
  - It shows the competitiveness of domestic producers
    - ✓ the higher it is, the higher the price of foreign goods expressed in domestic currency,
    - ✓ the higher it is, the greater the competitiveness of a given country,
  - this favors an increase in a country's net exports.

$$e_r = \frac{eP^*}{P}$$

where P^* - foreign prices level, P – domestic prices level

https://www.economist.com/big-mac-index

Real exchangerate

Task

Based on data from the network drive, calculate the real exchange rate in trade between Poland and the USA.

Inflation costs

- cost of torn soles
- cost of changed menus
- cost of the real interest rate
- tax drain
- taxation of capital income
- taxation of company income
- cost of redistribution
- the cost of uncertainty

Quantity theory of money

The relationship between the amount of money in circulation and the price level

- V- Money velocity is the speed at which money resources circulate in the economy. The average number of transactions handled by a payment unit over a given period of time.
- M – the amount of cash in the economy
- P – average price level
- Y – total number of transactions in goods trade (quantity of goods and services)

$$\frac{M}{P} = \frac{Y}{V}$$

Money demand

Demand for money (L) - demand for the money stock in real terms (adjusted for the level of inflation). It depends on the interest rate, income, and inflation level.

- Transactional motive – everyday expenses, amount of funds at immediate disposal. Depends on income level: L=f(Y)
- The motive of forethought – for unexpected expenses
- Portfolio motive (speculative) – results from risk aversion. We are ready to give up some of the potential profits in exchange for a sense of greater financial security : L=f(Y)

Money Supply

Money supply (M) – the value of money resources in circulation

- Depozits (D) – a sum of money placed in a bank for safekeeping by depositors (depositors)
- Reserves (R)– the amount of cash that banks have that can be used for immediate payment in the event of a request from deposit holders
- Reserves rate– ratio of the value of reserves to the value of deposits (R/D)

Money supply measures

- Monetary base (H) – a stock of high-power money. The total amount of banknotes and coins in non-bank circulation (CU) and the possession of banks (R).
- M0= monetary base (H) = CU + R
- M1= M0 + retail and wholesale deposits on demand
- M2= M1 + deposits and other liabilities of banks towards non-bank entities with an original maturity of up to 2 years (inclusive) and deposits with a notice period of up to 3 months (inclusive)
- M3= M2 + additionally, repurchase operations between banks and the non-banking sector and debt securities with a maturity of up to 2 years (inclusive) issued by banks
- M4= M3 + shares and contributions of construction companies + cash, bank contributions and certificates held by building societies

Money creation multiplier

- Reserves rate: re= R/D
- The ratio of cash in circulation to deposits: cu=CU/D
- Money supply = currency in circulation (CU) + deposits (D)

  M= CU+D = cu*D + D = D*(1+cu)
- Monetary base = money in circulation + money in banks

  H = CU+R = cu*D + re*D = D*(cu+re)

Money creation multiplier

- Sum of deposits

$$M = H + H*(1- re) + \ldots + H*(1- re) = H * \left(\frac{1-(1-re)(n+1)}{1-(1-re)}\right)$$

$$= H *\left(\frac{1-(1-re)(n+1)}{re}\right)$$

- Total loans = Total deposits– H =

$$=H \left(\frac{1-(1-re)(n+1)-re}{re}\right)$$

- The sum of required reserves in the central bank account

$$H * re * (1 + (1 - re)^1 + (1 - re)^2 + \cdots + (1 - re)^n) = H * re \frac{1 - (1 - re)^{(n+1)}}{1 - (1 - re)}$$

$$= H * re \frac{1 - (1 - re)^{(n+1)}}{re}$$

Money creation multiplier

- Asumming n->∞
- **The simple money multiplier is** $MM = \frac{1}{re}$
- **Total deposits** = M = H / re
- **Total credits** = H * (1-re)/re
- **The sum of required reserves deposited in the central bank accounts** = H* (re/re) = H

Money creation multiplier

Money creation multiplier (MM):

$$M = H \times \frac{1 + cu}{cu + re} = H \times MM \rightarrow MM = \frac{1 + cu}{cu + re} > 1$$

Simple Money creation multiplier

$$MM = \frac{1}{re}$$