Exchange rate in a short run

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Main definitions

Foreign exchange market – a market where one country's currency is exchanged for the other

Currency – used as a synonym to a word *money*, most of all in the context of international relations

Foreign currency – all foreign coins, banknotes, deposits in foreign banks and other foreign short-run financial assets (up to 1 year)

Exchange rate and types of quotations:

- Direct quotation: price of a foreign currency expressed in a domestic currency (American quotation, e.g. PLN/USD)

- Indirect quotation: price of a domestic currency expressed in a foreign currency (European quotation, e.g. USD/PLN)

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Foreign currency market
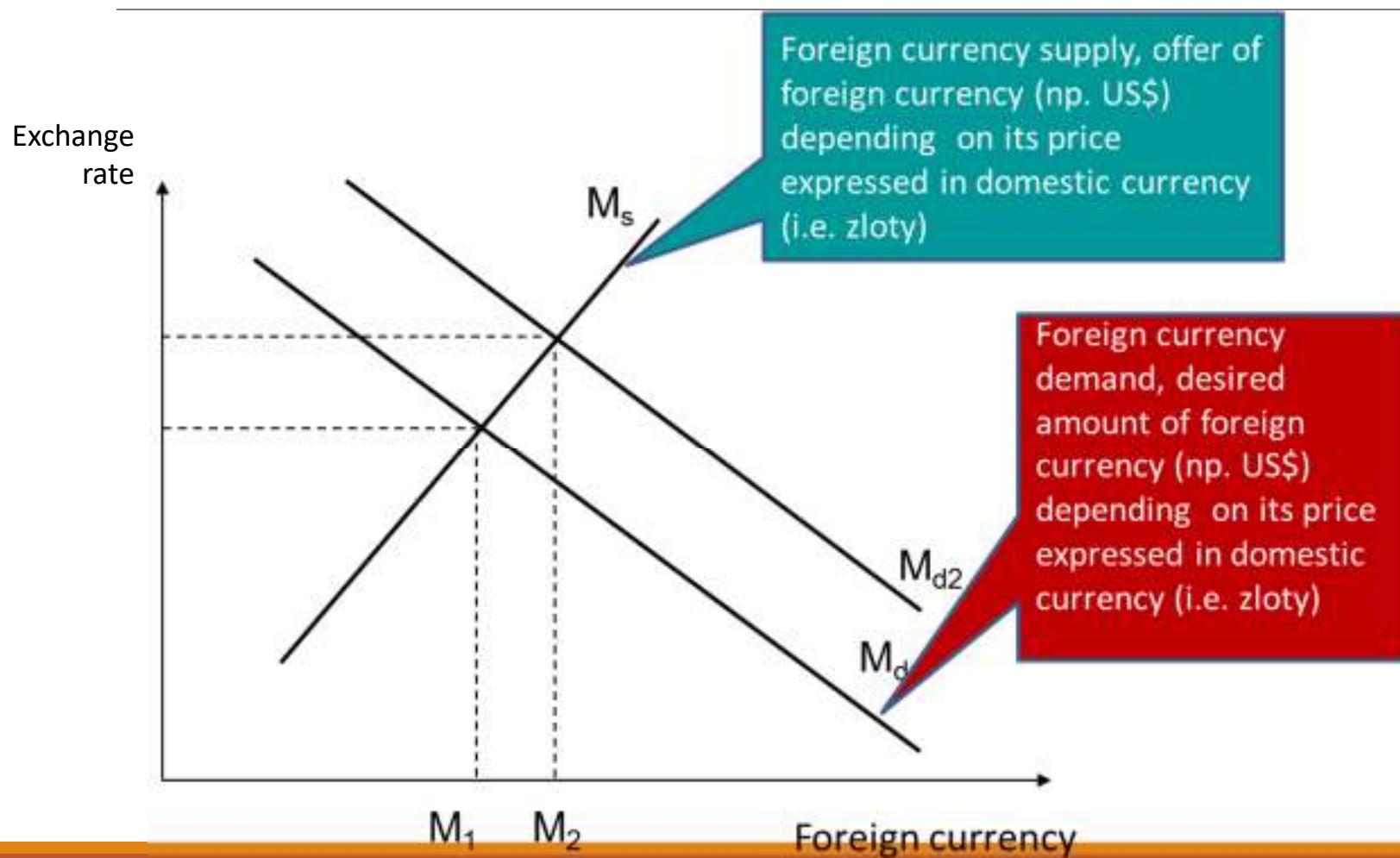
Sources of demand and supply for currency

- Foreign trade – e.g. if a Polish company exports its products to Germany, the contractor pays the amount in euros. The company bears the costs in zlotys (salaries, raw materials, energy, etc.) and therefore has to sell the euro on the currency market (to transfer it into zloty) → it increases the supply of euros.

- Remuneration of factors of production employed abroad – e.g. if an American company has subsidiaries in Poland, acting on the Polish market, it records a profit in zloty, and the company's profit is transferred to the U.S. - first zloty must be converted (in the currency market) the U.S. dollar → demand for dollars growing.

- The flow of capital - e.g. Finnish pension fund buys bonds of the Polish government; since the fund is denominated in euro, and the government sells bonds in zloty, the buyer must first use the currency market → euro supply increases.

Different types of exchange rate

- Nominal exchange rate

- Real exchange rate

- Nominal effective exchange rate

- Real effective exchange rate

- Floating exchange rate

- Fixed exchange rate

- Spot exchange rate

- Future exchange rate

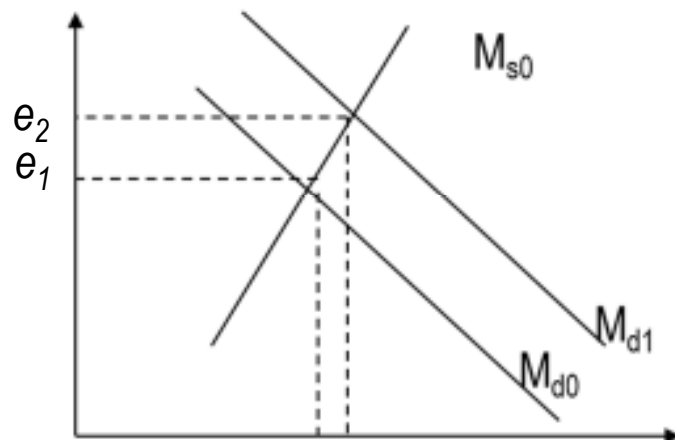# Nominal exchange rate versus real exchange rate

- Nominal exchange rate - the actual foreign exchange quotation, without adjustment for transaction costs or differences in purchasing power.

- Real exchange rate - a nominal exchange rate adjusted for the different rates of inflation between the two currencies. It shows the purchasing power of two currencies relative to one another.

- Nominal effective exchange rate – a weighted average of exchange rates of a given country's currency against currencies of its trading partners, where weights are the shares of each currency in the exchange with a given trading partner.

- Real effective exchange rate - a weighted average of a country's currency relative to an index or basket of other major currencies adjusted for the effects of inflation. The weights are determined by comparing the relative trade balances, in terms of one country's currency, with each other country within the index.

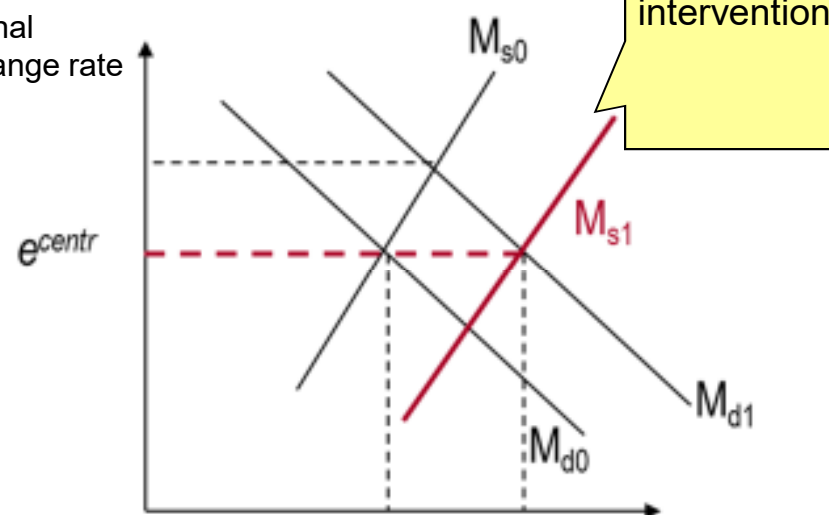# Floating exchange rate versus fixed exchange rate

Spot exchange rate versus forward exchange rate

- Spot exchange rate - the exchange rate for which two parties agree to trade two currencies at the present moment. The spot exchange rate is usually at or close to the current market rate because the transaction occurs in real time and not at some point in the future.

- Forward exchange rate - the exchange rate set today for a foreign currency transaction with payment or delivery at some future date.

- Spot currency contract - immediate delivery of currency (the end of a second working day after concluding the transaction).

- Forward currency contract - an agreement between two parties to exchange two currencies at a given exchange rate at some point in the future, usually 30, 60, or 90 days hence. A forward currency contract mitigates foreign exchange risk for the parties and is most useful when both parties have operations or some other interest in a country using a given currency. Forward currency contracts are over-the-counter contracts (negotiated between brokers and dealers).

Arbitrage

- The simultaneous purchase and sale of an asset in order to profit from a difference in the price

- It is a trade that profits by exploiting price differences of identical or similar financial instruments, on different markets

- Arbitrage exists as a result of market inefficiencies; it provides a mechanism to ensure prices do not deviate substantially from fair value for long periods of time

- Currency arbitrage

	Rate	Bid	Ask
Market 1	PLN/EUR	3,8695	3,8855
Market 2	PLN/EUR	3,8882	3,9012

- By buying 10 mln euro at market 1 and selling it at market 2 → profit of 327000 PLN (3,27%)

The arbitrage condition

- The arbitrage is possible only in case of price differences of identical or similar financial instruments, on different markets.

- Hence, in case of currency arbitrage we will define the arbitrage condition for three different currencies *j,k,m*, as:

  $e_{jk}e_{km}e_{mj} = 1$ where *e* stands for nominal exchange rate

- If the left hand side of the above equation is higher than1 then it is profitable to conduct a currency arbitrage.

- Moreover, from the above it follows that:

$$\frac{\Delta e_{jk}}{e_{jk}} + \frac{\Delta e_{km}}{e_{km}} + \frac{\Delta e_{mj}}{e_{mj}} = 0$$

Question 1. A US dollar costs 7.5 Norwegian kroner, but the same dollar can be purchased for 1.25 Swiss francs. What is the Norwegian kroner/Swiss franc exchange rate?

Question 2. On the first of January 1 EUR cost 1.3855 USD, and at the same time 1 EUR cost NOK 8.3122. During the year Norwegian kroner has appreciated by 4% while USD has depreciated by 18%. Calculate spot exchange rates at the end of the year.

Question 3. Suppose the quotations (note that USD/EUR 1.2597 means 1 EUR is worth USD 1.2597) of bilateral exchange rates between US dollar, euro and yen are given in the table below. Explore the possibility of three-point arbitrage. Suppose you have 1,000,000 USD. How would you realize your profits? Show the example of such transaction.

USD/EUR 1.2597
JPY/USD 119.06
JPY/EUR 150.08

Question 4. In reality there is a small spread between bid and ask rates. Suppose that the exchange rates between euro, U.S. dollar and the yen are given in the table below. Explore the possibility of three-point arbitrage between these currencies once you have $1,000,000.

	Bid	Ask
USD/EUR	1.2596	1.2599
JPY/USD	119.04	119.08
JPY/EUR	149.96	150.00

Question 5. Below you can find the quotations in two periods. Verify the arbitrage condition using the relative change of exchange rates.

	t_0	t_1
USD/EUR	1.2596	1.2256
JPY/USD	119.04	121.18
JPY/EUR	149.94	148.52

Question 6. Below you can find the price of "The Economist" in three different countries:

	price	exchange rate
USA	4.95 USD	-
Italy	3.55 EUR	0.7974 EUR/USD
Japan	670 JPY	119.51 JPY/USD

- Calculate the price in US dollars in each country.

- Calculate what should be the price in each country if there were no transport costs and purchase parity condition held.

- Which currency is overvalued and which undervalued against the US dollar? Why?

Question 7. How has changed the real exchange rate of euro against the US dollar if euro appreciated 3% in nominal terms and the prices in the US have grown faster than in the EU by about 1.6%?