

# Foreign Exchange Market and Exchange Rates



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# Foreign Exchange Market



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- Widely used abbreviations: FX market or FOREX
- The place where money denominated in one currency is bought and sold with money denominated in another currency
- The place where purchasing power in one currency can be converted into purchasing power in another currency
- The place where exchange rates of the traded currencies are determined



# Meaning of the Foreign Exchange Market

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- The largest financial market made up of banks, commercial companies, central banks, investment management firms, hedge funds, and retail brokers and investors
- Foreign exchange means the money of a foreign country; that is, foreign currency bank balances, banknotes, checks and drafts
- A foreign exchange transaction is an agreement between a buyer and a seller that a fixed amount of one currency will be delivered for some other currency at a specified date

# Size, Composition and Location of the FX Market

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- Market size is USD 6 trillion daily and the U.S. dollar is the most important currency on the foreign exchange market
  - Most of trades on the wholesale market
- The most commonly traded currency pairs are EUR/USD and USD/JPY
- FX market is a global market with no specific location
  - Several financial centres where most of trading is done
- Trading 24 hours a day
  - Market activity first heightens when Europe and Asia are open and again when Europe and the United States are open
  - FX market never sleeps...

# Size, Composition and Location of the FX Market

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- Electronic platforms made foreign currency transactions easier
  - Electronic brokerage systems, phone, SWIFT
- Market makers are crucial for trading on the FX market
- There is no central clearing of FX transaction
- Bank of International Settlements (BIS) plays a critical role in managing FX transactions worldwide
- Main trading centers: London, New York, Tokyo

# World Map of the FX Market



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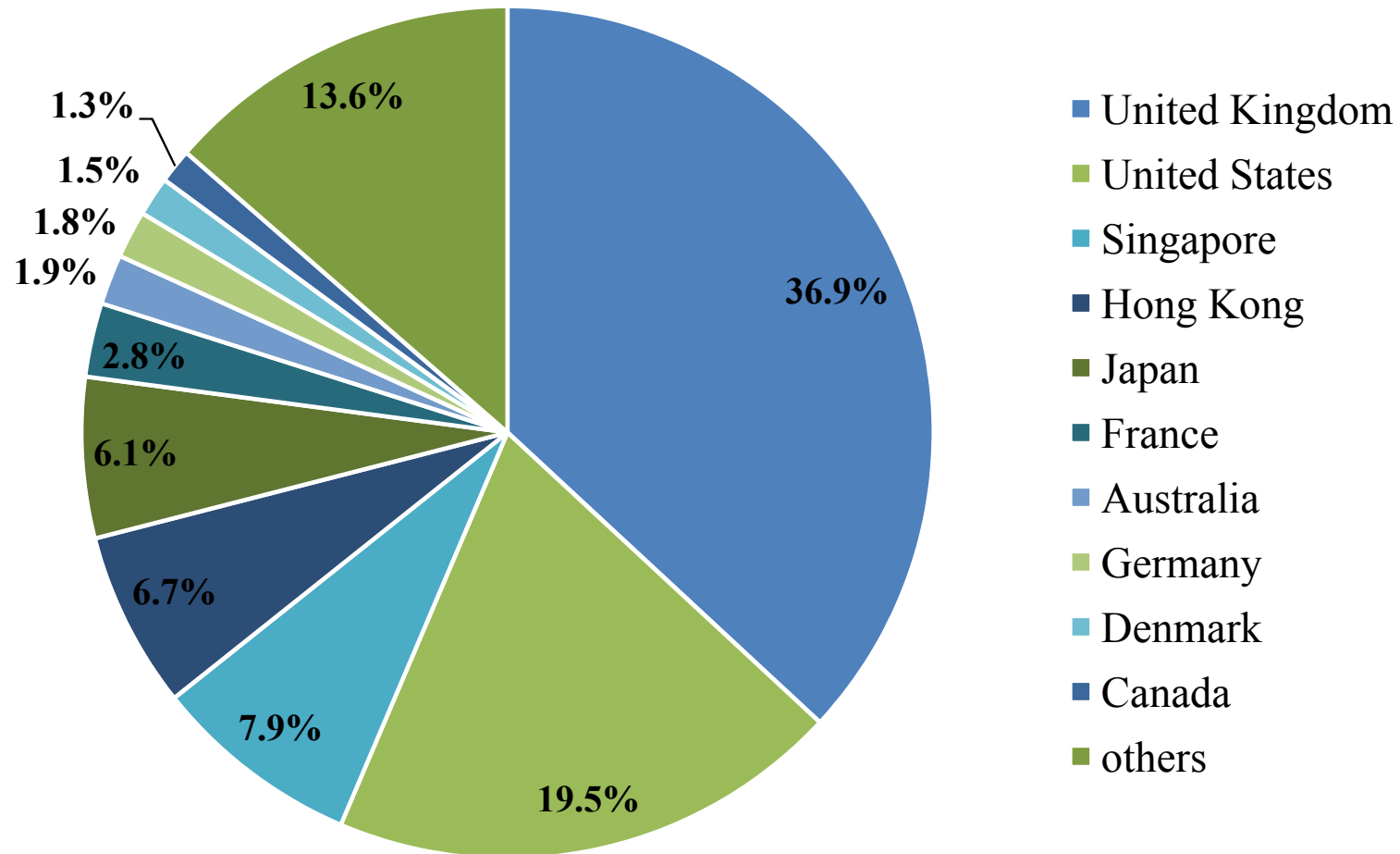


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# Share of Global FX Market Trading in Main Centres



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# FX Market Never Sleeps...



Forexoearlywarning.com



Liquidity by Trading Hours



All times are in GMT

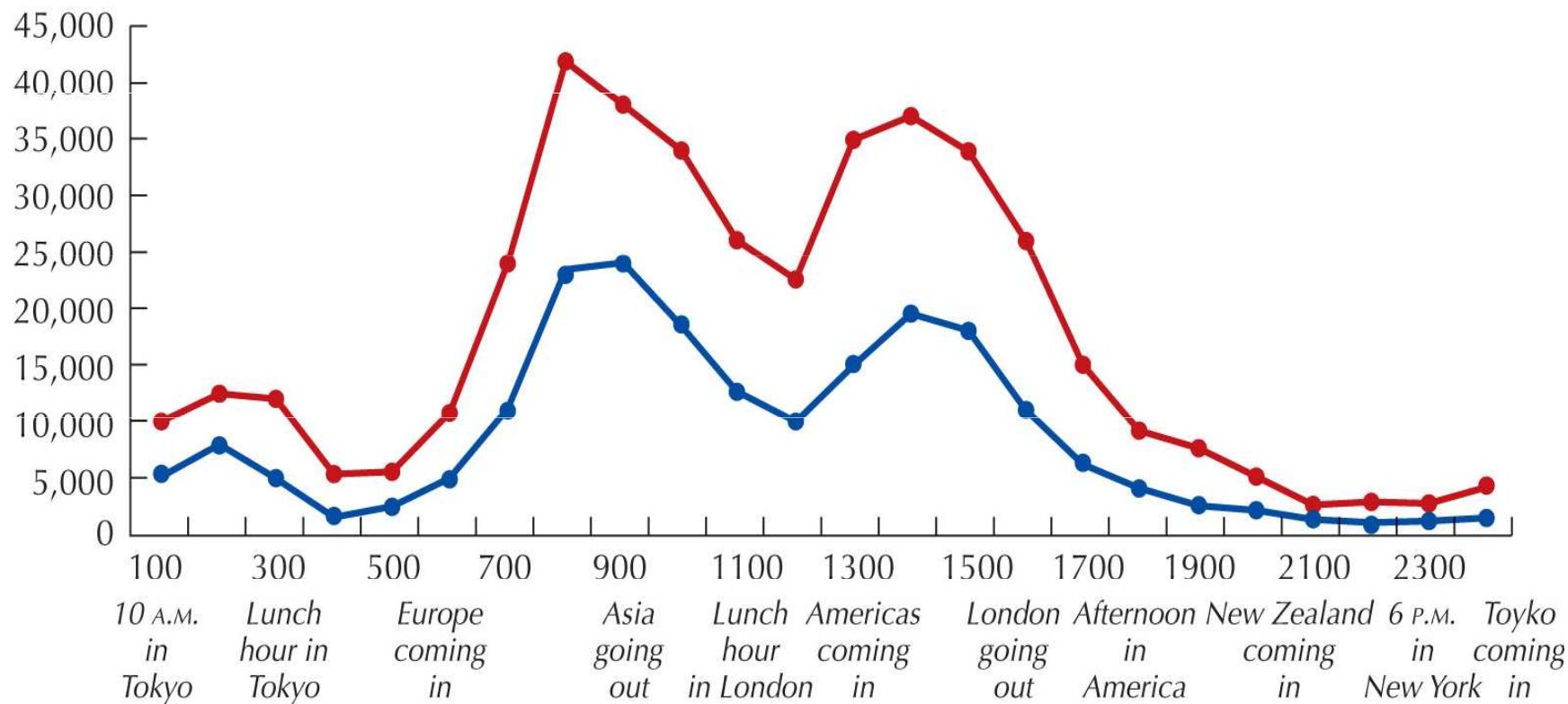


# ... but it Goes for a Lunch



Electronic conversations per hour (Monday–Friday, 1992–1993)

—●— Avg. —●— Peak



Note: Time (0100–2400 hours, Greenwich Mean Time)

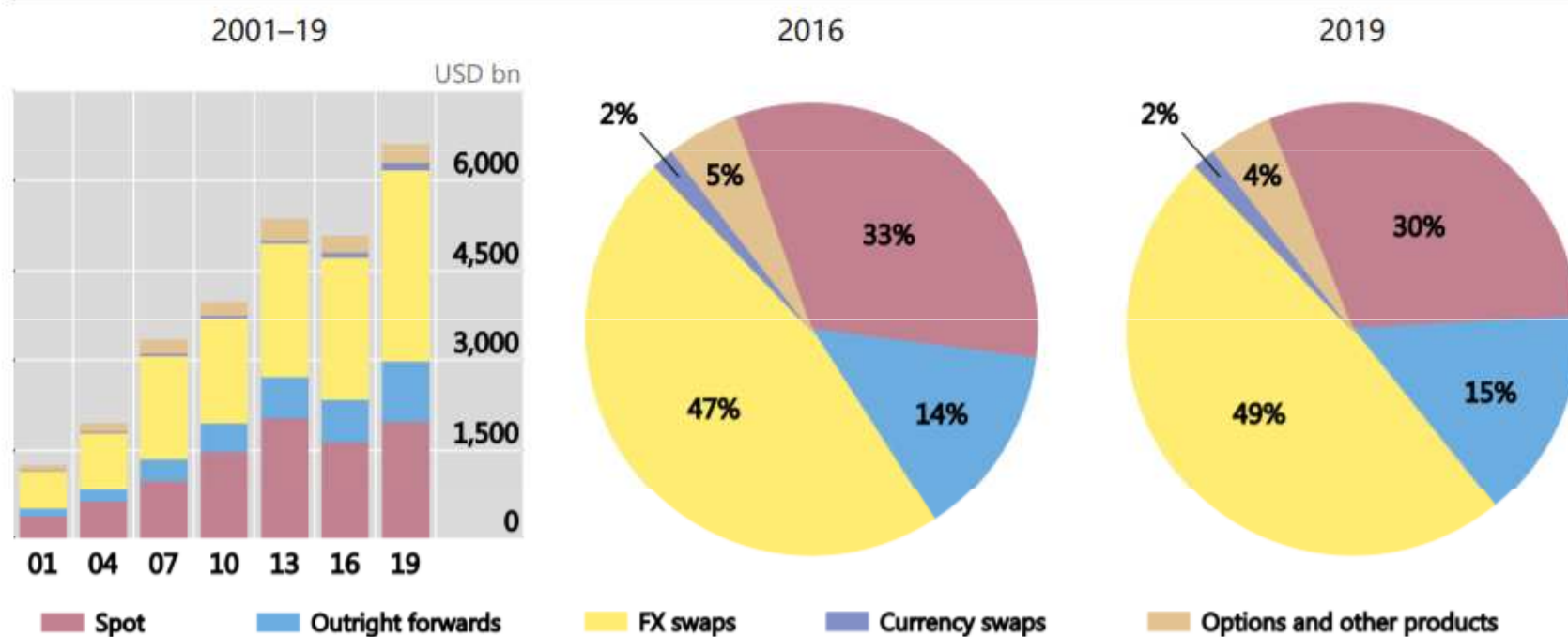
# Global FX Market Turnover by Instrument



## Foreign exchange market turnover by instrument<sup>1</sup>

Net-net basis, daily averages in April

Graph 2



# Currency Distribution of the FX Market Turnover (in % of transactions)



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|           | 1998   | 2001 | 2004 | 2007 | 2010 | 2013 | 2016 |
|-----------|--------|------|------|------|------|------|------|
| USD       | 87.3   | 90.3 | 88.7 | 85.6 | 84.9 | 87.0 | 87.6 |
| EUR (DEM) | (30.1) | 37.6 | 37.2 | 37.0 | 39.1 | 33.4 | 31.4 |
| JPY       | 20.2   | 22.7 | 20.3 | 16.5 | 19.0 | 23.0 | 21.6 |
| GBP       | 11.0   | 13.2 | 16.9 | 15.0 | 12.9 | 11.8 | 12.8 |
| AUD       | 3.1    | 4.2  | 5.5  | 6.7  | 7.6  | 8.6  | 6.9  |
| CAD       | 3.6    | 4.5  | 4.2  | 4.2  | 5.3  | 4.6  | 5.1  |
| CHF       | 7.1    | 6.1  | 6.1  | 6.8  | 6.4  | 5.2  | 4.8  |
| CNY       | 0.0    | 0.0  | 0.1  | 0.5  | 0.9  | 2.2  | 4.0  |
| CZK       | 0.3    | 0.2  | 0.2  | 0.2  | 0.2  | 0.4  | 0.3  |

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# FX Market Turnover by Currency Pair (in % of transactions)



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|               | 1998 | 2001 | 2004 | 2007 | 2010 | 2013 | 2016 |
|---------------|------|------|------|------|------|------|------|
| USD/EUR (DEM) | (20) | 30   | 28   | 27   | 28   | 24   | 23   |
| USD/JPY       | 18   | 20   | 17   | 13   | 14   | 18   | 18   |
| USD/GBP       | 8    | 11   | 14   | 12   | 9    | 9    | 9    |
| USD/AUD       | 3    | 4    | 5    | 6    | 6    | 7    | 5    |
| USD/CHF       | 5    | 5    | 4    | 5    | 4    | 3    | 4    |
| USD/CAD       | 3    | 4    | 4    | 4    | 5    | 4    | 4    |
| USD/CNY       |      |      |      |      | 1    | 2    | 4    |
| USD/others    | 12   | 17   | 16   | 15   | 11   | 13   | 12   |
| EUR/JPY       | ---  | 3    | 3    | 3    | 3    | 3    | 2    |

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# Questions and Applications

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**??? Why U.S. Dollar is so widely traded ???**

# Why U.S. Dollar is so Widely Traded?

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- Investment currency in many capital markets
- Reserve currency held by many central banks
- Transaction currency in many international commodity markets
- Invoice currency in many contracts
- Intervention currency employed by monetary authorities in market operations to influence their own exchange rates
- Vehicle currency that expedites transactions between currencies of limited circulation

# FX Market Participants

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- International banks
  - Around 100 large commercial banks dealers worldwide provide the core of the FX market and actively participate
  - „Make a market" in FX, trading FX on behalf of bank customers (MNCs, money managers, exporters, importers, private traders)
  - Most interbank trades are speculative or arbitrage transaction
- Nonbank dealers
  - Wholesale currency traders who are NOT commercial banks, e.g. investment banks (Solomon Smith Barney, Merrill Lynch, JP Morgan, Goldman Sachs, etc.)
  - Establish their own trading centers to trade directly in the FX market, and account for 28% of the interbank (wholesale) volume

# FX Market Participants

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- **FX brokers/dealers**
  - Brokers/intermediaries who track quotes offered by many dealers in the global market, and then match buyers and sellers for a fee (bid/ask spread), and "make a market," without taking a position themselves (no currency inventory)
  - More and more trading (50-70%) now takes place through automated electronic trading systems, making the role of FX brokers unnecessary
- **Central banks**
  - If a country has a fixed ex-rate (Argentina until recently, Hong Kong), or a pegged rate (China), the central bank (or currency board) has to make regular interventions to support the fixed/pegged ex-rate
- **Individuals and firms**
  - Use the FX market incidentally to their underlying commercial or investment purpose



# Benefits of Banks (dealers) Providing Foreign Exchange

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- **Competitiveness of quote**
    - Savings related to better exchange rate quotes.
  - **Special relationship with the bank**
    - Banks may offer cash management services or be willing to make a special effort to obtain even hard-to-find foreign currencies for the corporation.
  - **Speed of execution**
    - MNC prefer a bank that conducts the transaction promptly and handles any paperwork properly.
  - **Advice about current market conditions**
    - Banks may provide assessments of foreign economies and relevant activities in the international financial environment that relate to corporate customers.
  - **Forecasting advice**
    - Banks may provide forecasts of the future state of foreign economies and the future value of exchange rates.
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# Top 10 Forex Traders in 2019



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| Rank | Name  | Market share |
|------|---|--------------|
| 1    |  Citi                          | 12.9 %       |
| 2    |  JP Morgan                     | 8.8%         |
| 3    |  UBS                           | 8.8%         |
| 4    |  Deutsche Bank                 | 7.9%         |
| 5    |  Bank of America Merrill Lynch | 6.4%         |
| 6    |  Barclays                      | 5.7%         |
| 7    |  Goldman Sachs                | 4.7%         |
| 8    |  HSBC                        | 4.6%         |
| 9    |  XTX Markets                 | 3.9%         |
| 10   |  Morgan Stanley              | 3.2%         |

# Purposes of Trading on the FX Market

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- Hedging
  - Operations to minimize foreign exchange risk
- Arbitrage
  - Non-risk operations to exploit differences in exchange rates
  - Triangular arbitrage, covered interest rate arbitrage
- Speculation
  - Risky operations to bet on particular exchange rate development
  - Leverage trading
  - Carry trade, short selling
- Investment
  - Operations to invest in currencies as a class of assets

# Exchange Rate

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- A foreign exchange rate is the price of one currency expressed in terms of another currency
- A foreign exchange quotation (or quote) is a statement of willingness to buy or sell at an announced rate
- Each currency pair has a double exchange rate (to buy, to sell)
- Most foreign currencies in the world are stated in terms of the number of units of foreign currency needed to buy one dollar
  - Several exceptions exist, e.g. Euro, British pound, Australian dollar

# Basic Types of Exchange Rates

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- Nominal exchange rate vs. Real exchange rate
  - While the nominal exchange rate expresses the relative price of currencies the real exchange rate incorporates relative price levels and tells about purchasing power of currencies
- Bilateral exchange rate vs. Effective exchange rate
  - While the bilateral exchange rate refers to the relative price of two currencies the effective exchange rates show the currency value against a basket of currencies
- Nominal bilateral exchange rate
- Real bilateral exchange rate
- Nominal effective exchange rate
- Real effective exchange rate

# Nominal Bilateral Exchange Rate

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- The most common type of exchange rate
- Exchange rate at which the currency of one country can be swapped for that of another country
- Most frequently quoted as price of one foreign currency unit in units of domestic currency
- Important for international trade, price comparisons, clearing of international transactions
- Change of the exchange rate

$$\% \Delta E = \frac{(E_{t+1} - E_t)}{E_t} \times 100$$

# Real Bilateral Exchange Rate

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- Nominal bilateral exchange rate multiplied by the ratio of price levels in foreign and domestic country
- Information about purchasing power of the currency
- Price of currency expressed in goods
- Measured and reported as index
  - Ratio of prices of foreign and domestic goods expressed in domestic currency units

$$RE_t = E_t \times \frac{P_t^*}{P_t}$$

- Increase of the index means real depreciation of the home currency

# Nominal Effective Exchange Rate (NEER)



- Any currency may rise against one currency but depreciate against another over any particular period – what is the total change?
- Nominal effective exchange rate measures development of domestic currency against basket of the most important foreign currencies
- Each currency included has its own weight according to its significance for foreign trade and investment in the particular country
- Expressed in index form since many currencies included in the basket

$$NEER = \prod_{i=1}^n \left( \frac{S_i}{S_i^*} \right)^{w_i}$$

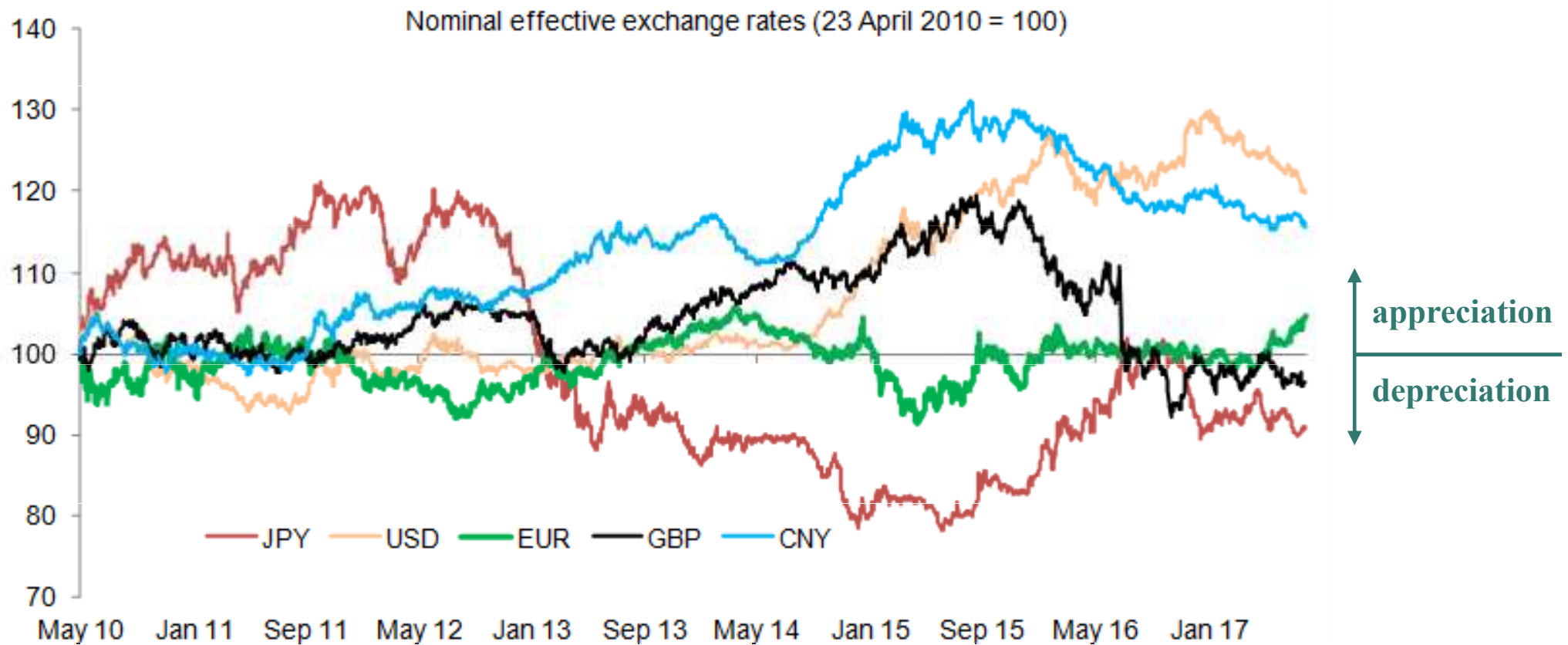
- $n$  is number of currencies in the basket
- $S_i$  is exchange rate of the national currency against the currency of the country  $i$
- $S_i^*$  is exchange rate of the national currency against the currency of the country  $i$  during the base period
- $w_i$  is country's weight (of the currency)



# NEER in Leading Economic Centers



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# Real Effective Exchange Rate (REER)



- Real effective exchange rate is a weighted average of a country's currency against a basket of other major currencies adjusted to the effects of inflation
- Widely used indicator of international competitiveness of the country
  - Real appreciation (depreciation) means losing (gaining) the competitiveness
- Reported as index in several versions differing in number of currencies included in the basket

$$REER = \prod_{i=1}^n \left( \frac{s_i}{s_i^*} \times \frac{p_i}{p} \right)^{w_i}$$

- $n$  is number of currencies in the basket
- $s_i$  is exchange rate of the national currency against the currency of the country  $i$
- $s_i^*$  is exchange rate of the national currency against the currency of the country  $i$  during the base period
- $w_i$  is country's weight (of the currency)
- $p_i$  is inflation rate in country  $i$
- $p$  is inflation in the home country

# Two-Way Quotation of Exchange Rates

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- Exchange rates are given as a bid and ask (also referred to as offer)
- Bid exchange rate
  - Price (i.e. exchange rate) in one currency at which a dealer will buy another currency
- Ask exchange rate
  - Price (i.e. exchange rate) at which a dealer will sell the other currency
- Spread
  - The difference between bid and ask rates
- Dealers bid (buy) at one price and ask (sell) at a slightly higher price, making their profit from the spread between the buying and selling prices
- A bid for one currency is also the offer for the opposite currency

# Two-way Quotation of Exchange Rates



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Trader buys  
Client sells

Bid  
exchange  
rate

**EUR / USD**  
**1.1741 / 1.1743**

Ask  
exchange  
rate

Trader sells  
Client buys

$$\text{Spread} = \text{Ask} - \text{Bid} = 1.1743 - 1.1741 = 0.0002 \text{ (2 pips)}$$
$$\text{Spread (\%)} = (\text{Ask} - \text{Bid}) / (\text{Ask}) = 0.0002 / 1.1743 = 0.017 \%$$
$$\text{Middle rate} = (\text{Bid} + \text{Ask}) / 2 = (1.1741 + 1.1743) / 2 = 1.1742 \text{ EUR/USD}$$

# Questions and Applications

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**The currency trader's quotation of the USD/EUR exchange rate for the client has the following form: 1.3442/70 (bid/ask). At what cost, you as his client, will you buy EUR expressed in USD?**

# Questions and Applications

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The currency trader's quotation of the USD/EUR exchange rate for the client has the following form: 1.3442/70 (bid/ask). At what cost, you as his client, will you buy EUR expressed in USD?

**Ask is 1.3470 USD/EUR.**  
**You will by 1 EUR for the 1.3470 USD.**

# Questions and Applications

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The bank is quoting the following DKK bid and ask exchange rate.  
Calculate the bid and ask exchange rate for USD (four decimal places).

|                | <b>Bid</b>    | <b>Ask</b>    |
|----------------|---------------|---------------|
| <b>USD/DKK</b> | <b>0.1705</b> | <b>0.1782</b> |

# Questions and Applications

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The bank is quoting the following DKK bid and ask exchange rate.  
Calculate the bid and ask exchange rate for USD (four decimal places).

|         | Bid    | Ask    |
|---------|--------|--------|
| USD/DKK | 0.1705 | 0.1782 |

$$\text{BID}_{\text{DKK/USD}} = 1 / \text{ASK}_{\text{USD/DKK}} = 1 / 0,1782 = \mathbf{5.6117}$$

$$\text{ASK}_{\text{DKK/USD}} = 1 / \text{BID}_{\text{USD/DKK}} = 1 / 0,1705 = \mathbf{5.8651}$$

**Bid has to be lower than Ask!!!**

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# Questions and Applications

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**Bank's dealer is quoting the following US dollar exchange rates. Calculate the middle rate and the spread in absolute and percentage terms.**

**CHF/USD**

**0.9538**

**0.9582**

# Questions and Applications

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Bank's dealer is quoting the following US dollar exchange rates. Calculate the middle rate and the spread in absolute and percentage terms.

|                | <b>Bid</b>    | <b>Ask</b>    |
|----------------|---------------|---------------|
| <b>CHF/USD</b> | <b>0.9538</b> | <b>0.9582</b> |

$$\text{Spread} = \text{Ask} - \text{Bid} = 0.9582 - 0.9538 = 0.0044 \text{ (44 pips)}$$

$$\text{Spread (\%)} = (\text{Ask} - \text{Bid}) / (\text{Ask}) = 0.0044 / 0.9582 = 0.459 \%$$

$$\text{Middle rate} = (\text{Bid} + \text{Ask}) / 2 = (0.9538 + 0.9582) / 2 = 0.956 \text{ CHF/USD}$$

# Direct vs. Indirect Quotation

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- Direct quote gives the home currency price of one unit of foreign currency
  - For example 26.10 Czech korunas for 1 euro written as 26.10 CZK/EUR (European convention) or EUR/CZK 26.10 (American convention)
- Indirect quote tells how many units of foreign currency can be purchased by one unit of domestic currency
  - For example 0.0383 euros for 1 Czech koruna written as 0.0383 EUR/CZK (European convention) or CZK/EUR 0.0383 (American convention)
- Direct quote is the reciprocal of the indirect quote
- In this pair of definitions, the home or base country of the currencies being discussed is critical
- The form of the quote depends on what the speaker regard as “home”

# Interpretation of Changes in Exchange Rates

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- Depreciation of home currency
  - Value of home currency falls relative to the foreign currency
  - Using direct quotation, depreciation of home currency means increase of the exchange rate !!!, e.g. change from 26.10 CZK/EUR to 27.00 CZK/EUR
- Appreciation of home currency
  - Value of home currency raises relative to the foreign currency
  - Using direct quotation, appreciation of home currency means decrease of the exchange rate !!!, e.g. change from 27.10 CZK/EUR to 26.20 CZK/EUR
- It is better to speak about value of currency than change of the exchange rate when using direct quotes

# Questions and Applications

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**The exchange rate of the euro (EUR) in the basic and current periods is specified as follows. Calculate the exchange rate of the Czech koruna (CZK) in both periods and the percentage change in the foreign exchange rate in both cases. Determine which currency has been appreciated and which has been depreciated.**

$$E_0 = 24.20 \text{ CZK/EUR}$$

$$E_1 = 26.70 \text{ CZK/EUR}$$

# Questions and Applications



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The exchange rate of the euro (EUR) in the basic and current periods is specified as follows. Calculate the exchange rate of the Czech koruna (CZK) in both periods and the percentage change in the foreign exchange rate in both cases. Determine which currency has been appreciated and which has been depreciated.

**EUR:**

$$E_0 = 24.20 \text{ CZK/EUR}$$

$$E_1 = 26.70 \text{ CZK/EUR}$$

$$\Delta E = (26.7 - 24.2) / 24.2 = 10.33 \%$$

**Euro appreciated against CZK in 10.33 %.**

**CZK:**

$$E_0 = 1/24.20 = 0.04132 \text{ EUR/CZK}$$

$$E_1 = 1/26.70 = 0.03745 \text{ EUR/CZK}$$

$$\Delta E = (0.03745 - 0.04132) / 0.04132 = -9.37 \%$$

**CZK depreciated against EUR in -9.37 %.**

# Main Instruments on the FX Market

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- **Spot transactions**
  - Purchase of foreign exchange, with delivery and payment between banks to take place, normally, on the second following business day
  - The date of settlement is referred to as the value date
- **Forward transactions (outright forward)**
  - Requires delivery at a future value date of a specified amount of one currency for a specified amount of another currency
  - The exchange rate is established at the time of the agreement, but payment and delivery are not required until maturity (several standard maturity dates)
- **Swap transactions**
  - Simultaneous purchase and sale of a given amount of foreign exchange for two different value dates with the same counterparty

# Spot FX Trading

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- The simplest FX instrument for immediate exchange of funds and execution
- Pricing on the spot market is by the actual demand and supply of the currency in the market
- Spot exchange rate movements are highly unpredictable even during a single trading day
  - Relying solely on spot trading may be risky
- Standard size of one trade is about USD 10 mil.
- Trading is very fast and hectic, the stakes are high
- Trading jargon widely used among traders to make communication as short and efficient as possible



# Forward FX Contracts

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- Contract settled today for future delivery/receipt of foreign exchange
- Agree today on price (forward exchange rate) and quantity (size of the trade) and settlement at fixed future date
  - Most typical are 30-day, 60-day, 90-day, 180-day, 360-day deliveries
- Forward rates are typically quoted in terms of points
  - It is not a foreign exchange rate as such
  - Rather, it is the difference between the forward rate and the spot rate
- Forward rate – spot rate = swap exchange rate
  - Forward > spot : currency is trading at forward premium (is more expensive in future)
  - Forward < spot : currency is trading at forward discount (is cheaper in future)

# Quotation of the Forward Exchange Rate



|           | USD/GBP |        | USD/EUR |        | CHF/USD |        |
|-----------|---------|--------|---------|--------|---------|--------|
| Spot      | 1.6604  | 1.6614 | 1.1575  | 1.1590 | 1.3820  | 1.3830 |
| 1 month   | 14      | 12     | 17      | 18     | 43      | 42     |
| 2 months  | 24      | 22     | 33      | 35     | 87      | 85     |
| 3 months  | 33      | 30     | 50      | 53     | 130     | 127    |
| 6 months  | 53      | 50     | 109     | 112    | 249     | 246    |
| 12 months | 66      | 62     | 230     | 235    | 481     | 476    |

- Add the premium to the spot rate
  - If the bid-ask combination in swap rate is smaller-bigger number
- Deduct the discount from the spot rate
  - If the bid-ask combination in swap rate is bigger-smaller number

# Forward Premium / Discount

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- The forward premium or discount is the difference between the forward exchange rate and the spot exchange rate, expressed as a percentage of the spot rate
- It is a standard to present the premium or discount annualized

$$\text{premium} = \frac{F_n - S}{S} \times \frac{360}{n} \times 100$$

$F_n$  = forward exchange rate

$S$  = spot exchange rate

$n$  = number of days in the forward contract (delivery period)

# Questions and Applications



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Calculate forward exchange rates for all maturity if you know the spot exchange rate and the quoted swaps. Calculate also the percentage annualised premium or USD discount.

| CZK/USD | bid   | ask   | $F_{bid}$ | $F_{ask}$ | Pr./Disc.<br>bid % | Pr./Disc.<br>ask % |
|---------|-------|-------|-----------|-----------|--------------------|--------------------|
| spot    | 19.40 | 20.25 |           |           |                    |                    |
| 14d     | 10    | 13    |           |           |                    |                    |
| 1m      | 14    | 19    |           |           |                    |                    |
| 2m      | 25    | 33    |           |           |                    |                    |
| 3m      | 36    | 48    |           |           |                    |                    |
| 6m      | 84    | 80    |           |           |                    |                    |
| 12m     | 125   | 159   |           |           |                    |                    |

# Questions and Applications



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Calculate forward exchange rates for all maturity if you know the spot exchange rate and the quoted swaps. Calculate also the percentage annualised premium or USD discount.

| CZK/USD | bid   |   | ask   | $F_{bid}$ | $F_{ask}$ | Pr./Disc.<br>bid % | Pr./Disc.<br>ask % |
|---------|-------|---|-------|-----------|-----------|--------------------|--------------------|
| spot    | 19.40 |   | 20.25 |           |           |                    |                    |
| 14d     | 10    | < | 13    | 19.50     | 20.38     | 13.25              | 16.51              |
| 1m      | 14    | < | 19    | 19.54     | 20.44     | 8.66               | 11.26              |
| 2m      | 25    | < | 33    | 19.65     | 20.58     | 7.73               | 9.78               |
| 3m      | 36    | < | 48    | 19.76     | 20.73     | 7.42               | 9.48               |
| 6m      | 84    | > | 80    | 18.56     | 19.45     | -8.66              | -7.90              |
| 12m     | 125   | < | 159   | 20.65     | 21.84     | 6.44               | 7.85               |



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***THANK YOU FOR YOUR  
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