

International Finance

The Spot Market for Foreign Exchange

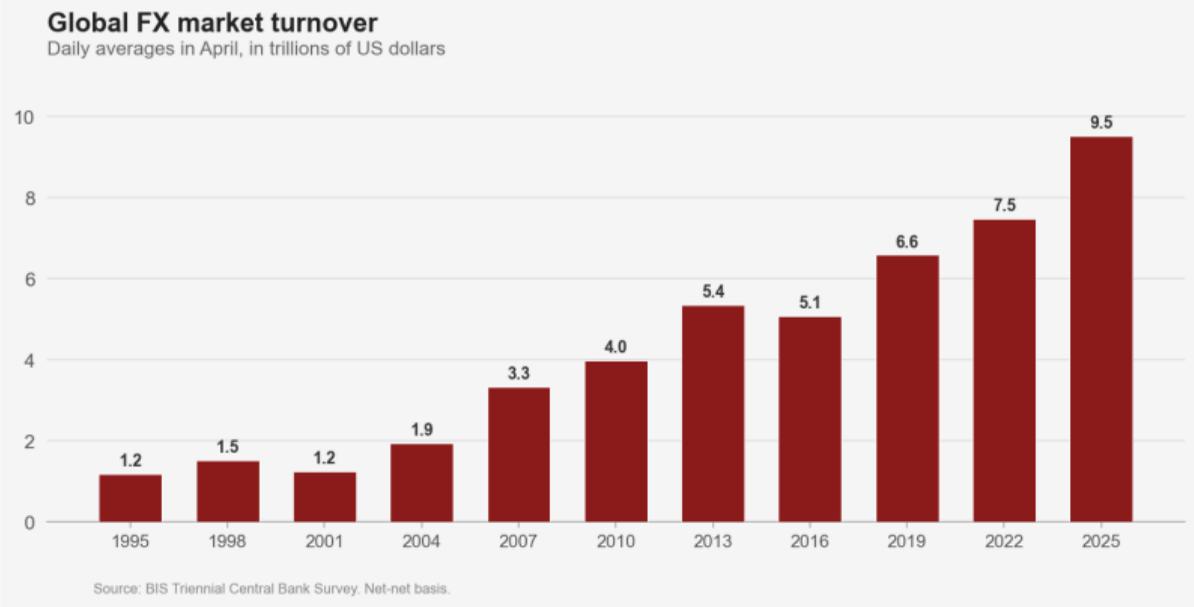
Main issues

- The foreign exchange market
- Conventions for quoting the spot exchange rate
- Bid-ask spreads and transaction costs
- Arbitrage and the law of one price

What is the FX market?

- Decentralized, global, over-the-counter (OTC) market for exchanging currencies
- The largest financial market in the world
- Open nearly 24 hours — follows the sun:
Sydney → Tokyo → London → New York
- Three questions:
 - How large is the FX market?
 - Who are the important participants?
 - Where is the market located?

Market size: daily turnover



Source: BIS Triennial Central Bank Survey (2025)

Turnover by currency pair

Foreign exchange market turnover by currency and currency pairs¹

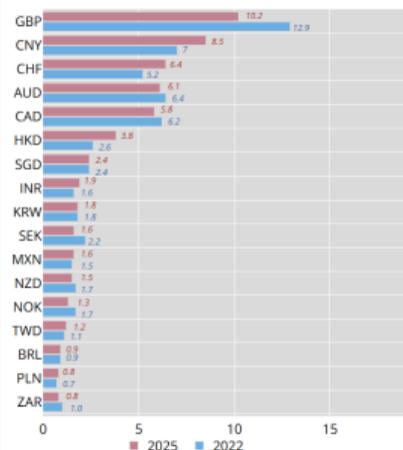
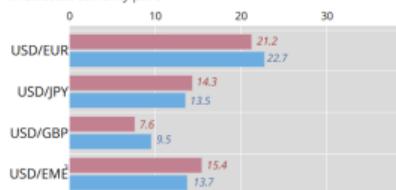
Net-net basis, daily averages in April, as a percentage of total turnover

Graph 2

A. Selected currencies²



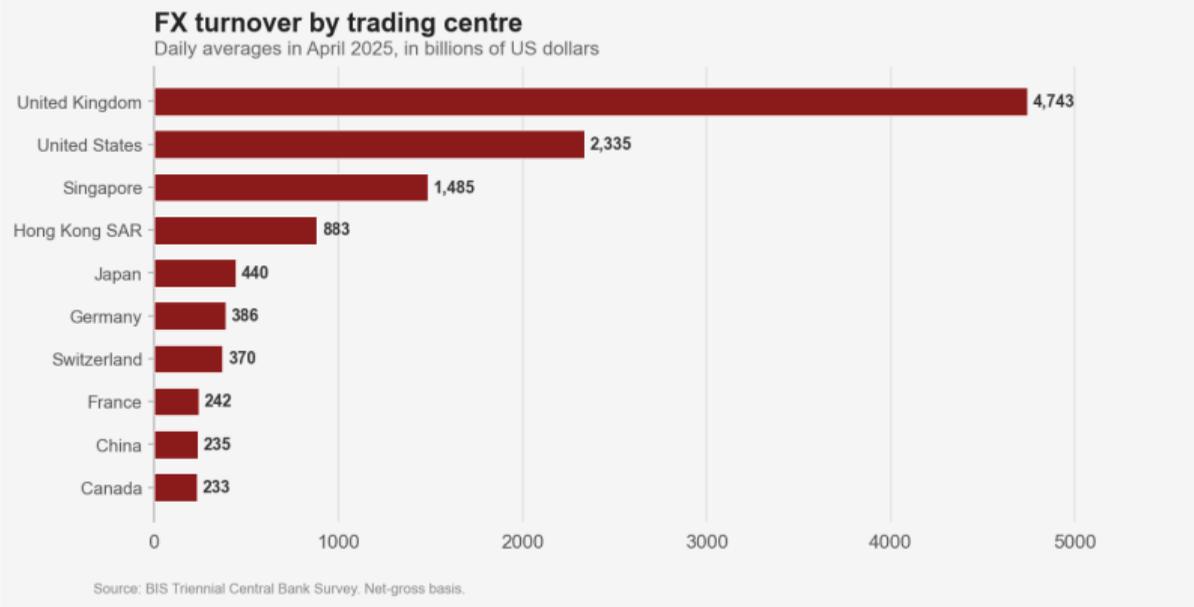
B. Selected currency pairs



¹ Adjusted for local and cross-border inter-dealer double-counting, ie "net-net" basis. ² As two currencies are involved in each transaction, the sum of shares in individual currencies will total 200%. ³ Emerging market economy currencies excluding the Chinese renminbi and Russian rouble: AED, ARS, BGN, BHD, BRL, CLP, COP, CZK, HKD, HUF, IDR, ILS, INR, KRW, MXN, MYR, PEN, PHP, PLN, RON, SAR, SGD, THB, TRY, TWD and ZAR.

Source: BIS Triennial Central Bank Survey. For additional data by currency and currency pairs, see Tables 4 and 5. See our [Data Portal](#) for access to the full set of

Turnover by geographic center



Source: BIS Triennial Central Bank Survey (2025)

Market participants

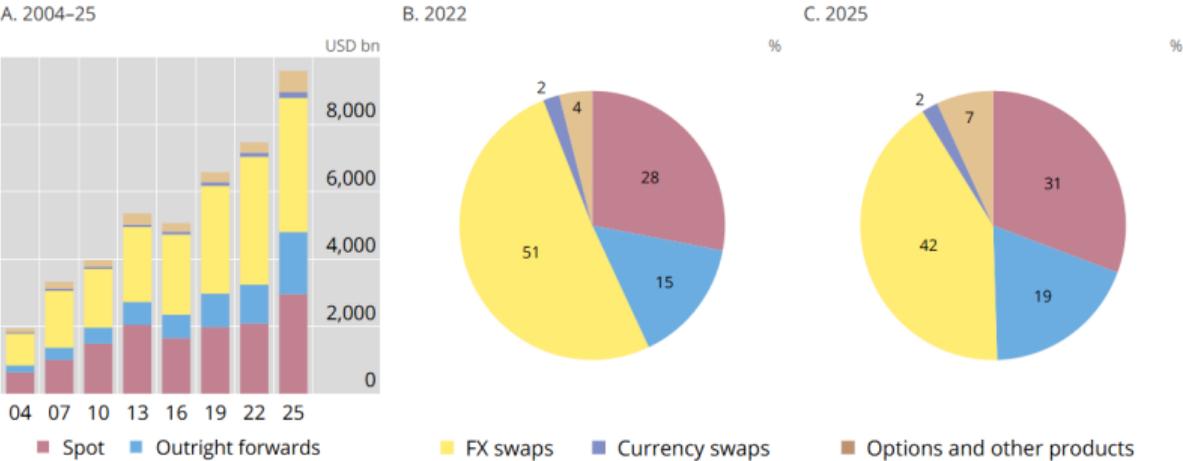
- **Reporting dealers (banks):** Make markets, warehouse risk, provide liquidity
- **Other financial institutions:** Asset managers, hedge funds, central banks, pension funds
- **Non-financial corporations:** Hedging commercial FX exposures
- **Retail:** Small fraction; mostly via online platforms

The market has shifted heavily toward electronic trading (EBS, Reuters Matching, multi-dealer platforms).

Turnover by instrument type

Foreign exchange market turnover by instrument¹
 Net-net basis, daily averages in April

Graph 1



¹ Adjusted for local and cross-border inter-dealer double-counting, ie "net-net" basis.
 Source: BIS Triennial Central Bank Survey. For additional data by instrument, see Table 1.

Source: BIS Triennial Central Bank Survey (2025)

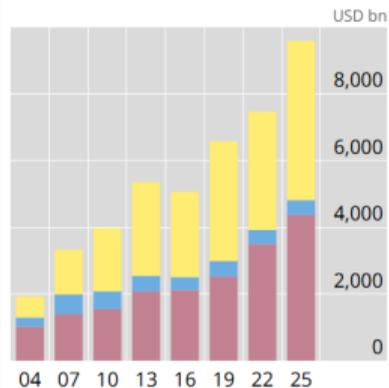
Turnover by counterparty

Foreign exchange market turnover by counterparty¹

Net-net basis, daily averages in April

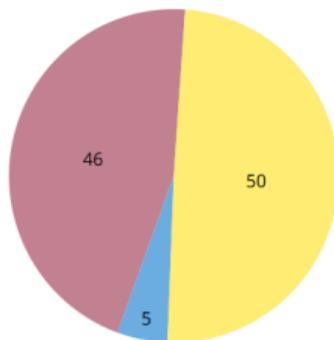
Graph 3

A. 2004–25



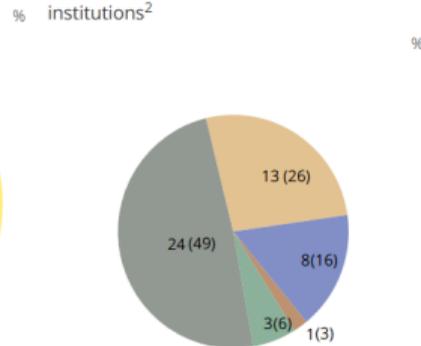
■ Reporting dealers
■ Non-financial customers
■ Other financial institutions

B. 2025



■ Reporting dealers
■ Non-financial customers
■ Other financial institutions

C. Breakdown of other financial institutions²



■ Non-reporting banks
■ Institutional investors
■ Hedge funds and PTFs³
■ Official sector
■ Other

¹ Adjusted for local and cross-border inter-dealer double-counting, ie “net-net” basis. ² For definitions of counterparties, see explanatory notes in the Annex. Shares in overall total, with shares in other financial institutions in brackets. ³ Proprietary trading firms.

Source: BIS Triennial Central Bank Survey. For additional data by counterparty, see Tables 2 and 3.

The spot market is only part of the picture

Instrument	Share of turnover
FX swaps	~42%
Spot	~31%
Outright forwards	~18%
Options & other	~8%

The **forward and swap markets** are larger than spot.

We cover forwards in Lecture 3, swaps in Lecture 6.

Two market segments

Spot market:

- Exchange of currencies for near-immediate delivery
- Settlement: T+2 for most pairs; T+1 for USD/CAD and USD/MXN

Forward market:

- Contract agreed today; delivery at a future date
- Standard tenors: 1M, 3M, 6M, 9M, 12M (and longer)
- OTC; customizable notional and maturity

We need to understand spot first — forward prices are *derived* from spot plus interest rates.

Definition of the spot exchange rate

The spot rate S_t is the amount of home currency (HC) per one unit of foreign currency (FC):

$$S_t = \frac{\text{HC}}{\text{FC}}$$

Think of it as a **price**:

- “USD 100 per textbook” is the price of a textbook
- “USD 1.10 per EUR” is the price of one euro
- “NOK 11.50 per USD” is the price of one dollar

Direct vs. indirect quotes

Direct (natural) quote — our convention:

- HC/FC: “How much HC do I need to buy one FC?”
- Example (US perspective): USD/EUR = 1.10

Indirect quote:

- FC/HC: “How much FC do I get for one HC?”
- Example: EUR/USD = $1/1.10 = 0.909$

Warning: Market convention is inconsistent. “EUR/USD = 1.10” means USD per EUR in practice. We always use HC/FC.

Live FX quotes: direct and indirect

Live Exchange Rates

Jump to

MAJORS PAIRS

EURO PAIRS

USD PAIRS

OTHER PAIRS

METALS

CRYPTOCURRENCIES

Majors Pairs

	Bid	Ask		Bid	Ask
EUR/USD	▼ 1.1815 ²	1.1816 ⁷	EUR/GBP	▲ 0.8716 ¹	0.8717 ⁴
USD/EUR	▲ 0.8462 ⁵	0.8463 ⁷	GBP/EUR	▼ 1.1471 ³	1.1473 ⁰
GBP/USD	▼ 1.3554 ⁵	1.3556 ⁵	EUR/CHF	▼ 0.9142 ⁵	0.9144 ¹
USD/GBP	▲ 0.7376 ⁵	0.7377 ⁶	CHF/EUR	▲ 1.0936 ⁰	1.0937 ⁹
USD/CAD	▲ 1.3676 ³	1.3678 ²	AUD/USD	▼ 0.7120 ⁹	0.7122 ³
CAD/USD	▼ 0.7310 ⁹	0.7311 ⁹	USD/AUD	▲ 1.4040 ⁴	1.4043 ²
USD/CHF	▼ 0.7737 ⁴	0.7738 ⁹	EUR/JPY	▼ 184.27 ¹	184.30 ⁰
CHF/USD	▲ 1.2921 ⁷	1.2924 ²	JPY/EUR	▲ 0.0054 ³	0.0054 ³
USD/JPY	▼ 155.95 ⁷	155.97 ⁴	GBP/JPY	▼ 211.40 ¹	211.43 ⁷
JPY/USD	▲ 0.0064 ¹	0.0064 ¹	JPY/GBP	▲ 0.0047 ³	0.0047 ³

Source: OANDA

Cross rates: calculation

To find the cross rate between two non-USD currencies, go through USD:

$$\frac{FC_1}{FC_2} = \frac{FC_1}{USD} \times \frac{USD}{FC_2}$$

Example: Find CHF/GBP given CHF/USD = 0.88 and USD/GBP = 1.27

$$CHF/GBP = 0.88 \times 1.27 = 1.118$$

Why? USD is the **vehicle currency** — almost all FX transactions go through USD, even when neither party wants dollars. USD liquidity is the spine of the FX market.

Percentage changes: the asymmetry

The % appreciation of currency A against B **does not equal** the % depreciation of B against A.

Example:

- Today: CAD/USD = 1.00. In one year: CAD/USD = 1.50

	Calculation	Result
USD appreciated by	$(1.50 - 1.00)/1.00$	+50%
CAD depreciated by	$(1/1.50 - 1/1.00)/(1/1.00)$	-33.3%

The discrepancy grows with the size of the move.

Bid and ask prices

When you trade FX, you face two prices:

- **Bid price:** The price the dealer pays to buy FC from you (you sell FC)
- **Ask price:** The price the dealer charges to sell FC to you (you buy FC)

Always: Ask $>$ Bid

The **bid-ask spread** = Ask - Bid

This is the dealer's compensation for providing liquidity and warehousing risk.

What drives the spread?

Factor	Effect on spread
Liquidity	Major pairs (EUR/USD): 1–2 pips. Exotic pairs (USD/TRY): 50+ pips
Volatility	Spreads widen during stress (2008, 2020)
Trade size	Institutional spreads < retail spreads
Time of day	Spreads widen outside major session overlaps

Spreads are a **transaction cost** — they directly affect hedging costs and arbitrage bounds.

Reading FX quotes: bid-ask spreads

Live Exchange Rates

Jump to

MAJORS PAIRS

EURO PAIRS

USD PAIRS

OTHER PAIRS

METALS

CRYPTOCURRENCIES

Majors Pairs

	Bid	Ask		Bid	Ask
EUR/USD	▼ 1.1815 ²	1.1816 ⁷	EUR/GBP	▲ 0.8716 ¹	0.8717 ⁴
USD/EUR	▲ 0.8462 ⁵	0.8463 ⁷	GBP/EUR	▼ 1.1471 ³	1.1473 ⁰
GBP/USD	▼ 1.3554 ⁵	1.3556 ⁵	EUR/CHF	▼ 0.9142 ⁵	0.9144 ¹
USD/GBP	▲ 0.7376 ⁵	0.7377 ⁶	CHF/EUR	▲ 1.0936 ⁰	1.0937 ⁹
USD/CAD	▲ 1.3676 ³	1.3678 ²	AUD/USD	▼ 0.7120 ⁹	0.7122 ³
CAD/USD	▼ 0.7310 ⁹	0.7311 ⁹	USD/AUD	▲ 1.4040 ⁴	1.4043 ²
USD/CHF	▼ 0.7737 ⁴	0.7738 ⁹	EUR/JPY	▼ 184.27 ¹	184.30 ⁰
CHF/USD	▲ 1.2921 ⁷	1.2924 ²	JPY/EUR	▲ 0.0054 ³	0.0054 ³
USD/JPY	▼ 155.95 ⁷	155.97 ⁴	GBP/JPY	▼ 211.40 ¹	211.43 ⁷
JPY/USD	▲ 0.0064 ¹	0.0064 ¹	JPY/GBP	▲ 0.0047 ³	0.0047 ³

Source: OANDA

Inverting quotes with bid-ask spreads

To convert HC/FC quotes to FC/HC quotes:

$$(FC/HC)_{bid} = \frac{1}{(HC/FC)_{ask}}$$

$$(FC/HC)_{ask} = \frac{1}{(HC/FC)_{bid}}$$

Why? The bid must always be the smaller number. Inverting the *larger* direct quote gives the *smaller* inverse quote.

Inverting quotes: worked example

Given: USD/EUR bid = 1.0950, ask = 1.0955

Find: EUR/USD bid and ask

$$(\text{EUR/USD})_{\text{bid}} = \frac{1}{1.0955} = 0.91282$$

$$(\text{EUR/USD})_{\text{ask}} = \frac{1}{1.0950} = 0.91324$$

Check: bid < ask

Cross rates with transaction costs

Use the law of the worst possible combination:

$$(FC_1/FC_2)_{ask} = (FC_1/USD)_{ask} \times (USD/FC_2)_{ask}$$

$$(FC_1/FC_2)_{bid} = (FC_1/USD)_{bid} \times (USD/FC_2)_{bid}$$

Example: CHF/USD 1.1520–1.1530, USD/EUR 1.2840–1.2850

- CHF/EUR ask = $1.1530 \times 1.2850 = 1.4816$
- CHF/EUR bid = $1.1520 \times 1.2840 = 1.4792$
- Synthetic spread: $1.4816 - 1.4792 = 24$ pips

Two mechanisms enforce the law of one price

Arbitrage:

- Buy the underpriced, sell the overpriced *simultaneously*
- Riskless profit, no capital required, no change in net position
- Limits price differences to the sum of transaction costs

Shopping around:

- You already intend to trade — you choose the better price
- Buyers go to the cheapest ask; sellers go to the highest bid
- Pushes prices toward a single quote

Arbitrage across market makers

Quotes:

- Bank X: USD/EUR 1.0450 – 1.0455
- Bank Y: USD/EUR 1.0460 – 1.0465

Trade:

- Buy EUR from X at 1.0455
- Sell EUR to Y at 1.0460
- Profit: **0.0005 USD per EUR**

This cannot persist — massive trading eliminates the opportunity instantly.

No-arbitrage condition: Dealer quotes must overlap.

Shopping around across market makers

Quotes:

- Bank X: USD/EUR 1.0461 – 1.0466
- Bank Y: USD/EUR 1.0460 – 1.0465

No arbitrage (X 's bid $<$ Y 's ask). But:

- All buyers go to Y (cheaper ask: 1.0465 vs. 1.0466)
- All sellers go to X (higher bid: 1.0461 vs. 1.0460)

Can be intentional — inventory management. But unsustainable for both banks if they want to stay active in the market.

Triangular arbitrage: worked example

Rates: EUR/USD = 0.9, CHF/USD = 1.5, EUR/CHF = 0.66

Implied EUR/CHF = EUR/USD × USD/CHF = 0.9 × (1/1.5) = **0.60**

Market EUR/CHF = 0.66 → CHF is too expensive in EUR

Trade (start with EUR 0.9m):

1. Buy USD 1m (pay EUR 0.9m)
2. Buy CHF 1.5m (pay USD 1m)
3. Sell CHF 1.5m for EUR (receive EUR 0.99m)

Profit: EUR 0.09m — riskless, no net capital

In practice, electronic trading closes these gaps in milliseconds

Why this matters for the course

- **Arbitrage-free pricing** is the foundation for forward rates
CIP (Lecture 3) is “triangular arbitrage in the time dimension”
- **Bid-ask spreads** are the first hedging cost
Wider spreads → more expensive to hedge (Lectures 4–5)
- **USD as vehicle currency** explains why dollar funding stress propagates globally
The basis (Lecture 3) and funding markets (Lecture 6) build on this
- **When arbitrage fails** — CIP deviations — it signals financial stress
This is a recurring theme from Lecture 3 onward