Dipartimento di
Scienze Economiche, Aziendali,
Matematiche e Statistiche "Bruno de Finetti"

B16. DERIVATIVES AND RISK MANAGEMENT

FINANCIAL MARKETS AND INSTITUTIONS

A.A. 2022/23

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TOPICS

- HEDGING AND THE WHY OF DERIVATIVES
- TYPES OF DERIVATIVES AND PAYOFF
- INVESTMENTS STRATEGIES WITH DERIVATIVES

HEDGING AND DERIVATIVES

- Hedging: protection through a **transaction offsetting another**
- **micro-hedging:**
  - One exposure protected by taking another symmetrical one
  - *F.i. an ITA firm has to pay $ in 30dd and buys a deposit in $ now*
- **macro-hedging:**
  - One group of similar exposures protected by taking one that is symmetrical
  - *F.i. an Italian bank holds a portfolio of fixed-interest loans and borrows through a fixed-interest bond*
- **partial hedging:**
  - One exposure protected through another for a component/portion of the whole risk
  - *F.i. an Italian firm that will buy oil gets a deposit in $ to hedge the currency risk only*
- **cross-hedging:**
  - One exposure protected through another that is highly correlated but not symmetrical
  - *F.i. exposure to fuel costs of a delivery company is protected through an exposure to Brent oil*

PROBLEM: offsetting exposures are costly, exact coverage hard to find, additional risks arise

HEDGING AND DERIVATIVES

How to make hedging more effective and simpler?

By designing an instrument that:

- Requires **little o no initial investment** (compared to the exposure effect obtained)
- **Settled at a future date**
- Referenced to one or more **external variables**

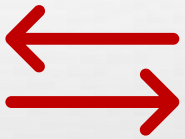
- Main instruments (mostly **OTC**, but also **exchange-traded**):

forward/future

Only one transaction
Both parties have to meet their obligation (payment/delivery)

option

Only one transaction
One party has the right to waive or enforce the settlement



swap

One or more transactions
Parties exchange the net stream of two opposed exposures

credit derivatives

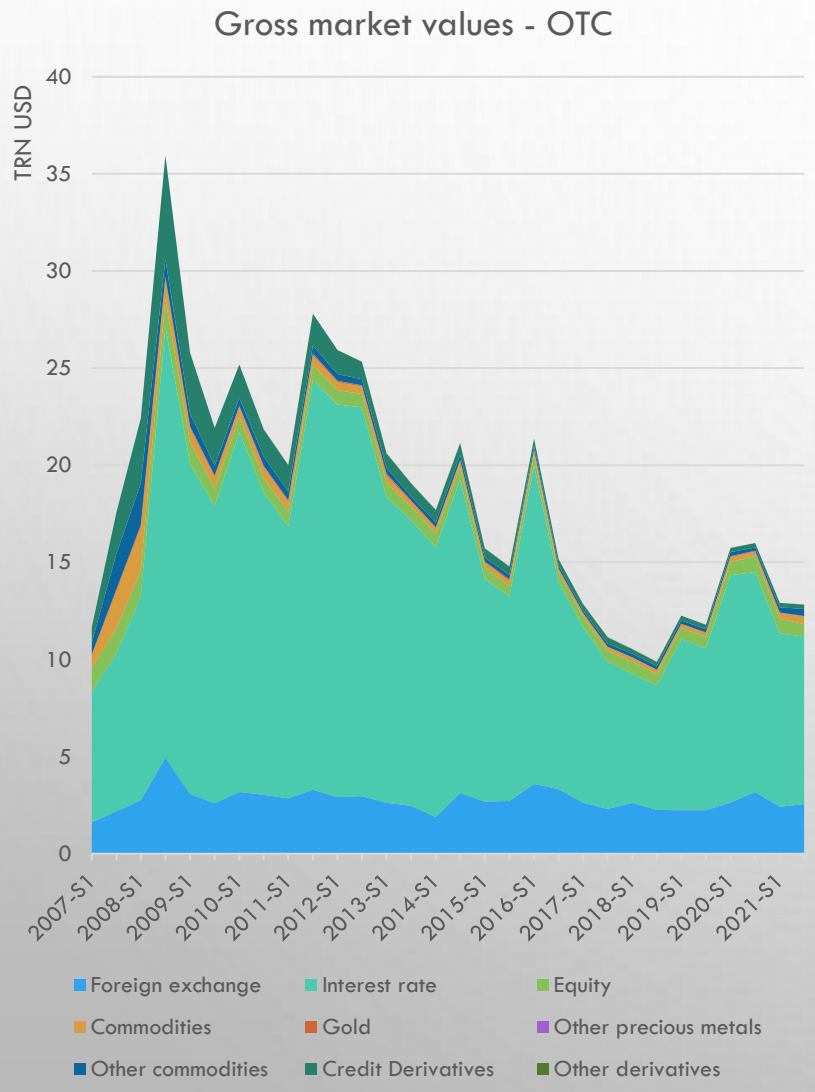
One or more transactions
One party obtains a change in the structure of credit risk exposures

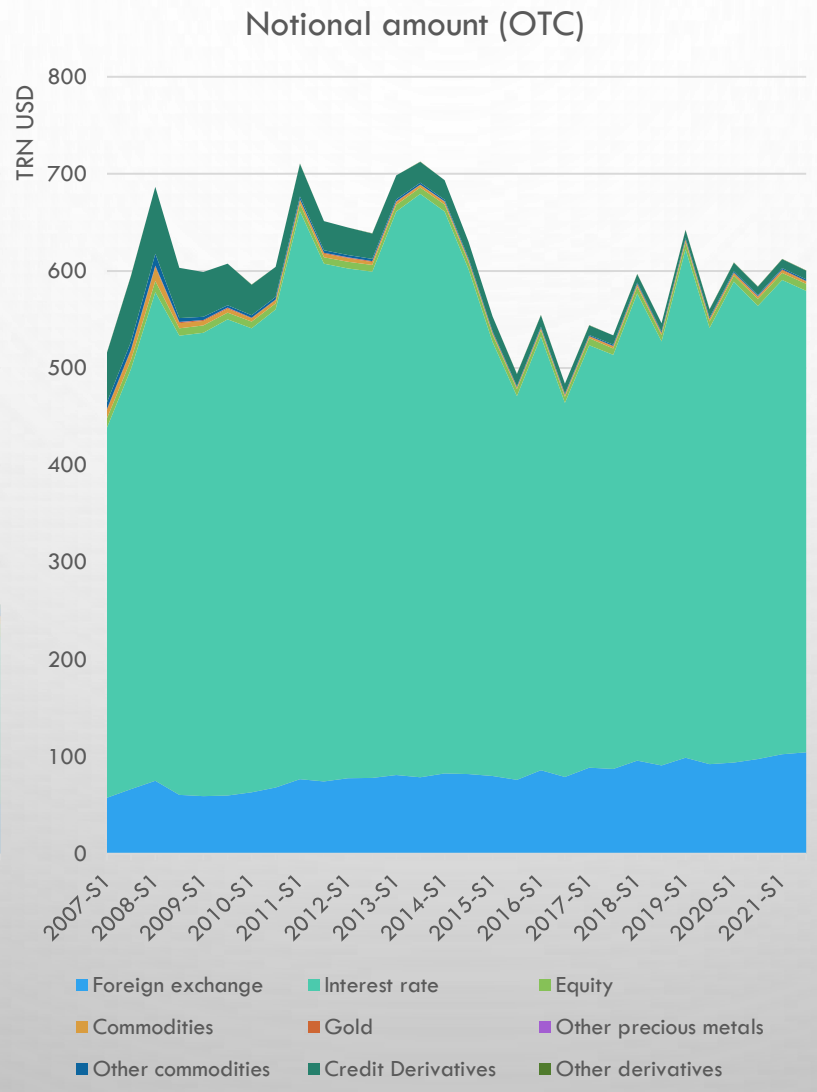
SOME USEFUL TERMINOLOGY…

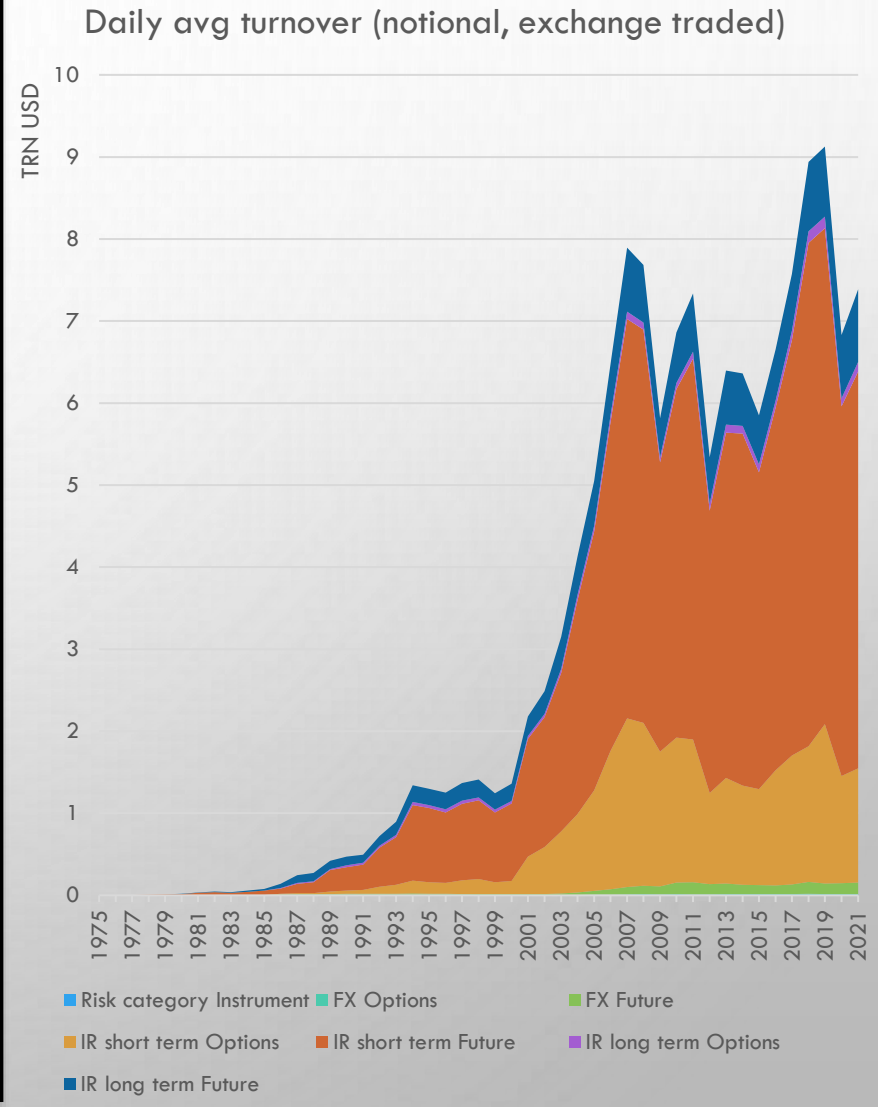
- **Strike price**: the reference amount required to settle a contract
- **Underlying:** asset, index, rate, commodity, … from which the contract derives its value and targets its settlement
- **Settlement date:** date at which obligations are met
- **Notional:** amount of underlying on which the contract is built
- **Market price**: current transfer/settlement price
- **Long VS short leg**: right to receive, or obligation to deliver (underlying or cash)
- **Open interest**: total number of contracts outstanding not settled yet (long or short, without adding the two sides, since for each buyer there is a seller…)
- **Trading volume:** number of transactions in a given instrument in a specific period of time (if I sell my contracts to a third party, open interest does not change, but volumes do)

MARKET TREND

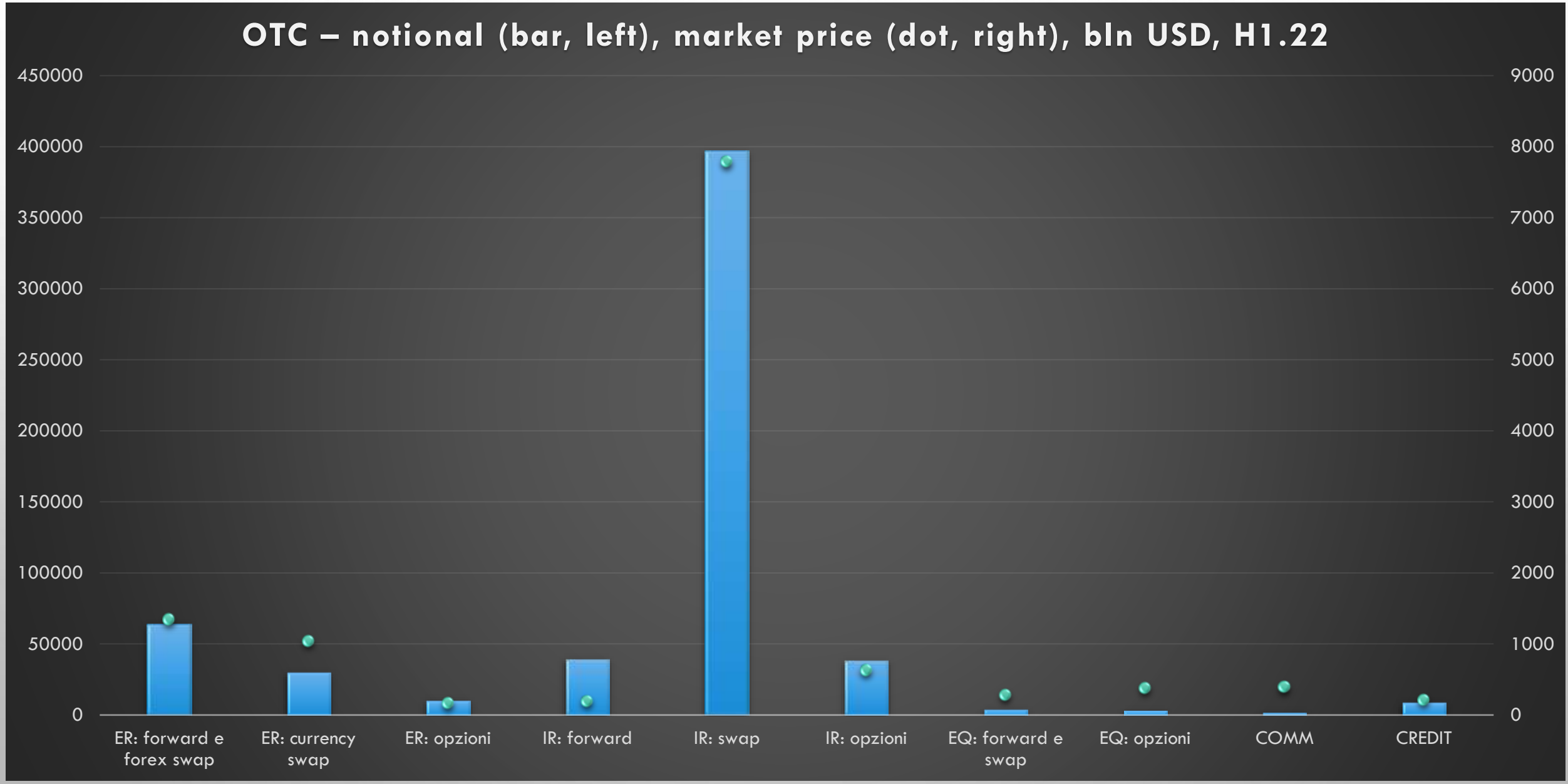
BIS statistics *(https://www.bis.org/statistics/derstats.htm)*



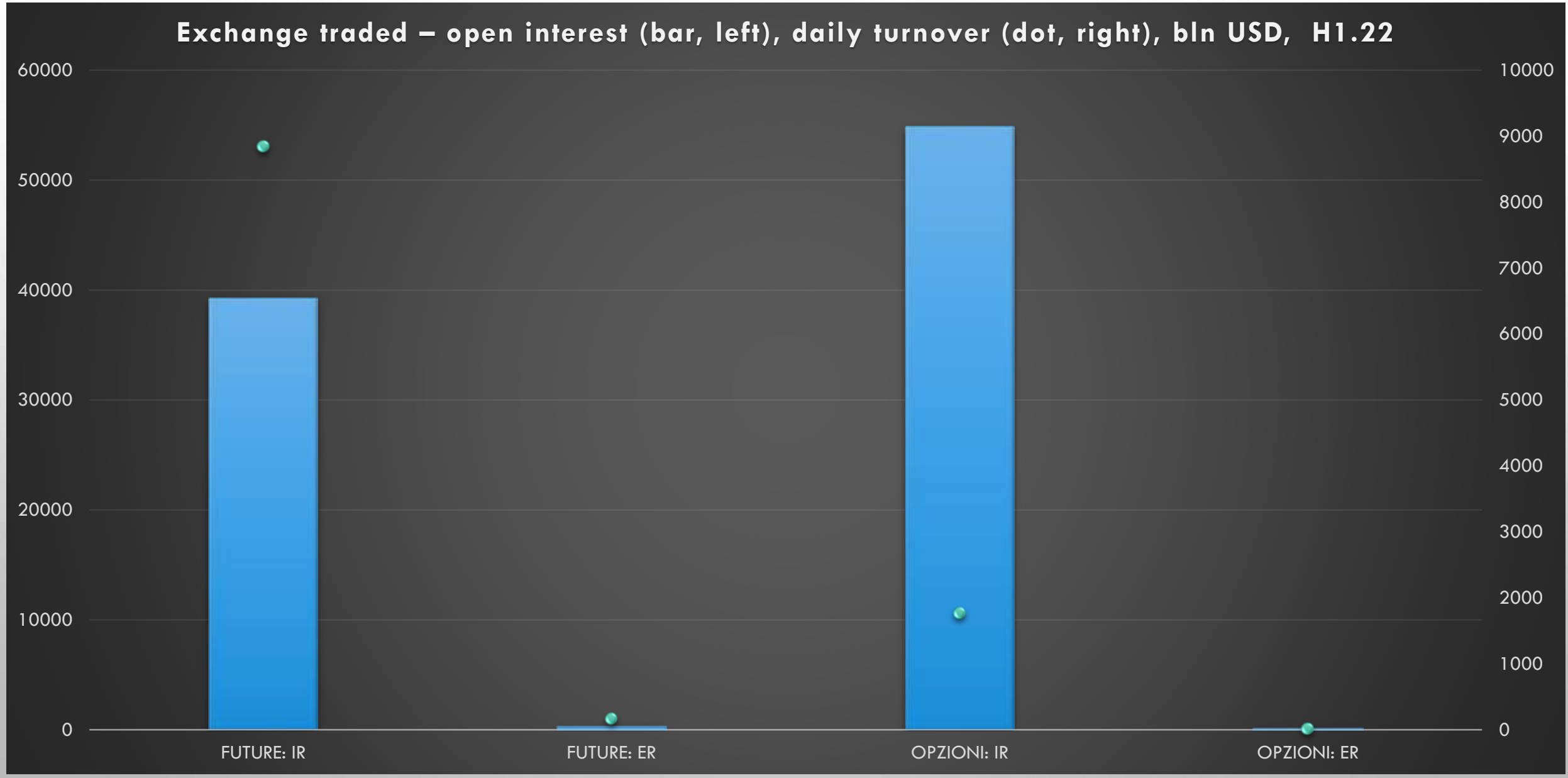




NOTIONAL VS MARKET PRICE BY UNDERLYING



OPEN INTEREST VS TURNOVER



FORWARD / FUTURE

- Two parties agree on settling a **transaction** on an **underlying** (stocks, bonds, IR, …) at the **expiration date** at a **strike price**

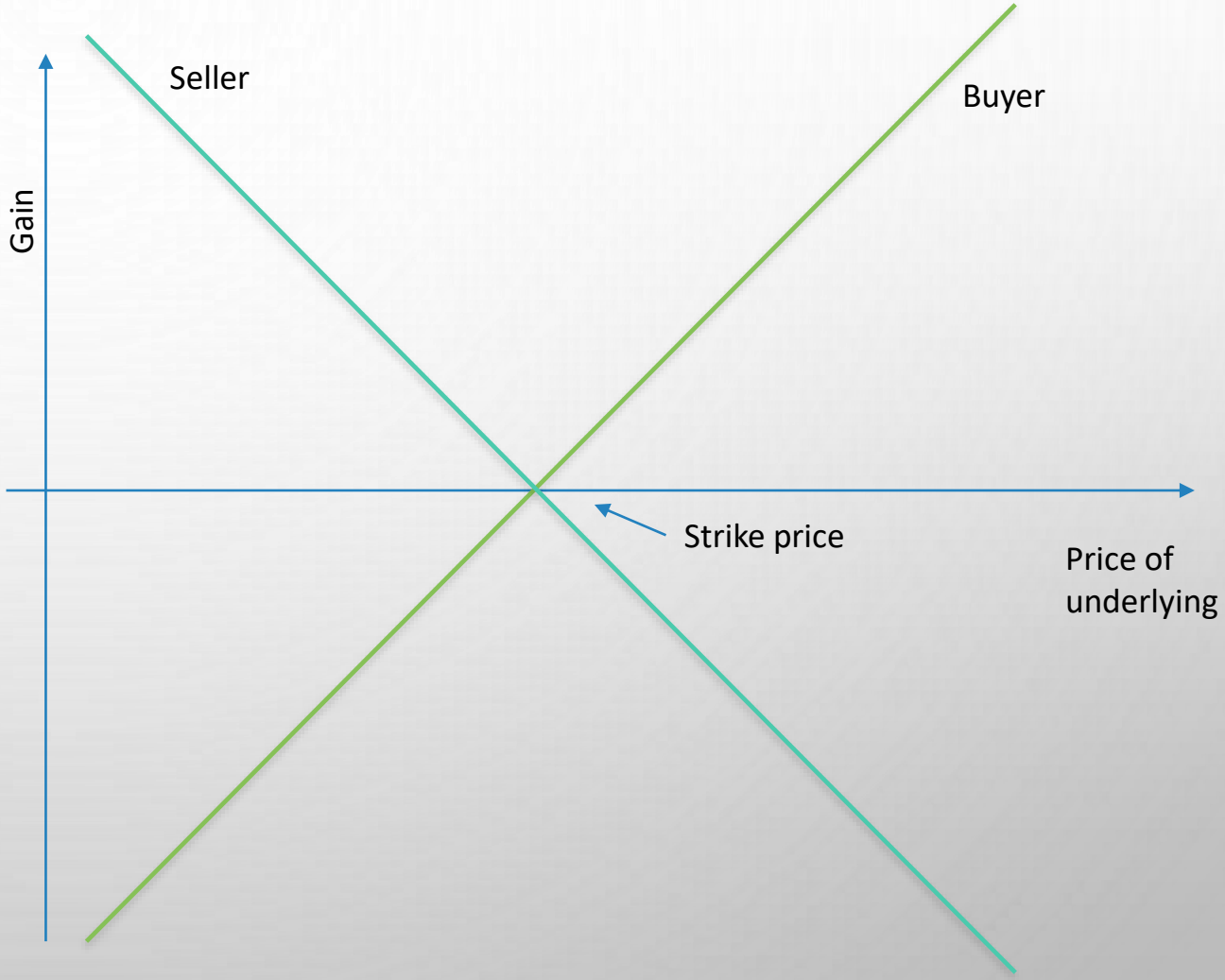
  F.i. John agrees today to pay Susan 50 €/g for 10 Kg of gold on 1st July

- **OTC**, **finding counterparties is difficult**, **illiquidity** and **credit risk**

  F.i. what happens if on 1st July John does not have the money or Susan the gold?

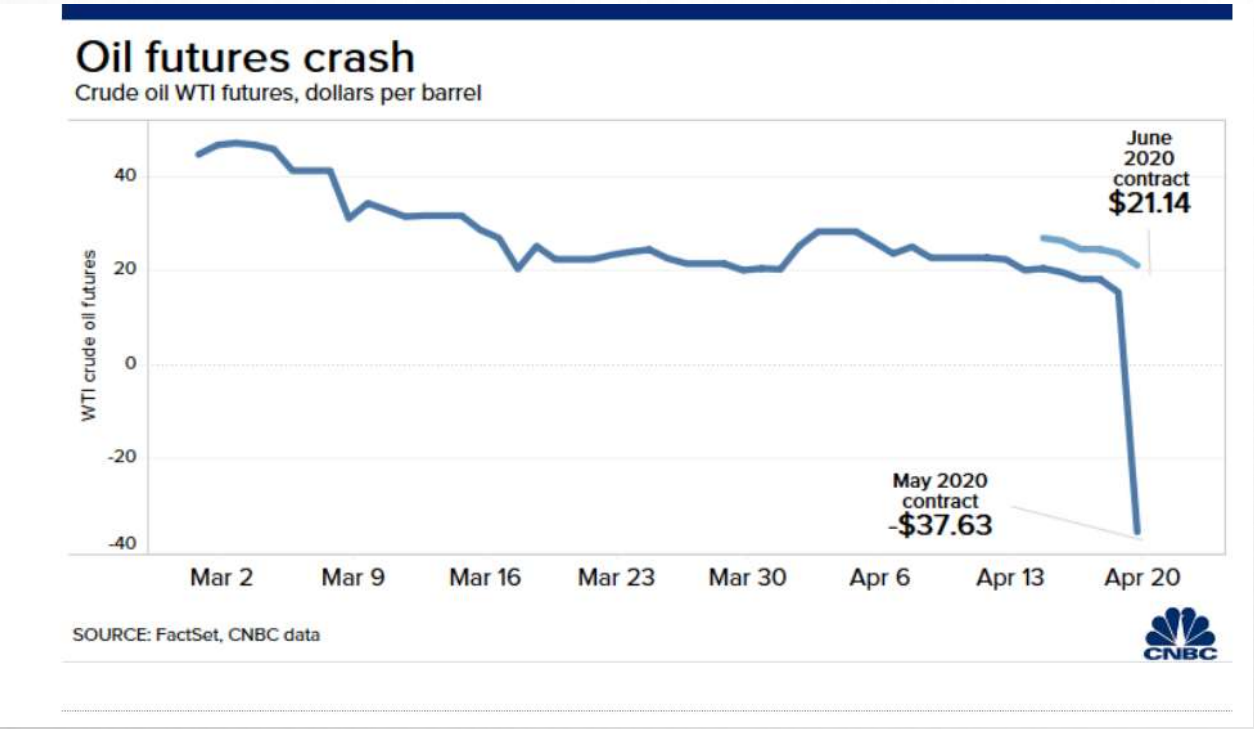
- Futures are **standardized** to be exchange-traded:
  - clearing houses and daily margins
  - "negotiability" through standard conditions
  - extension of deliverables increase volumes
  - cash-settlement VS physical settlement

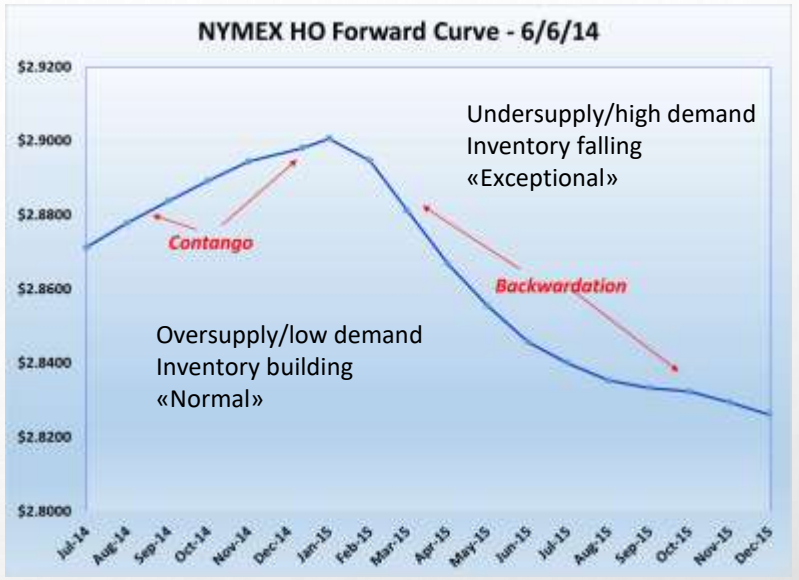
  F.i. if on 1st July gold trades at 52 €/g would it be the same for John to receive 10 Kg of gold or 20.000 €? And for Susan to deliver gold or the money?

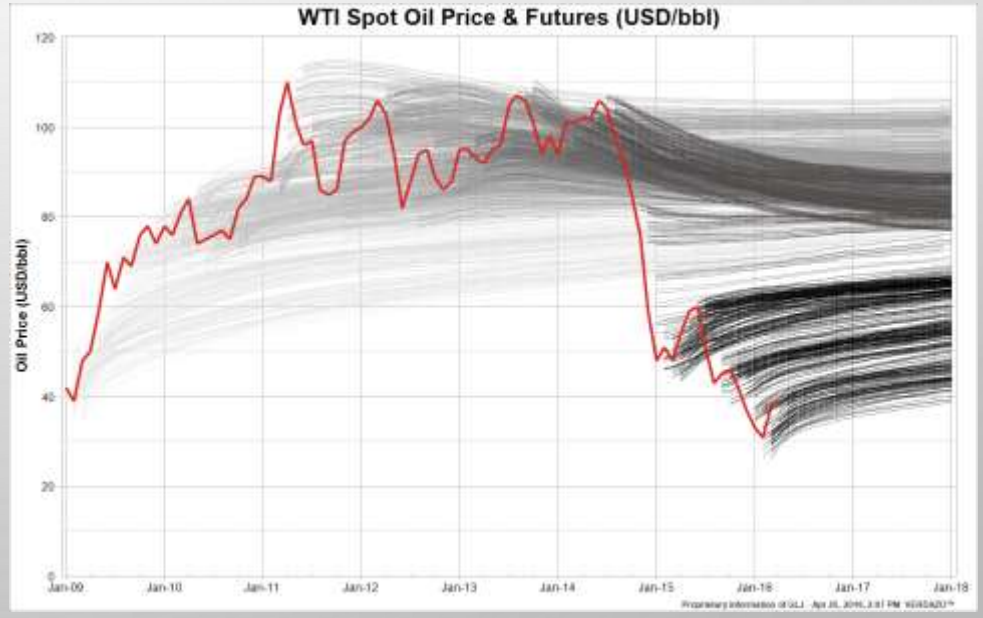


FORWARD / FUTURE

WTI future crash (20th April 2020)





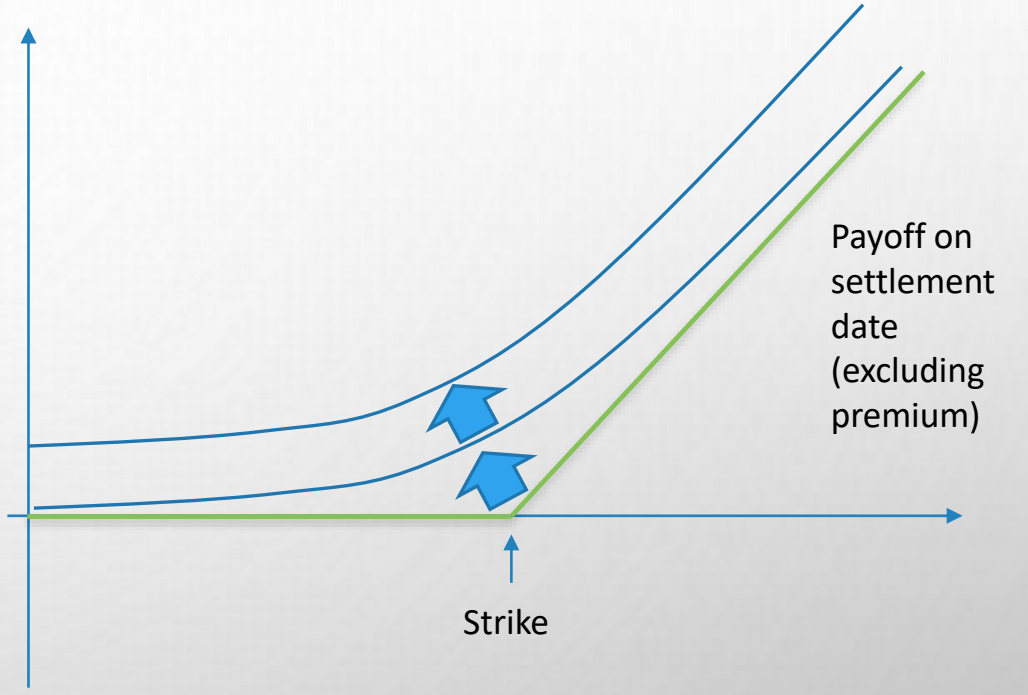


Commodities: supply VS demand, cost of carry and convenience yield due to physical underlying!

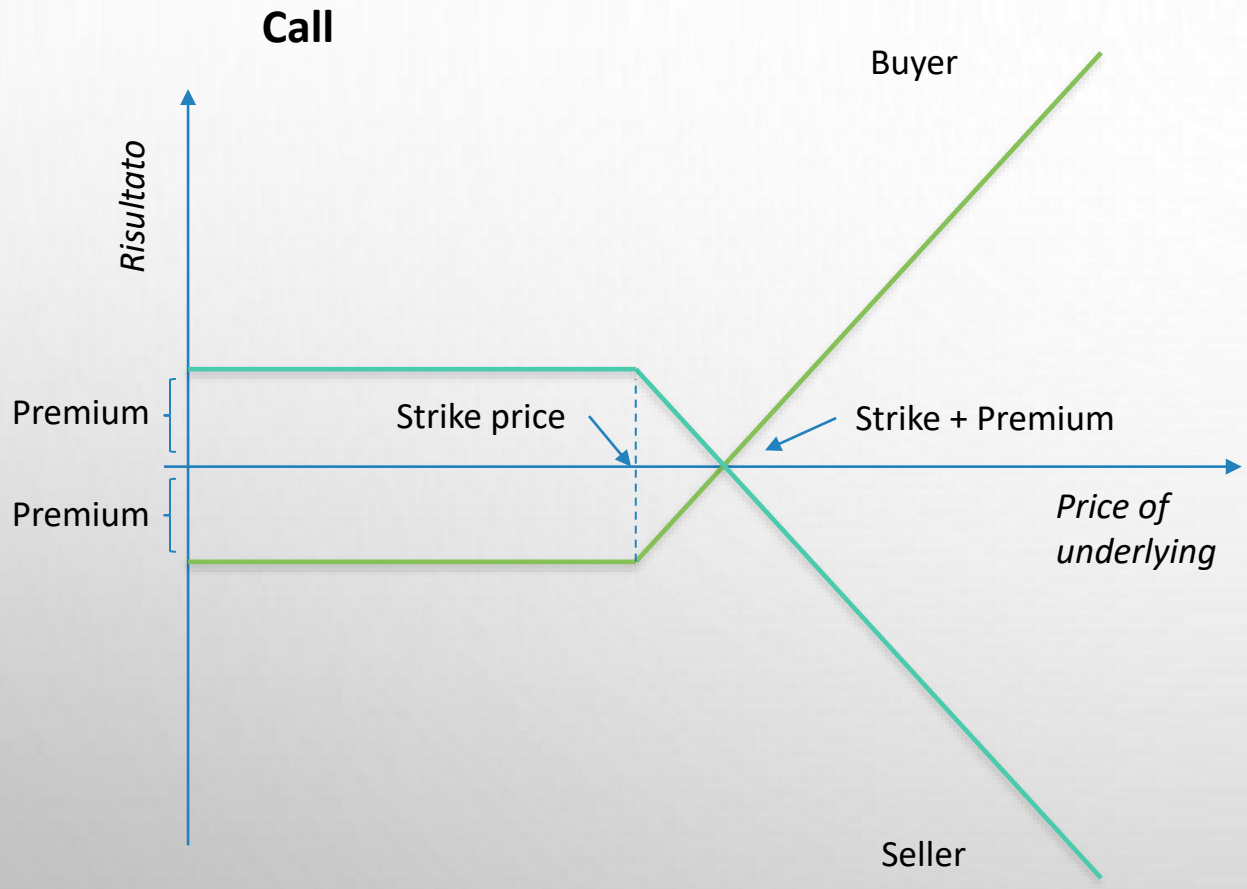
OPTIONS

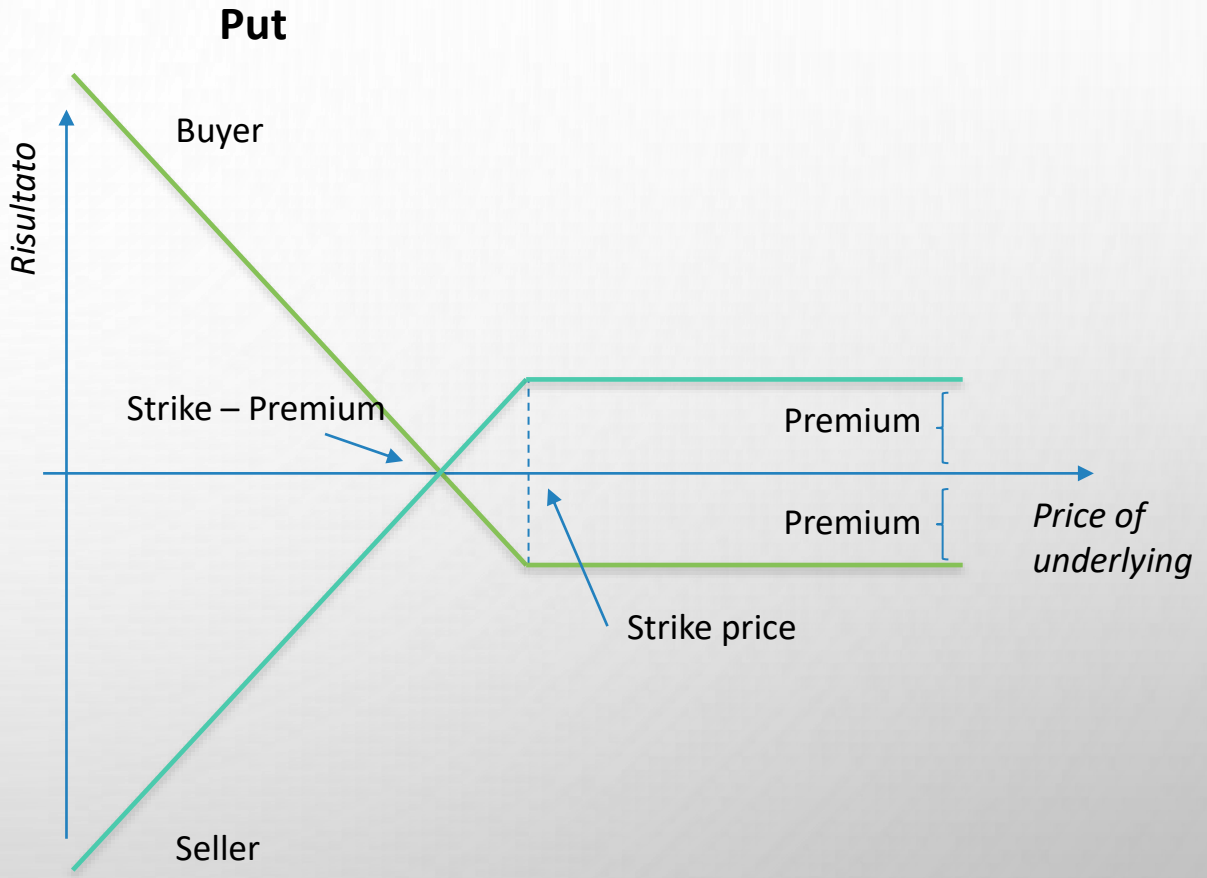
- **Plain-vanilla** (vs exotic such as Asian, path-dependent, …): a party gets the **faculty/right** to buy (**call**) or sell (**put**) the underlying at a specific **strike price,** exercise within (**American**) or at (**European**) a future date, from a counterparty (**writer**), by paying a **premium** today
- The premium prices the **asymmetry**: more likely exercises increase its level
- *In/at/out of-the-money*
- Premium based on maturity, spot price, expectations, IR, strike price, type of option, …:

PREMIUM = INTRINSIC VALUE (*what if* today) + TIME VALUE (*uncertainty*)



OPTIONS





Example: can you tell me what happens if I buy (sell) a call (put) on a stock, strike 250, premium 10, with price at the settlement date of 235, 255 or 270?

OPTIONS

Example: can you tell me what happens if I buy (sell) a call (put) on a stock, strike 250, premium 10, with price at the settlement date of 235, 255 or 270?

CALL

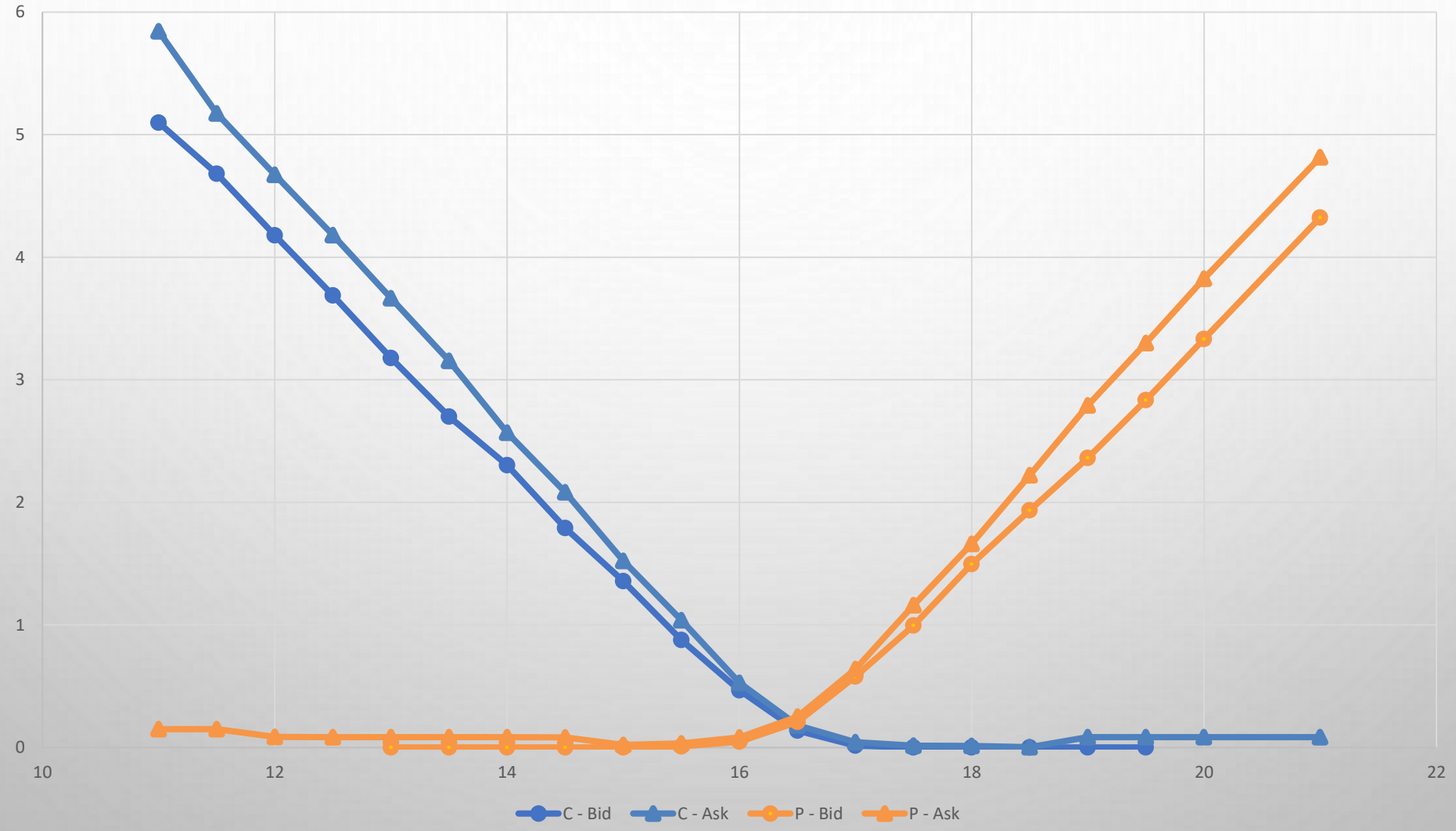
Price	Buyer	Seller
235		
255		
270		

PUT

Price	Buyer	Seller
235		
255		
270		

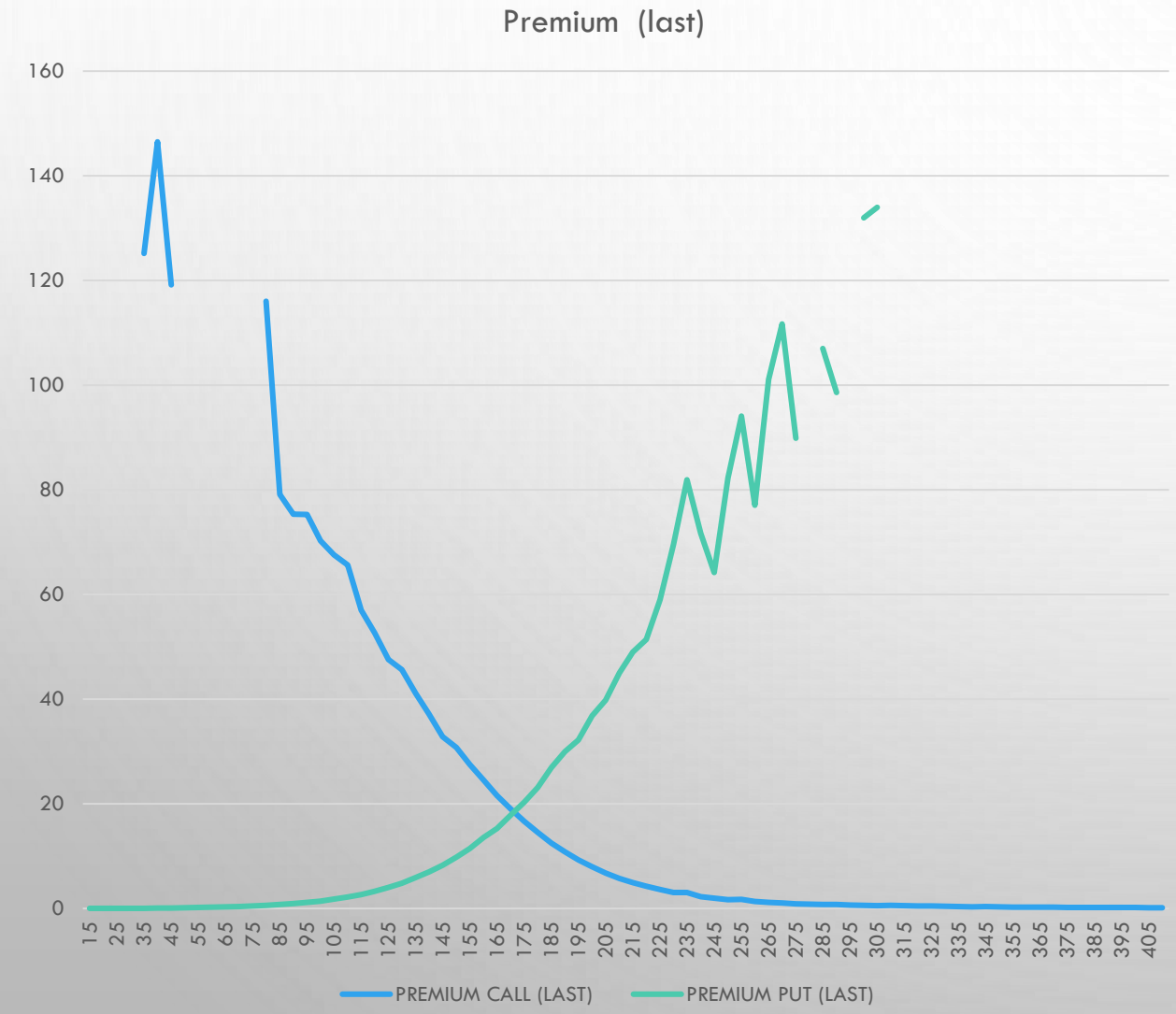
OPTIONS

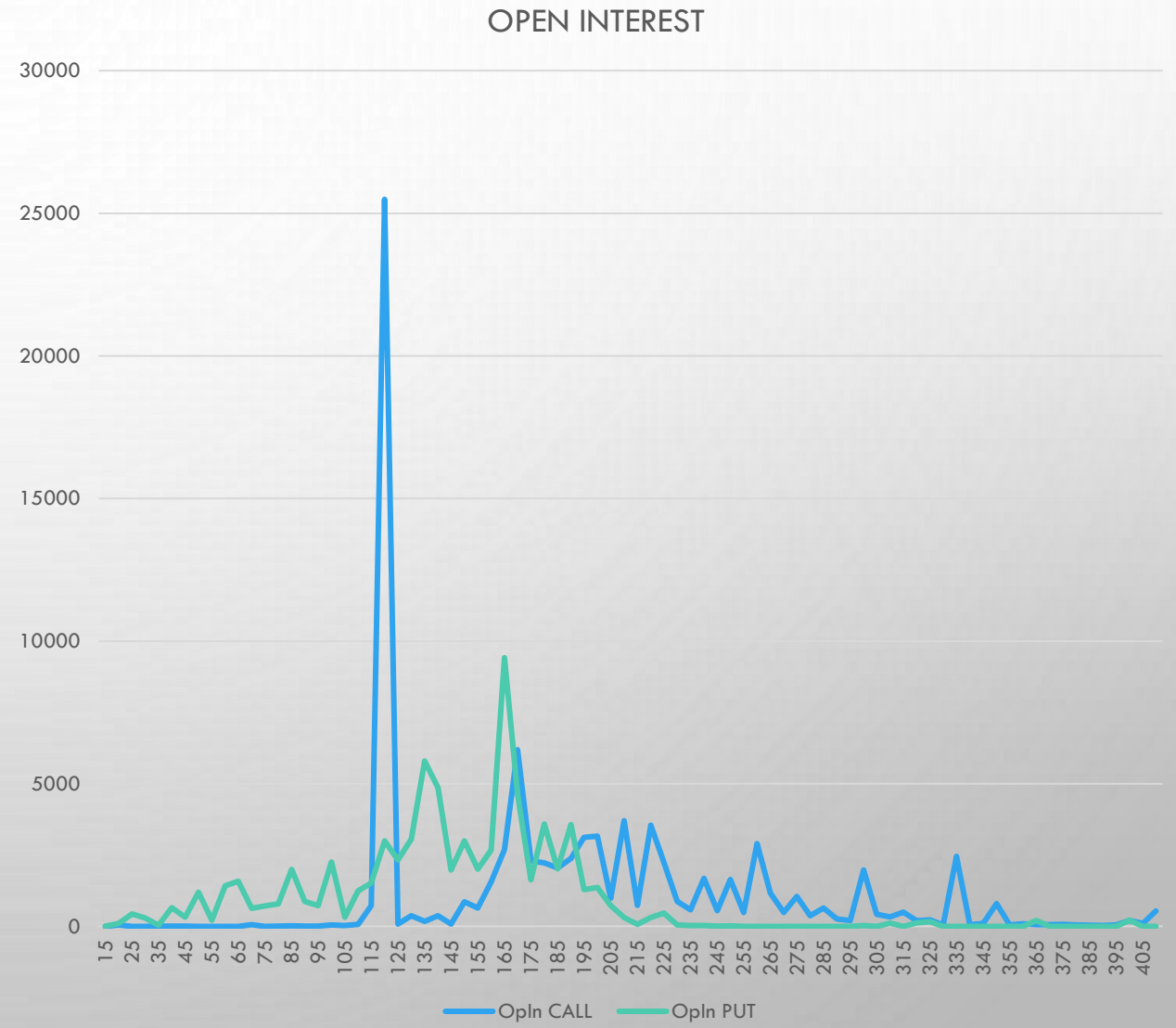
GENERALI (2019): 1 month bid-ask call and put prices, stock priced 16,43



OPTIONS

TESLA (2023): PRICE 169,15 ON 10/05/23 - SETTLEMENT AUG, 18



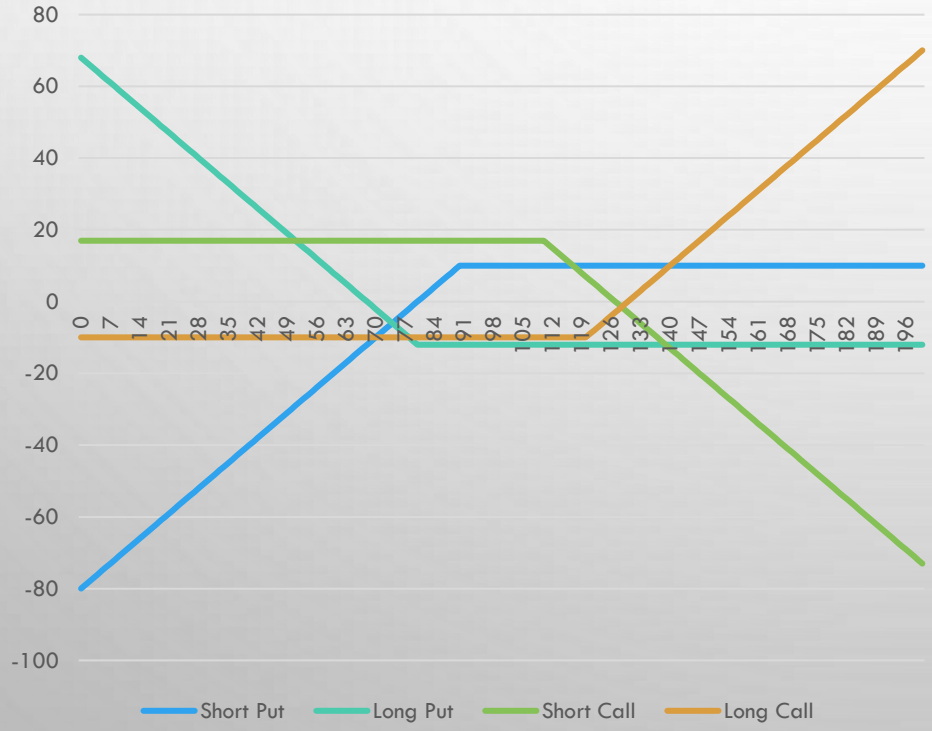


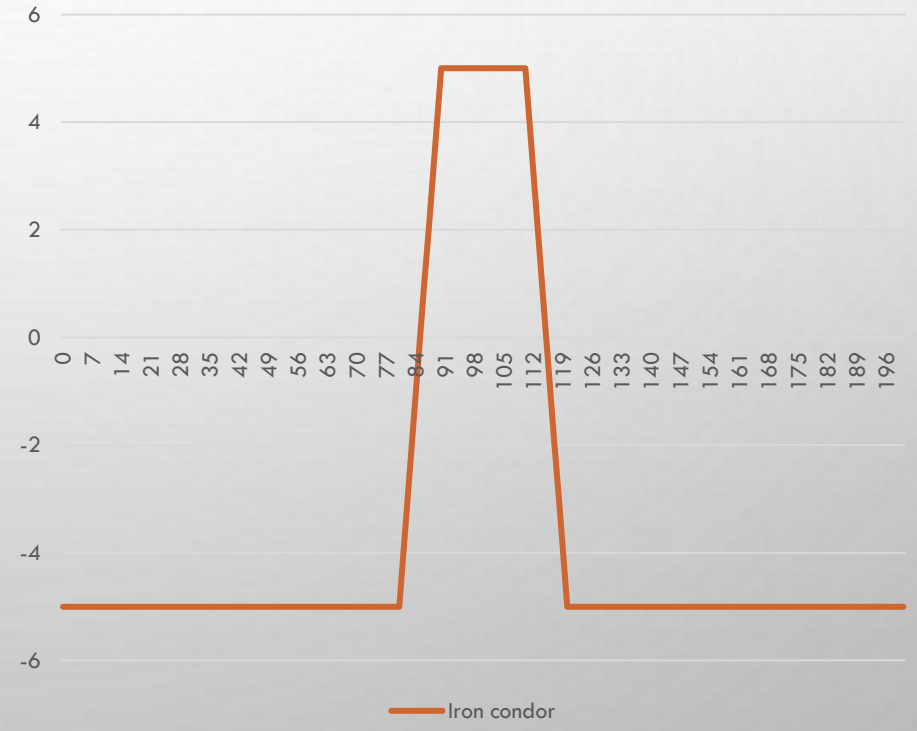
OPTIONS

Options' asymmetry (and variants) allow for interesting investment strategie. Example: *iron condor* (but many, many others exist!)

Same settlement date, same underlying

1.	SELL	PUT	STRIKE 90	PREMIUM 10
2.	BUY	PUT	STRIKE 80	PREMIUM 12
3.	SELL	CALL	STRIKE 110	PREMIUM 17
4.	BUY	CALL	STRIKE 120	PREMIUM 10





SWAP

- Each party pays to the other a **stream of payments** at **specific dates** within a **maturity** date
- Each party has a **long** exposure ("leg") and a **short** exposure **simultaneously** at each settlement date
- Typically, the two streams differ for **currency** (f.i. € Vs. $) or **IR** (f.i. variable Vs. fixed) underlying streams
- **OTC**: illiquid, credit risk, but tailor-made

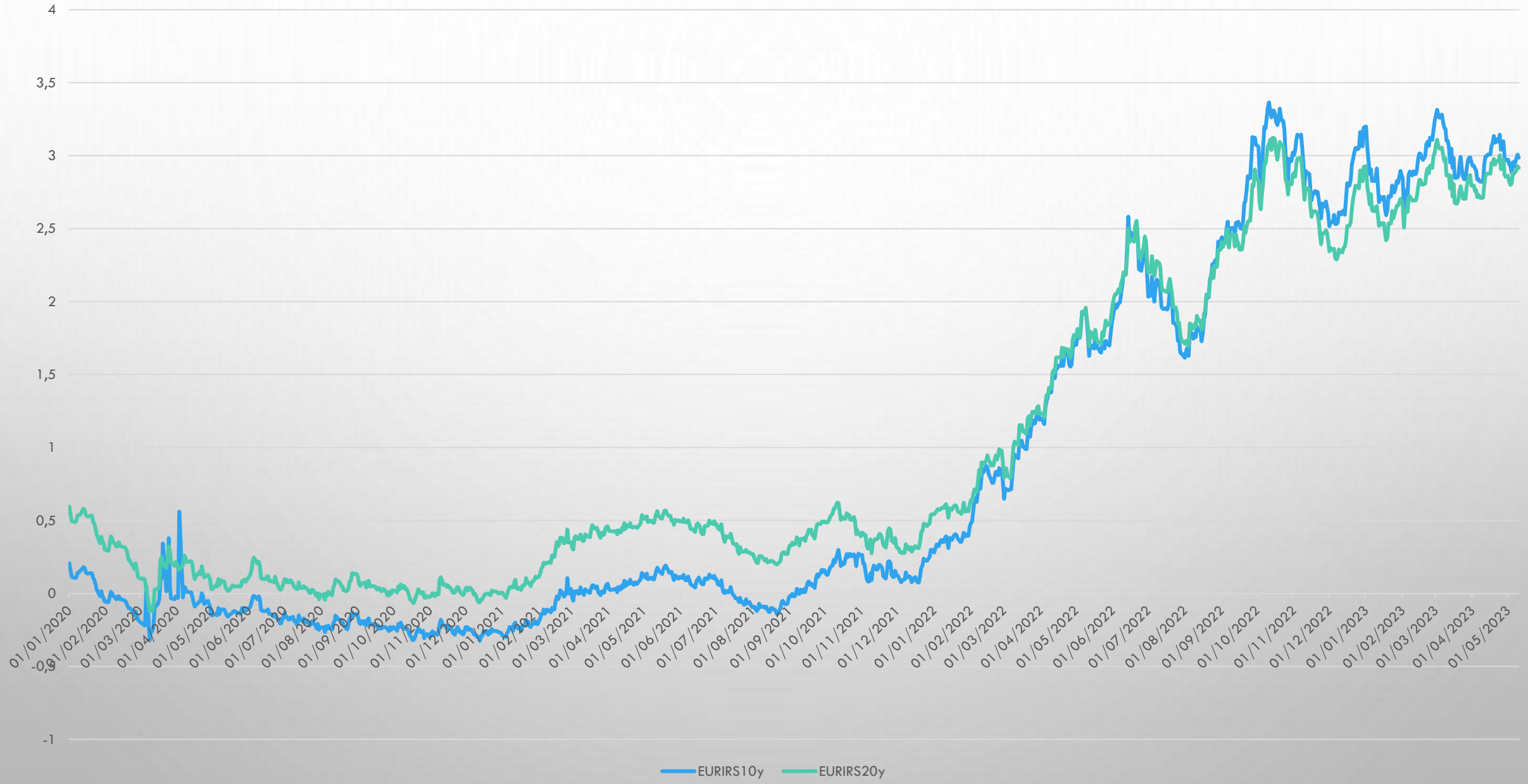
Example: payoff

A and B are in a 5-year swap from 1/1/18, notional 1 mln €. A pays annually EURIBOR1y+100bps and receives 1,5% fixed EURIBOR1a + 100bps in cambio di un tasso fisso all'1.5%.

	2018	2019	2020	2021	2022
EURIBOR1a	-0.2	-0.1	-0,2	-0,5	2,9

	FLOATING	FIXED	NET FOR A
2017	8.000	15.000	+7.000
2018	9.000	15.000	+6.000
2019	8.000	15.000	+7.000
2020	5.000	15.000	+10.000
2021	39.000	15.000	-24.000

SWAP


4
3,5
3
2,5
2
1,5
1
0,5
0
-0,5
-1
01/01/2020
01/02/2020
01/03/2020
01/04/2020
01/05/2020
01/06/2020
01/07/2020
01/08/2020
01/09/2020
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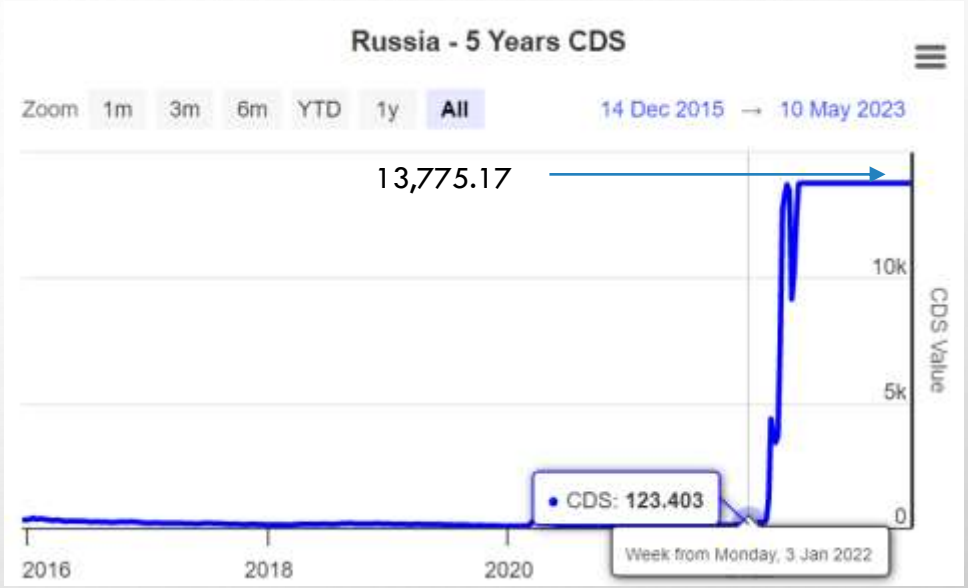
01/01/2023
01/02/2023
01/03/2023
01/04/2023
01/05/2023
EURIRS10y
EURIRS20y

CREDIT DERIVATIVES

- OTC in large denominations
- *Protection buyers* pay a cost to *sellers* (as a premium, or embedded in differences in payoffs)
- *Sellers* pay extra (notional, risk premiums, …) to the *buyer* in case of a *credit event* (default, rating downgrade, …) of a *reference entity/asset*

Main instruments:

- *Total return swaps* (TRS): exchange a given (variable/fixed) rate with the return (with capital gain) of a reference asset (credit *and* market risks)
- *Credit-default-swap* (CDS): *sellers* pay if a credit event occurs, receiving a periodic premium meanwhile
- *Credit-linked note* (CLN): structured bonds with the option, triggered by credit events, to receive lower coupons, a recovery value or similar change in payouts



CREDIT DERIVATIVES

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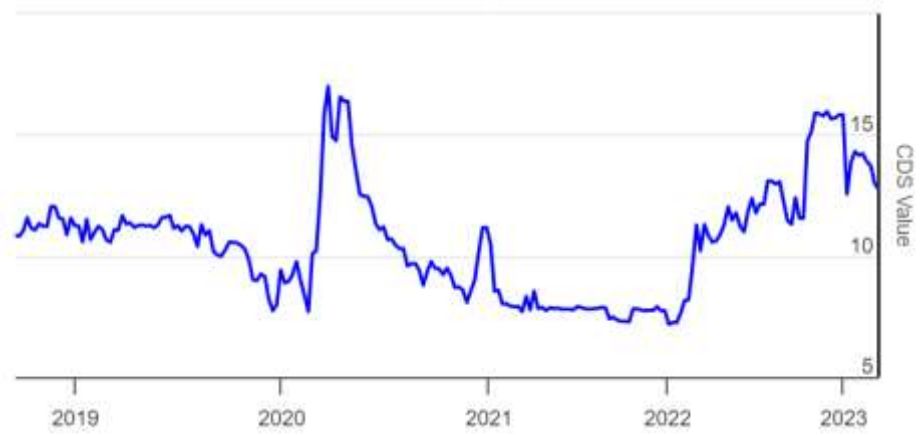
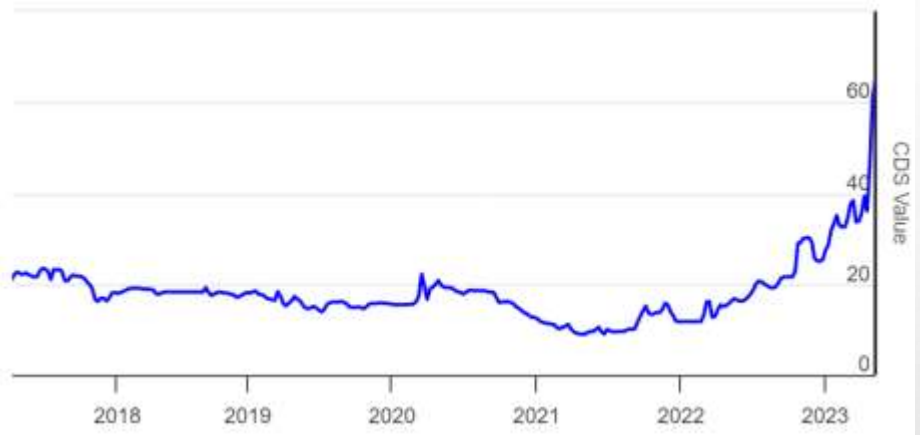


USA



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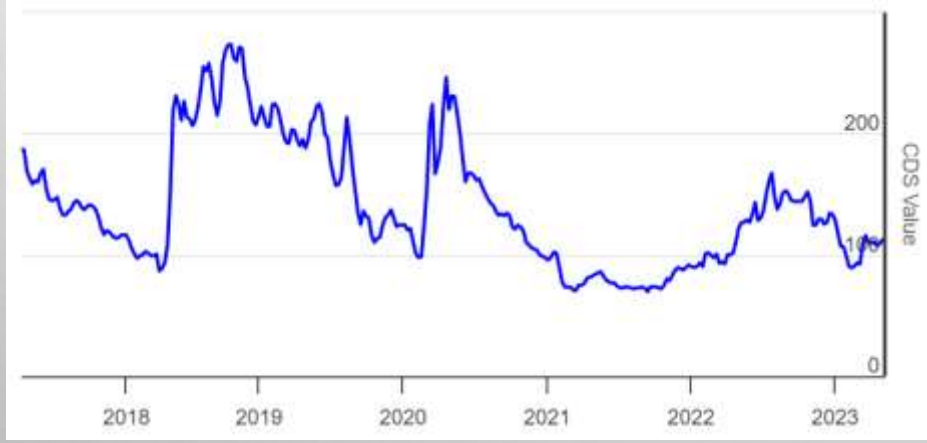

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