FINANCIAL MARKETS AND INSTITUTIONS

RISK MANAGEMENT, DERIVATIVES AND HEDGING

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DEAMS
University
of Trieste

AGENDA

- Derivatives:
  - Why: focus on hedging
  - How and what:
    - Futures, options and swaps
    - Credit derivatives

DERIVATIVES, HEDGING AND RISK MANAGEMENT

- Hedging: protection through a **transaction offsetting another**
- **micro-hedging:**
  - One specific exposure is protected by taking another symmetrical exposure
  - *F.i. an Italian firm has to pay $ at a future date acquires a deposit in $ now*
- **macro-hedging:**
  - One group of exposures to similar risks is protected by taking one additional symmetrical exposure
  - *F.i. an Italian bank holds a portfolio of fixed-interest loans and borrows through a fixed-interest bond*
- **partial hedging:**
  - One exposure is protected through another for just a component or a 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 is protected through another that is highly correlated, yet not exactly symmetrical
  - *F.i. exposure to fuel costs of a delivery truck is protected through an exposure to Brent oil*

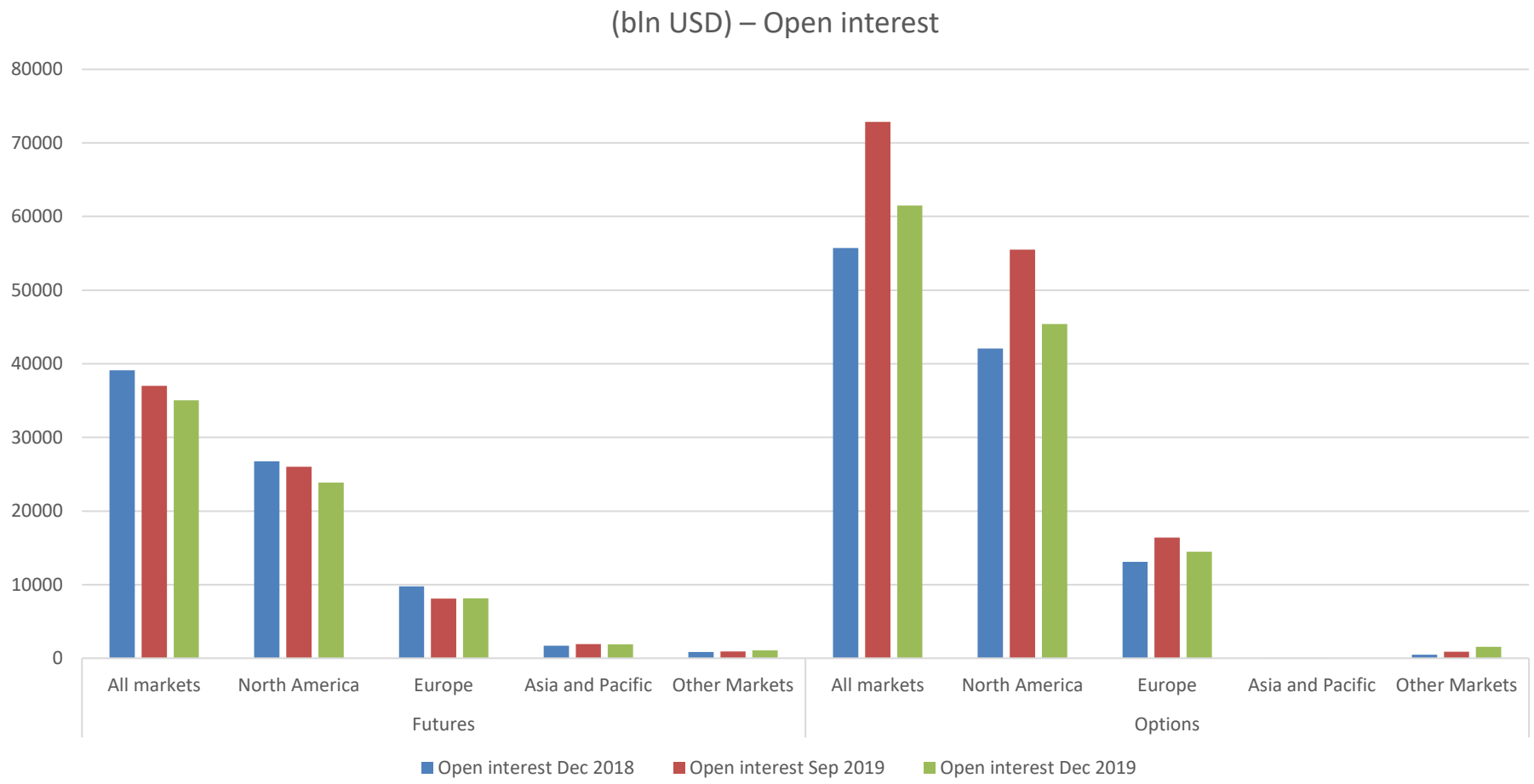
DERIVATIVES, HEDGING AND RISK MANAGEMENT

- Building offsetting exposures is costly and exact coverage is hard to find
- Derivatives:
  - initial investment zero or limited (much less than exposure)
  - settled at a future date
  - value depends on underlying variable
- Both exchange-traded and (mostly) OTC
- Main instruments:
  - **forwards/futures**
  - **options**
  - **swaps**
  - **credit derivatives**
- Terminology: **strike price, underlying, expiration/settlement date, contract size VS value, long VS short position**

DERIVATIVES, HEDGING AND RISK MANAGEMENT

BIS statistics

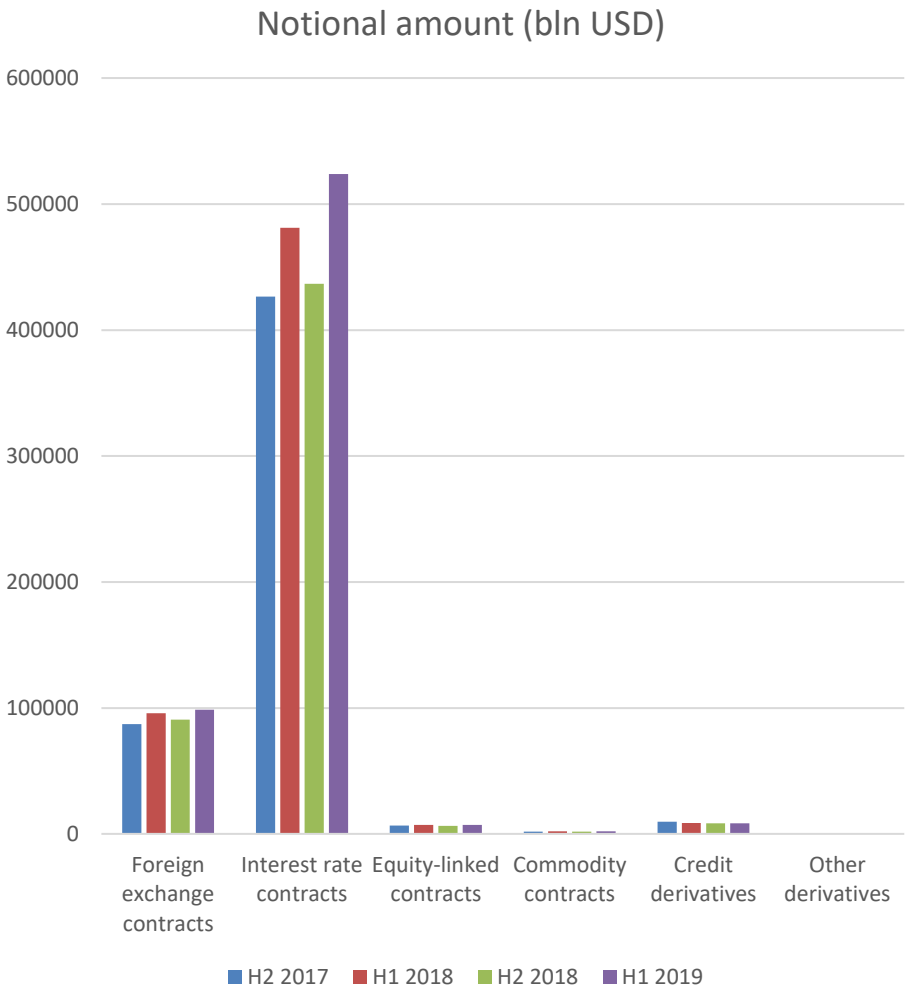
Exchange traded futures and options by geographical area

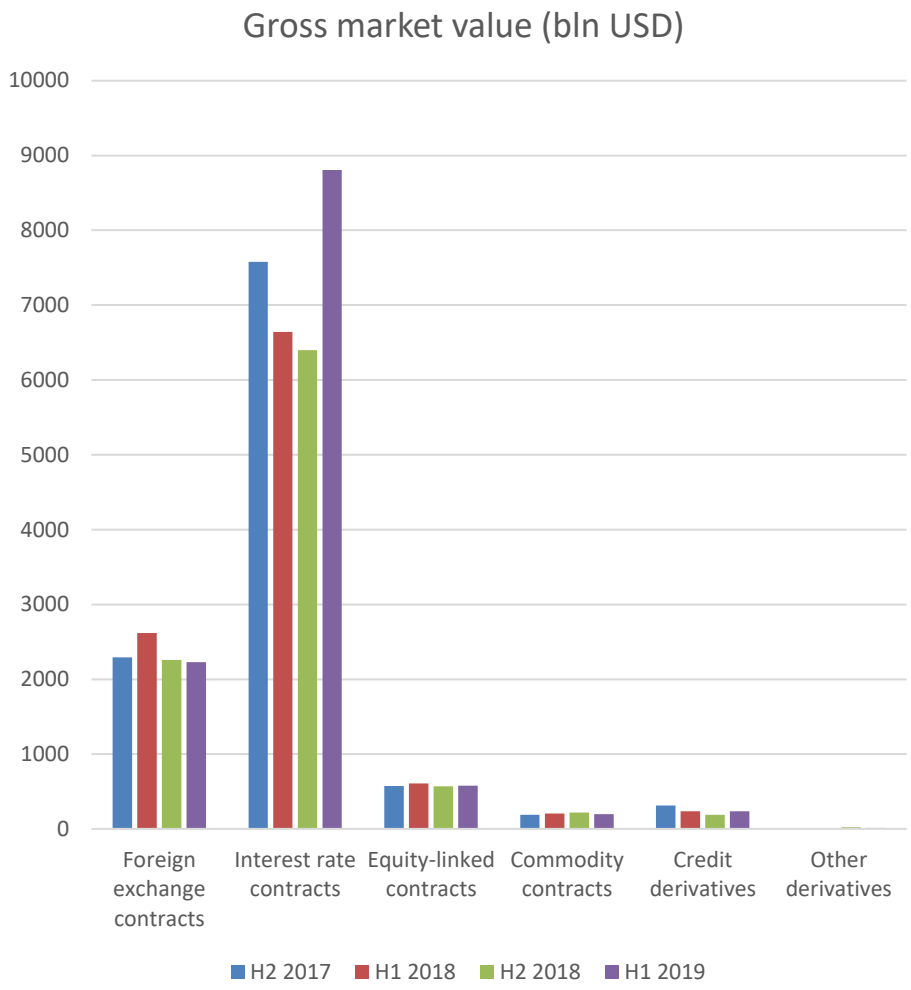


DERIVATIVES, HEDGING AND RISK MANAGEMENT

BIS statistics

OTC derivatives: notional amount and gross market value

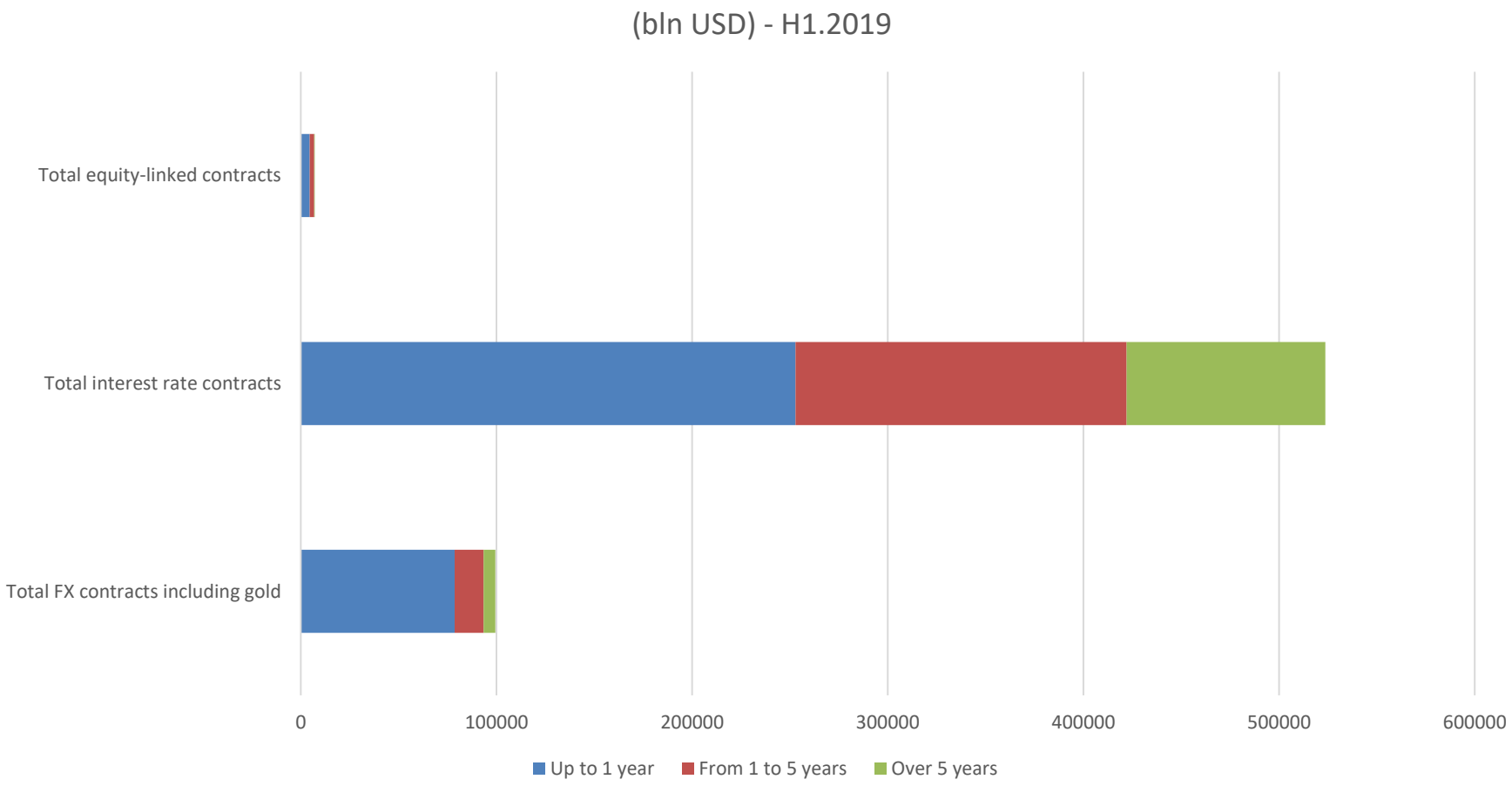




DERIVATIVES, HEDGING AND RISK MANAGEMENT

BIS statistics

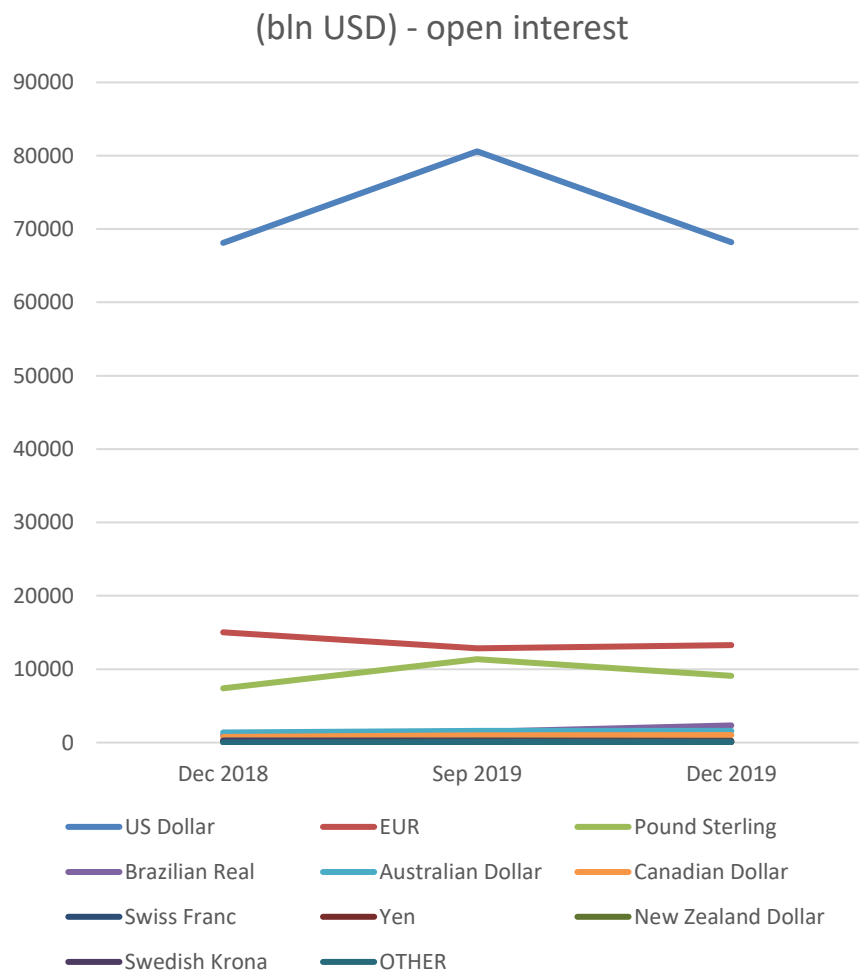
OTC derivatives by maturity

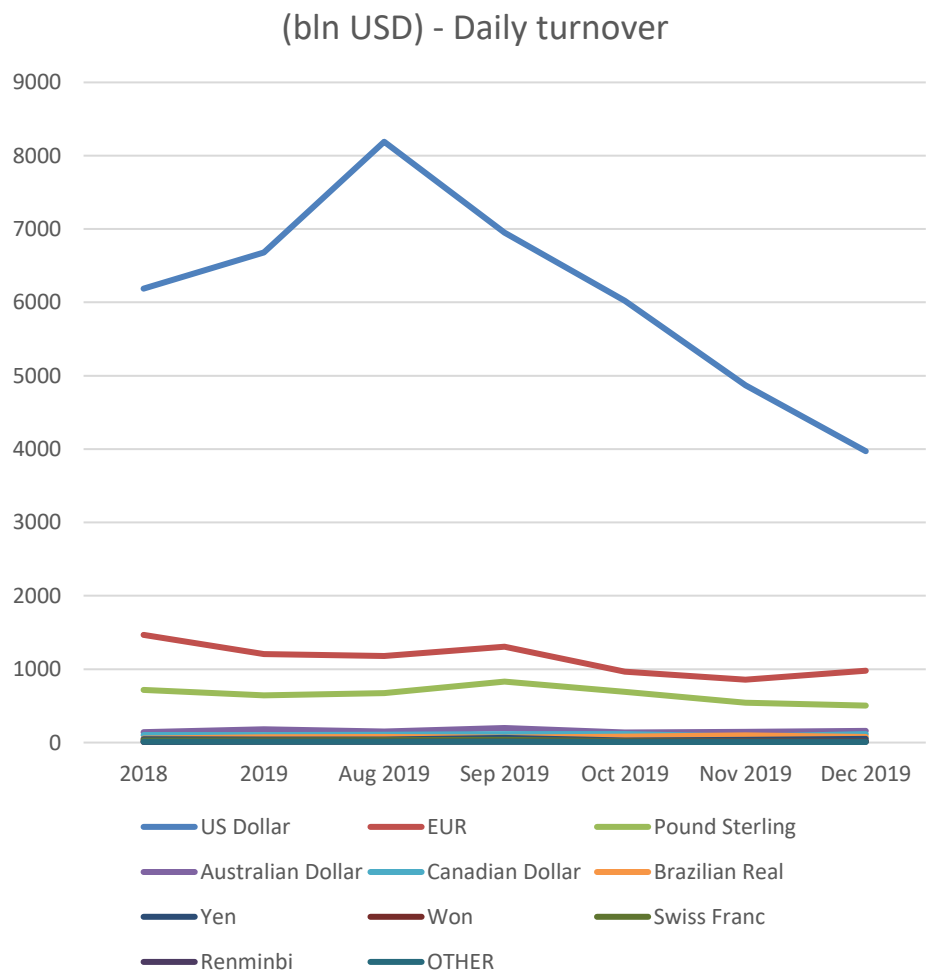


DERIVATIVES, HEDGING AND RISK MANAGEMENT

BIS statistics

Exchange-traded futures and options (by currency)





DERIVATIVES, HEDGING AND RISK MANAGEMENT

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 will pay Susan 50 €/g for 10 Kg of gold on 1st June

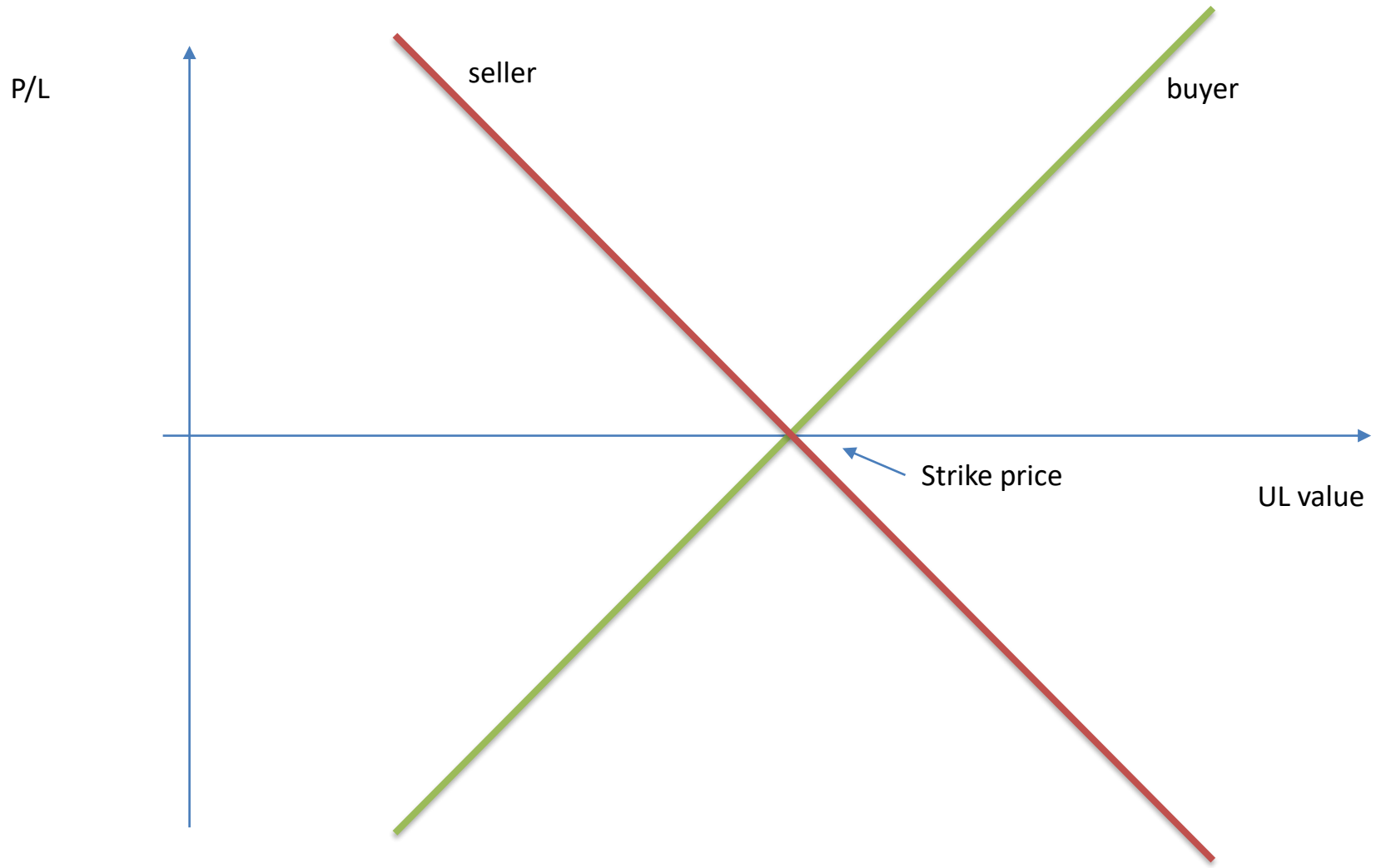
- **OTC**, **finding counterparties is difficult**, **illiquidity** and **credit risk**

F.i. what happens if on 1st June John does not have 500.000 Euros? Or Susan does not have 10 Kg of gold?

- Futures are **standardized** to be exchange-traded:
  - clearing houses absorb credit risk through day-by-day margins
  - "negotiability" through standard conditions, providing liquidity
  - extension of deliverables increase volumes
  - cash-settlement VS physical settlement

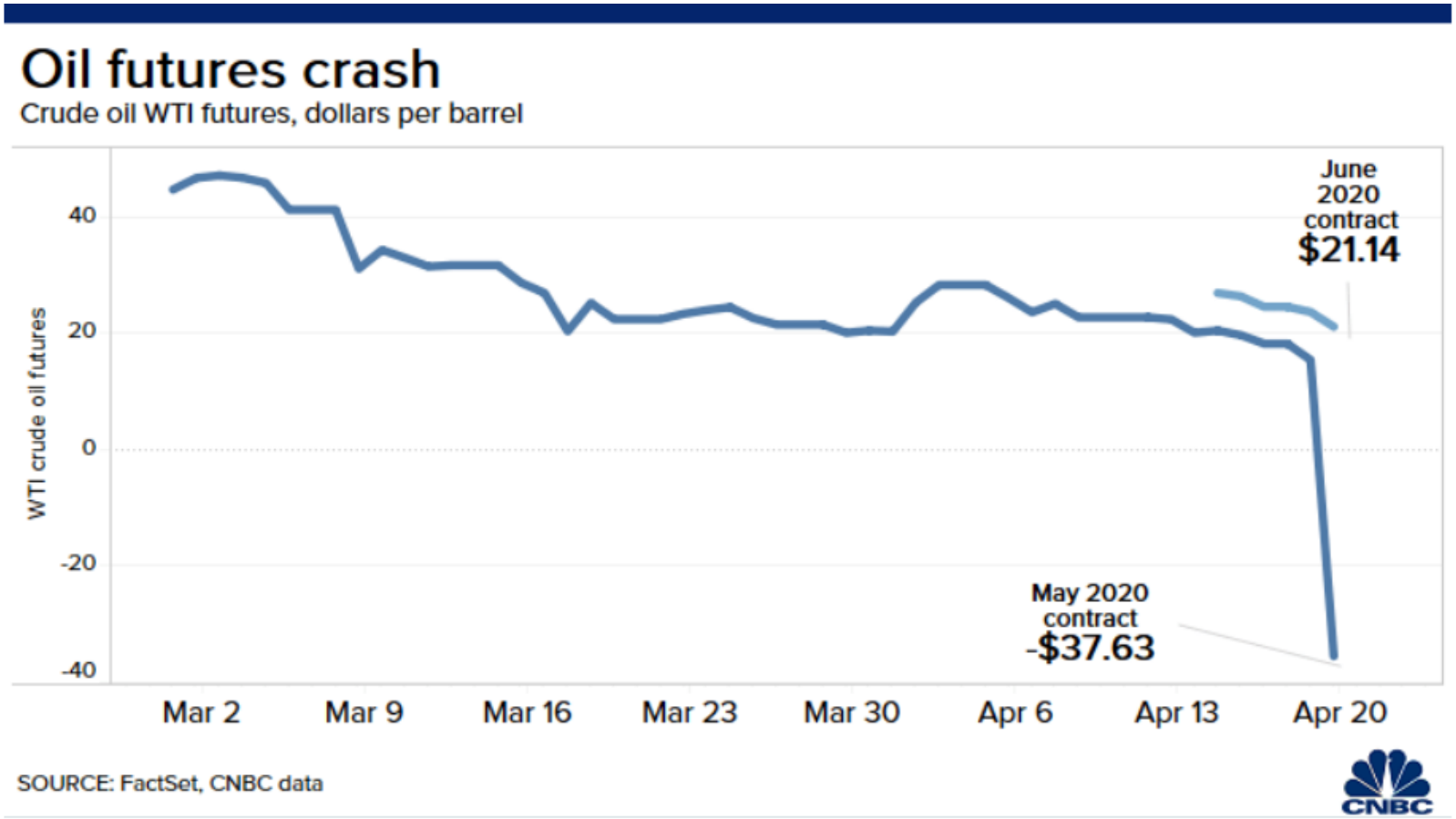
F.i. if on 1st June gold trades at 52 €/g would it be the same for John to receive 10 Kg of gold or 20.000 €? And for Susan to deliver gold or the money?

Forward/future payoff



DERIVATIVES, HEDGING AND RISK MANAGEMENT

The WTI future crash (20th April 2020)



DERIVATIVES, HEDGING AND RISK MANAGEMENT

Options

- **Plain-vanilla**:
  - 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 specific future date
  - from a counterparty (**writer**)
  - by paying a **premium** today
- Changing the above leads to "exotic" options (f.i. Asian, path-dependent, …)
- Require a stable fixed investment (premium) that varies on the maturity, spot price, expectations, IR, strike price, type of option, …:

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

- The premium prices the **asymmetry**: more likely exercises increase its level
- Terminology: *In-the-money* / *Out-of-the-money*

DERIVATIVES, HEDGING AND RISK MANAGEMENT

Options

- Example
  - You buy an option on 1,000 stocks A, strike price 250, premium 10
  - At the maturity date, this happens to you and the writer at different stock prices

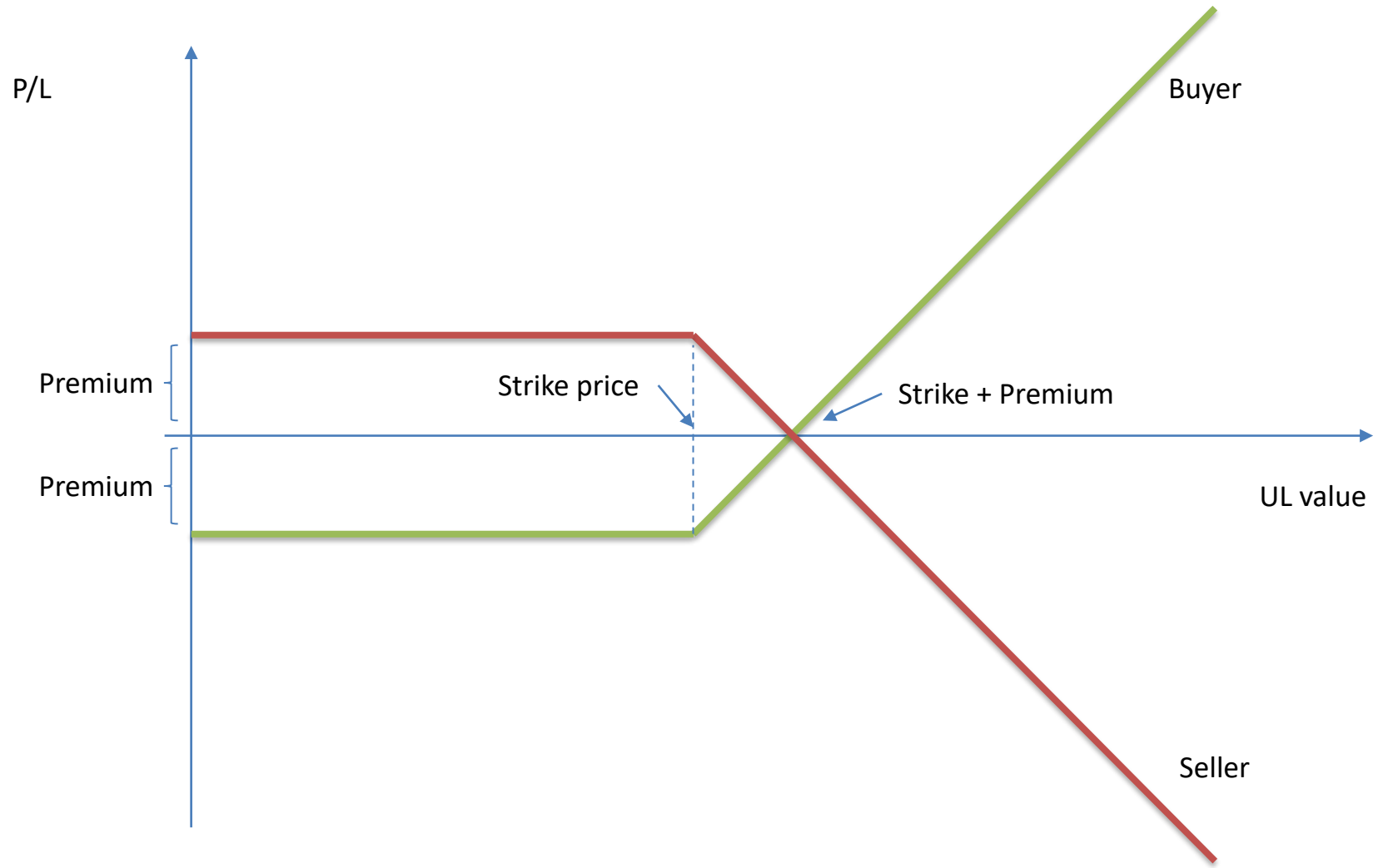
CALL

Price	235	255	270
Buyer	You pay 10 If you exercise, you have to pay 250 for a stock worth 235, losing 15 more. You lost 10	You pay 10 If you exercise, you have to pay 250 for a stock worth 255, gaining 5. You lost 5.	You pay 10 If you exercise, you have to pay 250 for a stock worth 270, gaining 20. You gained 10.
Seller	You get 10 If the buyer exercises, you get 250 for a stock worth 235, gaining 15. You gained 10	You get 10 If the buyer exercises, you get 250 for a stock worth 255, losing 5. You gained 5	You get 10 If the buyer exercises, you get 250 for a stock worth 270, losing 20. You lost 10.

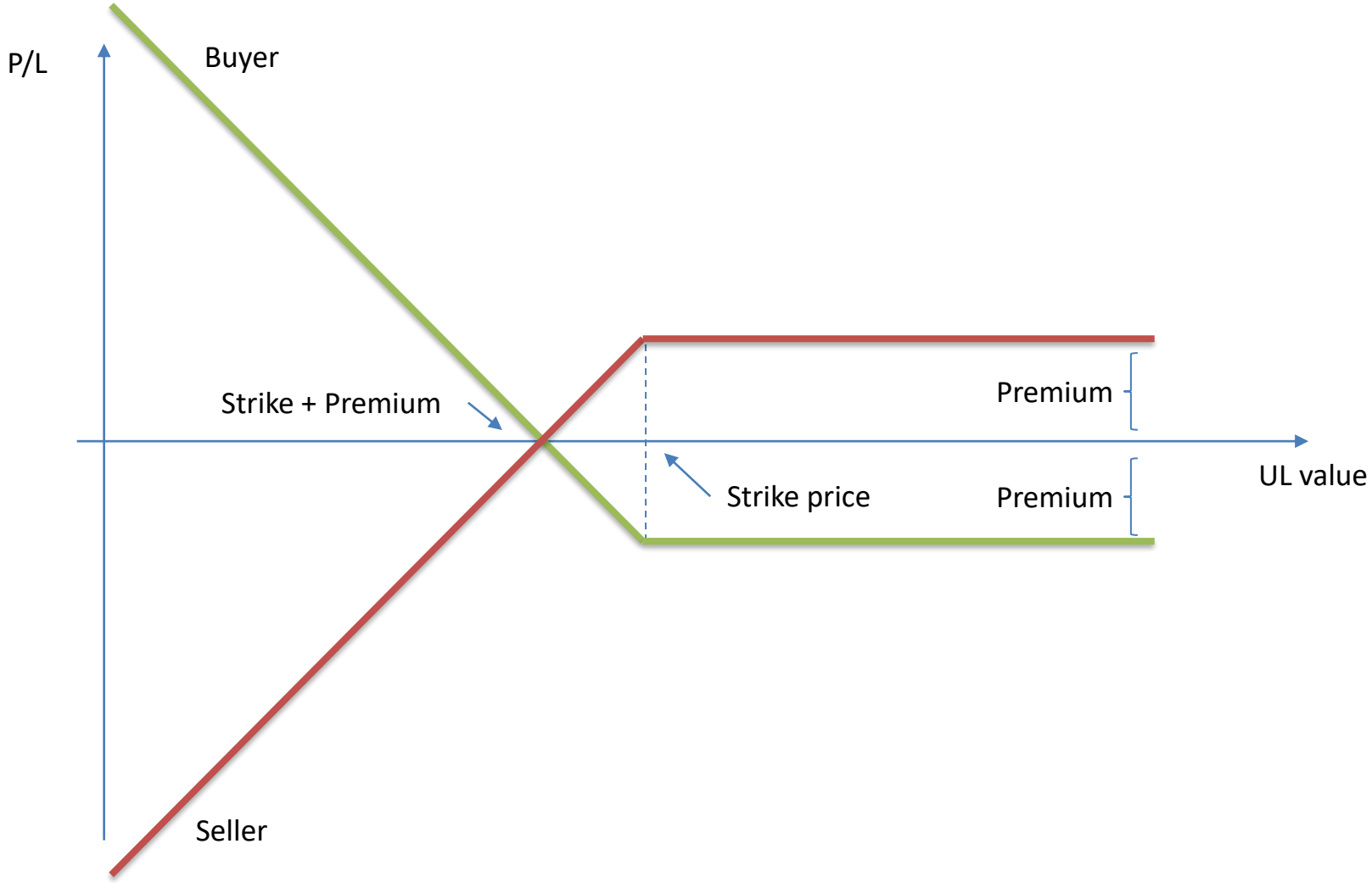
PUT

Price	235	255	270
Buyer	You pay 10 If you exercise, you get 250 for a stock worth 235, gaining 15. Better do. You gained 5	You pay 10 If you exercise, you get 250 for a stock worth 255, losing 5. Better not. You lost 10	You pay 10 If you exercise, you get 250 for a stock worth 270, losing 20. Better not You lost 10
Seller	You get 10 If the buyer exercises, you pay 250 for a stock worth 235, losing 15. You lost 5	You get 10 If the buyer exercises, you pay 250 for a stock worth 255, gaining 5. You gained 10	You get 10 If the buyer exercises, you pay 250 for a stock worth 270, gaining 20. You gained 10

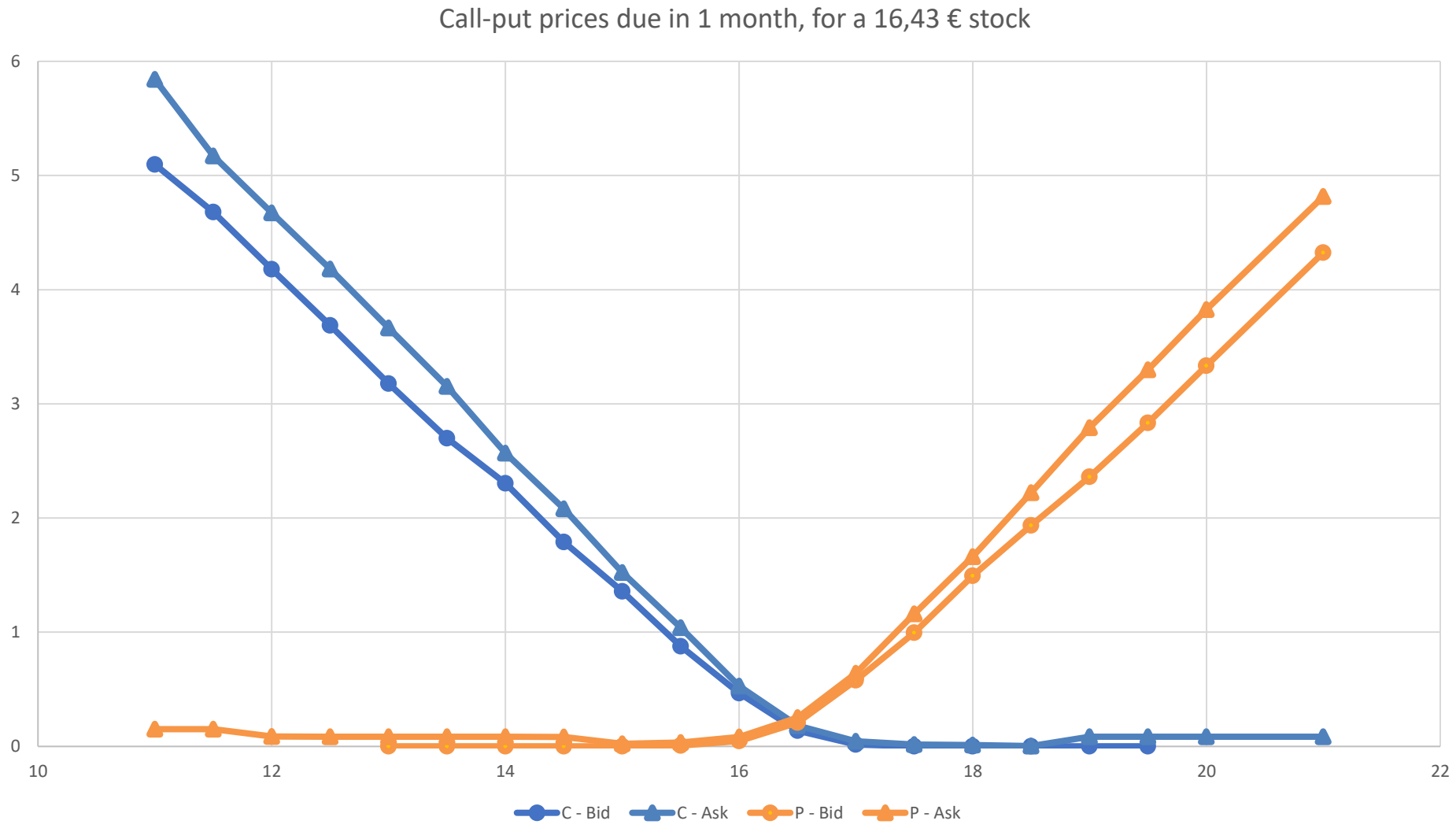
Option payoff: call



Option payoff: put



Example

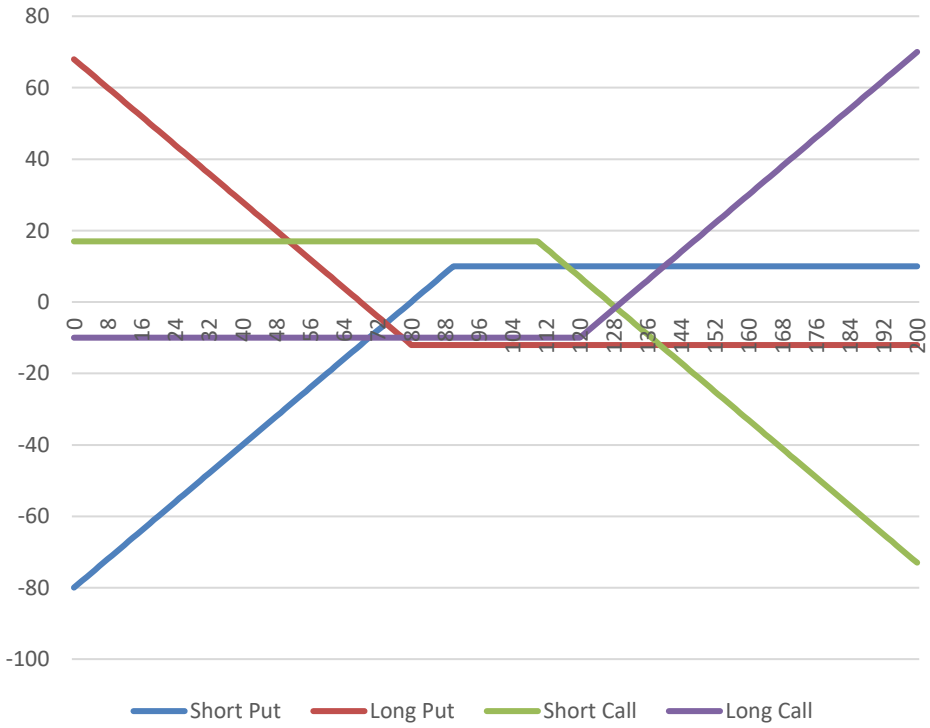

Call-put prices due in 1 month, for a 16,43 € stock
6
5
4
3
2
1
0
10
12
14
16
18
20
22
C - Bid
C - Ask
P - Bid
P - Ask

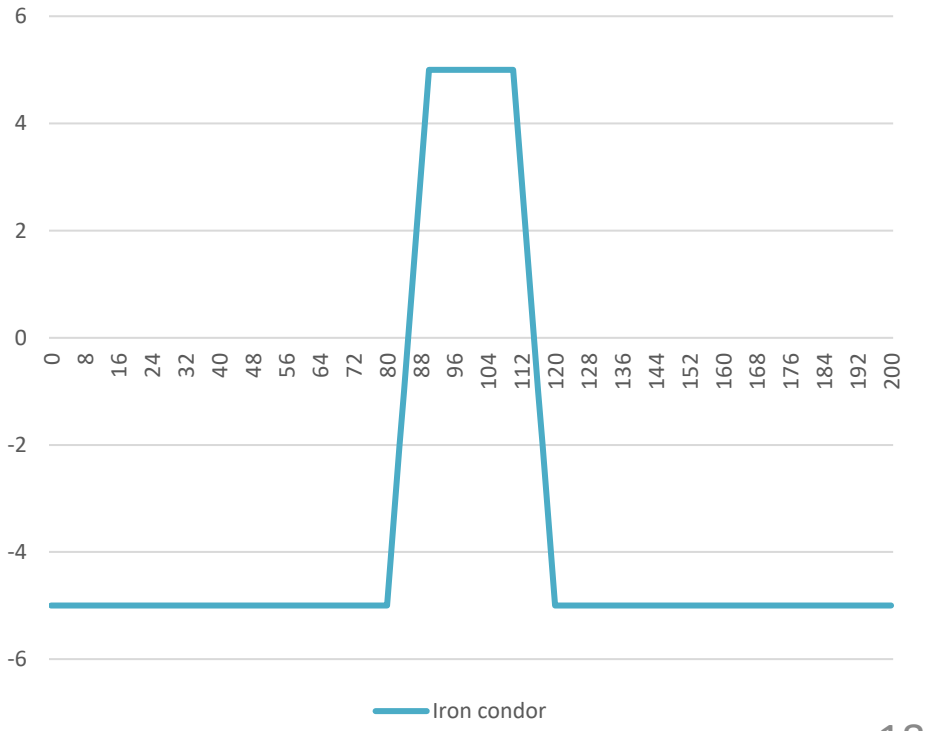
Time value VS Intrinsic value

Example

Imagine that you do the following on the same stock, same maturity date:

1. Sell a put with strike 90, premium 10
2. Buy a put with strike 80, premium 12
3. Sell a call with strike 110, premium 17
4. Buy a call with strike 120, premium 10





DERIVATIVES, HEDGING AND RISK MANAGEMENT

Swaps

- Each party pays to the other a stream of payments at specific dates within a medium/long maturity date (basically, the net balance)
- 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

Swap payoff example

5y swap, «A» pays EURIBOR1y+100bps, «B» pays 1.5%, on a 1 mln € notional

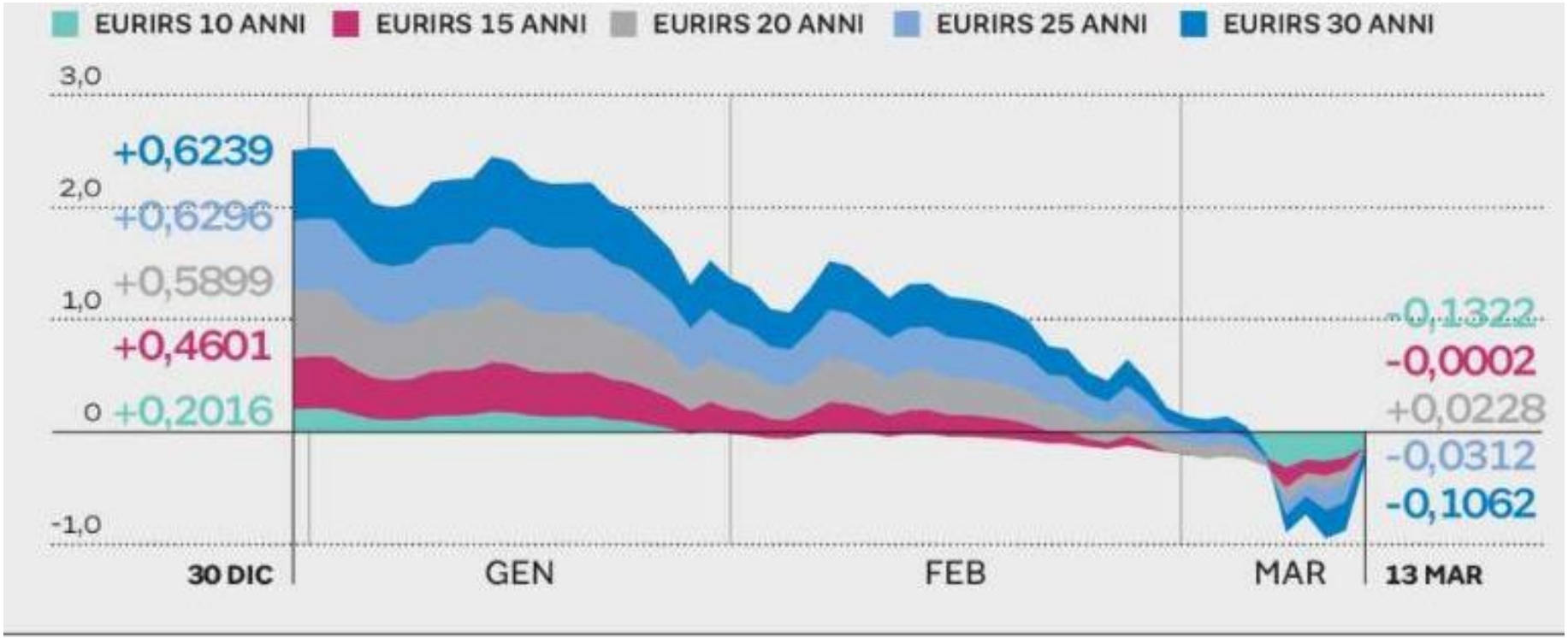
	2017	2018	2019	2020	2021
EURIBOR1y	-0.1	-0.2	0	0.5	1

Results:

	VARIABLE	FIXED	Net (for «A»)
2017	9.000	15.000	+6.000
2018	8.000	15.000	+7.000
2019	10.000	15.000	+5.000
2020	15.000	15.000	0
2021	20.000	15.000	-5.000

DERIVATIVES, HEDGING AND RISK MANAGEMENT

EURIRS



DERIVATIVES, HEDGING AND RISK MANAGEMENT

Credit derivatives

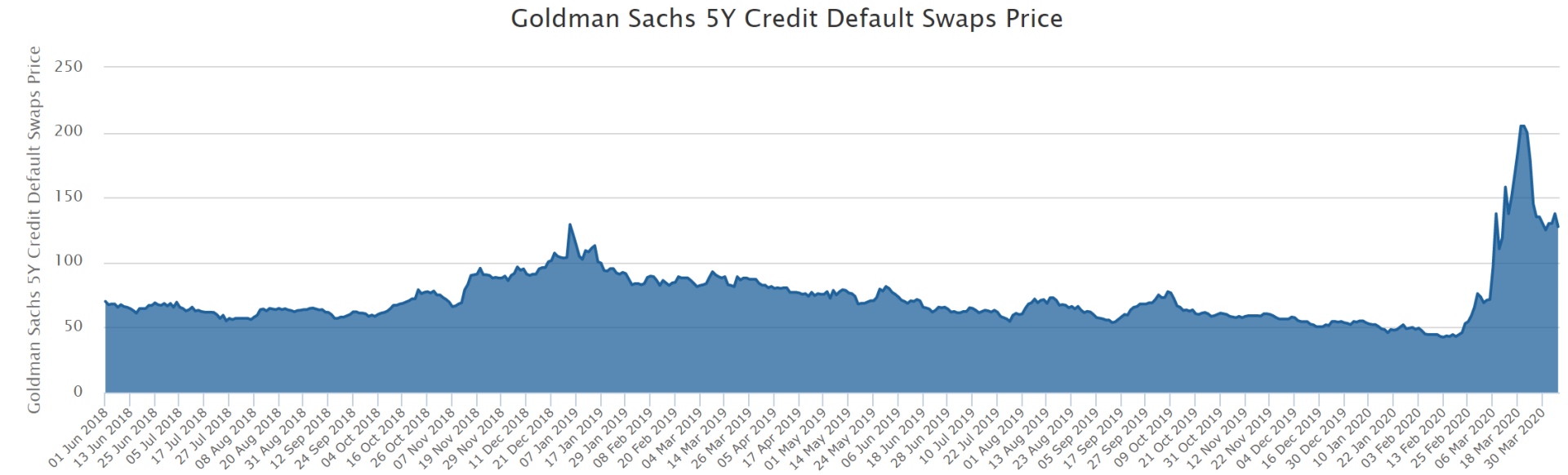
- OTC in large denominations
- *Protection buyers* pay a premium (usually periodic) to the *seller*
- *Seller* pays the notional to the *buyer* in case of a *credit event* (default, rating downgrade, …) of a *reference entity*

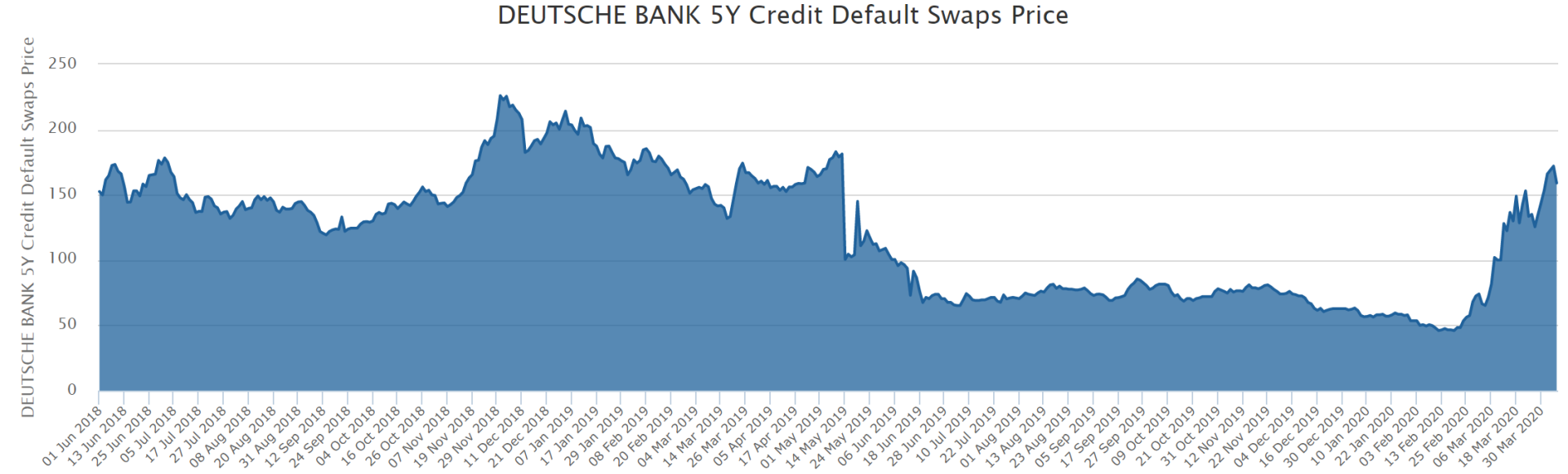
Main instruments:

- *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

DERIVATIVES, HEDGING AND RISK MANAGEMENT

CDS data (assetmacro.com)

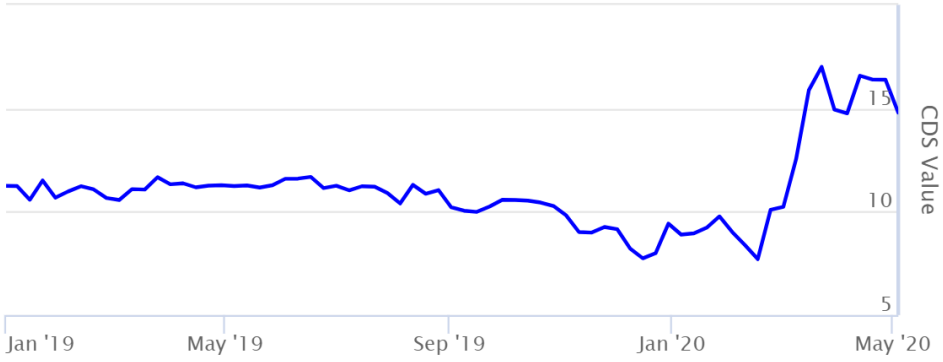




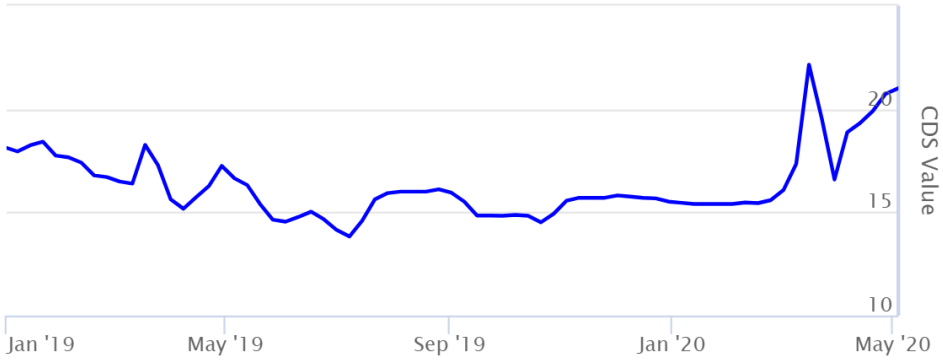
DERIVATIVES, HEDGING AND RISK MANAGEMENT

Credit derivatives

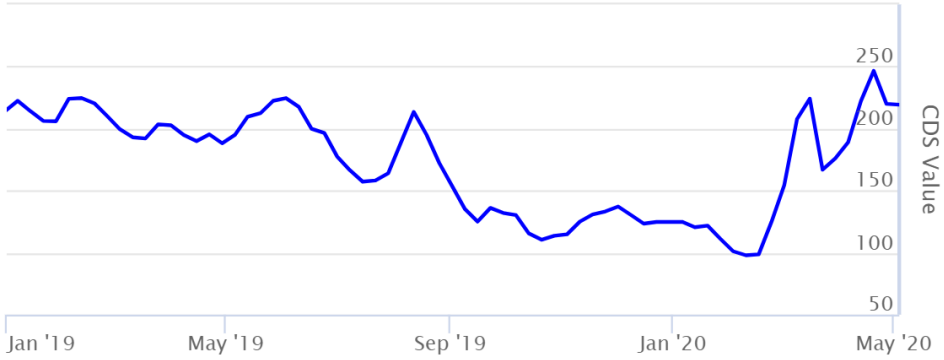
Denmark



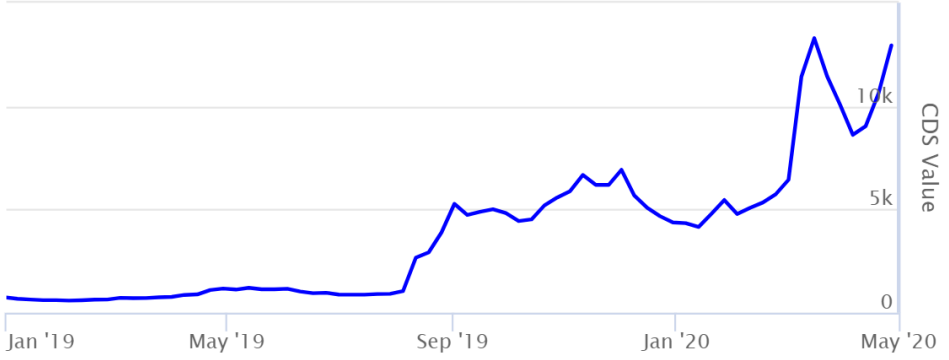
USA



Italy



Argentina



- http://www.worldgovernmentbonds.com/sovereign-cds/-