

KYOS Webinar  
17 November 2020  
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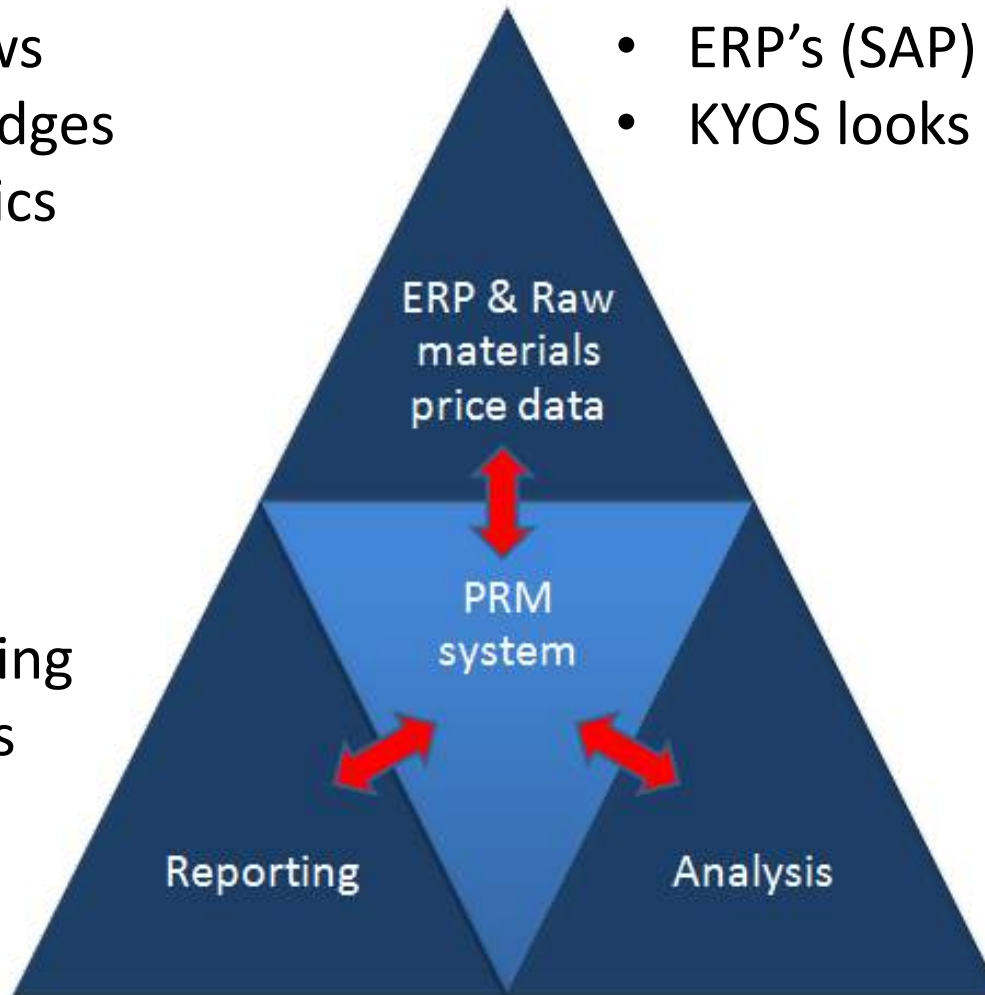
## Accumulators in commodity markets

Floris Hendriks & Cyriel de Jong, KYOS Energy Analytics

# KYOS CTRM & Analytics: look forward

- Physical flows
- Financial hedges
- Price analytics

- ERP's (SAP) look backward
- KYOS looks forward



- Hedge reporting
- Insight in risks
- Coverage

- CPO/CFO
- Treasury
- Risk officer

# Agenda

15:00 – Introduction - Cyriel de Jong



15:05 – Floris Hendriks

- **What is an accumulator?**
  - Benefits and risks
- **Deal analysis**
  - Compare different deals
  - Analyse a deal over time
- **Hedging with accumulators**
  - Analyse a portfolio including accumulators
  - How do accumulators compare to 'simple' future hedges



15:35 – Q&A

15:45 – End

# Poll: experience with accumulators



# What is an accumulator?

- Financial structured product
- Price is fixed, but quantity is determined by underlying price
- No premiums are paid upfront
- The contract duration is several months
- Buyers: commodity processors (e.g. FMCG)  
commodity producers (e.g. farmers)
- Sellers: financial institutions, such as investment banks  
commodity traders, such as Cargill and ADM

# Accumulator example - basics

- Suppose the current futures price is 113.35
- A food processor would like to buy at a lower price of 103
- The processor buys an accumulator from a bank.
- The accumulator is a financial swap at 103, but the volume is uncertain, between 150,000 and 600,000 lbs
- At the settlement date the pay-off for the processor is:
  - Accumulated volume x (Futures settlement price – 103)

# Accumulator example - details

- Underlying future: September 2020 of Commodity A
- Start period: 4 November 2019  
End period: 31 August 2020  
Trading days: 210
- Total contract volume: X units (e.g. 300,000 lbs)
- Daily volume:  $X / 210 = 1,429$  lbs
- Settlement day: 31 August 2020



# Accumulate volumes based on market price

Current future price 113.35

Payoff structure:

115 < price | 50 % daily volume | accumulation price 103  
103 < price ≤ 115 | 100 % daily volume | accumulation price 103  
price ≤ 103 | 200 % daily volume | accumulation price 103

For all trading days between 4 November 2019 and 31 August 2020





# Accumulator settlement



- The sum of all daily accumulated volumes is equal to 278,066 lbs
- The settlement price on 31 August 2020 is 1.298 \$ / lbs
- Settlement cash flow =  $278,066 \times (1.298 - 1.030) = 74,522$  \$

# Why would you trade an accumulator?

- The accumulation price is **fixed**
- The accumulation price is **below the current future price**
- An accumulator can help to achieve a **strategic price target**
  - Useful for hedging purposes
  - For example: A farmer can fix his price above his cost price

# Achieve strategic price target



# Achieve strategic price target



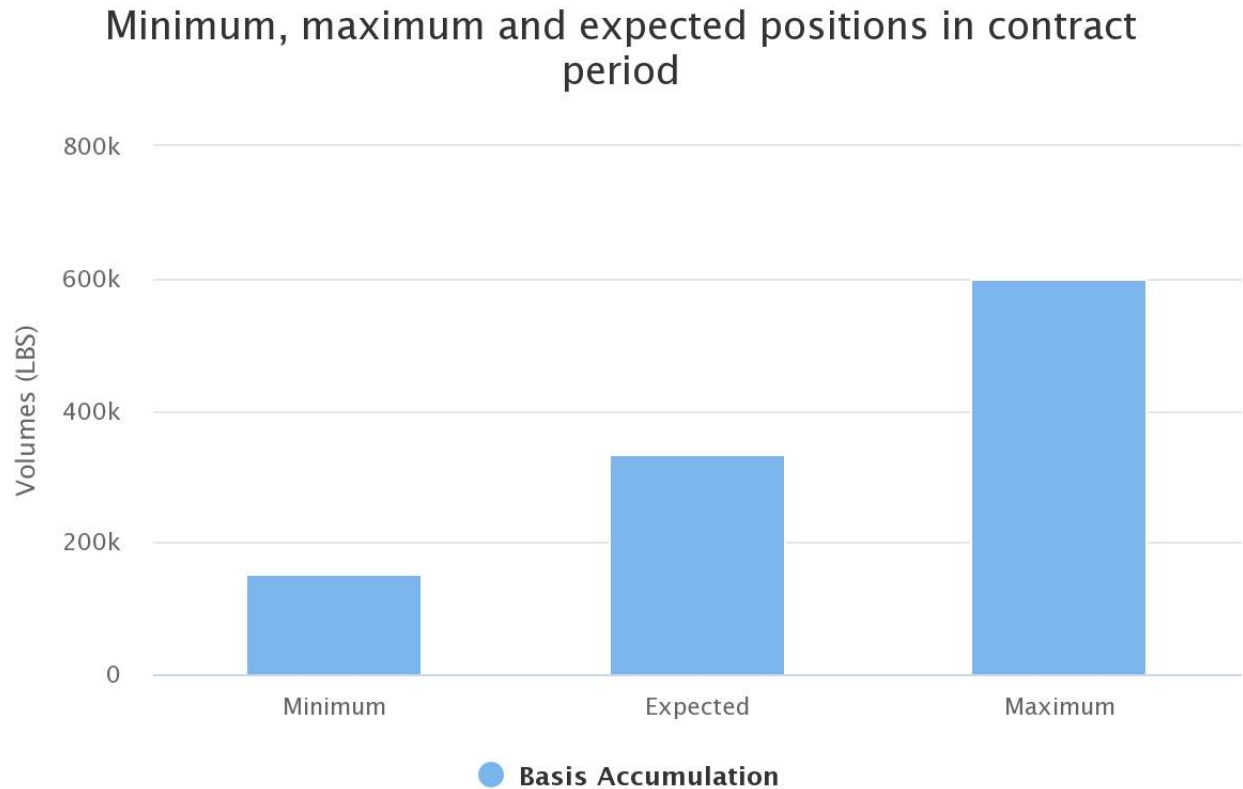
# Achieve strategic price target



# Risks of an accumulator

- Volume risk: too much or too few volume could be accumulated
- Market risk: Intensifying mark-to-market losses
- Pricing is more complicated
  - An accumulator can be replicated by a portfolio of a swap with barrier options
  - KYOS can help by offering an **unbiased** calculation of the expected volumes and mark-to-market with unique KyAccumulator model
- Liquidity risk: Structured product can not be sold easily on the market and could have exit costs

# Volume risk



Kyos Energy Consulting



# Accumulator: decompose in 'standard' options

Daily portfolio:

Part 1: buy | 50 % daily volume | swap | fixed price of 103



# Accumulator: decompose in 'standard' options

Daily portfolio:

|                    |                   |                        |                            |
|--------------------|-------------------|------------------------|----------------------------|
| Part 1: <u>buy</u> | 50 % daily volume | swap                   | fixed price of 103         |
| Part 2: <u>buy</u> | 50 % daily volume | call (up & out) option | barrier 115 and strike 103 |



# Accumulator: decompose in 'standard' options

Daily portfolio:

|                     |                    |                        |                            |
|---------------------|--------------------|------------------------|----------------------------|
| Part 1: <u>buy</u>  | 50 % daily volume  | swap                   | fixed price of 103         |
| Part 2: <u>buy</u>  | 50 % daily volume  | call (up & out) option | barrier 115 and strike 103 |
| Part 3: <u>sell</u> | 150 % daily volume | put option             | strike 103                 |



# Contract life cycle by KYOS



# KYOS platform

- KYOS offers a complete platform for valuing deals, including accumulators but also options and other products
- We offer advanced analytical tools to monitor the risk of a whole portfolio, such as Cashflow-at-Risk, Earnings-at-Risk and Value-at-Risk
- KyAccumulator: special model for accumulators, based on Monte Carlo method

# Deal capture



Settings Price data Time series Curves Assets & Contracts **Analytics** Custom analytics Reports Logs

KyStore KySwing KyCalibration KyPlant KySim KyRisk KyVaR KyWhat-if KyOption **KyAccumulator**

## Edit KyAccumulator profile

### General

Confirmation number

Confirmed  Contract is confirmed

Commodity

Simulation profile

Buy/Sell  Buy  Sell

Counterparty

Trade date

Early termination  Yes  No

Future

Lots or units  Lots  Units

Volume  LBS

Start accumulation

End accumulation

Pricing days

Settlement price 1 day  Yes  No

Settlement day

Payment date

# Deal capture

## Pay-off structure

(All prices are in USD cent / LBS)

| Market price >=                     | Market price <                      | Volume                             | Strike                              |
|-------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|
| <input type="text" value="0"/>      | <input type="text" value="103.75"/> | <input type="text" value="200"/> % | <input type="text" value="103.75"/> |
| <input type="text" value="103.75"/> | <input type="text" value="115"/>    | <input type="text" value="100"/> % | <input type="text" value="103.75"/> |
| <input type="text" value="115"/>    | <input type="text"/>                | <input type="text" value="50"/> %  | <input type="text" value="103.75"/> |

Add Pay-off

Trigger price

USD cent / LBS

## Additional accumulations

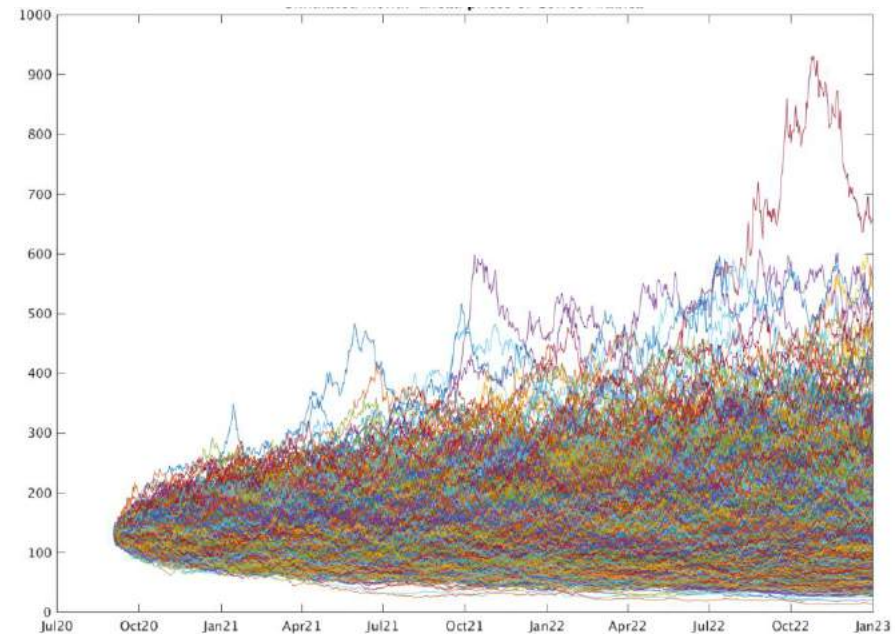
Add additional accumulation

- Possibility to add extra legs with pricing based on different futures, and/or add barrier levels on specific legs



# Valuation and volume expectations

- Our **KySim** model provides **Monte Carlo price simulations** consistent with the current forward curves
- Key parameters such as **volatility** can be calculated by the model or set by the user
- On these **price scenarios** we apply the price structure of the accumulator to get realistic and **transparent valuations** and **volume expectations**



# What is possible with KYOS?

- Same example as at the beginning:
  - Accumulator on September 2020 futures price
  - Today is 4 November 2019
  - Today the futures price is 113.35
- Accumulator should have 0 market value at initiation (no premiums)
- What is a fair accumulation price?

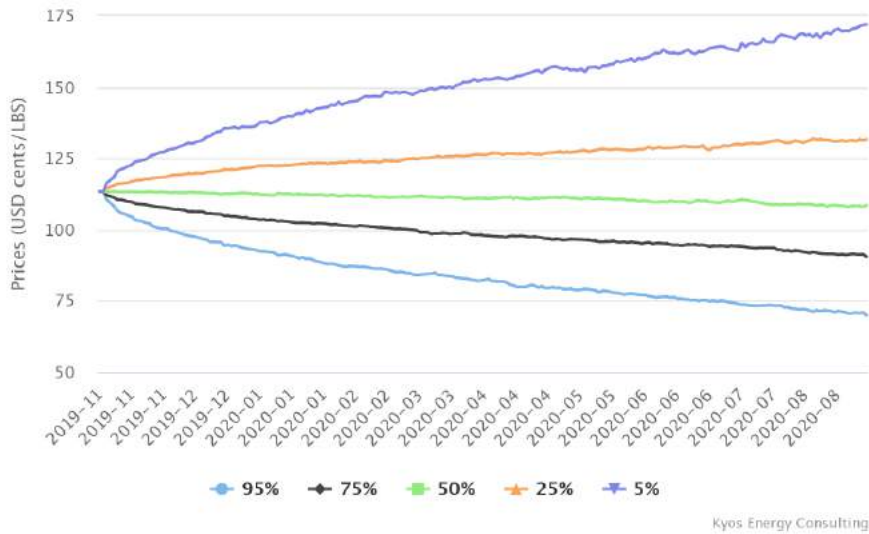
|   | <u>Price</u> | <u>MtM</u> |
|---|--------------|------------|
|   | 102.00       | 21,290     |
|  | 103.75       | 355        |
|   | 105.50       | -20,877    |

# What is possible with KYOS?

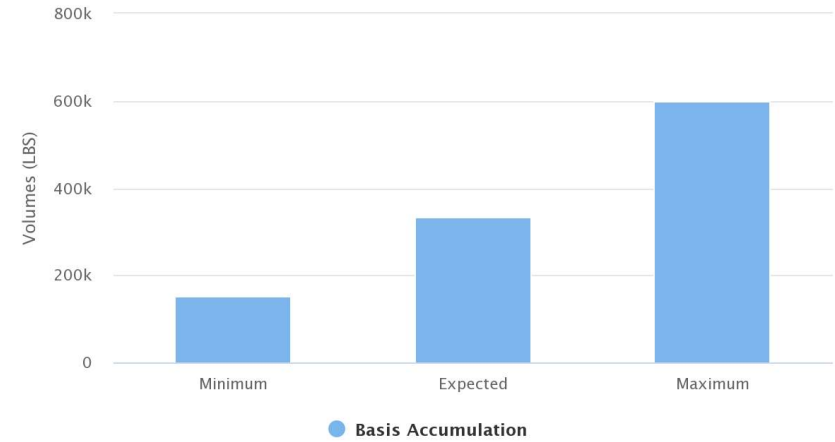
- **Analyse deals over time:** Every day new prices come in
- Part of the contract can already be fixed, because the underlying price is settled
- For the future part of the contract, we need updated simulations so that every trading day the valuation is updated
- The KYOS platform recalculates deal values automatically
- We will investigate one deal over time

# Analysis – November 2019

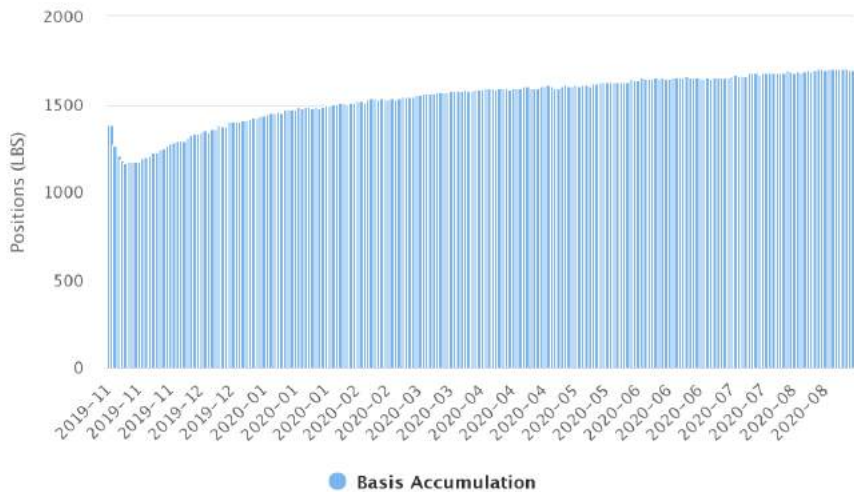
### Price Distribution



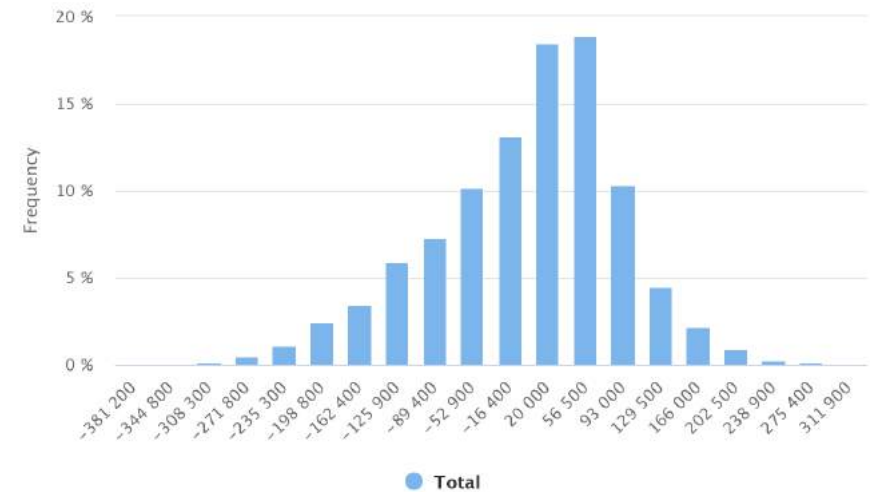
### Minimum, maximum and expected positions in contract period



### Daily Expected Position Change (Financial)

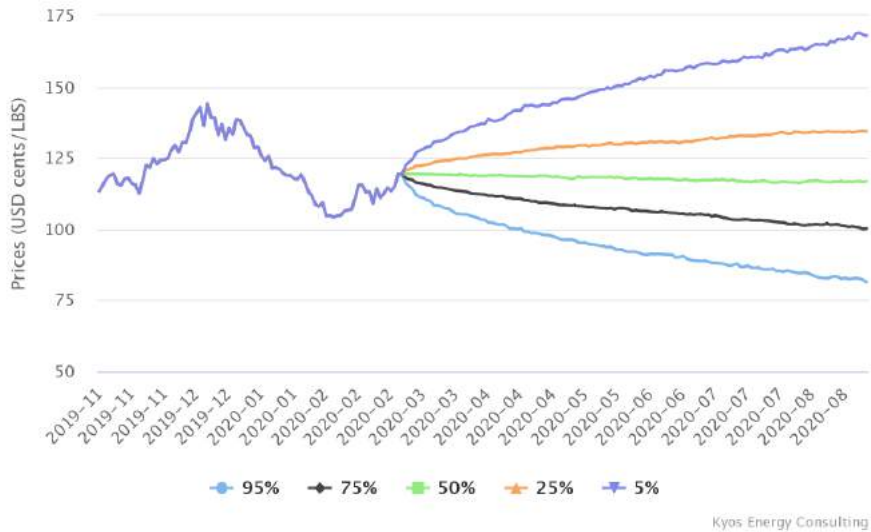


### Mark-to-Market Distribution

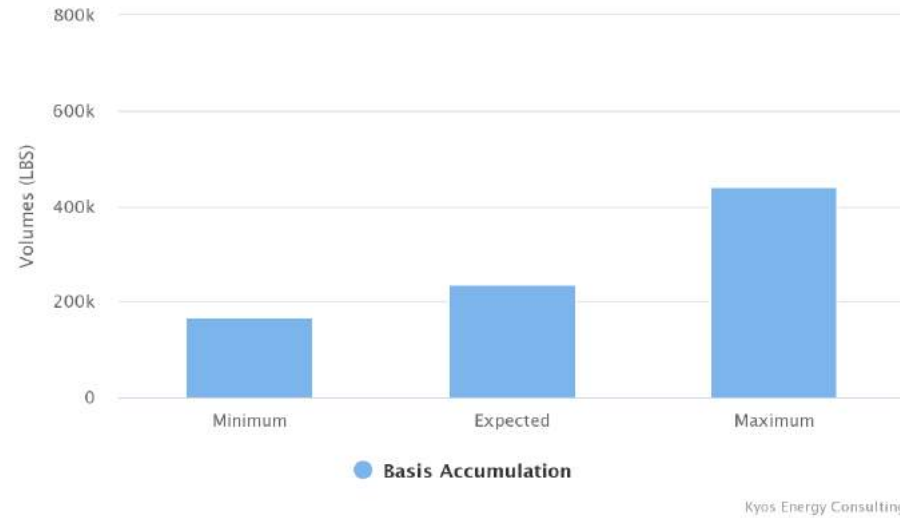


# Analysis – March 2020

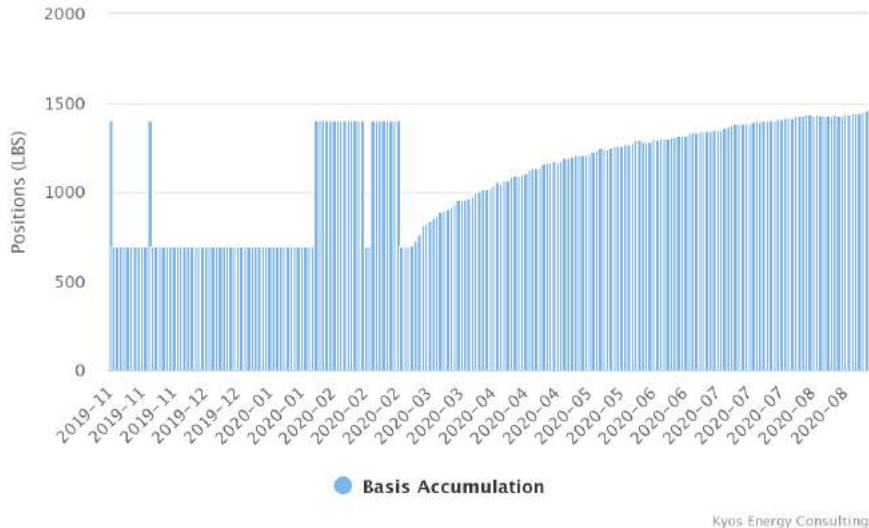
### Price Distribution



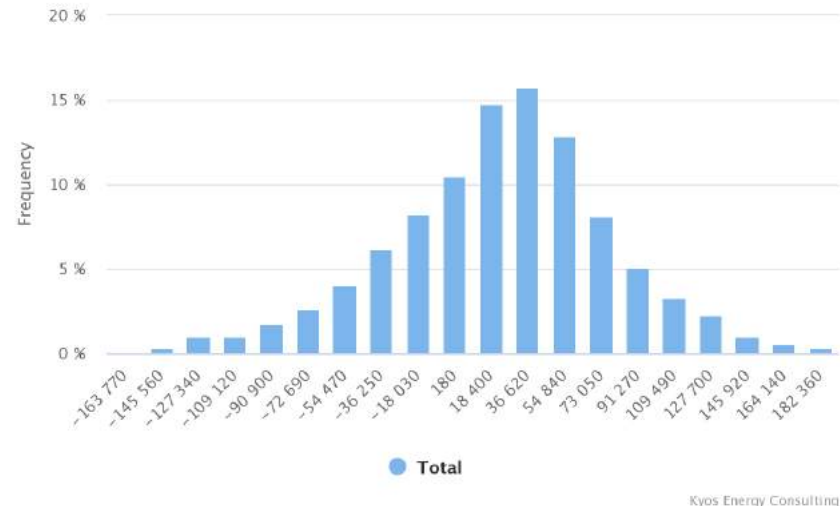
### Minimum, maximum and expected positions in contract period



### Daily Expected Position Change (Financial)

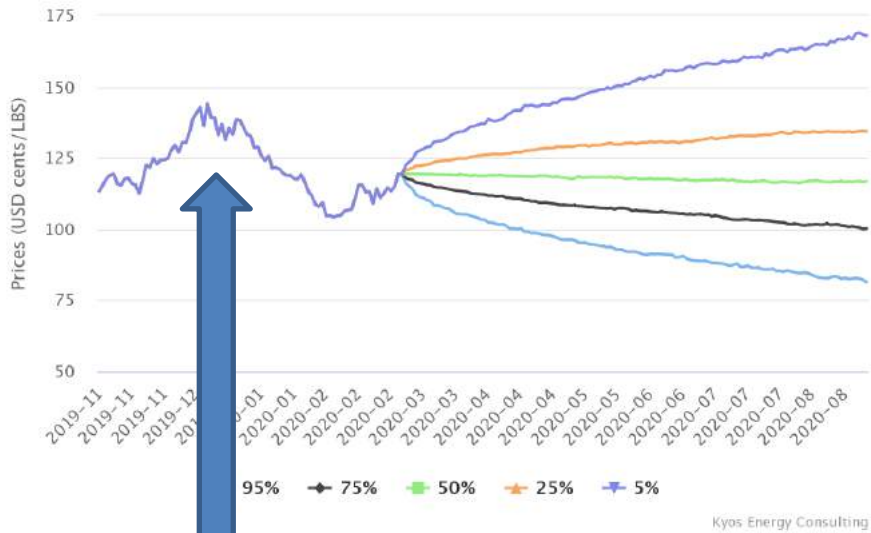


### Mark-to-Market Distribution

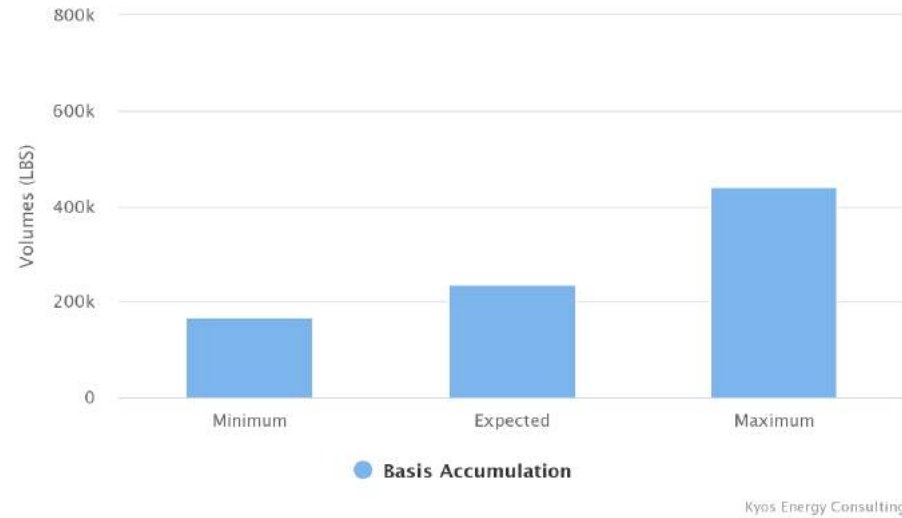


# Analysis – March 2020

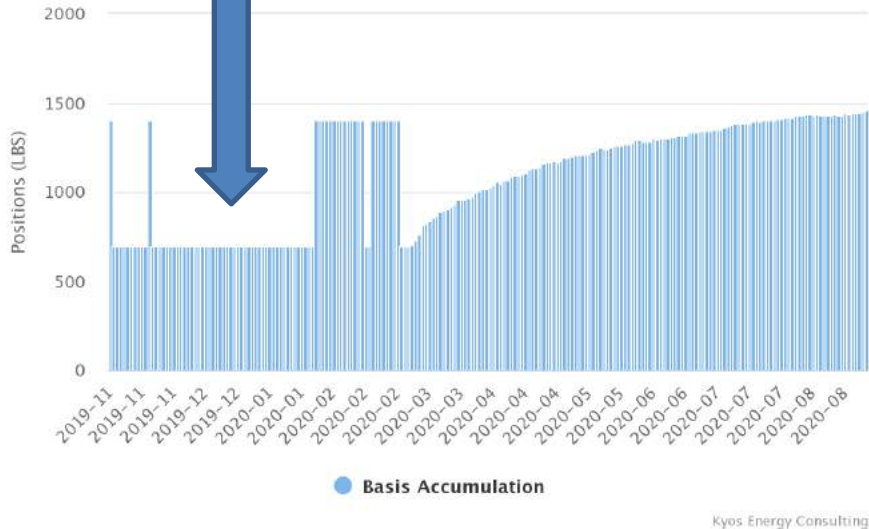
## Price Distribution



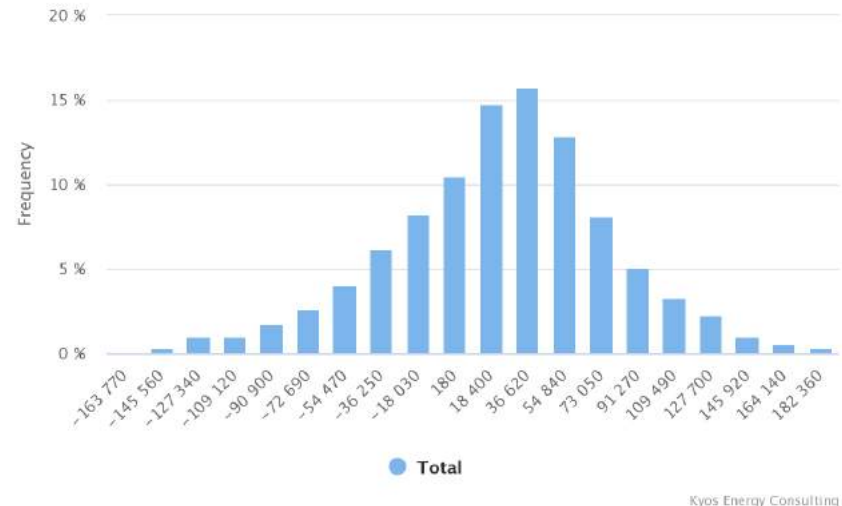
## Minimum, maximum and expected positions in contract period



## Daily Expected Position Change (Financial)



## Mark-to-Market Distribution









# Hedging



# Hedging strategies - Analysis

1. Define three hedging strategies
2. Analyse these strategies with a simplified one day example.  
What happens if the price goes to:
  - a) 85 \$ct
  - b) 113 \$ct
  - c) 150 \$ct
3. Then we discuss the more advanced cash flow distribution

# Accumulator hedge or futures hedge?

- Strategy 1: No hedge
  - Huge uncertainty about future cash flows
- Strategy 2: Buy futures
  - + Lock in the price at current levels (reduce price risk)
  - If market price falls, then lock-in price is bad
- Strategy 3: Accumulator contract
  - + Possibility to buy below current futures price
  - Volume is uncertain

# Question: What is a good hedging strategy?

| Strategy 1    | Price | Volume % | volume unit |
|---------------|-------|----------|-------------|
| buy at market | ?     | 100%     | 1,000,000   |

| Strategy 2     | Price | Volume % | volume unit |
|----------------|-------|----------|-------------|
| financial swap | 113   | 80%      | 800,000     |
| buy at market  | ?     | 20%      | 200,000     |

| Strategy 3     | Price | Volume % | volume unit |
|----------------|-------|----------|-------------|
| financial swap | 113   | 40%      | 400,000     |
| accumulator    | 103   | 30%*     | 300,000     |
| buy at market  | ?     | 30%*     | 300,000     |

\*Expected

# Price Scenario 1: Price decreases to 85 USD cent

|                   |           |                                      |  |
|-------------------|-----------|--------------------------------------|--|
| Future price      | 113       | All prices are expressed in USD cent |  |
| Accumulator price | 104       |                                      |  |
| Market price      | 85        |                                      |  |
| Volume            | 1,000,000 |                                      |  |

| Strategy 1      |  | % Volume | Accumulator factor | Volume    |       |
|-----------------|--|----------|--------------------|-----------|-------|
| Buy at market   |  | 100      |                    | 1,000,000 |       |
| Effective price |  |          |                    |           | 85    |
| Strategy 2      |  | % Volume | Accumulator factor | Volume    |       |
| Future          |  | 80       |                    | 800,000   |       |
| Buy at market   |  | 20       |                    | 200,000   |       |
| Effective price |  |          |                    |           | 107.4 |
| Strategy 3      |  | Volume   | Accumulator factor | Volume    |       |
| Future          |  | 40       |                    | 400,000   |       |
| Accumulator     |  | 30       | 2                  | 600,000   |       |
| Buy at market   |  | 0        |                    | 0         |       |
| Effective price |  |          |                    |           | 107.6 |

# Price Scenario 2: Price stays at 113 USD cent

|                   |           |                                      |  |
|-------------------|-----------|--------------------------------------|--|
| Future price      | 113       | All prices are expressed in USD cent |  |
| Accumulator price | 104       |                                      |  |
| Market price      | 113       |                                      |  |
| Volume            | 1,000,000 |                                      |  |

| Strategy 1      | % Volume | Accumulator factor | Volume    |
|-----------------|----------|--------------------|-----------|
| Buy at market   | 100      |                    | 1,000,000 |
| Effective price |          |                    | 113       |

| Strategy 2      | % Volume | Accumulator factor | Volume  |
|-----------------|----------|--------------------|---------|
| Future          | 80       |                    | 800,000 |
| Buy at market   | 20       |                    | 200,000 |
| Effective price |          |                    | 113     |

| Strategy 3      | Volume | Accumulator factor | Volume  |
|-----------------|--------|--------------------|---------|
| Future          | 40     |                    | 400,000 |
| Accumulator     | 30     | 1                  | 300,000 |
| Buy at market   | 30     |                    | 300,000 |
| Effective price |        |                    | 110.3   |

# Price Scenario 3: Price increases to 150 USD cent

|                   |           |                                      |  |
|-------------------|-----------|--------------------------------------|--|
| Future price      | 113       | All prices are expressed in USD cent |  |
| Accumulator price | 104       |                                      |  |
| Market price      | 150       |                                      |  |
| Volume            | 1,000,000 |                                      |  |

| Strategy 1      | % Volume | Accumulator factor | Volume    |
|-----------------|----------|--------------------|-----------|
| Buy at market   | 100      |                    | 1,000,000 |
| Effective price |          |                    | 150       |

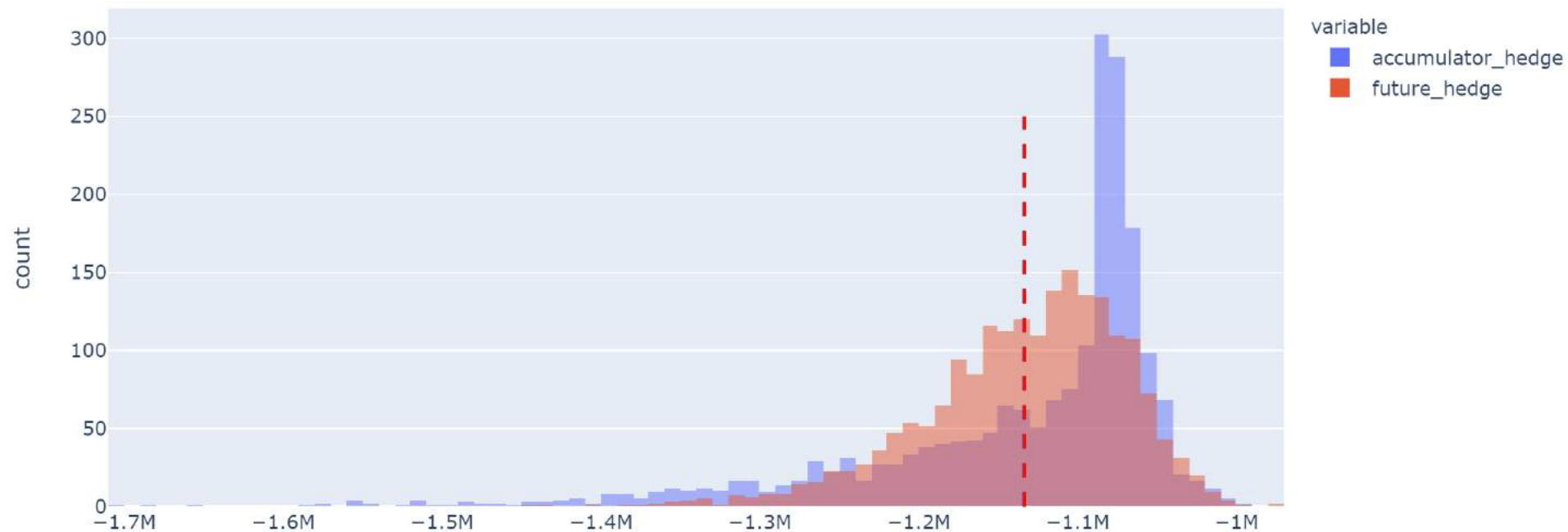
| Strategy 2      | % Volume | Accumulator factor | Volume  |
|-----------------|----------|--------------------|---------|
| Future          | 80       |                    | 800,000 |
| Buy at market   | 20       |                    | 200,000 |
| Effective price |          |                    | 120.4   |

| Strategy 3      | Volume | Accumulator factor | Volume  |
|-----------------|--------|--------------------|---------|
| Future          | 40     |                    | 400,000 |
| Accumulator     | 30     | 0.5                | 150,000 |
| Buy at market   | 45     |                    | 450,000 |
| Effective price |        |                    | 128.3   |



# Compare distributions

- Future hedge vs accumulator hedge
- The averages are similar in this example
- Tail risks when the price significantly increases make the accumulator hedge tricky



# Conclusion and questions



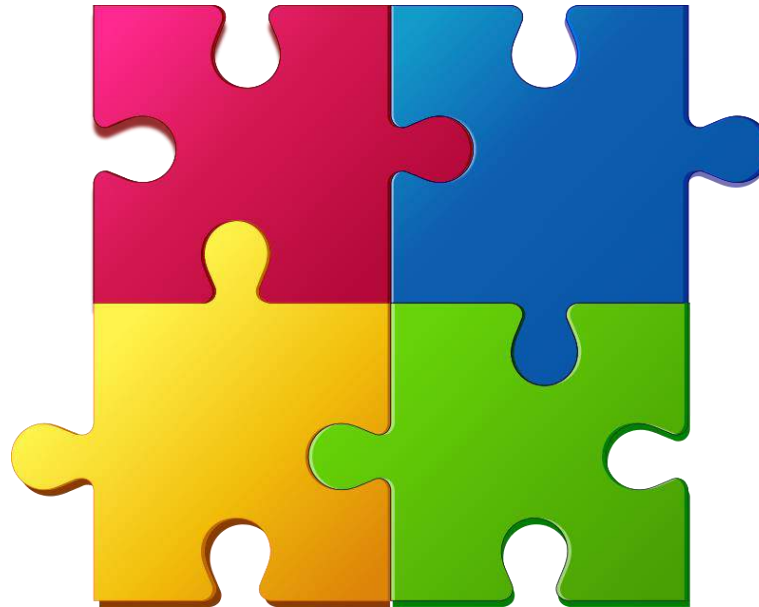
# Takeaways

- Accumulator could be an interesting hedging product
- For the buyer of this financial product it is **important** to know the **benefits** but also the **risks**
- A buyer should be able to calculate **independently** from the counterparty the **key variables** of the accumulator
- This helps to understand the risks of the financial product and increases the negotiation position of the buyer

# KYOS provides

## Unbiased deal valuations

We provide a detailed description for every (accumulator) deal



## Portfolio & Risk management

Daily reporting tool

## Advanced risk analytical tools

- Value-at-Risk
- Cashflow- at-Risk
- Earnings-at-Risk

## Customized reports

- To suit the needs of procurement, finance, treasury
- Easily add more detail if needed

## Poll: Growth in accumulators



# Questions?





# Contact Details

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