



**Do not try to beat
the market...**

Be prepared

KYOS software adds value to the chain

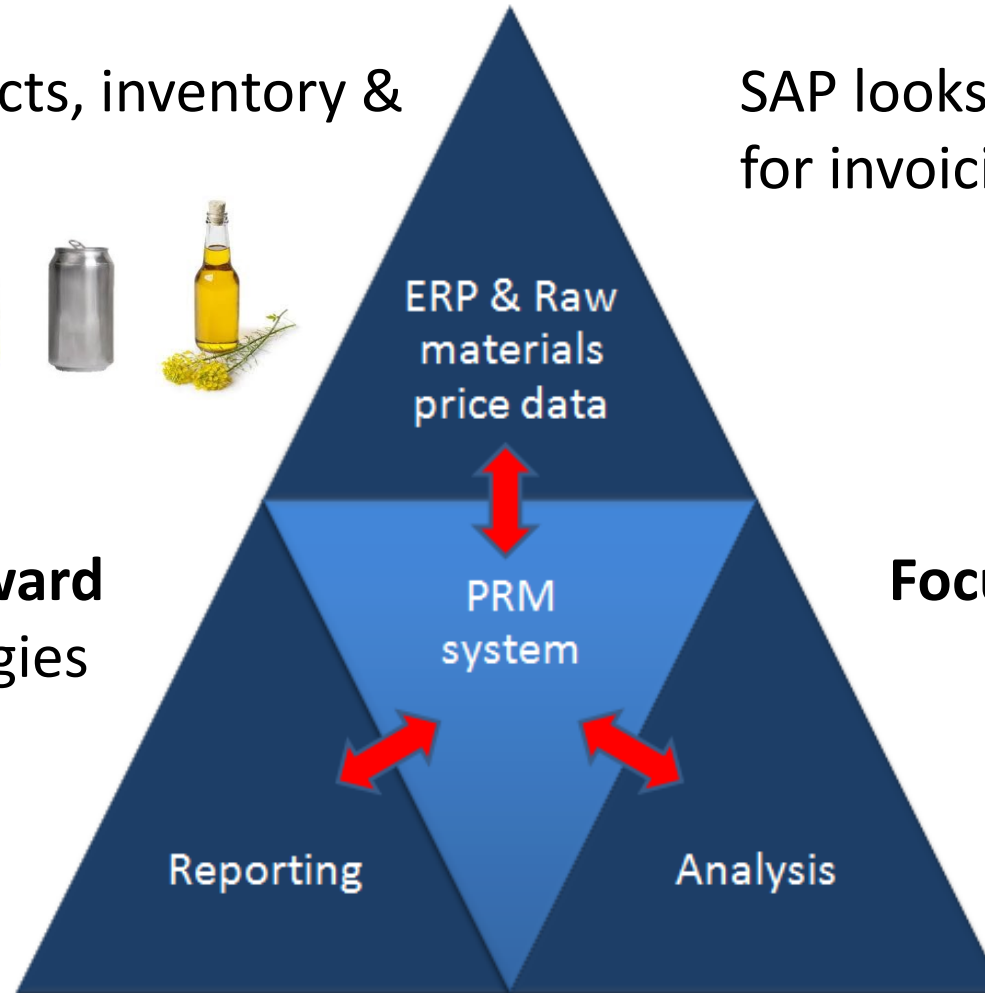
Budgets, contracts, inventory & market prices



SAP looks back, used for invoicing & control

KYOS looks forward

- Hedge strategies
- Cash flows
- Positions
- Risks



Focus on changes

- Unforeseen
- Foreseen

Example companies with KYOS software



Common factor: “price reference – indexation ”



- **Chemical & Energy producers:**
 - Gas, Coal, Oil, Carbon, Power + IR & FX



- **Beverage & Food:**
 - Sugar, PalmOil, Corn, Packaging, Energy + IR & FX



- **Packaging & Waste:**
 - Glass, Plastics, Aluminium, Steel, Energy + IR & FX



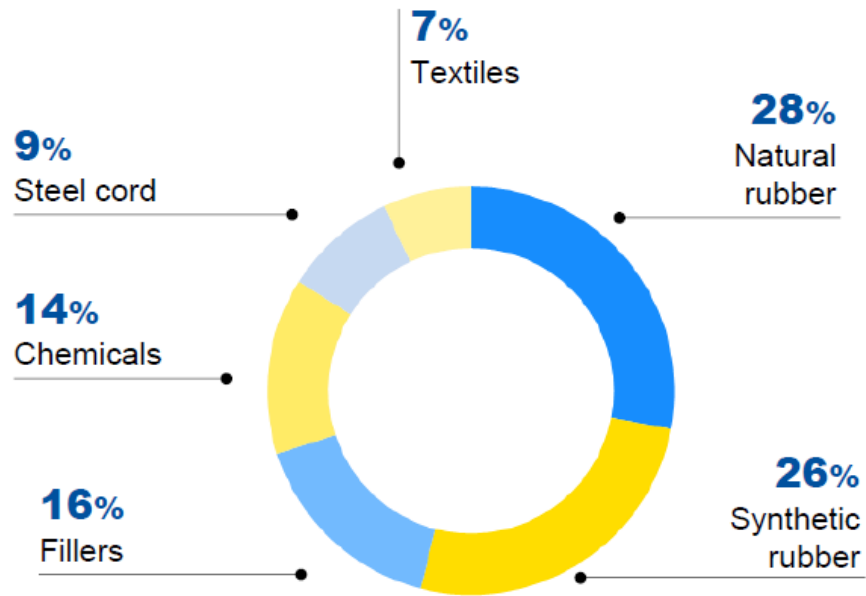
- **Financial Institutions:**
 - IR (ECB Euribor) & FX (ECB EURUSD)

Annual Report – 2018 - Michelin

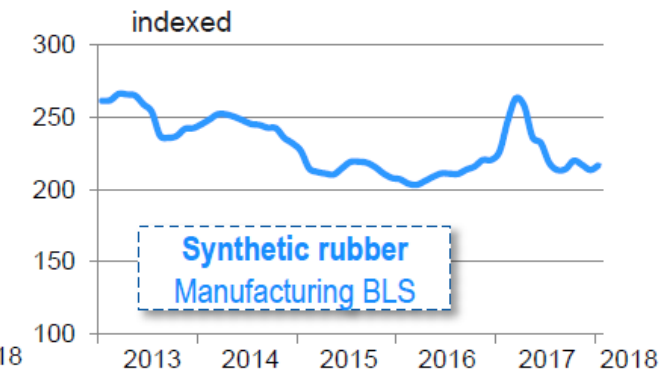
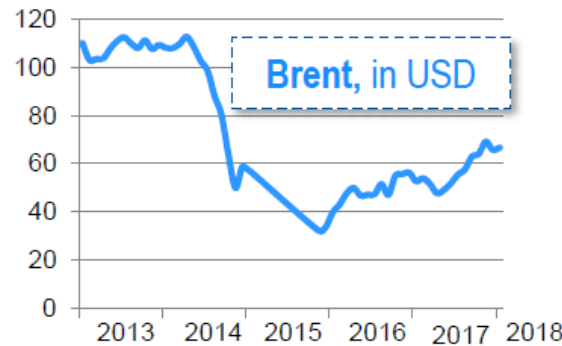
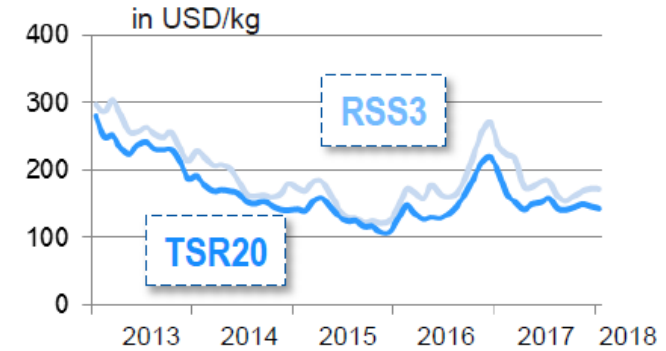
Raw materials



▲ Raw material purchases in 2017 (€5.2bn)



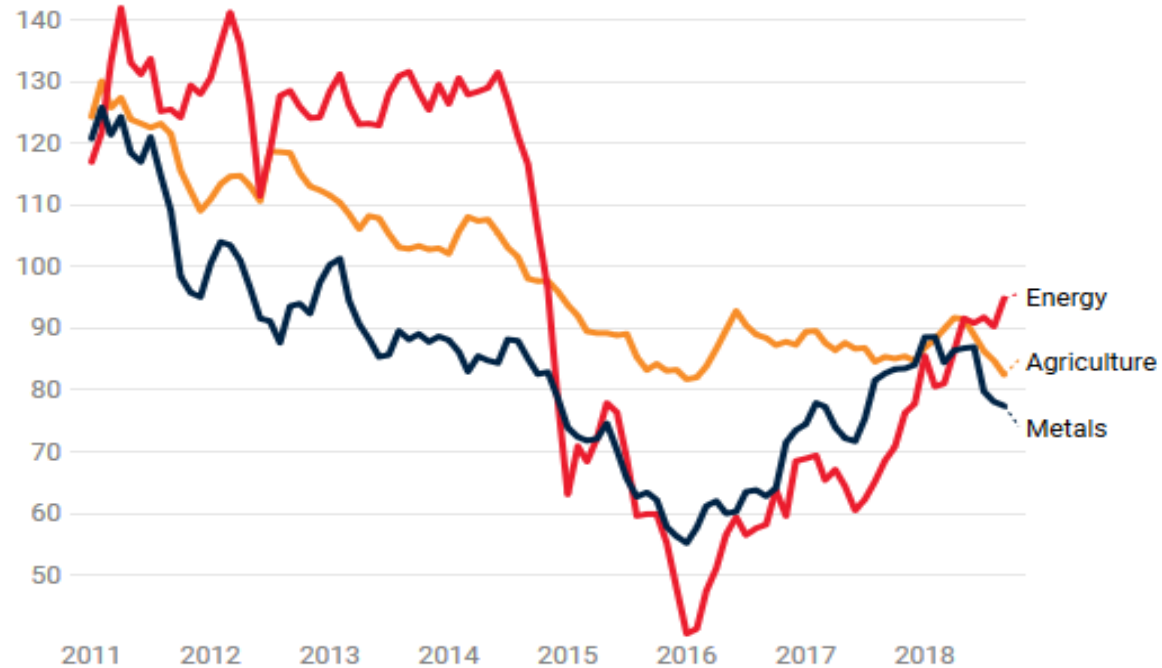
€/€ exchange rate:
 Average Q1 2017: 1.065
+15.0%
 Average Q1 2018 : 1.228



Worldbank Historical Price Indexes

Commodity Price Indexes:

US\$, 2010=100



LME = Hong Kong Exchanges



CBOT = CME Group



EEX

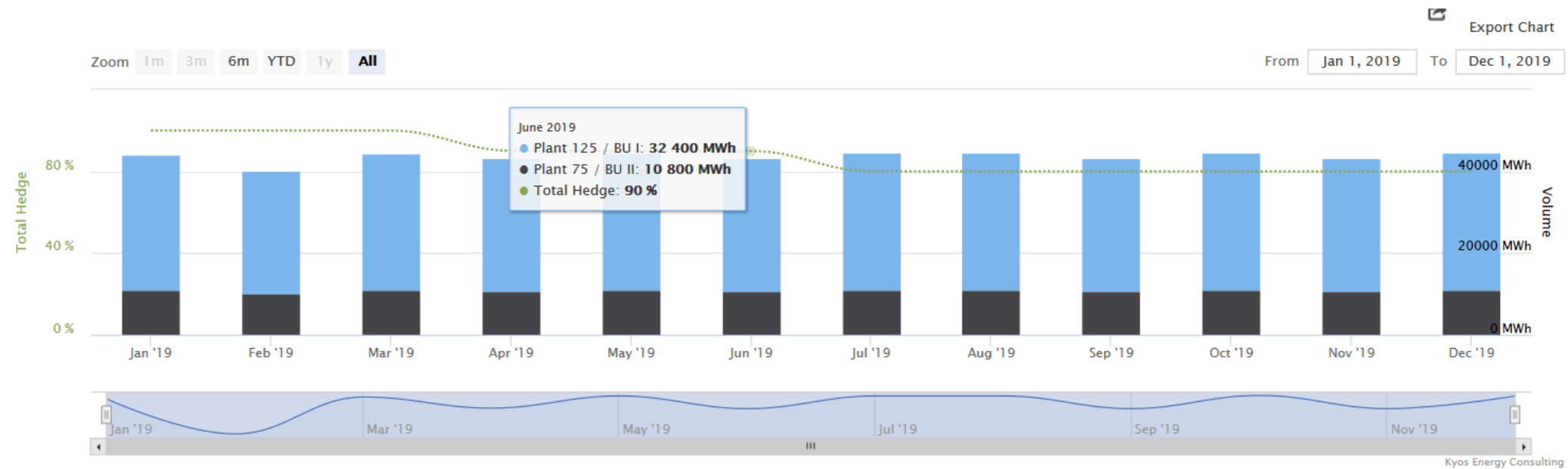


Commodity prices have been buffeted by a number of factors this year, including commodity-specific disruptions, rising U.S. interest rates, an appreciation of the U.S. dollar, growing trade tensions between major economies, and financial market pressures in some emerging market and developing economies.

Risk Policy leads to a Risk Cycle



Expected Commodity Consumption



	Unit	Total	Jan 2019	Feb 2019	Mar 2019	Apr 2019	May 2019	Jun 2019	Jul 2019	Aug 2019	Sep 2019	Oct 2019	Nov 2019	Dec 2019
Plant 125 / BU I	Latest known MWh	393 930	33 210	30 240	33 390	32 445	33 480	32 400	33 480	33 480	32 400	33 525	32 400	33 480
Plant 75 / BU II	Latest known MWh	131 310	11 070	10 080	11 130	10 815	11 160	10 800	11 160	11 160	10 800	11 175	10 800	11 160
TOTAL	Latest known MWh	525 240	44 280	40 320	44 521	43 259	44 640	43 200	44 640	44 640	43 200	44 700	43 200	44 640

Starting point: Budget and Risk Tolerance

From Consumption to “To be hedged”

Hedging strategy Hedge prices **Physical** Financial

Physical positions															
2019															
		Tot	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
The Netherlands / Gas [159]	MWh	525 600	44 640	40 320	44 520	43 260	44 640	43 200	44 640	44 640	43 200	44 700	43 200	44 640	
Hedge strategy															
2019															
			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
The Netherlands / Gas [159]	%		100.00	100.00	100.00	90.03	90.00	90.00	80.00	80.00	80.00	80.00	80.00	80.00	
To be hedged															
2019															
		Tot	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
The Netherlands / Gas [159]	MWh	459 498	44 640	40 320	44 520	38 946	40 176	38 880	35 712	35 712	34 560	35 760	34 560	35 712	
Physical contracted positions															
2019															
			Tot	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
The Netherlands / Gas [159]	TTF	Fixed price	MWh	210 240	17 856	16 128	17 832	17 280	17 856	17 856	17 856	17 280	17 880	17 280	17 856
		Floating price	MWh	315 360	26 784	24 192	26 688	25 980	26 784	25 920	26 784	25 920	26 820	25 920	26 784

Exposure minus Financial Hedges = Residual Risk

				2019												
				Tot	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Total financial position																
The Netherlands / Gas [159]	TTF	Floating price	MWh	-315 360	-26 784	-24 192	-26 688	-25 980	-26 784	-25 920	-26 784	-26 784	-25 920	-26 820	-25 920	-26 784
Financial contracted positions																
The Netherlands / Gas [159]	TTF	Fixed price	MWh	214 620	18 228	16 464	18 204	17 640	18 228	17 640	18 228	18 228	17 640	18 253	17 640	18 228
Financial contracted cash flows																
The Netherlands / Gas [159]	TTF	Fixed price	EUR	-4 038 360	-342 984	-309 792	-342 523	-331 920	-342 984	-331 920	-342 984	-342 984	-331 920	-343 445	-331 920	-342 984
		Floating price	EUR	5 156 943	475 824	430 056	469 250	419 373	420 265	401 028	412 135	411 406	406 690	432 292	429 869	448 755
Residual risk																
The Netherlands / Gas [159]	TTF	Floating price	MWh	-100 740	-8 556	-7 728	-8 485	-8 340	-8 556	-8 280	-8 556	-8 556	-8 280	-8 568	-8 280	-8 556

Mind you....Residual risk is different then the hedging strategy

Hedge overview : “To be hedged today”

Hedge strategy (hedge volume target)														
2019														
		Tot	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
The Netherlands / Gas [159]	MWh	459 498	44 640	40 320	44 520	38 946	40 176	38 880	35 712	35 712	34 560	35 760	34 560	35 712
Physical hedge														
2019														
		Tot	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
The Netherlands / Gas [159]	TTF MWh	210 240	17 856	16 128	17 832	17 280	17 856	17 280	17 856	17 856	17 280	17 880	17 280	17 856
Financial hedge														
2019														
		Tot	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
The Netherlands / Gas [159]	TTF MWh	214 620	18 228	16 464	18 204	17 640	18 228	17 640	18 228	18 228	17 640	18 253	17 640	18 228
To be hedged today														
2019														
		Tot	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
The Netherlands / Gas [159]	MWh	34 638	8 556	7 728	8 485	4 026	4 092	3 960	-372.00	-372.00	-360.00	-372.50	-360.00	-372.00

Underhedged

Overhedged

Hedge effects - Costs of a hedging program

Hedging strategy		Hedge prices	Physical	Financial												
All physical contracts																
2019																
			Avg	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
The Netherlands / Gas [159]	TTF	EUR / MWh	21.92	23.16	23.17	22.96	21.77	21.33	21.14	21.07	21.04	21.33	21.71	22.12	22.27	
Fixed physical contracts																
2019																
			Avg	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
The Netherlands / Gas [159]	TTF	EUR / MWh	18.75	18.75	18.75	18.75	18.75	18.75	18.75	18.75	18.75	18.75	18.75	18.75	18.75	
Financial contracts																
2019																
			Avg	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
The Netherlands / Gas [159]	TTF	EUR / MWh	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	
Physical & financial contracts																
2019																
			Avg	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
The Netherlands / Gas [159]	TTF	EUR / MWh	19.46	19.85	19.86	19.78	19.41	19.27	19.21	19.18	19.18	19.27	19.39	19.52	19.57	

MtM of Financial Hedges - embedded in the Physical Costs

Create a clear format of risk analysis

Cash flow based upon current prices (EUR 15.7 million)

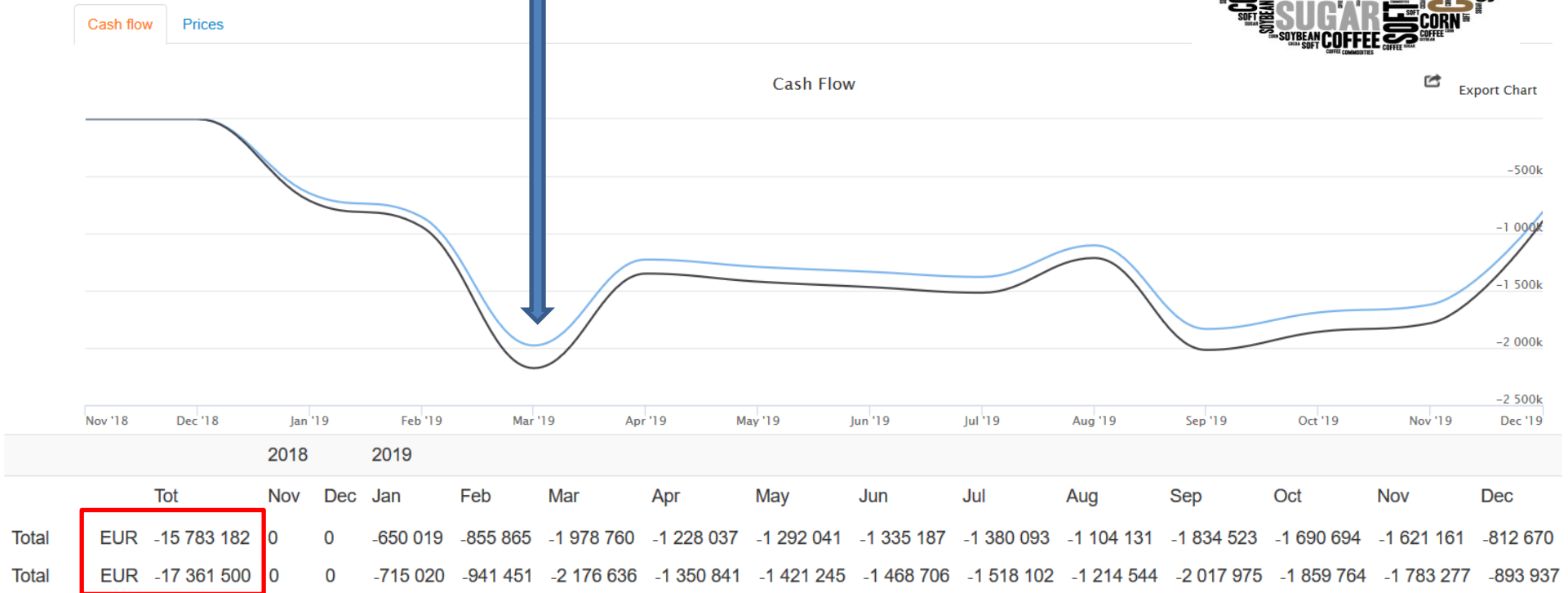
- Stress testing (volume and prices)
- Value-at-Risk (VaR)
- Cash flow-at-Risk (CfaR)



Leading to a widely accepted Risk Policy (Risk Cycle)

Initial “quick scan” stress testing

What happens if prices rise with 10%



Bring statistics into practise

VaR : 5,000 MT Aluminium



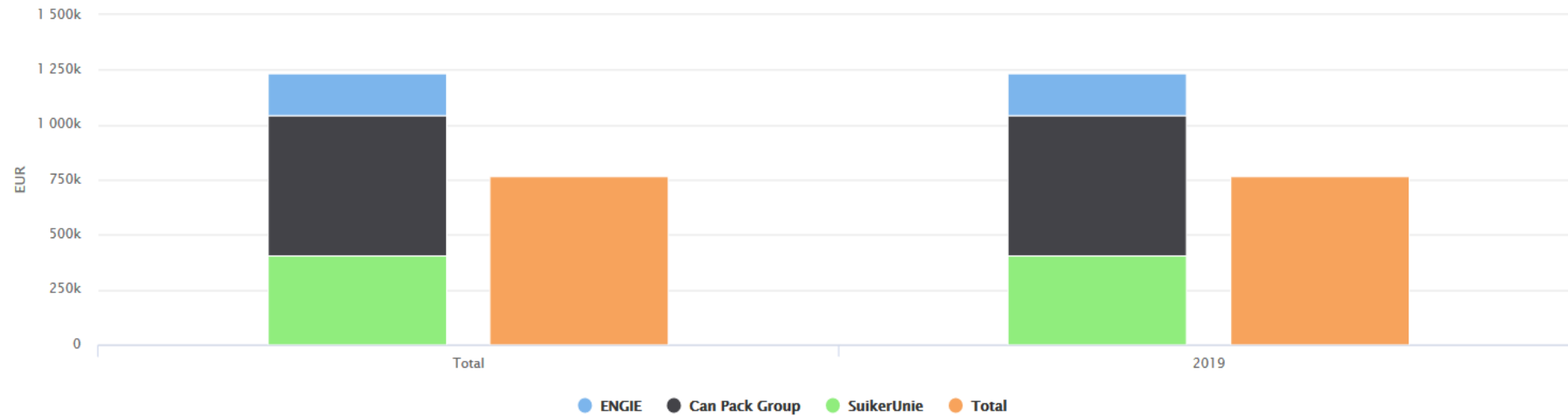
Annualized Volatility	21.99%
* Underlying Price	1,945 USD/MT
* Confidence-Level	95%
* $\sqrt{\text{Holding Period}}$	10 days
10 day VaR	USD 750,000

Value-at-Risk for Multiple commodities

10 day VaR in EUR

VaR per counterparty

[Export Chart](#)




Kyos Energy Consulting

	VaR 2018-11-14 (EUR)		VaR 2018-11-14 (EUR)		Change in VaR (EUR)	
	Total	Jan '19 - Dec '19	Total	Jan '19 - Dec '19	Total	Jan '19 - Dec '19
VaR total	766 130	766 130	691 360	691 360	74 770	74 770
VaR per commodity						
TTF	188 490	188 490	188 490	188 490	0.00	0.00
Sugar #11	406 270	406 270	637 630	637 630	↓ -231 360	↓ -231 360
Aluminium	637 640	637 640	637 630	637 630	↑ 10.00	↑ 10.00

VaR is used for Short term risk assessments

10 day VaR

- 95% chance costs will be lower than 16.9 million
- This is not the maximum 
- 5% chance costs will be higher than 16.9 million

Suggestion: Run a VaR analysis with different volatilities

From short to long term risk assessments

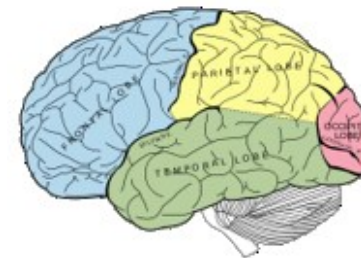
We calculated that a 10 day VaR is approximately EUR 1.2 million

A budget forecast has to be given for e.g. 2019 and not for 10 days

2019



2020



Cash flow-at-Risk = Long Term Risk Assessment

Monte Carlo price simulation engine embedded

[KySwing](#) [KyCalibration](#) **[KySim](#)** [KyRisk](#) [KyVaR](#) [KyWhat-if](#) [KyOption](#)

[General settings](#) **Commodities settings** [Cointegration and volatility](#) [Spreads settings](#)

Edit KySim profile: FC Test

Commodity 1

Butter - EUR [167] ▼

Forward data profile (Base)

Butter (Forward) (2017-01-02 to 2018-11-14) [321] ▼

Forward curve profile

Butter (Forward) [171] ▼

Half life in years: creates forward mean-reversion

no ▼

Commodity 2

European Whey Powder - EUR [352] ▼

Forward data profile (Base)

European Whey Powder (Forward) (2017-01-02 to 2018-11-14) [321] ▼

Forward curve profile

European Whey Powder (Forward) [172] ▼

Half life in years: creates forward mean-reversion

no ▼

Commodity 3

Skimmed Milk Powder - EUR [169] ▼

Forward data profile (Base)

Skimmed Milk Powder (Forward) (2017-01-02 to 2018-11-14) [321] ▼

Forward curve profile

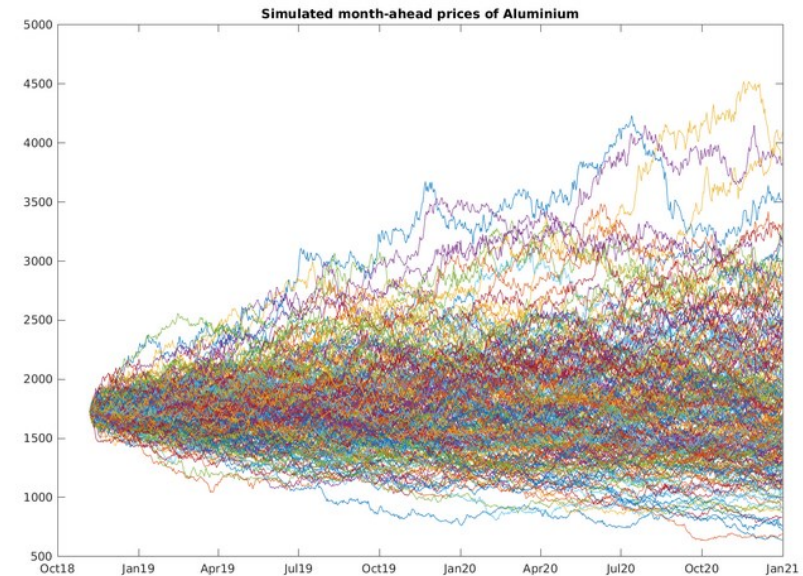
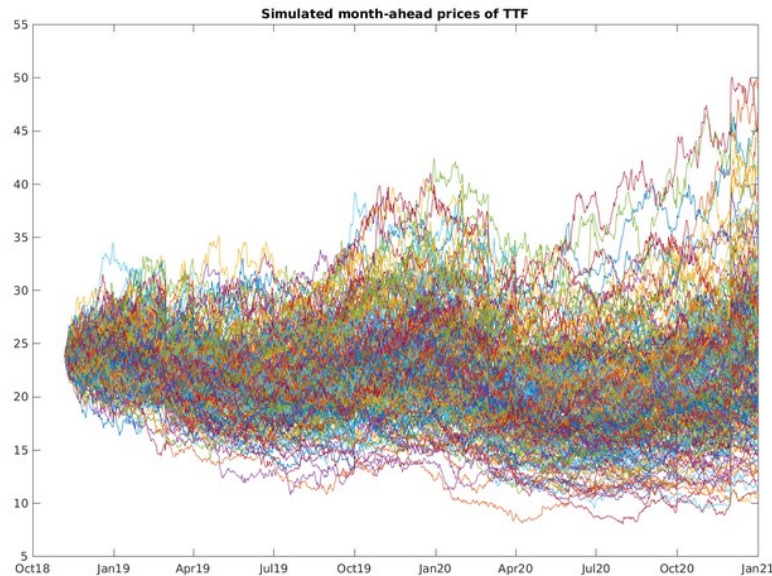
Skimmed Milk Powder (Forward) [173] ▼

Half life in years: creates forward mean-reversion

no ▼

CfaR is used for Long term risk assessments

Price simulations are a first step towards cash flow simulations



Some markets (like TTF) have “seasonality”

KYOS analytics....Your advantage

Risk Profile: Dact floating portfolio 2018-11-05

Earnings at Risk Cash-flow at Risk Volumes at Risk

Cash-flow at Risk Summary

Currency

95% at Risk

Total

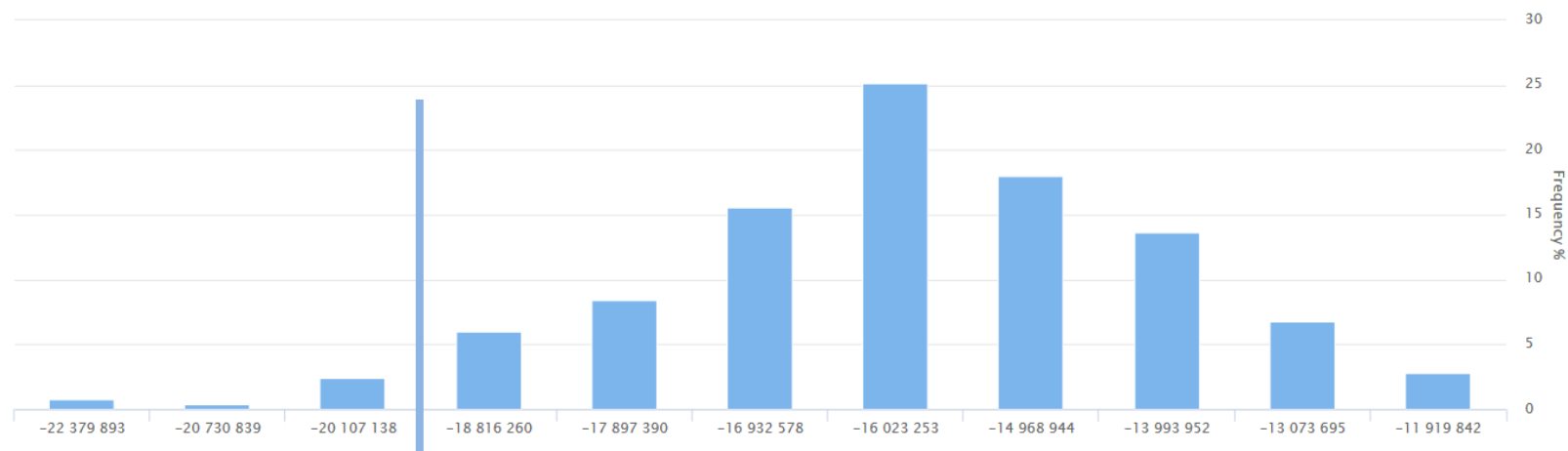
EUR

3 120 578

95% at Risk

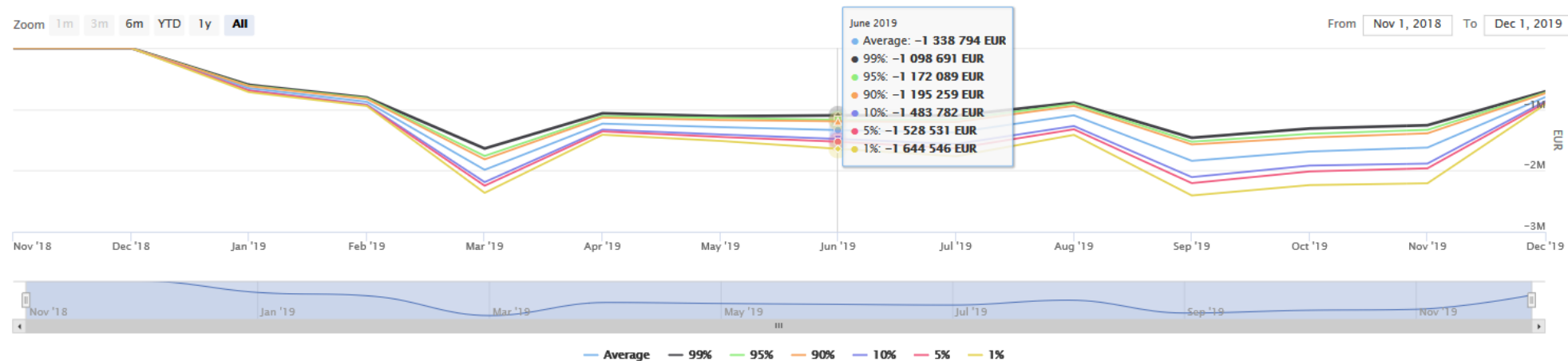
3 120 578

Histogram graph



Zoom in on individual commodities

Monthly Cashflow Distribution



Kyos Energy Consulting

[Show/hide monthly cashflow distribution table](#)

Percentiles

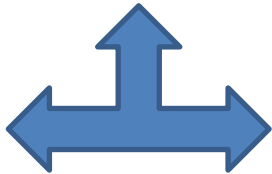
Commodity	Currency	Avg	1%	5%	10%	90%	95%	99%
Total	EUR	-15 807 342	-18 917 783	-17 894 777	-17 366 045	-14 277 353	-13 955 359	-13 249 940
TTF	EUR	-2 263 592	-3 092 718	-2 756 426	-2 642 494	-1 914 379	-1 811 207	-1 584 850
Sugar #11	EUR	-4 790 137	-5 647 070	-5 415 700	-5 300 426	-4 366 428	-4 272 900	-4 057 890
Aluminium	EUR	-8 753 613	-11 584 300	-10 556 624	-10 134 128	-7 568 446	-7 219 218	-6 917 687



What is your Risk Tolerance ?

Costs at current market prices versus simulated market prices

Commodity	Currency	Avg	95% at Risk	
			3 120 578	5%
Total	EUR	-15 876 586		-18 997 165
TTF	EUR	-2 262 808		-2 757 400
Can 33cl	EUR	-8 807 014		-11 587 208
Sugar	EUR	-4 806 764		-6 380 837



Your risk appetite or tolerance determines the hedging strategy

Adjust your strategy....lower your risk

Risk Profile: DACT Partially Hedged Portfolio 2018-11-05

95% at Risk

Earnings at Risk Cash-flow at Risk Volumes at Risk

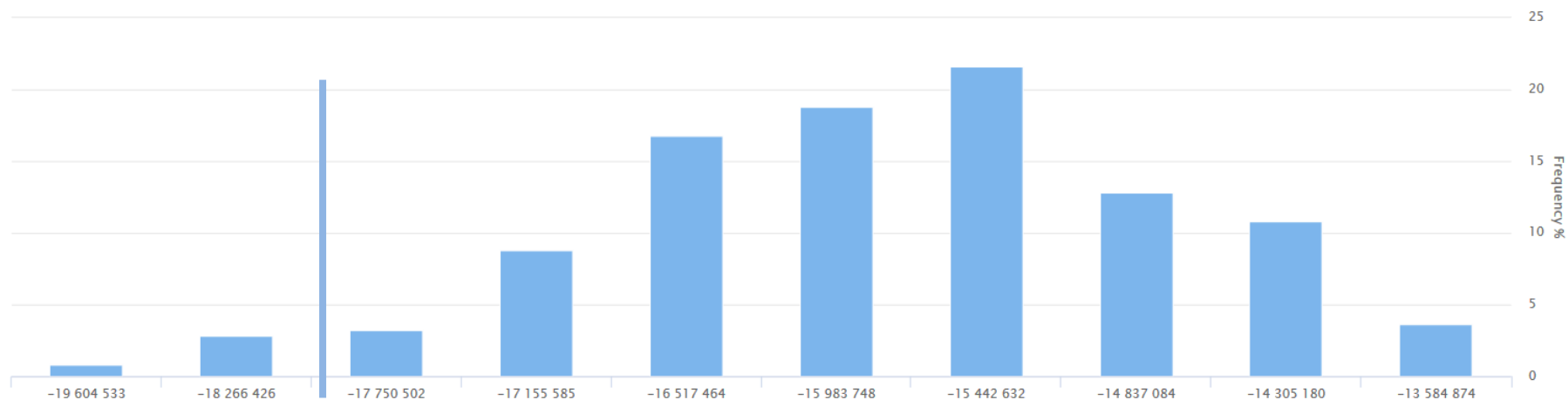
Cash-flow at Risk Summary

	Currency	95% at Risk
Total	EUR	2 008 531

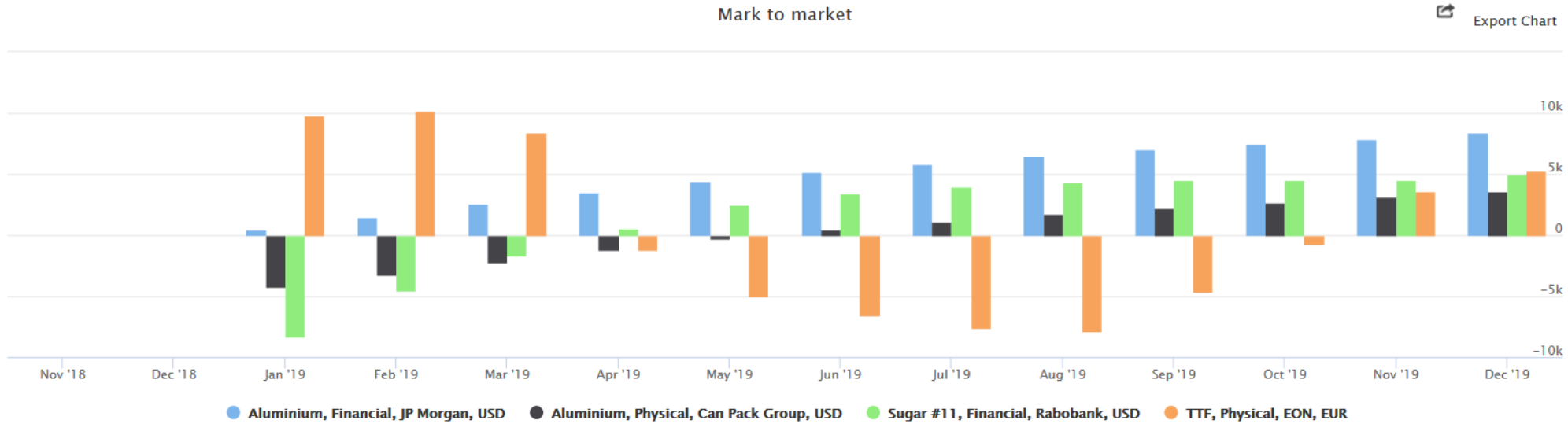
2 008 531

Commodity: Total

Histogram graph



Mark-to-Market: physical and financial



Kyos Energy Consulting

Contracts

				2018		2019												
				Tot	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Aluminium	Financial	JP Morgan	USD	60 720	0	0	437.50	1 458	2 552	3 544	4 419	5 192	5 877	6 475	7 000	7 467	7 904	8 395
	Physical	Can Pack Group	USD	3 845	0	0	-4 302	-3 281	-2 188	-1 196	-320.83	452.08	1 138	1 735	2 260	2 727	3 165	3 655
Sugar #11	Financial	Rabobank	USD	18 905	0	0	-8 367	-4 564	-1 711	570.45	2 472	3 423	3 993	4 373	4 564	4 564	4 564	5 024
TTF	Physical	EON	EUR	3 733	0	0	9 833	10 173	8 433	-1 233	-5 033	-6 600	-7 567	-7 833	-4 600	-780.00	3 620	5 320
Total			USD	83 469	0	0	-12 231	-6 386	-1 347	2 918	6 570	9 066	11 008	12 584	13 824	14 757	15 632	17 074
			EUR	3 733	0	0	9 833	10 173	8 433	-1 233	-5 033	-6 600	-7 567	-7 833	-4 600	-780.00	3 620	5 320

Zoom in : MtM of Aluminium

Display options [Reset selection](#)

Trading date: 2018-11-15

Report period from: Jan 2019 to: Dec 2019

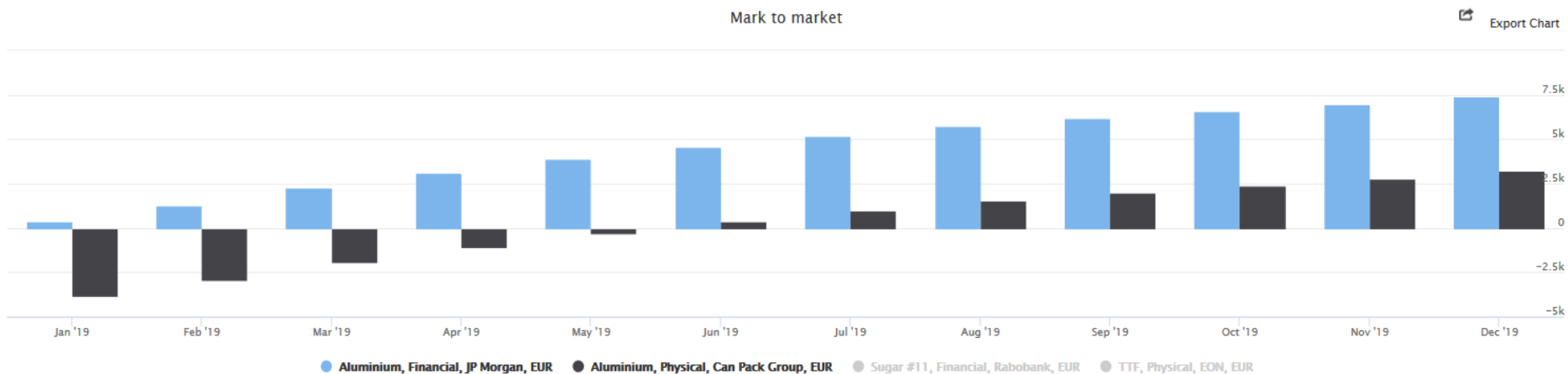
Display options: Physical/Financial, Counterparty, (None), (None)

Report currency: EUR default currency

Report in original unit

[Export to Excel](#) [Create report](#)

Positions Positions + underlying Cash flow Average price Cash flow + costs Average price + costs **Mark to market**



Kyos Energy Consulting

Contracts

			2019												
			Tot	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Aluminium	Financial	JP Morgan	EUR 53 753	387.31	1 291	2 259	3 137	3 912	4 596	5 203	5 732	6 197	6 610	6 997	7 432
	Physical	Can Pack Group	EUR 3 404	-3 809	-2 905	-1 937	-1 059	-284.02	400.22	1 007	1 536	2 001	2 414	2 802	3 236

Realized business values

Overall effect:

- Consistency & transparency

For whom:

- Procurement - Sales - Finance & Treasury

Measurable effect:

- Uncertainty translated into EUR

THE KEY IS NOT
TO PREDICT THE
FUTURE, BUT TO
BE PREPARED FOR
THE FUTURE

PERICLES, 495 – 429 V. CHR.



Thank you

KYOS

+31 23 5510 221

www.kyos.com
info@kyos.com