Commodities Strategy | April 2020

Oil Outlook - Things are going to get worse before they get better

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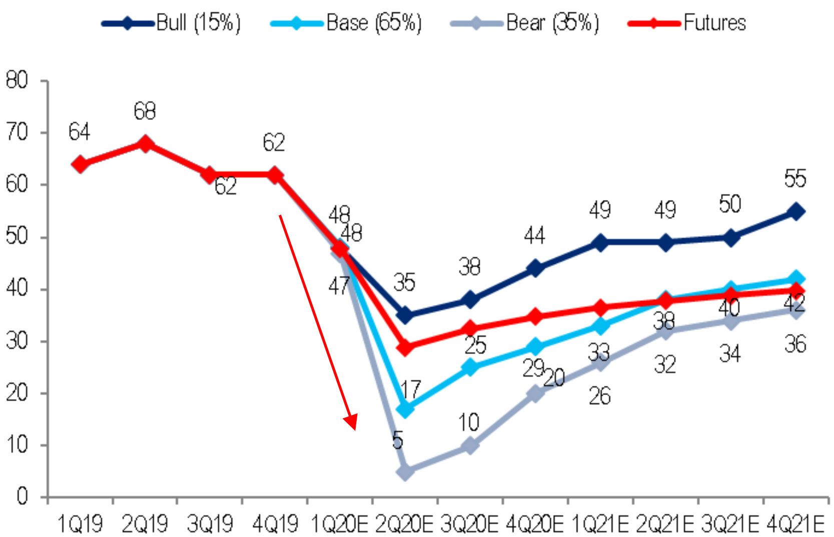
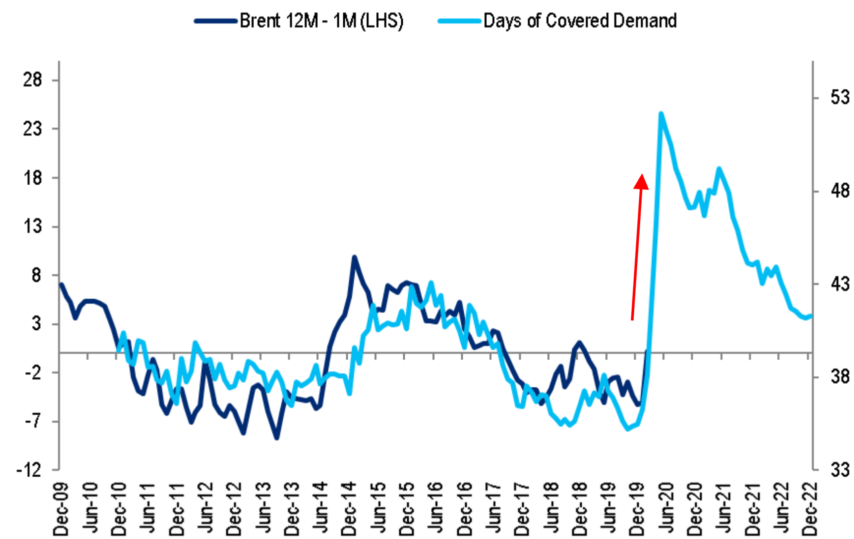
Oil supply faces shut-ins to meet a market that is shrinking massively, for now

We lowered our already-bearish oil priced deck further as coronavirus containment cuts into global oil demand, while the balance is getting longer on the supply side due to OPEC+ schism. We now see Brent averaging $30/bbl this year and $17/bbl in 2Q’20. Supercontango and storage congestion could drag some price points below zero.

Citi Brent crude oil price outlooks vs. forward curve—prices have crashed since 4Q’19 ($/bbl, 2019-21E)



Brent spread (LHS, 12M-1M, $/bbl) vs. days of demand cover* (RHS)



Citi oil price outlook and scenarios ($/bbl)

Base Case Forecasts ($/bbl)	1Q19	2Q19	3Q19	4Q19	1Q20E	2Q20E	3Q20E	4Q20E	1Q21E	2Q21E	3Q21E	4Q21E	2019E	2020E	2021E	2022E	2023E
Brent	64	68	62	62	48	17	25	29	33	38	40	42	**64**	**30**	**38**	**45**	**50**
WTI	55	60	56	57	44	17	25	29	32	37	38	40	**57**	**29**	**37**	**43**	**47**
Brent-WTI	9	9	6	5	4	0	0	0	1	1	2	2	**7**	**1**	**2**	**2**	**3**

Brent Scenarios ($/bbl)	1Q19	2Q19	3Q19	4Q19E	1Q20E	2Q20E	3Q20E	4Q20E	1Q21E	2Q21E	3Q21E	4Q21E	2019E	2020E	2021E	2022E	2023E
Bull					48	35	38	44	49	49	50	55	**64**	**41**	**51**	**57**	**60**
Base	64	68	62	62	48	17	25	29	33	38	40	42	**64**	**30**	**38**	**45**	**50**
Bear					47	5	10	20	26	32	34	36	**64**	**21**	**32**	**38**	**40**
Futures	64	68	62	62	49	31	35	37	38	40	41	42	**64**	**38**	**40**	**44**	**47**

Source: Bloomberg, Citi Research estimates   * implied stock builds, without storage constraint

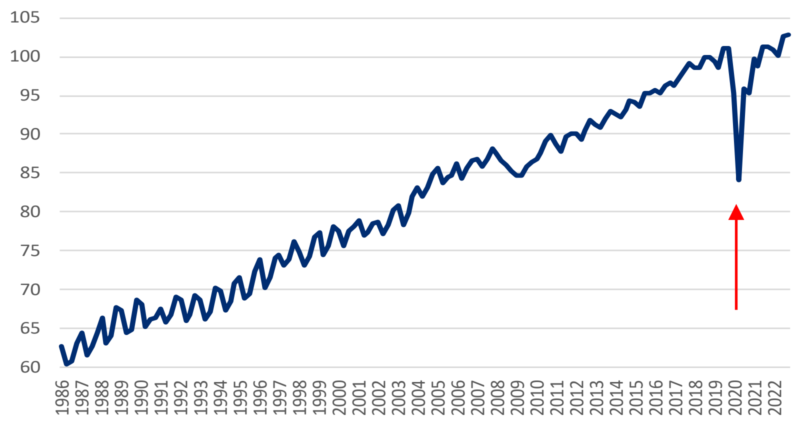
Oil demand is plummeting by a historically unprecedented15-20%

The rapid shuttering of activities in Europe and North America, just as China is seeing a recovery, points to a steep decline in demand. This could mean a demand impact of ~16-m b/d or more in 2Q'20, so that global demand growth could fall by 8.7-m b/d in '20. The bear case could see ~20-m b/d hit in 2Q, 10.6-m b/d for 2020 as a whole.

- **As the pandemic worsens, more countries are imposing the type of lockdown and social distancing measures seen in China and Italy.** Oil is directly hit by these strict measures. In our base case, transport fuel demand could fall as much as 70% in affected regions. Further, a recession would follow over the rest of the year even as containment measures ease for 2H'20. All in all, the oil demand impact from COVID-19 and the possible subsequent economic slowdown could be ~8.7-m b/d on an annual basis. Thus, in our base case, 2020 oil demand growth could end up being down by 7.5-m b/d against growth of 1.25-m b/d expected in late 2019 forecasts. In the bull case, with a faster recovery, the demand impact could still be ~4-m b/d, such that 2020 growth would be negative 2.8-m b/d y/y. But in our bear case, where we assume a widespread and longer-lasting adoption of severe containment measures, the demand impact could be ~10.6-m b/d, so that 2020 growth would be down by 9-m b/d.

- **We project that 2021 demand recovers from 2020 to grow at 1-m b/d on top of baseline 2020 growth of -0.8 m b/d, setting aside the impact of COVID-19, with 2021 vs. 2019 growth thus at +0.2-m b/d.** Although a longer-lasting economic downturn remains a risk, the low base of 2020, a resumption of trade activity, boosts from economic stimuli, as well as economy-wide oil secondary and tertiary level restocking as demand recovers, could all help drive a large bounce in oil demand after the outbreak is contained.

Global oil demand since 1980s, projected through 2020E-22E (m b/d, quarterly average)



Demand reduction by quarter due to the COVID-19 disease and subsequent real demand growth in 2020 and 2021, organized by different demand cases

	Demand impacts (m b/d)				
	1Q	2Q	3Q	4Q	Annual
Bull	(4.47)	(10.59)	(0.63)	(0.40)	(4.02)
Base	(5.40)	(15.83)	(6.56)	(7.03)	(8.70)
Bear	(6.01)	(20.06)	(8.60)	(7.76)	(10.61)

Source: IEA, Citi Research estimates

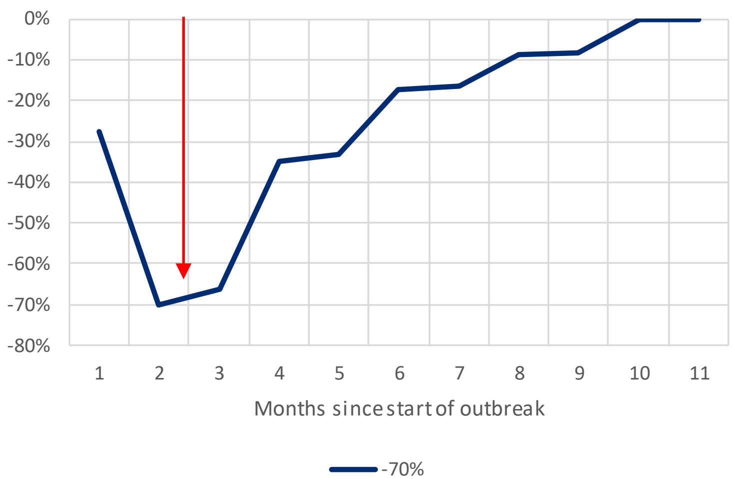
The demand hit looks deepest in 2Q, but could see a second wave 4Q on

There are great uncertainties around the course of the coronavirus outbreak and containment measures, including potential second wave impacts in 4Q onwards, until a vaccine becomes available.

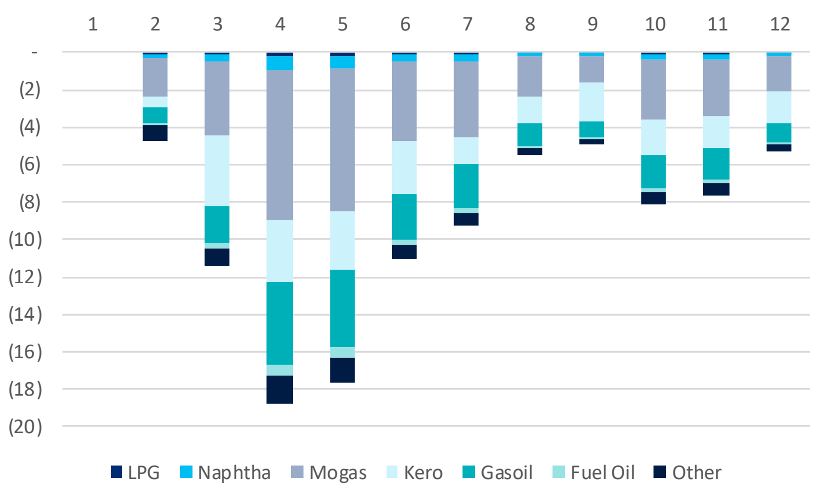
- **The assumed duration of the most draconian social distancing measures might last for several weeks, perhaps two months, before a period of recovery sets in.** Two months are about the length of four standard 14-day incubation/quarantine periods. Note how China has sharply reduced the number of new cases and so has South Korea, in some respects, with extended quarantine or lockdown policies. The 1918 pandemic and recent epidemiological studies by Imperial College and others also have shown similar impact durations

- **At the product level, jet/kerosene and gasoline would be hit the hardest because the movement of people is most hit due to government quarantine and social distancing policies and the public's reluctance to go out for fear of being exposed.** Although industrial activities are certainly affected, the impact may not be as substantial as for fuels related to passenger transportation. Heating fuel, such as LPG, should be hurt less by the outbreak and more so by the mild winter. Naphtha demand could hold up better than gasoline and jet as long as petchem facilities still operate at close to normal levels, as seen in China. Diesel demand can hold up relative to other fuels, and supply can tighten as refiners shut to prevent oversupply of jet and gasoline, but also in turn reduce diesel supply.

Demand decline curves for transport fuel, ex-aviation



Global refined product demand impacts (m b/d)

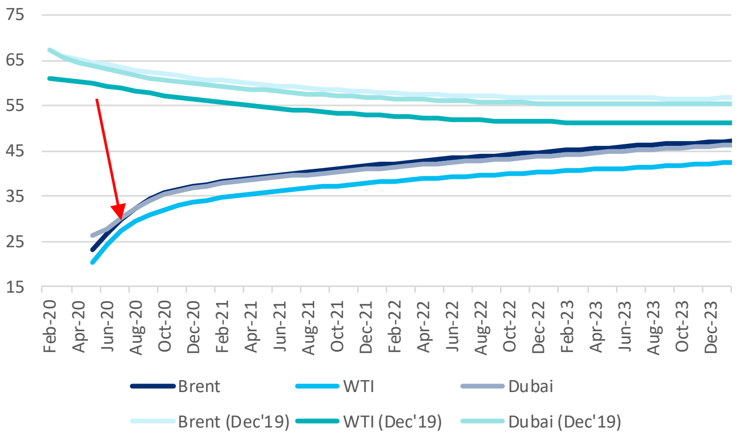


Source: WHO, Citi Research estimates

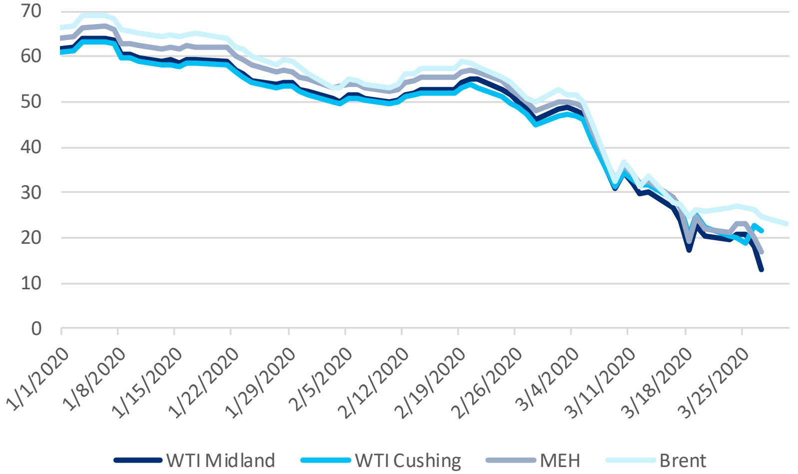
Storage distress and shut-in economics reflected in forward curves, crude diffs

Forward curves are moving into supercontango. US crude benchmarks and diffs are reflecting relative storage distress, providing incentives to store global oversupply in US storage tanks, with Brent-WTI narrow, though MEH is weak. Midland and MEH are pricing lower—in the $10s—to move barrels to Cushing, and ration Permian output.

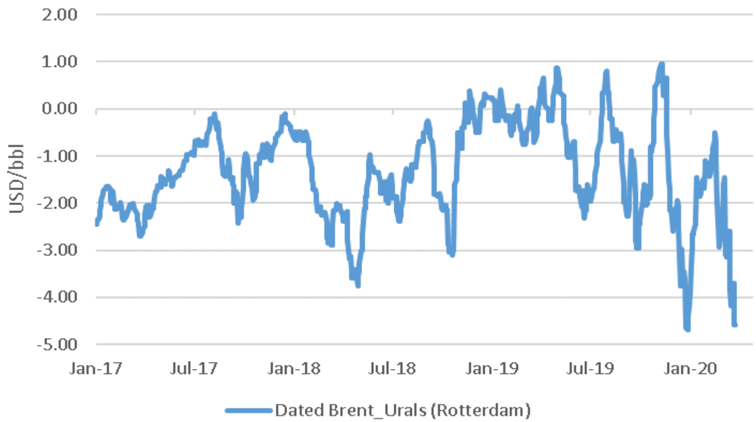
Benchmark crude forward curves have shifted to deep contango ($/bbl, end-Mar'20 vs. end-Dec'19)



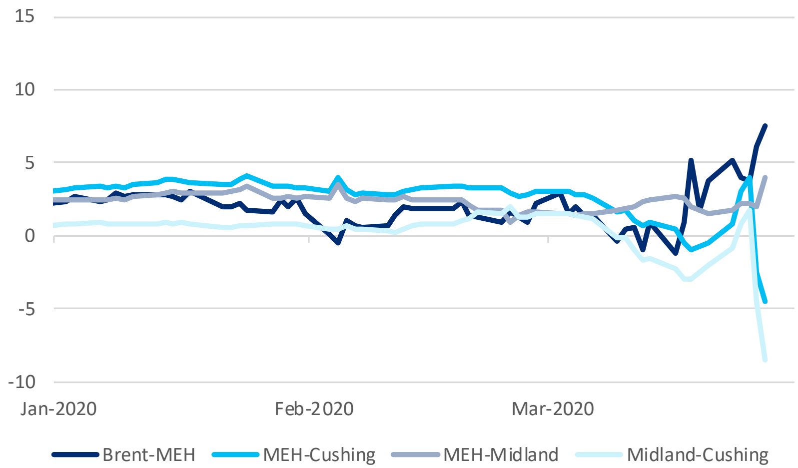
Brent, Houston, Cushing, Midland crude prices ($/bbl)



Northwest Europe crude differentials (Urals-Brent) reflecting sour crude glut



Brent, Houston, Cushing, Midland crude diffs ($/bbl)



Source: Bloomberg, Platts, Citi Research estimates

Global inventories are surging, regardless of the OPEC+ impasse

Demand	1Q19	2Q19	3Q19	4Q19	1Q20	2Q20	3Q20	4Q20	1Q21	2Q21	3Q21	4Q21	2019	2020	2021	2022	19'	20'	21'	22'
US	20.64	20.65	21.43	20.98	19.96	16.76	20.09	19.86	20.36	20.38	21.14	20.68	20.93	19.17	20.64	20.73	0.11	-1.76	1.47	0.09
Other OECD Americas	4.75	4.70	4.92	4.68	4.55	3.65	4.54	4.36	4.67	4.62	4.83	4.59	4.77	4.28	4.68	4.70	0.06	-0.49	0.40	0.02
OECD Europe	13.92	14.04	14.67	14.06	12.98	9.80	13.05	12.66	13.53	13.65	14.25	13.63	14.17	12.12	13.77	13.76	-0.09	-2.05	1.64	-0.01
OECD Asia	8.34	7.49	7.62	8.01	8.05	6.23	7.01	7.18	8.11	7.27	7.38	7.76	7.87	7.12	7.63	7.62	-0.19	-0.75	0.52	-0.01
OECD Demand	**47.66**	**46.89**	**48.65**	**47.74**	**45.55**	**36.44**	**44.69**	**44.06**	**46.67**	**45.93**	**47.60**	**46.67**	**47.73**	**42.69**	**46.72**	**46.81**	**-0.11**	**-5.05**	**4.03**	**0.09**
China	13.24	13.62	13.88	14.13	11.15	13.11	13.95	13.24	13.60	13.98	14.24	14.49	13.72	12.86	14.08	14.43	0.32	-0.86	1.22	0.35
India	4.96	4.80	4.51	4.78	4.90	3.71	4.24	4.59	5.21	5.04	4.78	5.05	4.76	4.36	5.02	5.23	0.13	-0.41	0.66	0.21
Total Other Asia	8.94	8.72	8.66	9.19	9.01	8.14	8.56	8.97	9.21	8.98	8.95	9.48	8.88	8.67	9.15	9.42	0.11	-0.21	0.49	0.26
Africa	4.33	4.29	4.17	4.19	4.38	4.15	4.11	4.17	4.47	4.42	4.32	4.34	4.25	4.20	4.39	4.49	0.00	-0.04	0.18	0.10
Non-OECD Europe	0.71	0.79	0.80	0.80	0.70	0.75	0.78	0.77	0.69	0.77	0.78	0.78	0.77	0.75	0.76	0.76	0.01	-0.02	0.01	0.00
FSU	4.49	4.54	4.73	4.79	4.53	4.54	4.77	4.83	4.49	4.54	4.73	4.79	4.64	4.67	4.64	4.70	0.06	0.03	-0.03	0.06
Latin America	6.60	6.62	6.86	6.73	6.62	6.16	6.24	6.36	6.56	6.58	6.82	6.69	6.70	6.34	6.66	6.73	0.05	-0.36	0.32	0.07
Middle East	8.51	8.39	8.87	8.77	8.45	7.03	8.52	8.39	8.76	8.63	9.13	9.04	8.64	8.10	8.89	9.13	0.22	-0.54	0.79	0.24
Non-OECD Demand	**51.79**	**51.78**	**52.49**	**53.39**	**49.73**	**47.58**	**51.18**	**51.33**	**52.99**	**52.96**	**53.75**	**54.66**	**52.36**	**49.96**	**53.59**	**54.88**	**0.92**	**-2.41**	**3.64**	**1.29**
Total Demand	**99.45**	**98.66**	**101.14**	**101.12**	**95.28**	**84.03**	**95.87**	**95.39**	**99.67**	**98.88**	**101.35**	**101.33**	**100.09**	**92.64**	**100.31**	**101.64**	**0.81**	**-7.45**	**7.67**	**1.33**

Supply	1Q19	2Q19	3Q19	4Q19	1Q20	2Q20	3Q20	4Q20	1Q21	2Q21	3Q21	4Q21	2019	2020	2021	2022	19'	20'	21'	22'
Total Supply	**100.1**	**99.6**	**99.5**	**100.6**	**100.4**	**101.8**	**100.1**	**100.1**	**97.4**	**97.3**	**96.7**	**96.1**	**100.0**	**100.6**	**96.9**	**95.9**	**0.0**	**0.6**	**-3.7**	**-1.0**

Net	0.6	1.0	-1.6	-0.5	5.1	17.8	4.2	4.7	-2.3	-1.6	-4.6	-5.3	-0.1	7.9	-3.4	-5.8	-	8.1	-11.4	-2.3
Refinery Infrastructure	0.1	0.3	0.2	0.1	0.2	0.0	0.2	0.1	0.1	0.0	0.0	0.0	0.2	0.1	0.0	0.1	-	-	-	-
Stockbuilds for infrastructure	-1.6	-1.2	-1.1	-0.5	-1.0	-0.8	-0.8	-0.9	-0.9	-0.8	-0.6	-0.8	-1.1	-0.9	-0.8	-0.8	-	-	-	-

Error Term/Seasonality Adjustment	1.5	0.6	1.8	0.8	1.4	0.6	1.2	0.6	1.4	0.6	0.9	0.5	1.2	0.9	0.8	0.8	-	-	-	-
Expected Total Stock Change	**0.5**	**0.4**	**-1.0**	**-0.2**	**5.5**	**17.5**	**4.5**	**4.4**	**-1.8**	**-1.8**	**-4.4**	**-5.6**	**-0.1**	**8.0**	**-3.4**	**-5.8**	**-**	**-**	**-**	**-**

Stock build rate (m b/d)					5.5	17.5	4.5	4.4	-1.8	-1.8	-4.4	-5.6		8.0	-3.4					
Stock builds (m bbls)					497	1576	409	397	-164	-166	-398	-501		2879	-1229					
Stock build constraint? (m b/d)						8.0	8.0	8.0	8.0	8.0	8.0	8.0		8.0	8.0					
Constrained stock build rate?						8.0	4.5	4.4	-1.8	-1.8	-4.4	-5.6		5.7	-3.4					
Stock build constrained by capacity						**8.0**	**4.5**	**2.9**	**-1.8**	**-1.8**	**-4.4**	**-5.6**								
Storage capacity space					1407	677	262	0	166	334	738	1246								
Forced supply curtailments (m b/d)						**-9.5**	**0.0**	**-1.5**	**0.0**	**0.0**	**0.0**	**0.0**		**-3.7**	**0.0**					
Call on global supply (m b/d)					**100.4**	**92.3**	**100.1**	**98.6**	**97.4**	**97.3**	**96.7**	**96.1**		**97.8**	**96.9**					

- **Stock builds may be constrained by a rate of fill (above shows fill rate constrained at 8-m b/d sustained) and a storage capacity constraint** (~1.4-bn bbls at end-March, including China SPR (255-m bbls), Indian SPR (20-m bbls), but no US SPR (which could be 77-m bbls)). Commercial storage does not include Saudi Arabia, the UAE, and Kuwait, but does include the US (~176-m bbls) and China (~72-m bbls).
- **This implies short-term forced supply curtailments of ~9-m b/d in 2Q, ~2-m b/d in 4Q. At peak demand impact of ~18.7-m b/d in April, this could be over 10-m b/d.** With refinery run cuts in most places down by the local demand hit, most producers look likely to need to curtail significantly in 2Q'20, including Saudi Arabia and Russia, but also the US and non-OPEC producers. Implied prices for this could be in the $10s or even single digits. Prices in some locations would be negative, as observed for Wyoming Sweet, recently bid at -19c/bbl. In a bear case, supply curtailments might need to be ~14-m b/d in 2Q.
- **Supply looks set to fall drastically in 2021-22 too, perhaps in the 3-5-m b/d range as decline rates accelerate rapidly.**

Source: Citi Research estimates * Table shows base case demand scenario. Total supply is shown as projected before accounting for storage constraints.

Oil stock builds can overwhelm storage, whether capacity or rate of fill

Without storage constraints, 2Q'20 could see 12-m b/d of global oil surplus looking for storage, or some 1.1 billion barrels. In our bear case, this could be 18-m b/d, or 1.6-bn bbls. But is there enough storage capacity?

- **We identify 6.17-bn bbls of global commercial and strategic crude storage capacity, with an estimated 1.65-bn bbls of effective spare crude storage capacity as of March 2020, led by the US at ~250-m bbls and China at ~330-m bbls, including SPRs**. Currently, there are 75-m bbls of oil stored at sea, but 2/3 are Iranian. Floating storage might provide between 100 and 130-m bbls of additional crude storage on 77 VLCCs, assuming 90% of effective capacity. Single product inventories could max out earlier than others though. For individual products, we estimate ~50-m bbls of effective storage space for jet fuel, ~225-m bbls for gasoline and ~330-m bbls for diesel.
- **Some of this capacity may not be filled, particularly the US SPR, and Saudi/GCC storage tanks.** The US has talked about opportunistic buying of oil to refill the SPR, but this will require legislation. Congressional Democrats are attaching additional funding requests, and passage remains uncertain and we do not factor this in in our base case. Meanwhile, given that Saudi Arabia, the UAE, and Kuwait are pushing oil out into the market, their domestic storage tanks look out of bounds for storage plays, except for their own supply, but they may prefer to shut in instead, if reservoirs are not negatively affected.
- **The rate of fill matters too.** Even with storage space available, there could still be constraints in terms of how quickly it can fill.

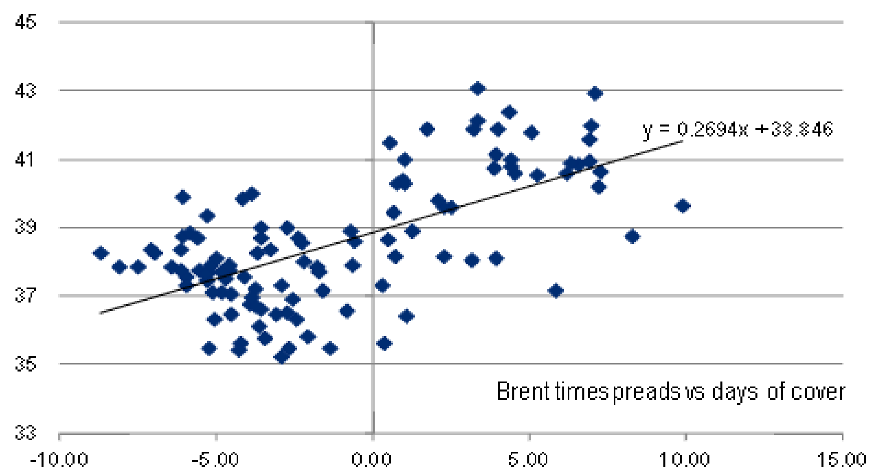
2Q'20, global oil stockbuilds in (m bbls)

		Demand cases Bull	Base	Bear
Supply	Bull	397	885	1387
	Base	606	1095	1597
	Bear	618	1106	1608

2020 annual, global oil stockbuilds in (m bbls)

		Demand cases Bull	Base	Bear
Supply cases	Bull	57	689	2209
	Base	641	1272	2734
	Bear	964	1596	3058

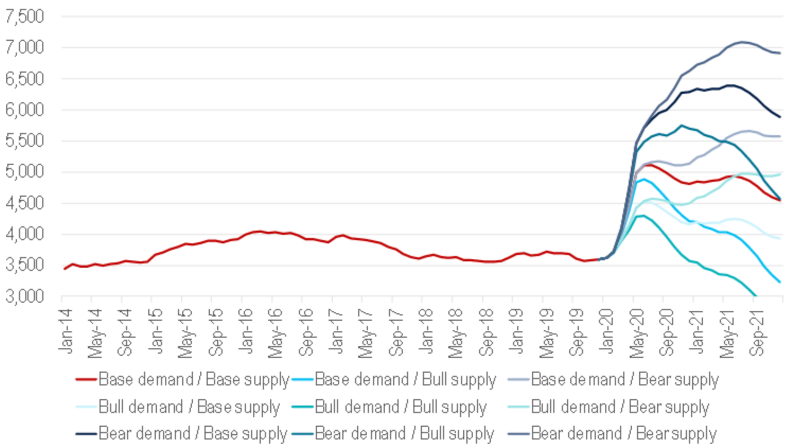
Historical relationship between oil inventories in days of demand cover and Brent timespreads (12M-1M)



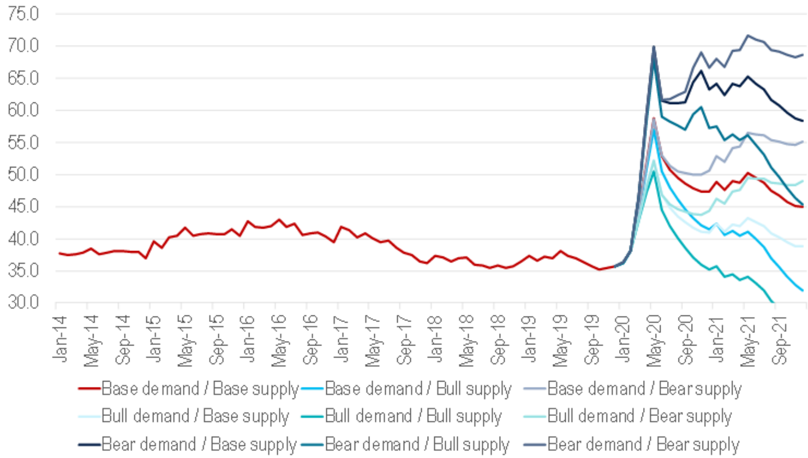
Source: Bloomberg, Citi Research estimates * tables shown are before forced supply curtailments

Global inventories look set to rise to unprecedented highs above prior peaks

Global observable oil inventory outlooks, with demand hit and OPEC+ oversupply (m bbls), without storage constraints, before supply cutbacks



… and global observable oil inventory outlooks, in days of demand cover, without storage constraints, before supply cutbacks



Global crude oil effective storage capacity estimates, and in selected key countries (m bbls)

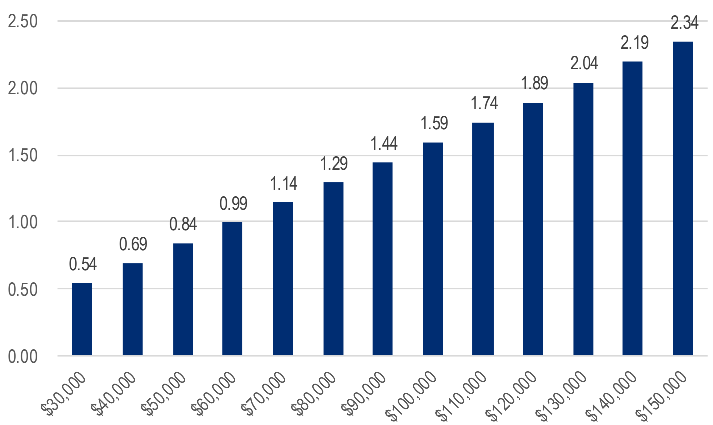
	Inventory level			Spare capacity			Estimated storage capacity		
Country	Total	Comm	SPR	Total	Comm	SPR	Total	Comm	SPR
Total	**4518**	**2940**	**1578**	**1650**	**1240**	**409**	**6168**	**4180**	**1988**
US	1089	454	635	253	176	77	1342	630	712
China	1173	828	345	327	72	255	1500	900	600
India	107	87	20	59	43	20	166	130	40
Saudi Arabia	155	155		174	174		329	329	
UAE	51	51		38	38		90	90	
South Africa	20	20		25	25		45	45	
Japan	380	90	290	54	54		434	144	290
South Korea	206	124	82	80	26	54	286	150	136

Source: IEA, JODI, Ursa, OilX, Citi Research estimates

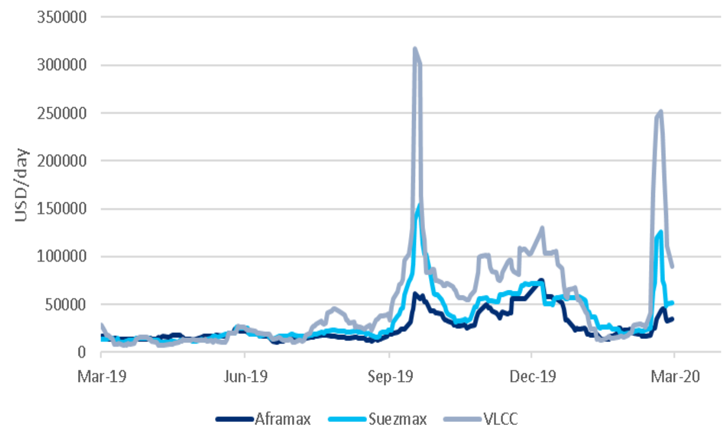
Floating storage is more expensive due to Saudi export surge, scarcity pricing

Typically, floating storage would be economic in a >$1/bbl/mth contango environment, up to $1.50/bbl/mth; however, with the Saudis pushing oil into the market, VLCCs are scarce, pushing required contango to $2-2.50

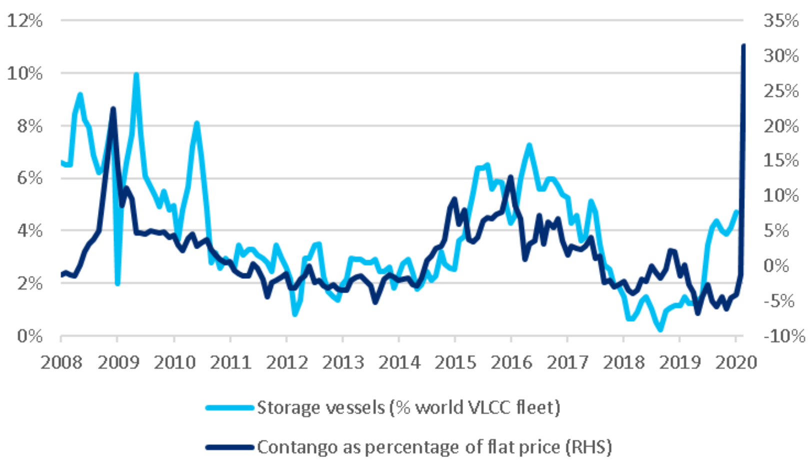
Indicative contango required for floating storage at various tanker rates ($/bbl/mth)



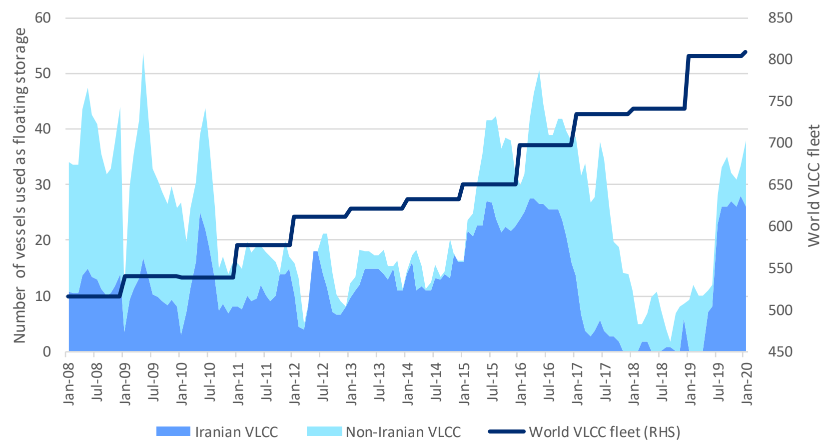
Tanker rates have surged due to Saudi Arabia flooding the market with crude oil



Floating storage economics and vessels employed



Global crude floating storage and VLCC fleet

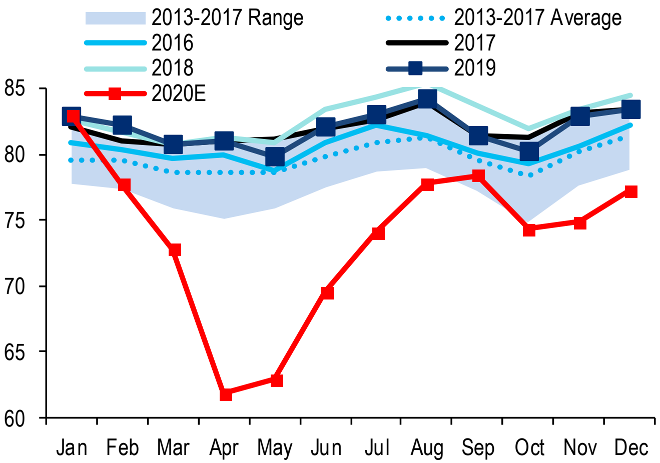


Source: IEA, EA Gibson, SSY, OilX, Bloomberg, Citi Research estimates

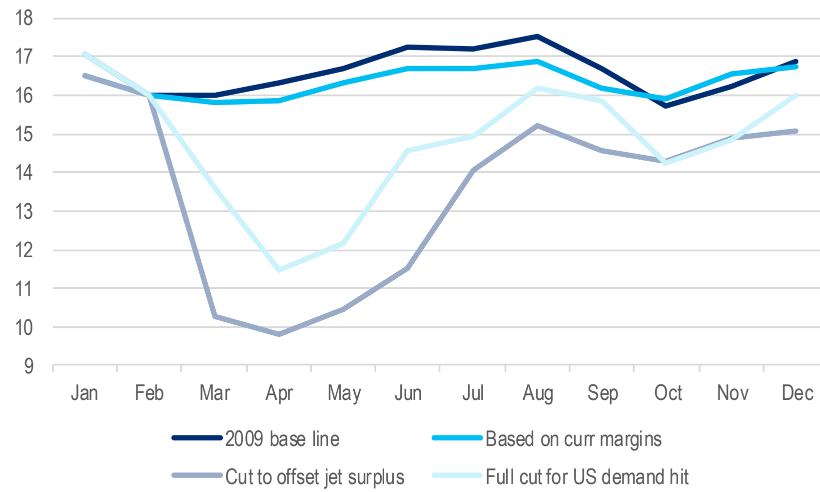
Weaker refinery margins, deeper run cuts to come, as crude buying dries up

Weaker refinery margins are already driving lower refinery runs and heavier maintenance, but refinery runs are somewhat supported for now, helped by cheap crude. However, as key product storage maxes out, particularly jet, margins collapse, and refiners cut runs hard, moving stock builds back to crude. Diesel could tighten a lot though.

Global refinery runs, if runs were cut to same magnitude as projected oil demand hit (m b/d)



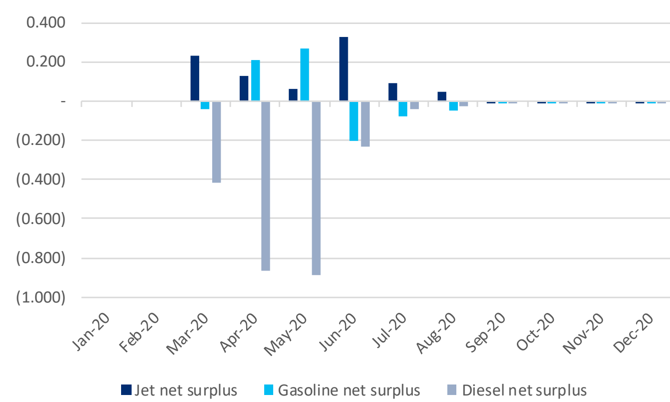
US refinery run scenarios (m b/d)



Net surplus change if global refinery runs fall to meet total global oil demand loss, holding yields unchanged—jet and gasoline margins remain under pressure, diesel margins strengthen, with limited yield switching possible

	Quarter				Annual
	1Q	2Q	3Q	4Q	Total
Naphtha	-5%	-5%	-6%	-5%	-5%
Mogas	7%	11%	8%	7%	9%
Kero	16%	10%	15%	15%	13%
Gasoil	-16%	-11%	-12%	-13%	-13%
Fuel Oil	-7%	-6%	-6%	-6%	-6%

Net impacts in the US on principal products in full US run cut scenario—diesel looks relatively tight



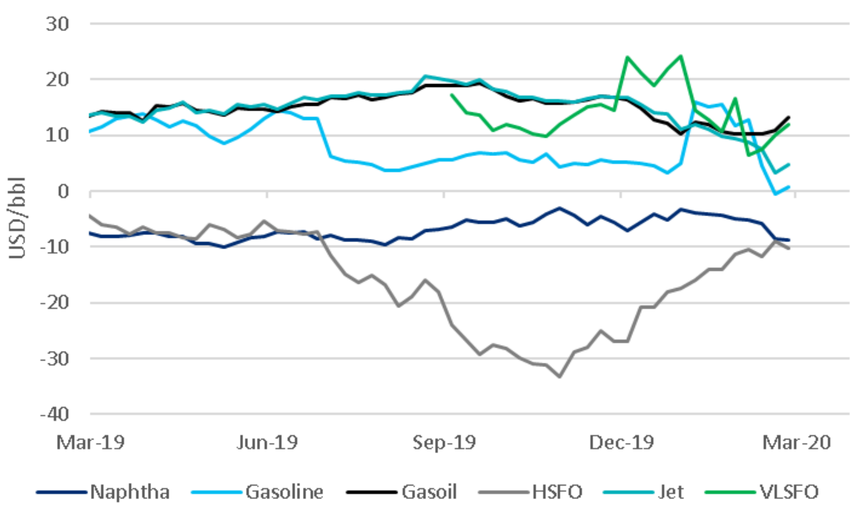
Source: IEA, EIA, Citi Research estimates

Refinery margins hit by weak jet and gasoline, though diesel might spike

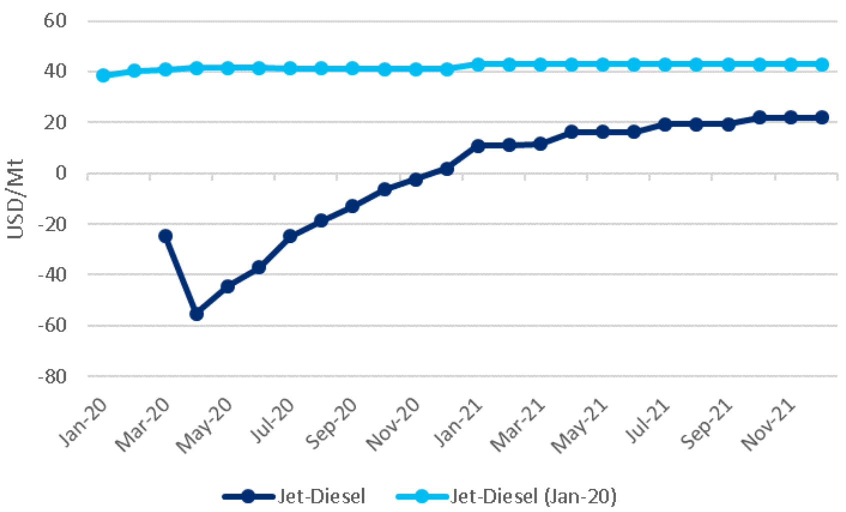
Despite cheap crude prices, refineries are facing an unprecedented drop in end-user demand, and margins across the barrel are in free fall. Refineries need to shrink jet output desperately. Diesel cracks are holding, but are at risk of further industrial slowdown, though they are likely to tighten as run cuts could mean stock draws for the product.

- **Since quarantine and social distancing measures have been enacted throughout Europe and the US, demand for transportation fuels has tanked.** While jet demand was hit first following the bans on international travel, it took longer for gasoline to discount the impact of the COVID-19. Indeed, record FCC outages and high VGO prices had boosted gasoline margins in Feb-20. Since then, gasoline cracks have collapsed, at times below zero. Europe is typically long gasoline, therefore with domestic demand being hit and exports at risk due to COVID-19 spreading into the US too, the continent needs to shut down its FCC runs. We hear that US plants have already optimized their runs cutting naphtha longer in order to reduce the surplus of gasoline. This should weigh on already weak naphtha cracks due to weak petchem demand East of Suez.
- **Diesel cracks are still strong. Logistical constraints are a burden for jet output, leaving refiner's only one option—to cut runs.** We estimate 50-m bbls of jet fuel storage space worldwide, and notably the product is sensitive to contamination and degrades quickly, and therefore cannot be stored for long. Refiners are shifting to diesel where they can because of the poor margins associated with jet fuel. Yet, jet kero yield switching is limited, forcing refineries to cut runs to reduce the jet overhang.

Refined product margins



Jet differential to diesel



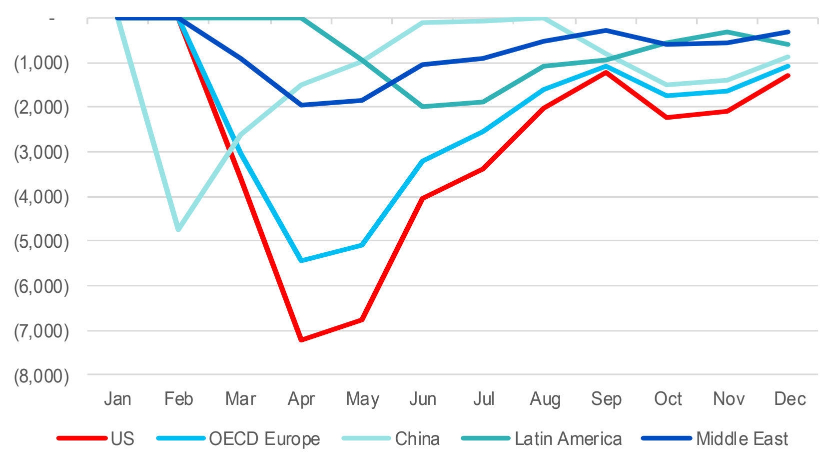
Source: Bloomberg, Citi Research

Supply curtailments—how much from OPEC, how much from non-OPEC?

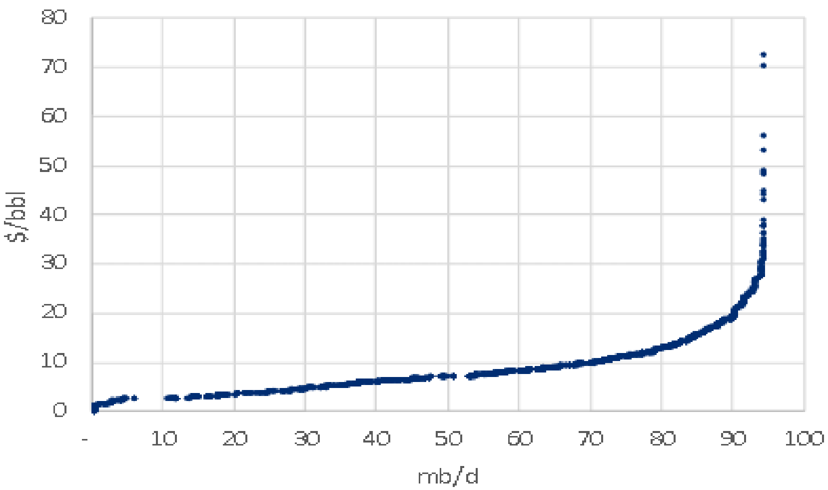
Canadian oil is being hit early on due to expensive crude-by-rail. US oil output is set to decline as shale capex drops, and heavy oil and stripper wells are at risk. $20/bbl already cuts into opex of ~4-5-m b/d of global supply.

- **Capex is being cut and OpEx is being tested.** This could mean a steady swing to declining production through 2H'20. US oil production could be down by as much as 2-4-m b/d by end-2021 as shale activity halts, while stripper wells and heavy oil slow down and shut in sooner. Depending on the remaining surplus after OPEC+ cuts (or not), and storage constraints (either by fill rate or effective capacity), then OpEx curve shut-in price levels could point to $17/bbl or below given the forced curtailments required. But even if production is stickier than expected, sustained $10 should put ~25-m b/d of production underwater, which should be enough to balance markets. The issue is that in the short run, prices could overshoot to below these levels.
- **Some oil production should be limited by refinery run cuts and thus limited buying, forcing supply to be shut in or stored domestically**, notably given substantial Saudi storage capacity. In Iran and perhaps Venezuela, given US sanctions constraining exports, crude production can only be run in domestic refineries, or put in domestic storage tanks. With demand dropping and refinery run cuts, crude production will need to shut-in too.
- **Other oil production could be hit by operational shut-ins as part of COVID-19 containment.**

Oil demand loss by region—refinery runs should follow suit, driving local forced supply curtailments in 2Q in particular, but potentially also 4Q (k b/d, 2020)



Global oil and liquids OpEx curve ($/bbl, m b/d) helps to indicate shut-in economics for producing fields



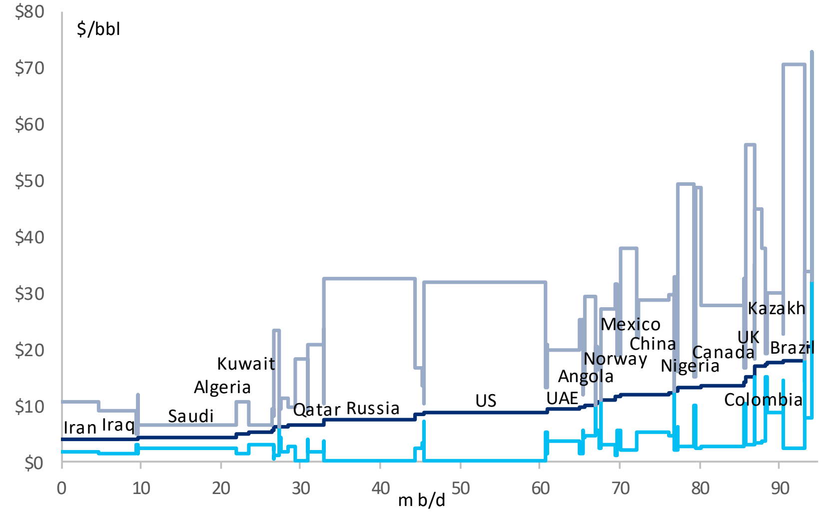
Source: Woodmac, Citi Research

Oil production with high OpEx costs are most at risk of short-term forced cuts

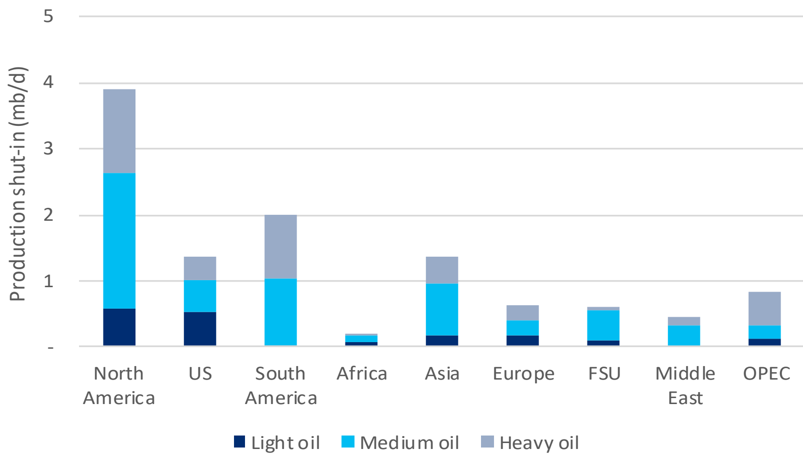
Oil volumes at risk, by crude quality, based on total ~10-m b/d supply curtailment and highest OpEx fields shutting in first

m b/d	Light oil	Medium oil	Heavy oil	Total
Total	**1.24**	**5.22**	**3.49**	**9.95**
North America	**0.58**	**2.06**	**1.25**	**3.89**
US	0.53	0.50	0.33	1.36
South America	**0.03**	**1.02**	**0.94**	**1.99**
Africa	**0.07**	**0.11**	**0.01**	**0.19**
Asia	**0.18**	**0.79**	**0.39**	**1.36**
Europe	**0.16**	**0.24**	**0.22**	**0.62**
FSU	**0.09**	**0.47**	**0.04**	**0.60**
Middle East	**-**	**0.32**	**0.13**	**0.45**
OPEC	**0.11**	**0.21**	**0.52**	**0.84**
Algeria	-	-	-	-
Angola	-	0.07	-	0.07
Equatorial Guinea	0.00	-	-	0.00
Gabon	0.01	0.08	-	0.10
Libya	-	-	-	-
Nigeria	0.06	0.06	0.02	0.14
Republic of Congo	-	-	-	-
Iran	-	-	-	-
Iraq	-	-	-	-
Kuwait	-	-	-	-
Saudi Arabia	-	-	-	-
United Arab Emirates	0.04	-	-	0.04
Venezuela	-	-	0.50	0.50

Global OpEx curve by country average, including min and max OpEx cost range for projects in-country



Indicative forced curtailment volumes based on top 10-m b/d of OpEx cost curve, based on base case demand hit projected for April/May 2020

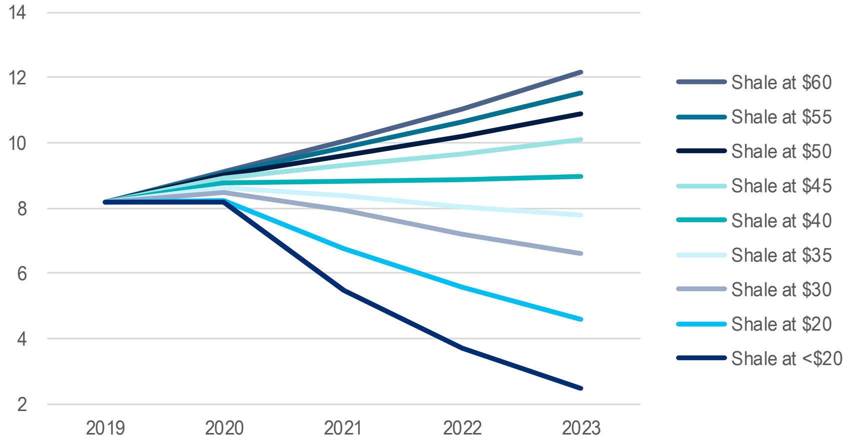


Source: Woodmac, Citi Research estimates

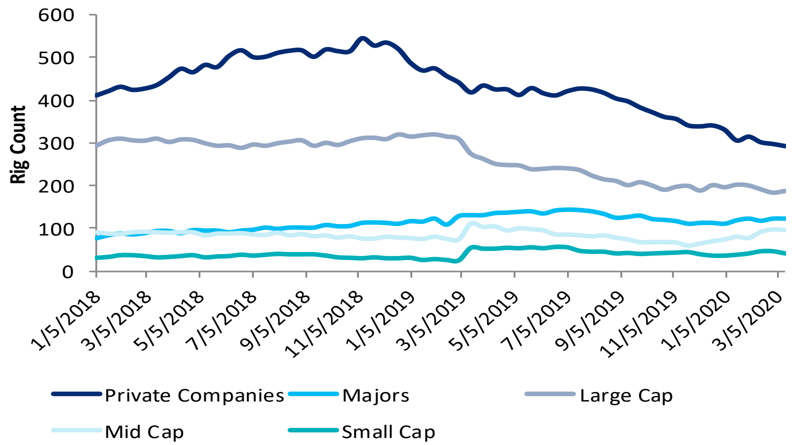
US oil set to decline as shale, heavy oil, stripper wells are hit by low prices

Oil prices in the $20s and below means significant pull-back in capex, rigs, completions, moving shale into declines, deferring production into the future. Meanwhile, US marginal wells shut-in at an accelerating rate.

Indicative US shale production trajectories at various sustained WTI price levels (m b/d)



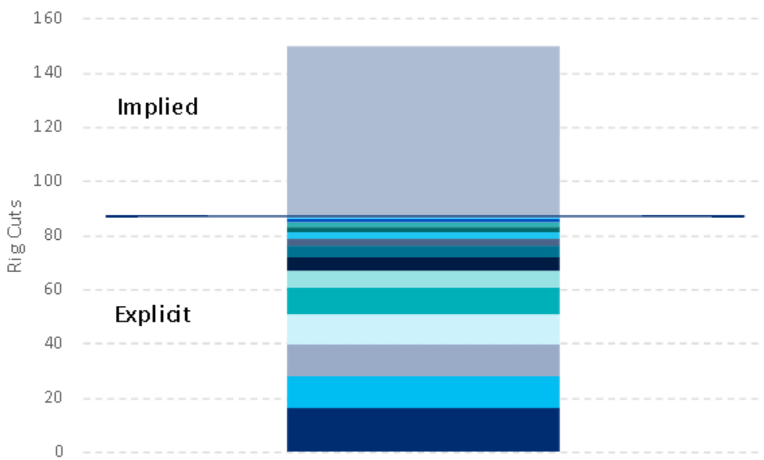
US rig count by company type



US conventional oil output by cohort: 450-k b/d from ~200,000 wells that produce 5 b/d or less

Daily Oil Production in Bbls			
Low	**High (including)**	**Well Count**	**Cohort Daily Production**
0	5	198,717	449,928
5	10	45,426	341,783
10	25	33,465	533,293
25	50	11,851	415,211
50	100	5,462	375,516
100	200	2,254	311,956
200	300	775	188,442
300	400	380	131,914
400	500	256	114,290
Includes all vertical, directional, and undisclosed (usually very old) wells			

US rig count cuts to come?



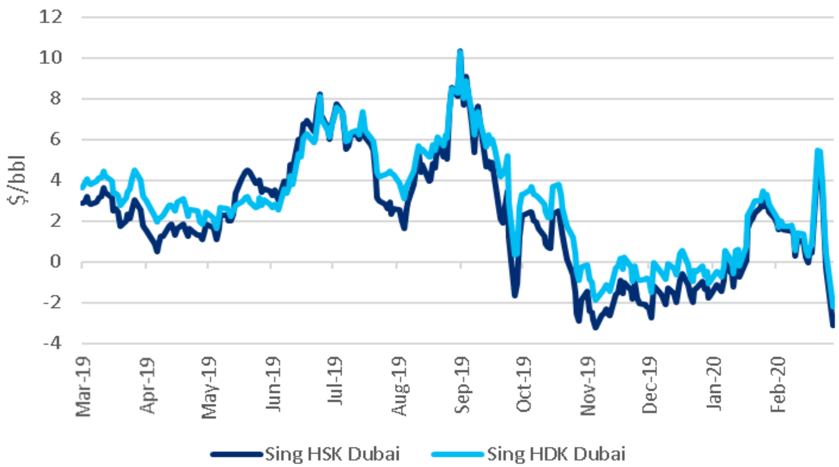
Source: Enverus, Citi Equity Research estimates, Citi Research estimates

Whether OPEC+ producers return to the table or not, their supply should fall

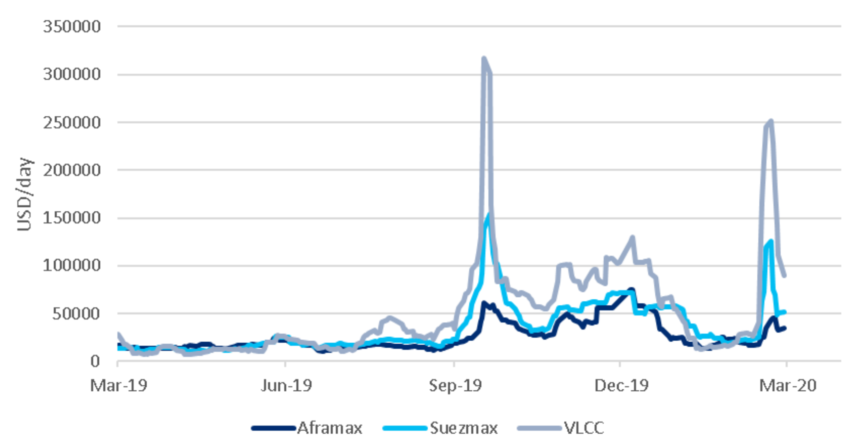
While Saudi Arabia and Russia might try to keep producing and exporting at elevated levels, this does not look sustainable as refineries reduce nominations sharply, as they confront low demand and financial distress.

- **The Saudis may quote a high number for supply over the next months, having referenced as much as 12.3-m b/d, but look set for disappointment as the global refining system stops buying.** The unprecedented OSPs discounts for April were met by decent buying interest from refineries, but May and June should be much tougher, as collapsing demand bites hard, margins keep weakening, and refiners hit logistic bottlenecks. This leaves them with the only option of cutting runs. Further, the recent surge in freight rates partially offset the OSP discount anyway, denting refineries' cash margins.
- **Rhetoric points to a continued price war for now, but sub-$20, even sub-$10 prices, could shake producers enough to come back to the table in 2Q.** As OPEC+ has surged supply, oil prices are low—far below the Saudi "fiscal breakeven oil price", though the Kingdom is able to sustain some duration of a price war, and would hope to bring Russia back to the table. Meanwhile, Russia is seeing oil prices fall perhaps even lower than they might have expected, with the ruble following suit, and the Russian central bank intervening, though they remain reluctant to resume production cuts, especially as they see the COVID-19 demand impact as temporary, and adjustment as needing to fall on the shoulders of shale and other non-OPEC+ producers. Indeed, US shale producers are in severe distress, such that some at the Texas Railroad Commission have even suggested a return to production quotas not seen since the '70s. However, as we discuss later, even with no deal, OPEC+ and others may be forced to reduce supply due to the lack of buyers, reflected in distressed pricing.

Singapore hydroskimming and hydrocracking margins



Freight rates Arabian Gulf-China by vessel class



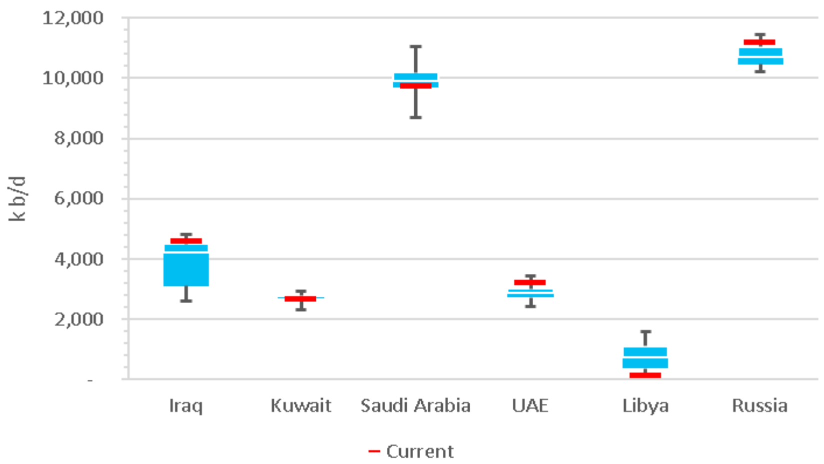
Source: Bloomberg, ICE, Citi Research

Scenarios for a return to OPEC+ oil quotas—or a continued breakdown?

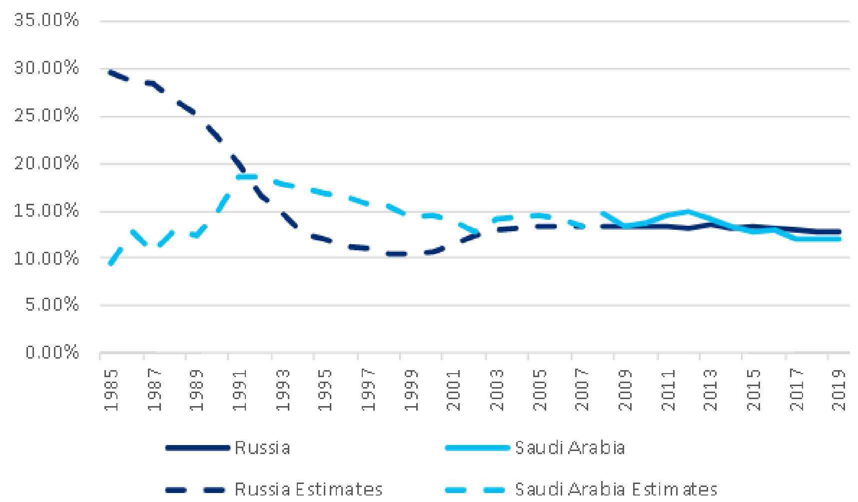
While brinksmanship may last for longer, we do expect OPEC+ to meet by mid-year and return to Dec’19 quotas. However, our bear case sees OPEC+ attempt to maintain high output. Our bull case sees earlier, proactive cuts.

- **In our base case (60% probability), Saudi Arabia and other OPEC producers continue for now with a shock-and-awe strategy to corner Russia, before eventually agreeing on a truce or even a new round of production cuts.** Despite attempts and rhetoric to continue to supply large volumes to the market, we see OPEC and Russia succumbing along with major producers everywhere as refiners drop crude buying and storage fills up. We see an OPEC+ meeting as possible, with some nominal cuts perhaps for 2H’20 and onwards, at Dec’19 quota levels. However, OPEC+ is likely to look like it is “overcomplying” as refinery buying remains a major constraint in 2Q and 3Q, perhaps in 4Q too as demand impacts linger. We do not expect US SPR buying in the base case.
- **In our bear case (35% probability), Saudi Arabia attempts to keeps production heightened at 10.2-m b/d until year end, while the rest of OPEC+ attempts to produce all out.**
- **In our bull case (15% probability), OPEC takes a proactive approach, deepening unilaterally production cuts by 1- to 1.5-m b/d.** The US also passes legislation to buy crude to refill its SPR, while other storage capacity may be more robust than expected.

Production range for selected countries, 2011-current



Russia and Saudi oil exports as a share of world exports

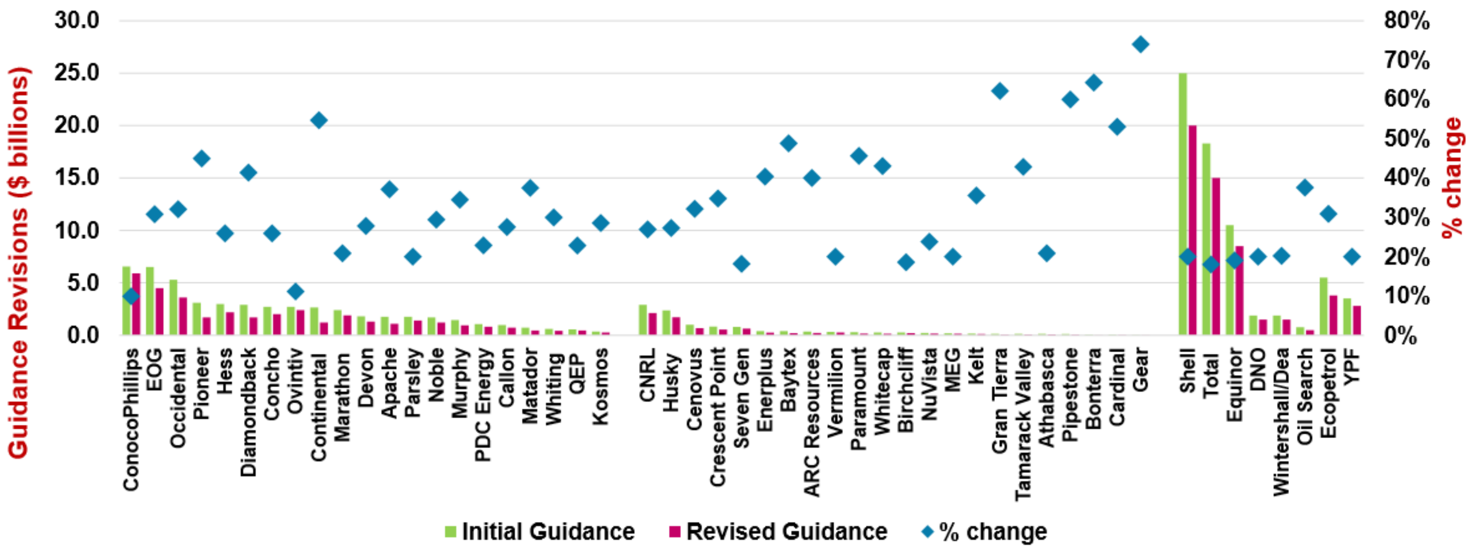


Source: Bloomberg, EIG, BP, Citi Research

Upstream fallout—the oil industry faces restructuring, petro states face failure

Oil producers face a massive challenge of downsizing quickly due to massive demand destruction. Companies are cutting capex, some face severe financial distress. Petro states relying on oil revenues also face fiscal stress even as they deal with a health crisis, creating greater risks of state failure. Supply declines should accelerate markedly.

Global upstream capex cuts so far this year have continued to deepen, pointing to slower growth, faster declines



Recent fiscal breakeven oil prices ($/bbl) for selected producers

	Average 2000–2015	2016	2017	2018	Projections 2019	Projections 2020
				Fiscal Breakeven Oil Price		
MENAP oil exporters						
Algeria	102.6	102.5	91.4	104.2	129.8	109.0
Bahrain	74.1	105.7	112.6	118.4	95.1	91.8
Iran, I.R. of	55.9	58.4	64.8	82.0	155.6	194.6
Iraq	...	46.3	42.3	45.4	62.5	60.3
Kuwait	43.8	43.4	45.7	54.2	54.3	54.7
Libya	70.4	244.5	102.8	95.6	94.8	99.7
Oman	62.5	101.7	96.9	99.5	87.3	87.6
Qatar	45.0	54.0	50.6	50.3	48.8	45.7
Saudi Arabia	78.0	96.4	83.7	88.6	86.5	83.6
United Arab Emirates	47.6	51.1	59.8	66.7	70.2	70.0

- While the Saudis and Russians may be able to sustain low oil prices for some period, other producer countries may find it much tougher.
- For instance, Iran and Venezuela are facing public health crises even as sanctions mean they cannot export oil, keeping crude production constrained by refinery runs, which are already limited by the demand shock, and limited storage space.
- And even the Saudi fiscal position is not sustainable over time, while oil prices and the weak ruble are a challenge for Russia too.

Source: S&P Global Platts, IMF, Citi Research

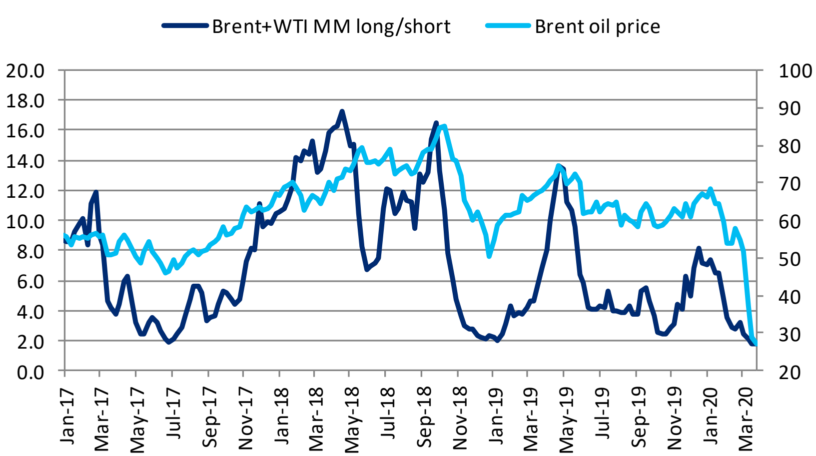
The bear market is weighing on speculative flows, and passive investments

A contango of over $3/bbl/month for the 12-month strip could potentially arise across both the Brent and WTI curves. Even more modest levels of contango weigh on roll yields, making passive investments less attractive.

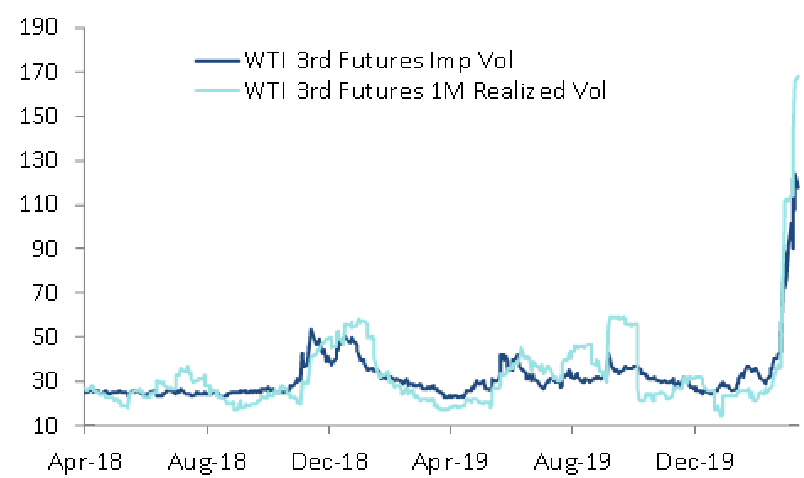
- **The crude oil bear market and super-contango across the prompt forward curve should itself reinforce speculative outflows and allow for further dislocations in the energy volatility space.** On the fund side, the WTI and Brent combined money manager gross long/short ratio which has historically bottomed at 2.0x, even during the January 2016 price rout, has already been breached. We anticipate funds will flip to net short crude oil in the next 0-3m, with the l/s ratio possibly sinking to a record low 0.25x-0.5x range. And it is not just the weak flat price environment that matters. Energy market roll yields are already the worst performing across major commodities sectors this year, despite the strong crude oil backwardation observed in January and early February. Commodity index outflows from passive real money and pension fund investors, which tend to lag, should put further downward pressure on prices, with the flip from backwardation to steep contango likely to accelerate unwinds.

- **Crude oil implied vols, having crossed 100% (!) in early March, should remain historically elevated in this bearish price environment, especially if volatility keeps realizing high levels and daily $/bbl break/evens hold steady**. Yet even as a steep contango and record stock builds should support vols, we think the extreme richness in asset market vols more broadly could begin to taper on central bank and fiscal policy responses, and these macro factors can eventually weigh on oil vols.

WTI + Brent MM combined long/short ratio versus Brent price



NYMEX WTI 3M implied and realized volatility



Source: Bloomberg, Citi Research

Appendix A-1

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