Commodities Strategy | January 10, 2019

# The Heisenberg Principle for Oil Markets

## OPEC+ efforts to assure market *stability* become a source of market *volatility*

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**See Appendix A-1 for Analyst Certification, Important Disclosures and non-US research analyst disclosures**
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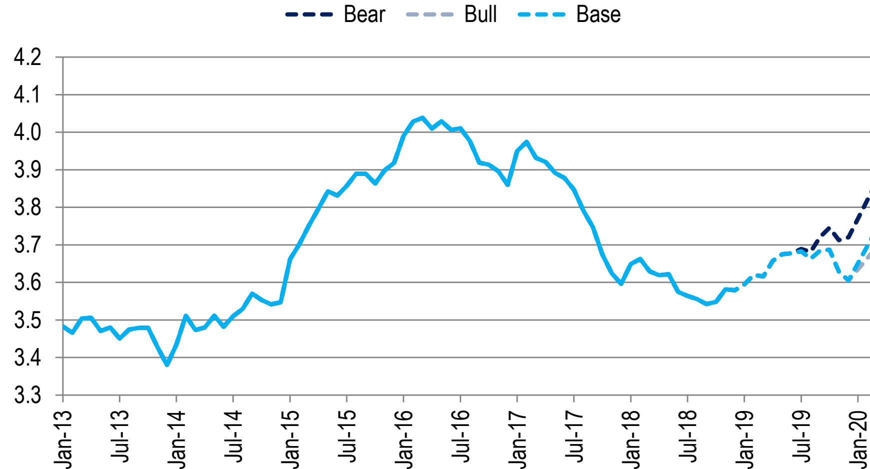
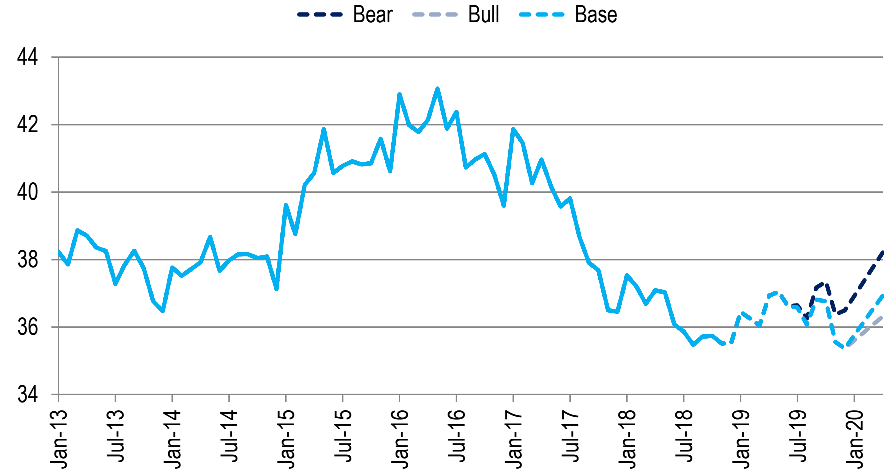
# Will OPEC+ hold cuts to end-2019, or end cuts in mid-2019?

## Global observable oil inventory trajectories*
(bn bbls, 2013-20E)




## Global observable oil inventory trajectories in days of cover*
(days of demand cover, 2013-20E)




- **Case 1 (55% probability) – OPEC holds output cuts to the end of 2019.** In Dec'18, OPEC+ agreed to cut a nominal 1.2-m b/d; we show our estimates for individual OPEC+ country production in balance tables later. In this scenario, inventories would not build much in 2019 in days of demand cover, though they should build in absolute barrel terms, which could surprise the market at times to the downside for prices in 1H'19 (as also happened in 1H'17). 4Q'19 could be tight though, as inventories could dip to new lows on a days of cover basis (see above right). This should only be momentary though; ending cuts and bringing back supply in 2020 drives strong stock builds, which could keep a lid on deferred prices, and might keep 4Q'19 prices weak too, preempting that. Meanwhile, the US shale production trajectory is already mostly locked in through 3Q'19 even at a lower WTI outlook than before, and additional price support through that time would incentivize higher rates of shale production growth through 2020.
- **Case 2 (30% probability) – Ongoing monthly OPEC+ meetings to assess the market may mean course corrections by 2Q'19, with 2H'19 seeing a gradual return of supply to market.** An early end to production cuts should depress 2H'19 prices as inventories begin to build, but should make for a more stable period after 2020. Starting in mid-2019, OPEC+ decides to gradually return supply to market in the fight for market share, keeping global inventories flat(-ish) in days of cover. 2020 could see stock builds, but OPEC+ would also be capturing more market share as US and other non-OPEC producers see their production growth curbed by weaker prices.
- **Case 3 (15% probability) – What if OPEC+ holds production cuts through to end-2020?** Brent could stay in the high $60s through to end-2020, given low inventories in days of cover, but 2021 onwards would see increasing downside risks. Deferred oil forward prices could be stronger given lower inventories for longer, but this could reverse as faster non-OPEC supply growth in 2020 and onwards creates the next OPEC+ crisis.

Source: Citi Research estimates    * Showing inventory trajectories if OPEC+ ends production in June 2019, end-2019, or end-2020



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# Case 1: OPEC+ production cuts persist through to end-2019

| | 1Q18 | 2Q18 | 3Q18 | 4Q18 | 1Q19 | 2Q19 | 3Q19 | 4Q19 | 2018 | 2019 | 2020 | 17' | 18' | 19' | 20' |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **OECD Demand** | **47.83** | **47.16** | **48.06** | **48.49** | **47.95** | **47.24** | **48.10** | **48.52** | **47.88** | **47.95** | **47.79** | **0.44** | **0.47** | **0.07** | **-0.17** |
| **Non-OECD Demand** | **50.37** | **51.12** | **51.48** | **51.73** | **51.57** | **52.32** | **52.62** | **52.82** | **51.17** | **52.33** | **54.11** | **1.28** | **1.15** | **1.16** | **1.78** |
| **Total Demand** | **98.20** | **98.28** | **99.54** | **100.22** | **99.52** | **99.56** | **100.73** | **101.34** | **99.06** | **100.29** | **101.90** | **1.72** | **1.62** | **1.23** | **1.61** |

| Supply | 1Q18 | 2Q18 | 3Q18 | 4Q18 | 1Q19 | 2Q19 | 3Q19 | 4Q19 | 2018 | 2019 | 2020 | 17' | 18' | 19' | 20' |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| US | 10.23 | 10.54 | 11.25 | 11.78 | 12.26 | 12.56 | 12.57 | 12.72 | 10.95 | 12.53 | 13.53 | 0.50 | 1.60 | 1.58 | 1.00 |
| Canada | 4.23 | 4.09 | 4.07 | 4.51 | 4.30 | 4.60 | 4.61 | 4.67 | 4.23 | 4.55 | 4.80 | 0.30 | 0.26 | 0.32 | 0.25 |
| Mexico | 1.90 | 1.87 | 1.83 | 1.81 | 1.80 | 1.80 | 1.79 | 1.78 | 1.85 | 1.79 | 1.78 | -0.21 | -0.10 | -0.06 | -0.01 |
| Brazil | 2.67 | 2.68 | 2.73 | 2.85 | 2.90 | 3.05 | 3.20 | 3.35 | 2.73 | 3.13 | 3.56 | 0.11 | 0.10 | 0.39 | 0.44 |
| Russia | 10.96 | 11.00 | 11.20 | 11.43 | 11.30 | 11.20 | 11.20 | 11.20 | 11.15 | 11.23 | 11.53 | 0.02 | 0.17 | 0.08 | 0.30 |
| **Non-OPEC Crude** | **47.23** | **47.28** | **47.92** | **49.30** | **49.54** | **49.95** | **50.13** | **50.61** | **47.93** | **50.06** | **52.14** | **0.37** | **1.87** | **2.12** | **2.08** |
| EX-US Non-OPEC NGLs | 3.05 | 2.90 | 2.99 | 3.03 | 3.05 | 2.92 | 2.99 | 3.02 | 2.99 | 2.99 | 3.01 | 0.05 | 0.04 | 0.00 | 0.02 |
| US NGLs | 4.01 | 4.30 | 4.60 | 4.61 | 4.52 | 4.71 | 4.85 | 4.92 | 4.38 | 4.75 | 5.15 | 0.27 | 0.60 | 0.37 | 0.40 |
| **Non-OPEC Crude + NGLS** | **54.29** | **54.48** | **55.51** | **56.94** | **57.10** | **57.58** | **57.97** | **58.54** | **55.31** | **57.80** | **60.30** | **0.69** | **2.50** | **2.49** | **2.50** |
| Iraq | 4.44 | 4.44 | 4.71 | 4.70 | 4.65 | 4.65 | 4.70 | 4.70 | 4.57 | 4.68 | 4.81 | 0.12 | 0.02 | 0.10 | 0.14 |
| Iran | 3.68 | 4.10 | 3.53 | 2.96 | 2.75 | 2.70 | 2.50 | 2.50 | 3.57 | 2.61 | 2.80 | 0.22 | -0.22 | -0.95 | 0.19 |
| Kuwait | 2.70 | 2.71 | 2.79 | 2.79 | 2.75 | 2.75 | 2.75 | 2.75 | 2.75 | 2.75 | 3.10 | -0.18 | 0.04 | 0.00 | 0.35 |
| Libya | 1.01 | 0.89 | 0.90 | 1.04 | 0.95 | 0.95 | 0.95 | 0.95 | 0.96 | 0.95 | 0.90 | 0.44 | 0.14 | -0.01 | -0.05 |
| Nigeria | 1.66 | 1.51 | 1.62 | 1.64 | 1.65 | 1.65 | 1.65 | 1.65 | 1.61 | 1.65 | 1.70 | 0.06 | 0.08 | 0.04 | 0.05 |
| Saudi | 9.94 | 10.13 | 10.35 | 10.77 | 10.20 | 10.20 | 10.20 | 10.20 | 10.30 | 10.20 | 10.00 | -0.47 | 0.34 | -0.10 | -0.20 |
| U.A.E | 2.84 | 2.88 | 3.00 | 3.21 | 3.05 | 3.05 | 3.05 | 3.05 | 2.98 | 3.05 | 3.20 | -0.12 | 0.05 | 0.07 | 0.15 |
| Venezuela | 1.57 | 1.52 | 1.45 | 1.23 | 1.06 | 0.97 | 0.88 | 0.79 | 1.44 | 0.93 | 0.57 | -0.30 | -0.64 | -0.52 | -0.36 |
| **OPEC Crude** | **32.16** | **32.46** | **32.65** | **32.69** | **31.46** | **31.30** | **31.04** | **30.94** | **32.49** | **31.18** | **31.38** | **-0.41** | **-0.29** | **-1.31** | **0.20** |
| **OPEC Condensate & NGLs** | **6.69** | **6.68** | **6.71** | **6.73** | **6.76** | **6.76** | **6.76** | **6.76** | **6.70** | **6.76** | **6.89** | **0.13** | **0.05** | **0.06** | **0.13** |
| Unconventional Inc Biofuels | 2.87 | 3.60 | 3.86 | 3.22 | 3.00 | 3.65 | 3.90 | 3.43 | 3.39 | 3.49 | 3.64 | 0.05 | 0.23 | 0.10 | 0.15 |
| Processing Gains | 2.03 | 2.04 | 2.08 | 2.08 | 2.03 | 2.04 | 2.08 | 2.08 | 2.06 | 2.06 | 2.06 | 0.04 | 0.02 | 0.00 | 0.00 |
| **Total Supply** | **98.05** | **99.26** | **100.82** | **101.66** | **100.35** | **101.34** | **101.76** | **101.75** | **99.95** | **101.30** | **104.28** | **0.50** | **2.51** | **1.35** | **2.98** |
| Stockbuilds for SPR, infrastructure | -0.71 | -0.65 | -0.45 | -0.87 | -0.99 | -0.71 | -0.43 | -0.77 | -0.67 | -0.72 | -0.77 | - | - | - | - |
| Error Term/Seasonality Adjustment | 1.23 | -0.95 | -1.19 | -0.17 | 0.55 | -0.42 | -0.41 | -0.45 | -0.27 | -0.18 | -0.18 | - | - | - | - |
| **Expected Total Stock Change** | **0.37** | **-0.61** | **-0.36** | **0.40** | **0.39** | **0.65** | **0.20** | **-0.82** | **-0.05** | **0.11** | **1.43** | **-** | **-** | **-** | **-** |

| | 1Q18 | 2Q18 | 3Q18 | 4Q18 | 1Q19 | 2Q19 | 3Q19 | 4Q19 | 2018 | 2019 | 2020 | 17' | 18' | 19' | 20' |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Call on US Crude | 9.87 | 11.15 | 11.60 | 11.38 | 11.87 | 11.91 | 12.37 | 13.53 | 11.00 | 12.42 | 12.10 | - | - | - | - |
| Call on OPEC crude | 31.79 | 33.07 | 33.01 | 32.28 | 31.07 | 30.65 | 30.84 | 31.75 | 32.54 | 31.08 | 29.95 | - | - | - | - |

| | 1Q18 | 2Q18 | 3Q18 | 4Q18 | 1Q19 | 2Q19 | 3Q19 | 4Q19 | 2018 | 2019 | 2020 | 17' | 18' | 19' | 20' |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Crude Supply | 79.39 | 79.74 | 80.57 | 81.98 | 81.00 | 81.25 | 81.17 | 81.55 | 80.42 | 81.24 | 83.52 | -0.04 | 1.58 | 0.82 | 2.28 |
| Crude Runs | 81.43 | 81.77 | 84.07 | 83.56 | 82.73 | 83.07 | 85.07 | 84.56 | 82.71 | 83.86 | - | 1.42 | 0.95 | 1.15 | - |

Source: Bloomberg, Citi Research estimates



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# Case 2: In a battle for market share, OPEC+ ends cuts for 2H'19

| | 1Q18 | 2Q18 | 3Q18 | 4Q18 | 1Q19 | 2Q19 | 3Q19 | 4Q19 | 2018 | 2019 | 2020 | 17' | 18' | 19' | 20' |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **OECD Demand** | **47.83** | **47.16** | **48.06** | **48.49** | **47.95** | **47.24** | **48.10** | **48.52** | **47.88** | **47.95** | **47.79** | **0.44** | **0.47** | **0.07** | **-0.17** |
| **Non-OECD Demand** | **50.37** | **51.12** | **51.48** | **51.73** | **51.57** | **52.32** | **52.62** | **52.82** | **51.17** | **52.33** | **54.11** | **1.28** | **1.15** | **1.16** | **1.78** |
| **Total Demand** | **98.20** | **98.28** | **99.54** | **100.22** | **99.52** | **99.56** | **100.73** | **101.34** | **99.06** | **100.29** | **101.90** | **1.72** | **1.62** | **1.23** | **1.61** |

| **Supply** | 1Q18 | 2Q18 | 3Q18 | 4Q18 | 1Q19 | 2Q19 | 3Q19 | 4Q19 | 2018 | 2019 | 2020 | 17' | 18' | 19' | 20' |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| US | 10.23 | 10.54 | 11.25 | 11.78 | 12.26 | 12.56 | 12.57 | 12.72 | 10.95 | 12.53 | 13.13 | 0.50 | 1.60 | 1.58 | 0.60 |
| Canada | 4.23 | 4.09 | 4.07 | 4.51 | 4.30 | 4.60 | 4.61 | 4.67 | 4.23 | 4.55 | 4.80 | 0.30 | 0.26 | 0.32 | 0.25 |
| Mexico | 1.90 | 1.87 | 1.83 | 1.81 | 1.80 | 1.80 | 1.79 | 1.78 | 1.85 | 1.79 | 1.78 | -0.21 | -0.10 | -0.06 | -0.01 |
| Brazil | 2.67 | 2.68 | 2.73 | 2.85 | 2.90 | 3.05 | 3.20 | 3.35 | 2.73 | 3.13 | 3.56 | 0.11 | 0.10 | 0.39 | 0.44 |
| Russia | 10.96 | 11.00 | 11.20 | 11.43 | 11.30 | 11.20 | 11.35 | 11.50 | 11.15 | 11.34 | 11.81 | 0.02 | 0.17 | 0.19 | 0.47 |
| **Non-OPEC Crude** | **47.23** | **47.28** | **47.92** | **49.30** | **49.54** | **49.95** | **50.28** | **50.91** | **47.93** | **50.17** | **52.02** | **0.37** | **1.87** | **2.24** | **1.85** |
| EX-US Non-OPEC NGLs | 3.05 | 2.90 | 2.99 | 3.03 | 3.05 | 2.92 | 2.99 | 3.02 | 2.99 | 2.99 | 3.01 | 0.05 | 0.04 | 0.00 | 0.02 |
| US NGLs | 4.01 | 4.30 | 4.60 | 4.61 | 4.52 | 4.71 | 4.85 | 4.92 | 4.38 | 4.75 | 5.15 | 0.27 | 0.60 | 0.37 | 0.40 |
| **Non-OPEC Crude + NGLS** | **54.29** | **54.48** | **55.51** | **56.94** | **57.10** | **57.58** | **58.12** | **58.84** | **55.31** | **57.91** | **60.18** | **0.69** | **2.50** | **2.61** | **2.27** |
| Iraq | 4.44 | 4.44 | 4.71 | 4.69 | 4.65 | 4.65 | 4.70 | 4.70 | 4.57 | 4.68 | 4.81 | 0.12 | 0.02 | 0.10 | 0.14 |
| Iran | 3.68 | 4.10 | 3.53 | 2.96 | 2.75 | 2.70 | 2.50 | 2.50 | 3.57 | 2.61 | 2.80 | 0.22 | -0.22 | -0.95 | 0.19 |
| Kuwait | 2.70 | 2.71 | 2.79 | 2.79 | 2.75 | 2.75 | 2.90 | 3.10 | 2.75 | 2.88 | 3.20 | -0.18 | 0.04 | 0.13 | 0.33 |
| Libya | 1.01 | 0.89 | 0.90 | 1.04 | 0.95 | 0.95 | 0.95 | 0.95 | 0.96 | 0.95 | 0.90 | 0.44 | 0.14 | -0.01 | -0.05 |
| Nigeria | 1.66 | 1.51 | 1.62 | 1.64 | 1.65 | 1.65 | 1.65 | 1.65 | 1.61 | 1.65 | 1.70 | 0.06 | 0.08 | 0.04 | 0.05 |
| Saudi | 9.94 | 10.13 | 10.35 | 10.77 | 10.20 | 10.20 | 10.20 | 10.20 | 10.30 | 10.20 | 10.00 | -0.47 | 0.34 | -0.10 | -0.20 |
| U.A.E | 2.84 | 2.88 | 3.00 | 3.21 | 3.05 | 3.05 | 3.15 | 3.25 | 2.98 | 3.13 | 3.35 | -0.12 | 0.05 | 0.14 | 0.23 |
| Venezuela | 1.57 | 1.52 | 1.45 | 1.23 | 1.06 | 0.97 | 0.88 | 0.79 | 1.44 | 0.93 | 0.57 | -0.30 | -0.64 | -0.52 | -0.36 |
| **OPEC Crude** | **32.16** | **32.46** | **32.65** | **32.68** | **31.46** | **31.30** | **31.29** | **31.49** | **32.49** | **31.38** | **31.63** | **-0.41** | **-0.29** | **-1.10** | **0.25** |
| **OPEC Condensate & NGLs** | **6.69** | **6.68** | **6.71** | **6.73** | **6.76** | **6.76** | **6.76** | **6.76** | **6.70** | **6.76** | **6.89** | **0.13** | **0.05** | **0.06** | **0.13** |
| Unconventional Inc Biofuels | 2.87 | 3.60 | 3.86 | 3.22 | 3.00 | 3.65 | 3.90 | 3.43 | 3.39 | 3.49 | 3.64 | 0.05 | 0.23 | 0.10 | 0.15 |
| Processing Gains | 2.03 | 2.04 | 2.08 | 2.08 | 2.03 | 2.04 | 2.08 | 2.08 | 2.06 | 2.06 | 2.06 | 0.04 | 0.02 | 0.00 | 0.00 |
| **Total Supply** | **98.05** | **99.26** | **100.82** | **101.65** | **100.35** | **101.34** | **102.16** | **102.60** | **99.95** | **101.61** | **104.41** | **0.50** | **2.51** | **1.67** | **2.79** |
| Stockbuilds for SPR, infrastructure | -0.71 | -0.65 | -0.45 | -0.87 | -0.99 | -0.71 | -0.43 | -0.77 | -0.67 | -0.72 | -0.77 | - | - | - | - |
| Error Term/Seasonality Adjustment | 1.23 | -0.95 | -1.19 | -0.17 | 0.55 | -0.42 | -0.41 | -0.45 | -0.27 | -0.18 | -0.18 | - | - | - | - |
| **Expected Total Stock Change** | **0.37** | **-0.61** | **-0.36** | **0.40** | **0.39** | **0.65** | **0.60** | **0.04** | **-0.05** | **0.42** | **1.56** | **-** | **-** | **-** | **-** |

| | 1Q18 | 2Q18 | 3Q18 | 4Q18 | 1Q19 | 2Q19 | 3Q19 | 4Q19 | 2018 | 2019 | 2020 | 17' | 18' | 19' | 20' |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Call on US Crude | 9.87 | 11.15 | 11.60 | 11.38 | 11.87 | 11.91 | 11.97 | 12.68 | 11.00 | 12.11 | 11.57 | - | - | - | - |
| Call on OPEC crude | 31.79 | 33.07 | 33.01 | 32.28 | 31.06 | 30.65 | 30.69 | 31.45 | 32.54 | 30.97 | 30.07 | - | - | - | - |

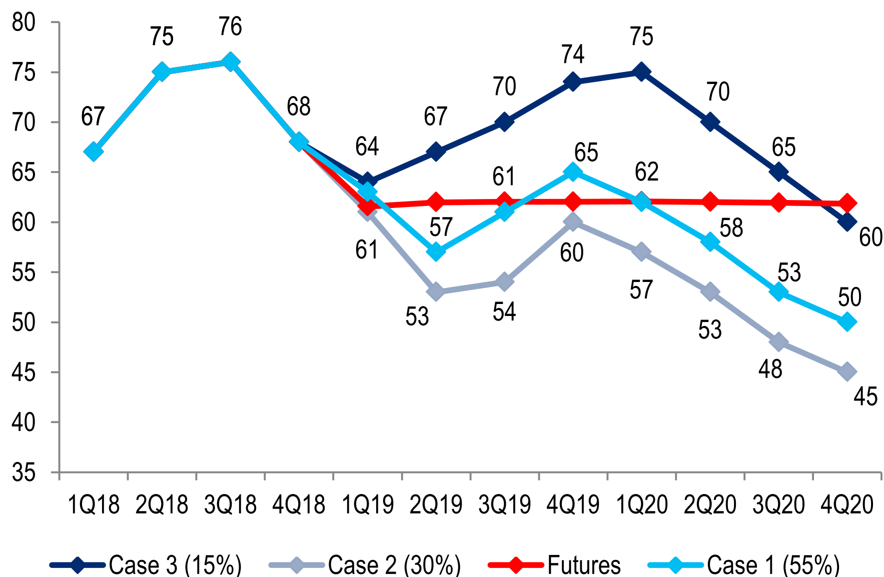
| | 1Q18 | 2Q18 | 3Q18 | 4Q18 | 1Q19 | 2Q19 | 3Q19 | 4Q19 | 2018 | 2019 | 2020 | 17' | 18' | 19' | 20' |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Crude Supply | 79.39 | 79.74 | 80.57 | 81.98 | 81.00 | 81.25 | 81.57 | 82.40 | 80.42 | 81.55 | 83.65 | -0.04 | 1.58 | 1.13 | 2.10 |
| Crude Runs | 81.43 | 81.77 | 84.07 | 83.56 | 82.73 | 83.07 | 85.07 | 84.56 | 82.71 | 83.86 | - | 1.42 | 0.95 | 1.15 | - |

Source: Bloomberg, Citi Research estimates

# OPEC+ efforts at stabilization could make for a volatile 2019

## Citi's Brent price scenarios

($/bbl, 1Q'18-4Q'20E)




- **Saudi and OPEC+ efforts to "stabilize" oil prices may actually be adding more volatility to markets.** Decisions to cut output or return it to market create swings in near-term stock trajectory expectations, and thus flat price and timespreads…
- **And these policy decisions are being driven by volatile geopolitics, not steady-handed "central bank" style governing, given OPEC+ claims not to be targeting prices.** This is seen in US tweets calling for lower oil prices, shifting US implementation of sanctions on Iran, the possibility of US bipartisan Congressional pressure on Saudi Arabia, and the potential waning interest of Russia in holding production cuts even as their output capacity keeps growing.
- **Meanwhile, US shale producers respond to OPEC+ decisions on a 6-18 month basis,** growing faster if OPEC+ cuts, or growing more slowly or even declining if OPEC+ returns supply to market. Combined with the momentum of US supply growth, capex and hedging decisions, this adds further uncertainty for the oil market to manage. Absent OPEC+ output decisions, we think the global oil markets would be roughly balanced over the next five years at $45-60 Brent.
- **The range of price volatility can move widely around quarterly averages, given all of the above factors,** to which can be added macro risk-on and risk-off dynamics, such as around economic growth scenarios, US-China trade negotiations, etc.

## Citi's January 2019 price deck

(Quarterly averages in $/bbl, 1Q'18-2023E)

| ($/bbl) | 1Q18 | 2Q18 | 3Q18 | 4Q18E | 1Q19E | 2Q19E | 3Q19E | 4Q19E | 1Q20E | 2Q20E | 3Q20E | 4Q20E | 2018E | 2019E | 2020E | 2021E | 2022E | 2023E |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Brent** | 67 | 75 | 76 | 68 | 63 | 57 | 61 | 65 | 62 | 58 | 53 | 50 | **72** | **62** | **56** | **50** | **60** | **65** |
| **WTI** | 63 | 68 | 69 | 58 | 52 | 45 | 52 | 60 | 57 | 53 | 48 | 45 | **64** | **52** | **51** | **45** | **55** | **60** |
| **Brent-WTI** | 4 | 7 | 7 | 10 | 11 | 12 | 9 | 5 | 5 | 5 | 5 | 5 | **7** | **9** | **5** | **5** | **5** | **5** |

| Brent Scenarios ($/bbl) | 1Q18 | 2Q18 | 3Q18 | 4Q18 | 1Q19 | 2Q19 | 3Q19 | 4Q19 | 1Q20 | 2Q20 | 3Q20 | 4Q20 | 2018E | 2019E | 2020E | 2021E | 2022E | 2023E |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Case 3 (15%)** | | | | 68 | 64 | 67 | 70 | 74 | 75 | 70 | 65 | 60 | **72** | **69** | **68** | **60** | **65** | **70** |
| **Case 1 (55%)** | 67 | 75 | 76 | 68 | 63 | 57 | 61 | 65 | 62 | 58 | 53 | 50 | **72** | **62** | **56** | **50** | **60** | **65** |
| **Case 2 (30%)** | | | | 68 | 61 | 53 | 54 | 60 | 57 | 53 | 48 | 45 | **72** | **57** | **51** | **45** | **55** | **60** |
| **Futures** | | | | 68 | 62 | 62 | 62 | 62 | 62 | 62 | 62 | 62 | **72** | **62** | **62** | **61** | **62** | **63** |

Source: Bloomberg, Citi Research estimates



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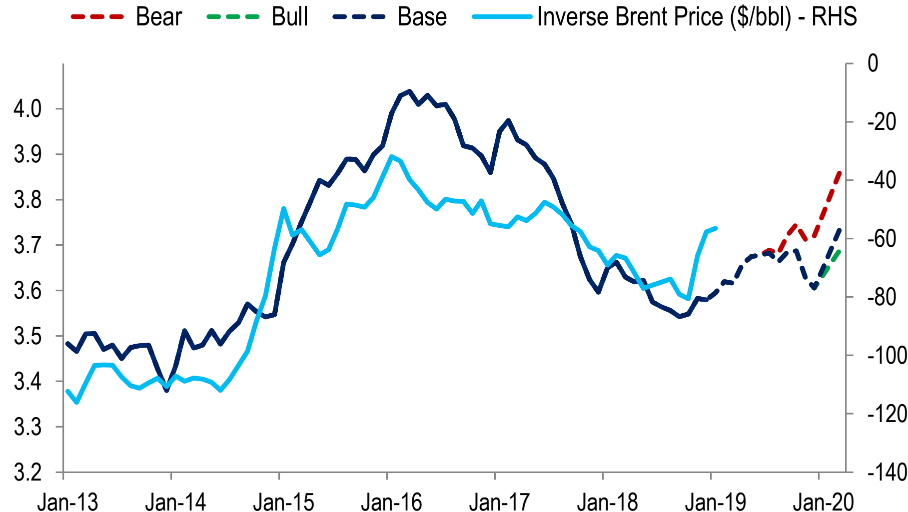
# Triangulating inventory trajectories and Brent oil prices

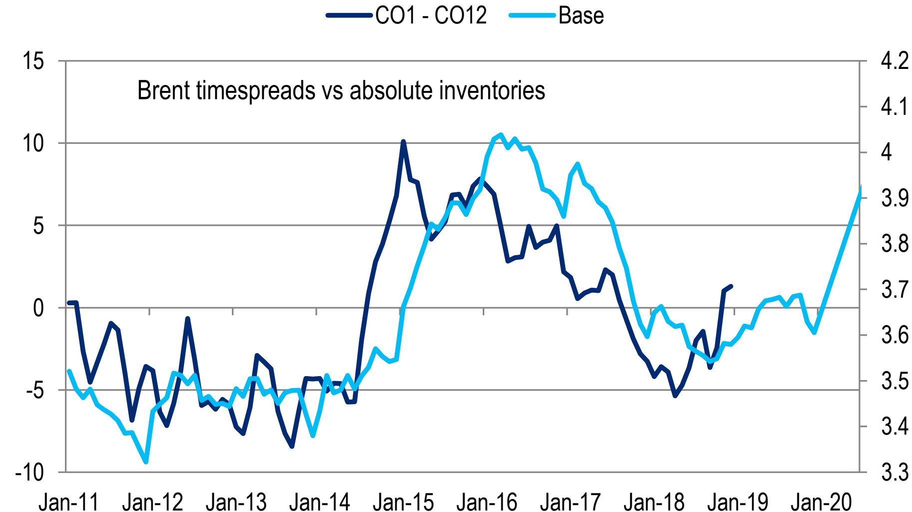
## Global observable oil inventory trajectories vs inverse Brent price

(LHS: bn bbls; RHS: $/bbl, 2013-20E)




## Global observable oil inventories vs. Brent timespreads

(LHS: differential, $/bbl; RHS: bn bbls, 2013-20E)




- **Our base scenario sees inventory builds in 1H'19 and draws in 2H'19, perhaps to fresh lows in days of demand cover by end 2019, though supply looks set to firmly outpace demand in 2020. Thus, end-2019 could see a price spike given low inventories, uncertainty on OPEC+ decision marking, and IMO 2020's boost to demand for light, sweet crude ahead of bunker fuel sulfur regs.**
- **Absolute inventories vs Brent flat price suggests potentially higher prices could come at the end of 2019**, but recent divergence of prices from inventory levels suggests something else is going on. Perhaps the market anticipates larger builds in 2019 than projected here. Or recent sell-offs could be preempting 2020 builds, which look likely even if OPEC+ holds cuts to end-2020. Meanwhile recent rallies based on broad risk-on market sentiment on less negative macroeconomic news look to have pushed Brent prices around too.
- **In all scenarios, the short-term price responsiveness of US shale production should generate an opposite force to OPEC+ cuts—faster supply growth to replenish inventories—which would drive a reversion to the medium-term equilibrium price, which we see in the $45-60 range even out to 2023 (discussed later).** Basically, higher prices in 2019 due to OPEC+ cuts drives faster US production growth in 2020, offsetting the cuts; lower prices in 2019 drive slower US growth in 2020, ceding more market share to OPEC+.
- **Saudi pledges to keep oil markets in balance—by not letting oil stockpiles exceed normal levels—could be misguided.** Their earlier targeting of five-year moving average OECD oil inventories had numerous problems, including the omission of crucial non-OECD inventories, and the numerical problem that the five-year moving average over-weights recent years. Further, inventories should be better considered as days of demand cover, which means a "normal" absolute level of inventories would grow over time to accommodate, say, 39 days of cover. This is 3.90 billion barrels at 100-m b/d of global oil demand, but 3.94 for 101-m b/d, etc. There would also need to be recognition that trying to keep inventories stable at a higher price than would clear the market means them accepting loss of market share.

Source: Bloomberg, Citi Research estimates



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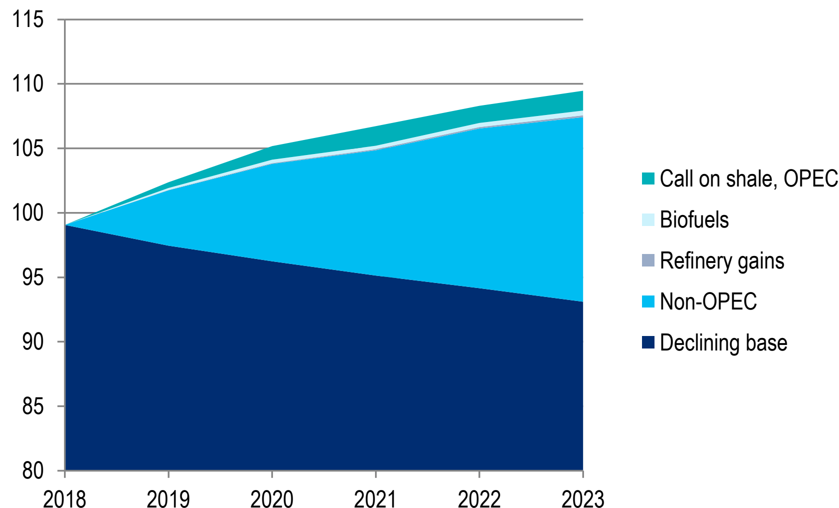
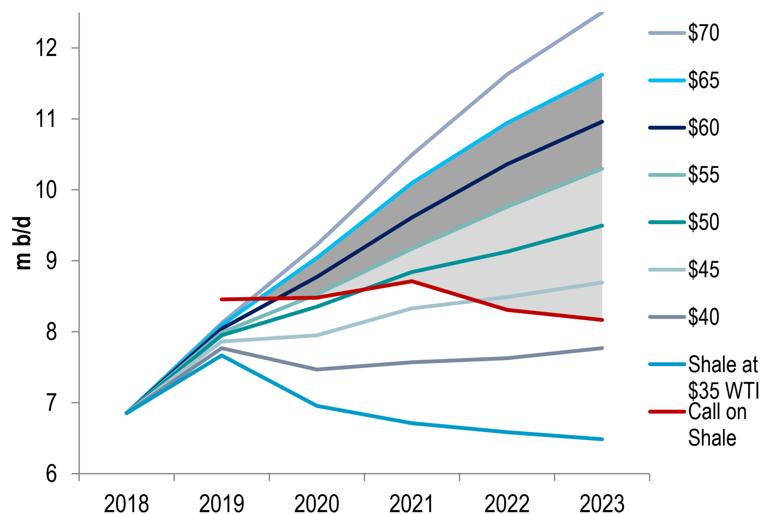
# The debate remains over whether a supply gap is emerging

Visual representation of oil "supply gap", showing limited room for OPEC+ and shale (m b/d, 2018-23E)




Call on shale base scenario* vs. US shale production at various WTI price levels (m b/d)




- **Saudi Arabia, and the IEA too, see the emergence of a "supply gap" in the next few years,** where upstream underinvestment since the 2014 oil price crash leads to a supply crunch as decline rates worsen, not able to keep up with demand growth. However, discussion of the "supply gap" are rarely accompanied by an assessment of what oil price would be needed to balance markets.
- **Citi does not see an insurmountable supply gap emerging in the medium term (next five years), at $45-60 prices.** Given weak demand growth, moderate decline rates, and a strong pipeline of projects, there looks to be limited space for both OPEC+ and shale growth. In recent years, demand growth has faltered and could cool further as global GDP growth faces downside risks, decline rates are moderating, and discoveries and developments are ramping up, with offshore projects coming in at half the cost and half the time to first oil.
- **In our view, $45-60 range covers many of the central scenarios for the oil market in the medium-term.** Considering the "call on shale" as the supply required in order to target 39 days of global demand cover, this points to an implied incentive price of $40-45/bbl WTI on the lower end, for a smooth sailing scenario without additional global supply disruptions. On the higher end, additional supply disruptions in the world could imply an incentive price of $55-60/bbl WTI to call on enough shale supply to balance a tighter market.
- **If Saudi Arabia were to target a $60-70/bbl price range, this could require 0.5-1.0-m b/d of lost market share per year over this period** as US supply ticks inexorably upwards to fill in the gaps. In terms of the net impact to revenues, this could make sense for a year or two but not thereafter; Saudi market share would be dropping by 5-10% per year, and more over time as the base falls over time. Spreading the burden of cuts across OPEC+ members could be more palatable…except to those producers with ambitious plans for growing production, not reducing volumes over time. And ending cuts and adding supply back to the market should yield a lower price than would otherwise prevail, eroding the earlier benefits of higher prices.

Source: Citi Research estimates * With no major additional supply disruption scenarios, with return of OPEC+ production cuts in 2020-21



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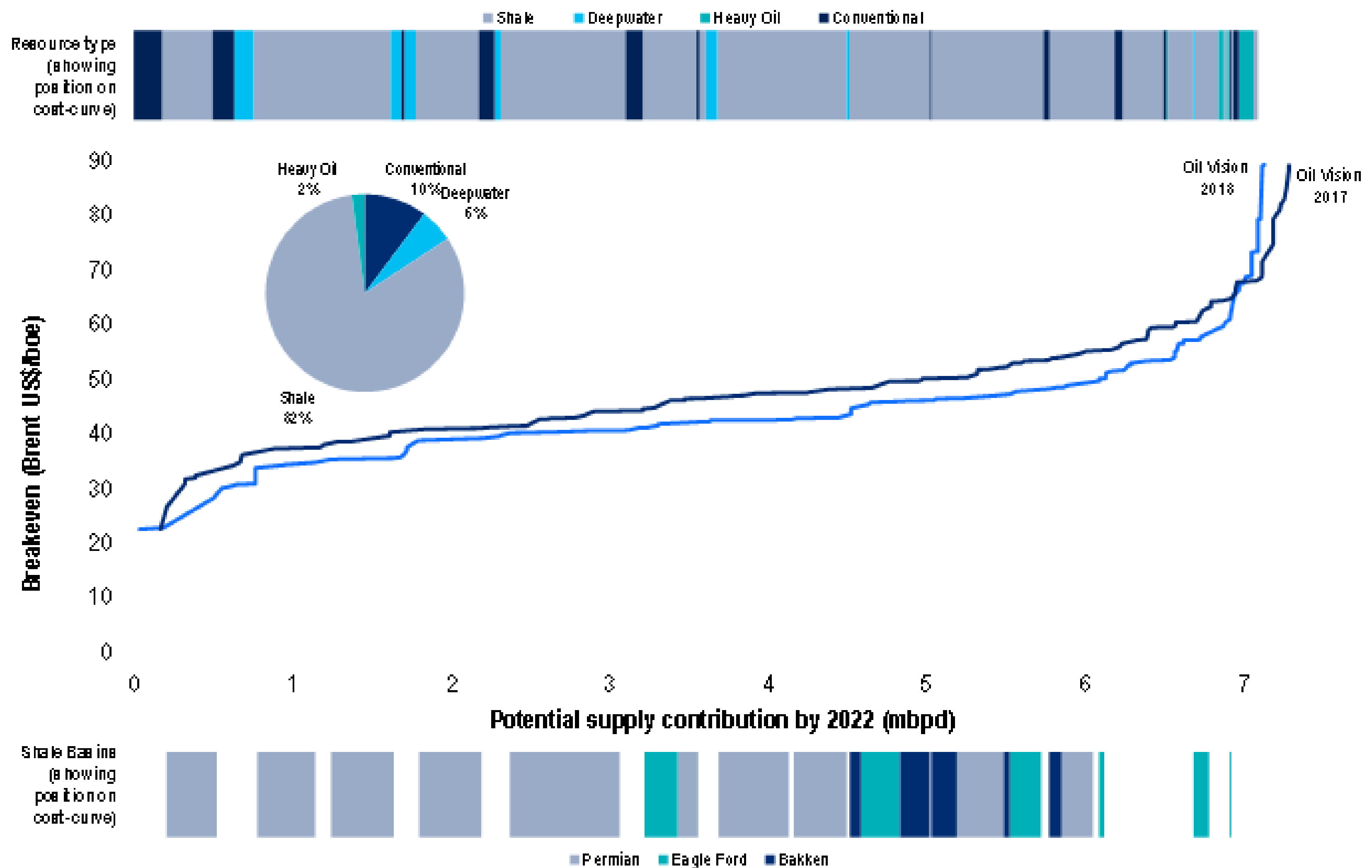
# Non-OPEC projects are coming in faster and cheaper




Source: Citi Equity Research's Oil Vision database, Citi Research



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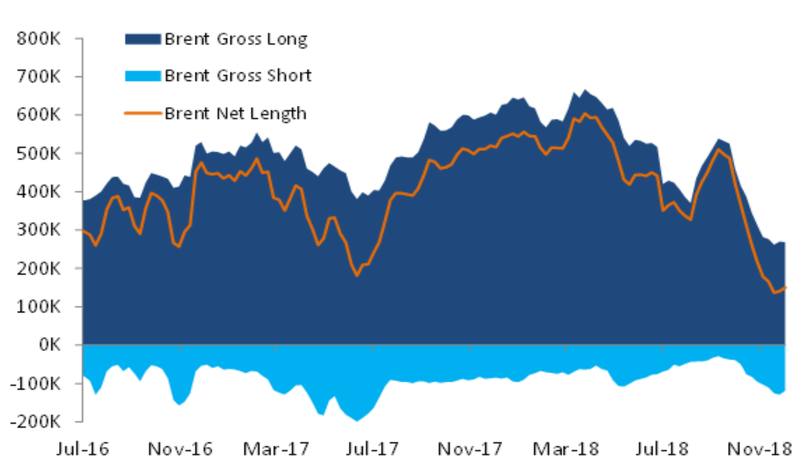
# Market positioning has normalized after 2018's dramatic sell-off

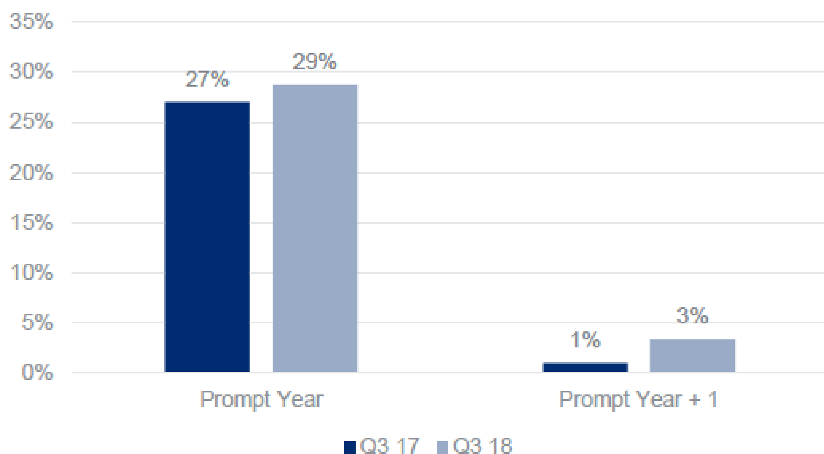
Investor positioning in oil is largely neutral. The gross long/short ratio rebounded off 18-month lows, though there is still room for more gross shorts. Meanwhile, North American producers have added to their hedges for 2019.

## ICE Brent Managed Money Positioning

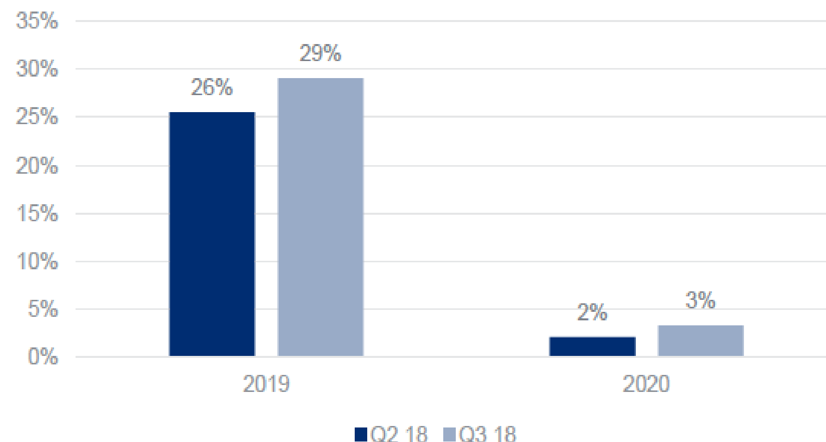



## ICE Brent Gross Long/Short Ratio

## Y/Y Change in Oil Hedge %




## Q/Q Change in Oil Hedge %




Source: BNEF, Citi Commodities Trading, Citi Research



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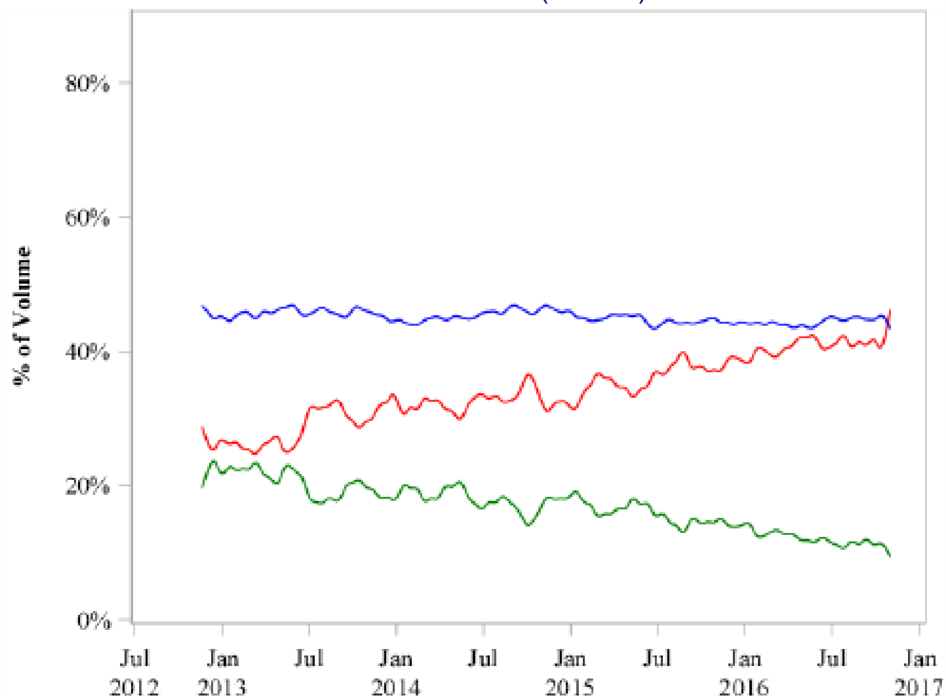
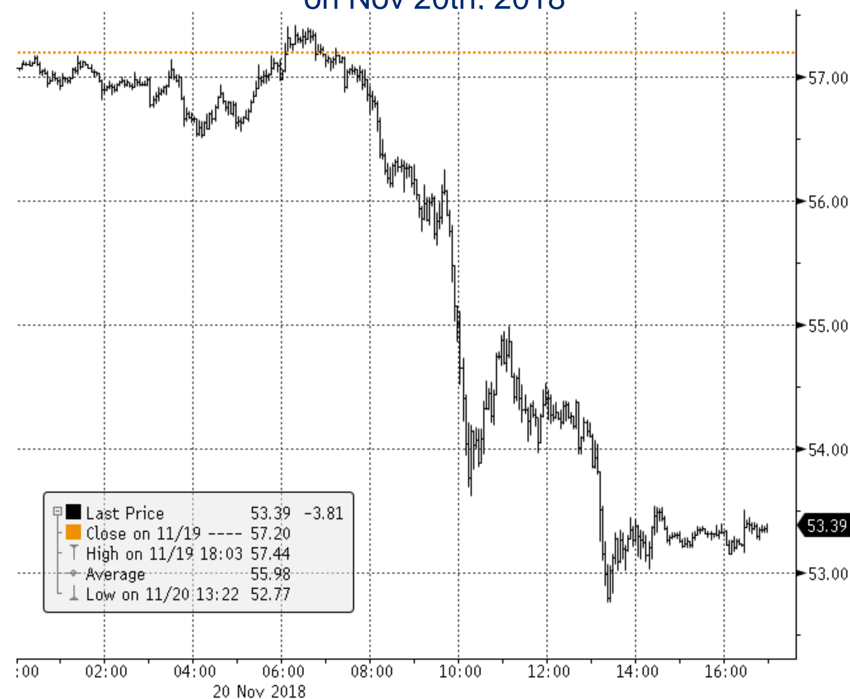
# Automated trading & systematic strategies add to price volatility

A CFTC paper shows that as of end-2016, orders originated by automated trading systems (ATS) accounted for almost 90% of the total transactions on crude oil futures, and it is more prevalent in outright directional trades than in spreading. This development has sped up oil transactions significantly, and, combined with the broad adoption of technical signals by CTA and other systematic strategies, can drive large price moves within a short period of time. Case in point—on Nov. 20th 2018, WTI's front contract lost nearly 6% of its value in two hours as concerns over a supply glut coincided with bearish macro sentiment to push WTI beneath its short-term 50-period moving average, a signal used by many trend followers that exacerbated the sell-off.

Daily volume percentage for ATS-ATS (Red), ATS-MAN (Blue), and MAN-MAN (Green)*




WTI Jan'19 contract intraday price chart on Nov 20th. 2018




Source: Bloomberg, CFTC, Citi Research *ATS: Automated system; MAN: manual



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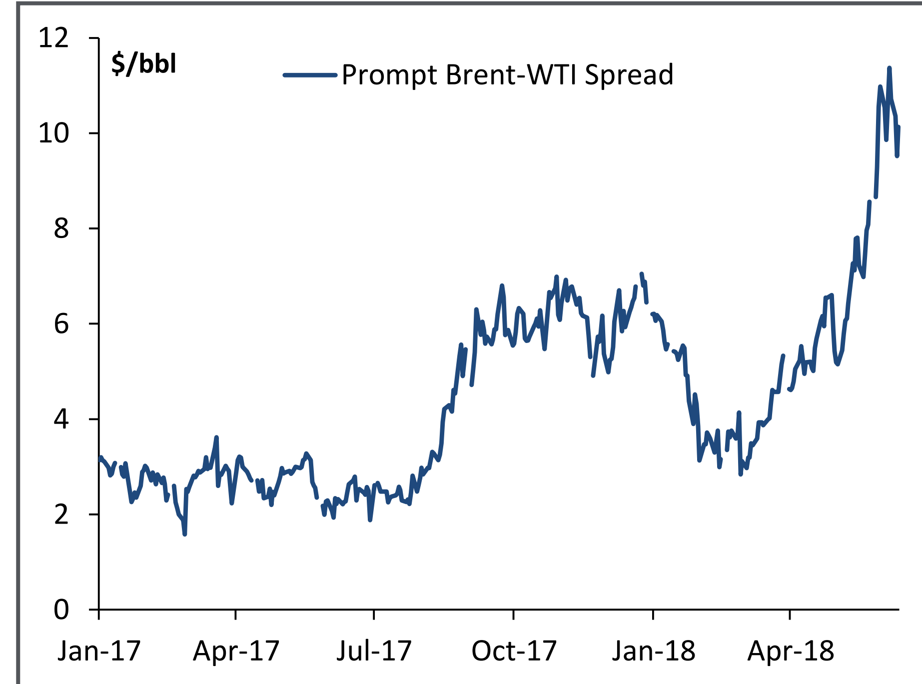
# In the “machine era”, volatility begets volatility

While some systematic strategies incorporate fundamental data such as high-frequency storage statistics, a large proportion of the algorithmic trading community tends to be mostly dependent on chart reading and machine learning that only takes into account technical indicators. Thus, we are seeing more and more often a large price move accelerate throughout a trading session. One recent example is the sharp pull-back in WTI prices in early June, which triggered a sell signal to machine traders and prompted two large trading houses to stop out of their WTI spread positions. This in turn added more downward pressure on WTI prices versus Brent, lifting the Brent-WTI spread, which was already on the rise due to infrastructure constraints in West Texas, well above reasonable expectations.

The daily candlestick chart pointed to a bearish break in WTI flat price…

…the same time as Brent-WTI prompt spread widened to above $10 in early June 2018




Source: Bloomberg, Aspen Graphics, Citi FX Technicals, Citi Research



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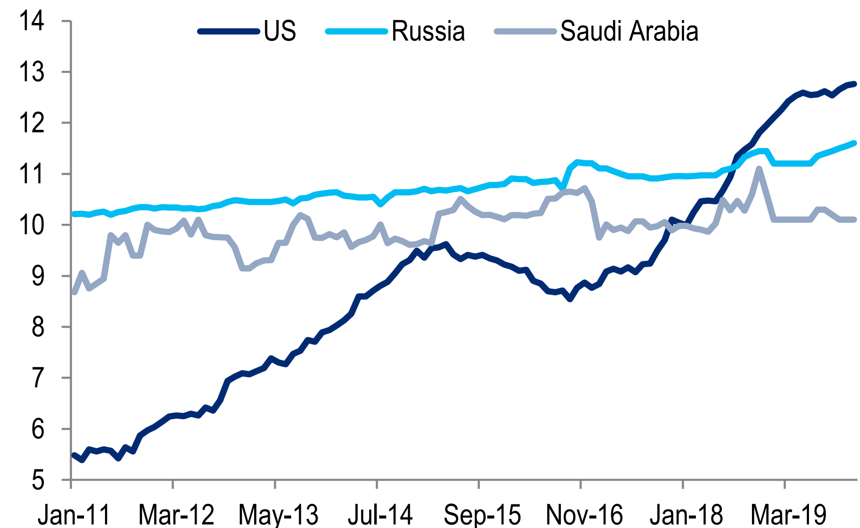
# The Disorganization of Petroleum Exporting Countries

- **The biggest three oil producers—the US, Russia, and Saudi Arabia—have their own preferred oil price targets, setting the stage for ongoing tensions.**
- **The US** White House wants low oil prices, wants OPEC+ to produce all out, and wants Iran exports to go as low as possible, hoping to put pressure on the Iranian government. Meanwhile, Congress is moving against Saudi Arabia following the Khashoggi incident with a potential NOPEC bill, cutting support for the Saudi war in Yemen.
- **Russia,** due to the rouble/tax system, fiscal situation as well as oil and gas company economics, is well insulated from USD oil prices. The Russia government budgets for $40 oil, and Putin has said that $60 oil is “fine”.
- **Saudi Arabia** has been on the back foot due to the Khashoggi affair, NOPEC bill. They may want higher oil prices ($70s, $80s) to fund government spending for their economic reform program, and see a tighter market in the medium term, but may be greatly disappointed as the price they want may not be supportable without losing significant market share.
- **Amid messaging uncertainty, it has emerged that Saudi Arabia has decided to curb exports by as much as 800-k b/d starting January 2019,** particularly looking to reduce exports to the US to impact the world’s most visible inventory indicators. But this could backfire by boosting WTI relative to Brent, offering US shale producers higher prices than they would otherwise receive.
- **While two Presidents and a Crown Prince are behind policy drivers of oil prices in the near term, they can’t push market prices far from equilibrium price levels for too long — Citi sees this in the $45-60 range in the medium term.**

## Crude oil output by the largest three producers

(m b/d, 2014-19E)




## Fiscal breakeven oil price estimates for MENA oil exporters

($/bbl, 2000-14 average vs. 2015-2019E)

| | Average 2000–2014 | 2015 | 2016 | 2017 | Projections 2018 | Projections 2019 |
|---|---|---|---|---|---|---|
| | | | Fiscal Breakeven Oil Price[2] | | | |
| **MENAP oil exporters** | | | | | | |
| Algeria | 102.1 | 106.8 | 102.5 | 86.7 | 105.7 | 84.3 |
| Bahrain | 71.2 | 118.7 | 106.9 | 116.2 | 113.0 | 110.6 |
| Iran, I.R. of | 56.8 | 43.0 | 58.4 | 67.4 | 68.1 | 71.6 |
| Iraq | 87.8 | 58.5 | 46.0 | 44.3 | 54.0 | 54.4 |
| Kuwait | 43.2 | 47.7 | 43.0 | 46.9 | 48.1 | 48.1 |
| Libya | 61.8 | 199.9 | 244.5 | 106.8 | 132.8 | 113.8 |
| Oman | 59.1 | 101.9 | 101.7 | 80.5 | 77.1 | 71.7 |
| Qatar | 43.9 | 52.4 | 52.9 | 48.3 | 47.1 | 44.5 |
| Saudi Arabia | 75.6 | 94.2 | 96.6 | 82.6 | 87.9 | 77.9 |
| United Arab Emirates | 46.5 | 64.7 | 54.4 | 62.4 | 71.5 | 64.8 |
| Yemen[1] | 179.1 | 305.0 | 364.0 | 125.0 | ... | ... |

Source: IEA, EIA, Interfax, Petro-Logistics, Bloomberg, IMF, Citi Research estimates



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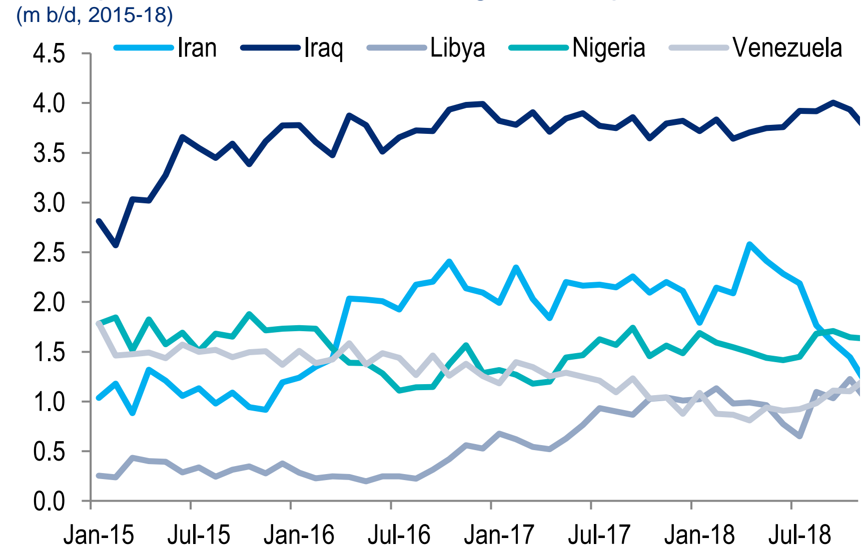
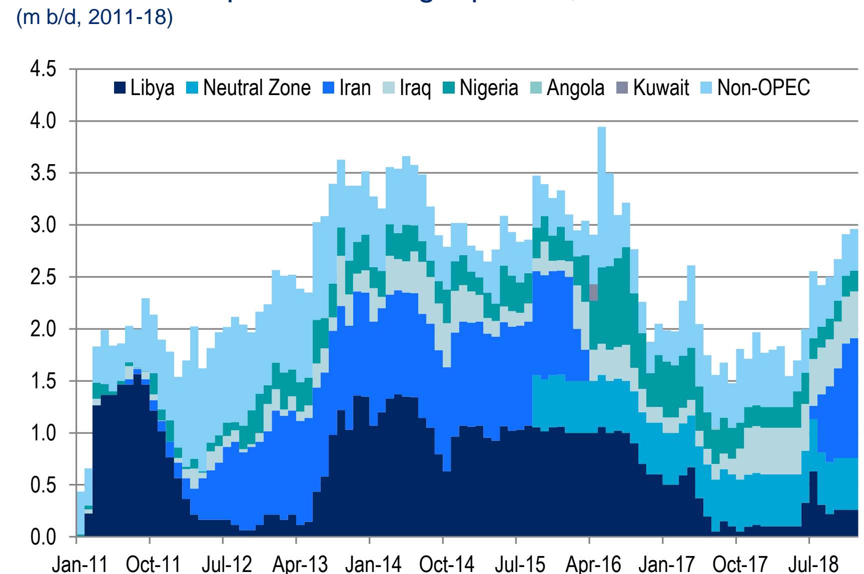
# Geopolitical risks join other wildcards for oil in 2019 and beyond

- **US-China trade / wider US-China relations** can impact oil demand growth, trade flows
- **OPEC+ and Saudi/Russia/US policy disagreements over output policy** can continue as the group monitors markets at ongoing JMMC meetings.
- **Iran sanctions waivers may turn out to be tighter** than the appearance of generous waivers touted in November, especially after any waivers offered expire by or before May 2019. The US may seek fresh negotiations that could further restrict Iranian supply.
- **Fragile Five producers**—Iraq, Iran, Libya, Nigeria, Venezuela—can yet see domestic political strife impact production and exports, although calmer periods may allow for bearish supply growth
- **Canadian oil production cuts / infrastructure constraints** can impact North American balances and continental crude price differentials next year but also over the medium term period
- **IMO 2020** impacts, waivers, policy issues, blended 0.5% bunker fuel standards, and potential White House opposition to the regulations
- **Renewable Fuel Standards** in the US and other countries' policies on ethanol blending into gasoline (particularly China)
- **Climate change impacts on weather, floods, wildfires, and policy changes** bear watching, given the urgency of recent UN FCCC and US government reports. The transformation of the transportation sector due to EVs and AVs, as well as pushback against plastics and petchems, is important for the medium- to long-term outlook for oil demand.
- **Political risks remain in other arenas,** likely with limited first order impacts for oil: North Korea, Brexit, elections around the world.

Oil exports still at risk in the "Fragile Five" producers
(m b/d, 2015-18)




Global oil disruptions due to geopolitics, state failure
(m b/d, 2011-18)




Source: Petro-Logistics, Citi Research estimates



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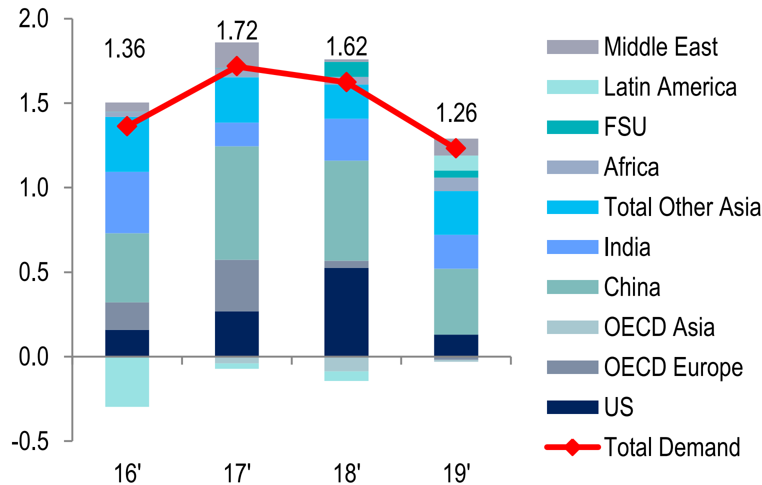
# Oil demand is on the back foot, even as IMO 2020 looms

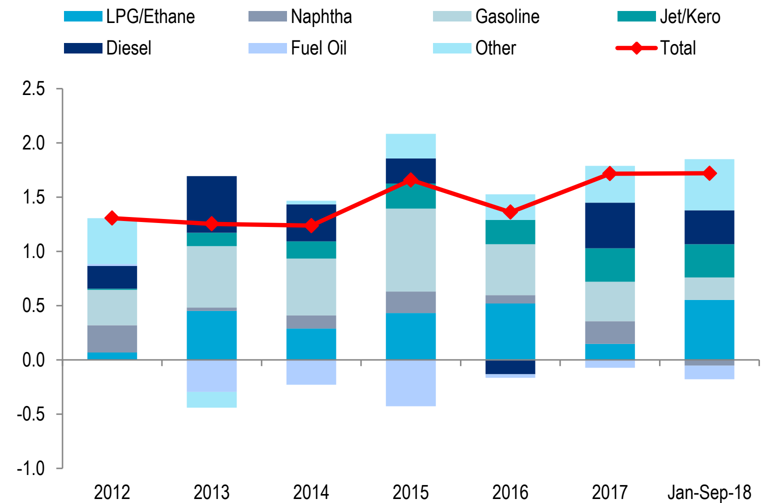
## Global oil demand growth by region

(m b/d, 2016-2019E)




## Global oil demand by product

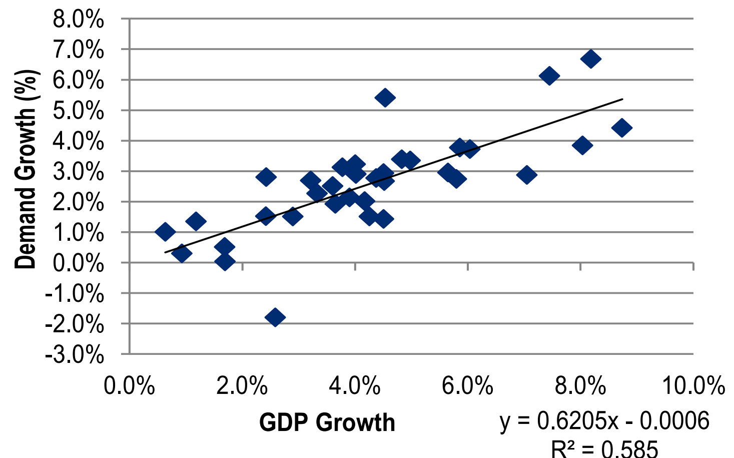
(2012-18YTD)




- **Demand concerns add to uncertainty, with more skew to the downside, though a US-China trade deal surprise could help a price rally.**
- **Citi has revised down 2019 oil demand growth to +1.26-m b/d,** assuming the 10% US tariff on Chinese goods does not rise to 25% tariff. With a 25% tariff imposed, global oil demand growth could be even lower at +1.00-m b/d; if a trade deal is done, oil demand could grow +1.40-m b/d. This represents a ~0.2-m b/d swing either way in a base/bull/bear case for oil demand.
- **Overall demand has been driven by LPG, jet, and "other products", with gasoline and diesel demand growth slowing considerably** since early 2018 strength. Gasoline demand has been weak with higher recent prices, a strong USD. Weaker EM local currencies and the cutting of fuel subsidies means end users have felt the price rise more acutely.

## Global oil demand vs. global GDP growth

(%)




Source: IEA, IIR, ICIS, EIA, KNOC, METI, NBS, FGE, BP, JODI, IHS Markit, Citi Research estimates



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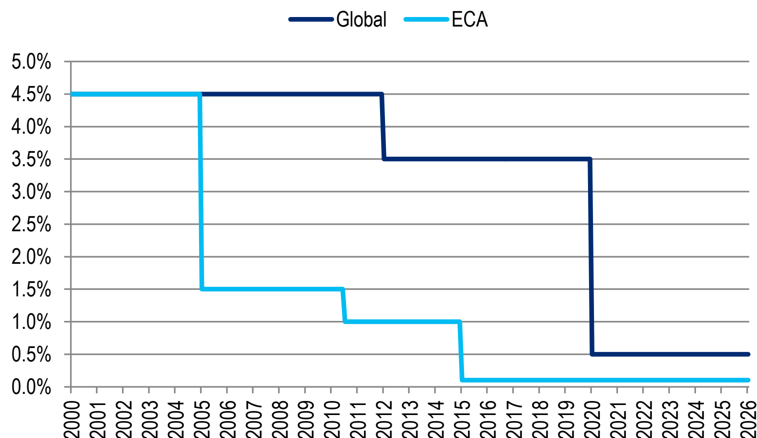
# IMO 2020 is bullish diesel demand, bearish HSFO demand

2020 may be awash with oil, but the wrong kind of oil. IMO sulfur cap on marine fuels drives up diesel demand, drops HSFO demand. Light, sweet crude balances could be tight, even while heavy, sour crudes face a glut.

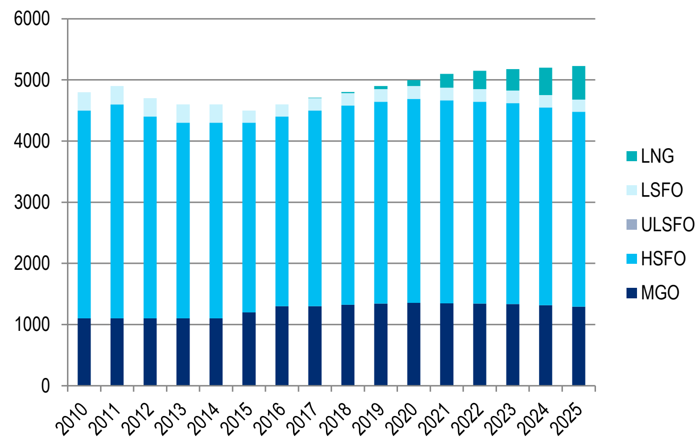
## IMO marine bunker fuel sulfur caps

(2000-2025, %)



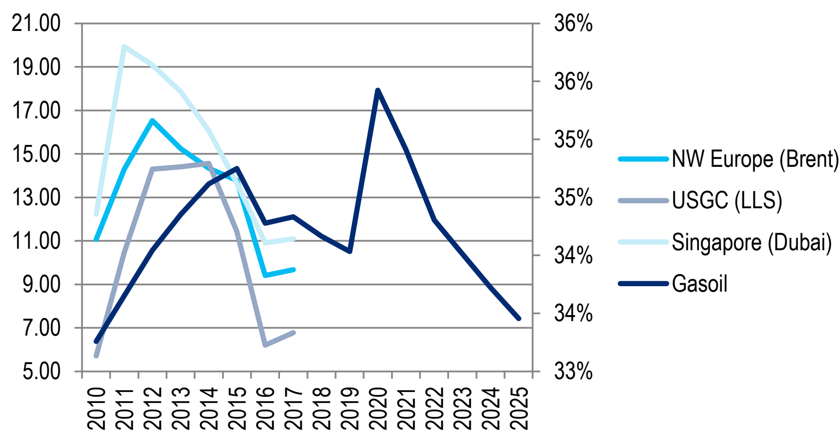

## Global bunker fuel market, baseline w/o sulfur cap

(k b/d, 2010-25E)



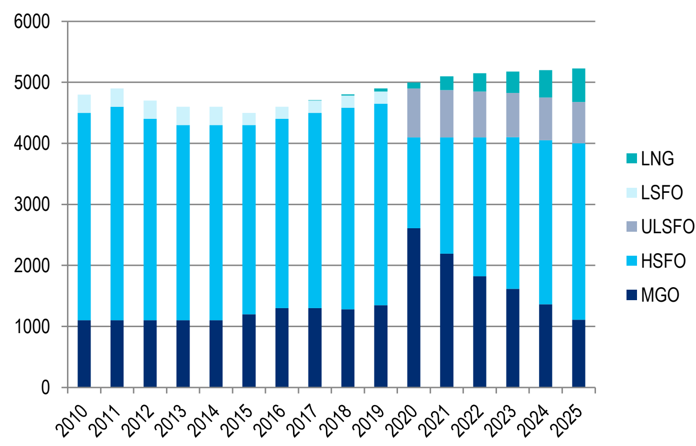

## Gasoil yields need to spike to supply diesel demand surge

(Selected gasoil cracks $/bbl on left axis, implied gasoil yield on right axis, 2010-25E)




## Global bunker market with sulfur cap

(k b/d, 2010-25E)




Source: Bloomberg, FGE, Citi Research



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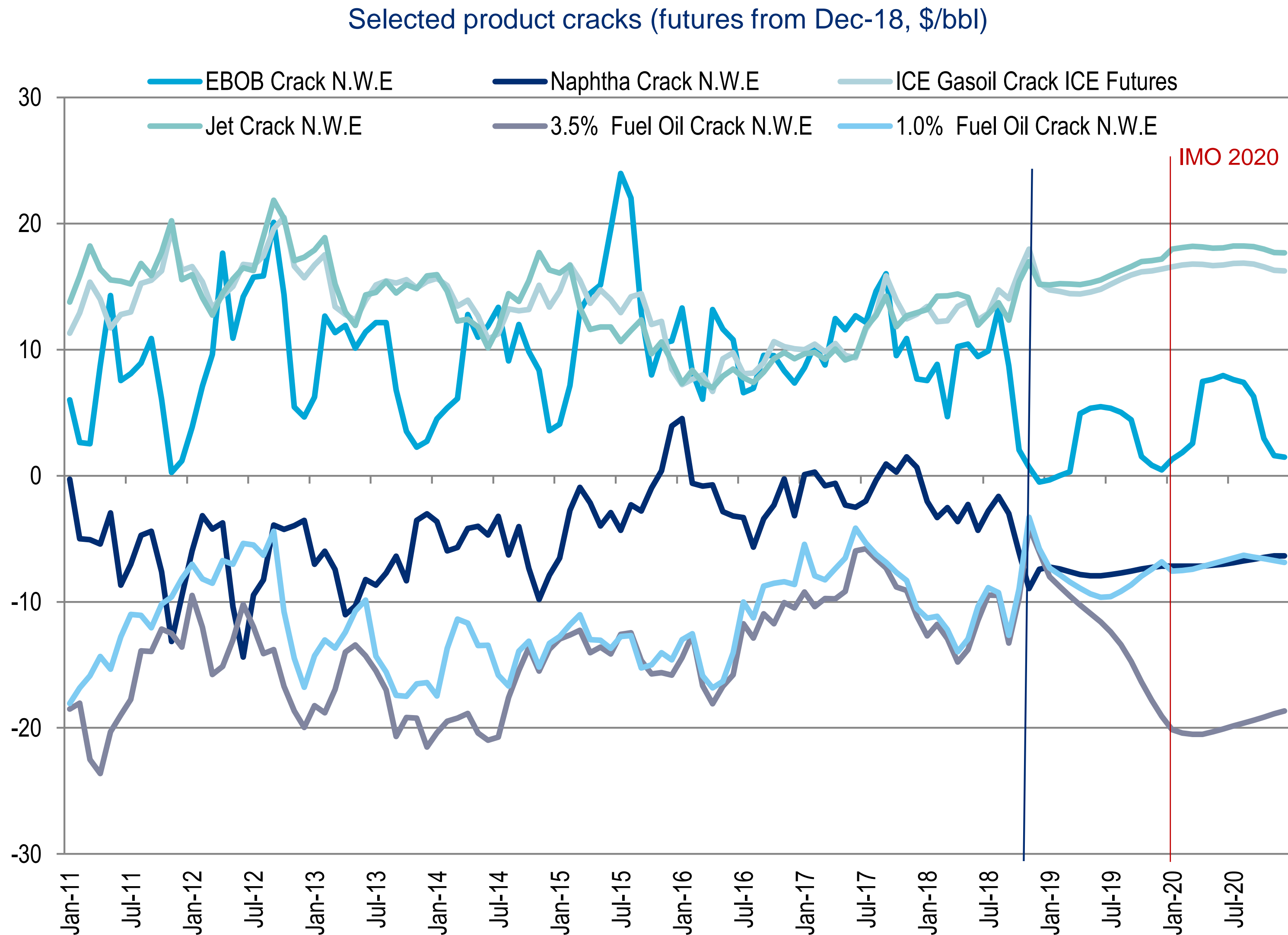
# IMO 2020 drives a wedge between diesel/jet and HSFO

IMO 2020 should displace 3.5-m b/d of HSFO globally; while as much as 1.0-1.5-m b/d could be absorbed by scrubbers and non-compliance, refineries should still be hard pressed to supply this new demand mix.

Selected product cracks (futures from Dec-18, $/bbl)




Source: Bloomberg, Citi Research



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# Appendix A-1

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