

CORNERSTONE MACRO

Economics, Policy, Strategy & Technicals

NY Energy Forum

In the Age of Energy Abundance, Oil Defies a Deflationary Spiral Oil Prices Should Rally Some More

NEW YORK, JANUARY 16, 2018

OIL PRICES: HOW HIGH IS TOO HIGH

Our core view

- Oil is rallying
- Sensibly, oil should stay close to \$60
- – so it will not

Supply side twists and turns have driven oil prices this decade, our base case for the nearer term:

- Opec has called the shots since 2014
- In a twist, this year should be US Centric
 - Only US production grows meaningfully
 - **Key question:** Will US oil production grow too much or too little?
 - **Answer = both** → too little in the near term, then too much for another spell

Risks (ordered subjectively, by likelihood, but not exhaustive):

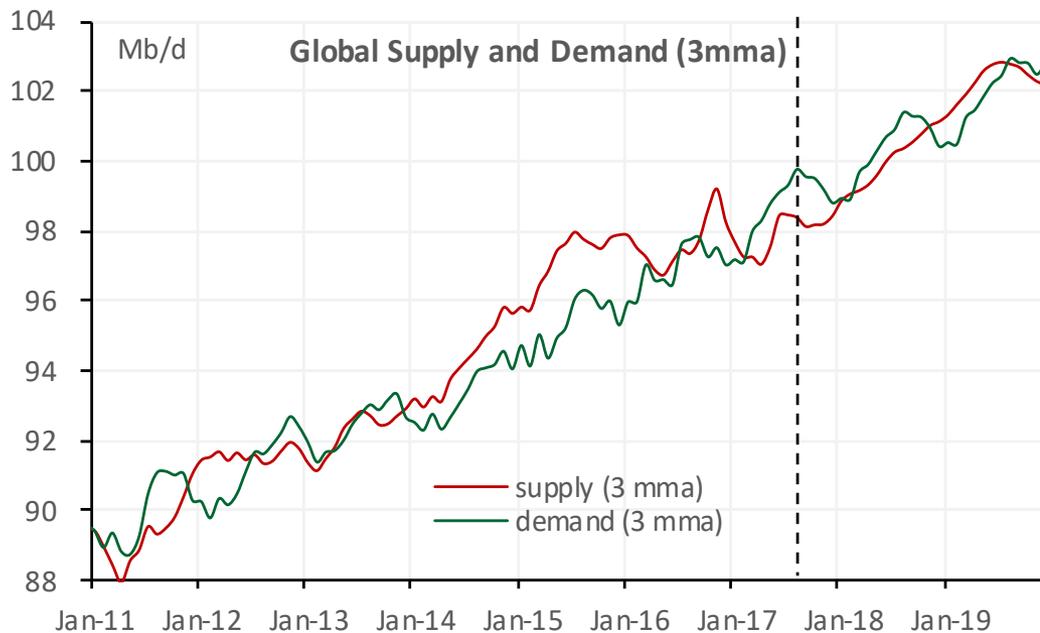
1. Accelerating demand growth U
2. Conflict(s) leading to supply disruption(s) and/or loss(es) U
3. Greater declines in mature oil provinces U
4. US oil production outperforms our (already relatively) high forecasts O
5. Opec discord resurfaces, incriminations fly, price war ensues O
6. Global economic growth decelerates significantly in 2018-'19 -

ENERGY MACRO: OUR METHOD AMIDST THE MADNESS

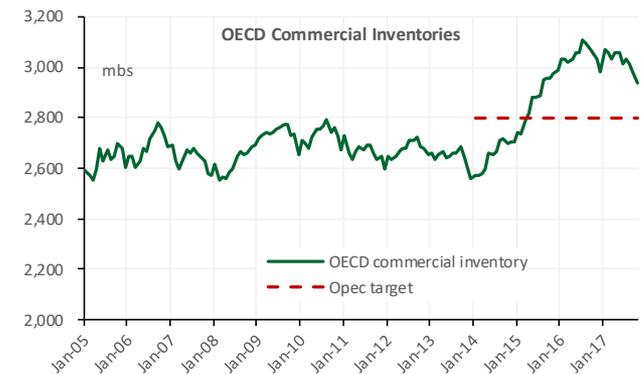
- How we do what we do (“in God we trust, everyone else bring data”)
- What the numbers show (how we got to where we are)
- How strong was 2017 (much stronger)
- Where are we now (in a pronounced supply deficit)
- Our outlook through 2018-'19 (Opec over-tightens, before shale can respond)
 - Supply side
 - Industry – US shale (huge potential); the rest (not so much)
 - Sovereign producers, i.e. political risk (little stability, lots of friction but very little oil currently off-line)
 - Demand side
 - Still more growth (against higher capacity utilization)
 - Composed of key products made from real crude oil
 - Geographically broad based
 - Inventories (close to normal, veering toward lean)
- Scenarios (and key risks, including positioning, currencies etc)
- Observations on the medium term (to 2022)

SUPPLY AND DEMAND: ACTUALLY, IT'S BEEN ABOUT SUPPLY MOSTLY

Fundamentals matter, even in an age of machines: After the 2013-'14 supply surge tipped balances into surplus and prices collapsed, growth momentum was lost only in H2 of 2015; surpluses began to shrink and inventories finally begin their trek toward normal in H2 2016. A big supply deficit emerged only last year.

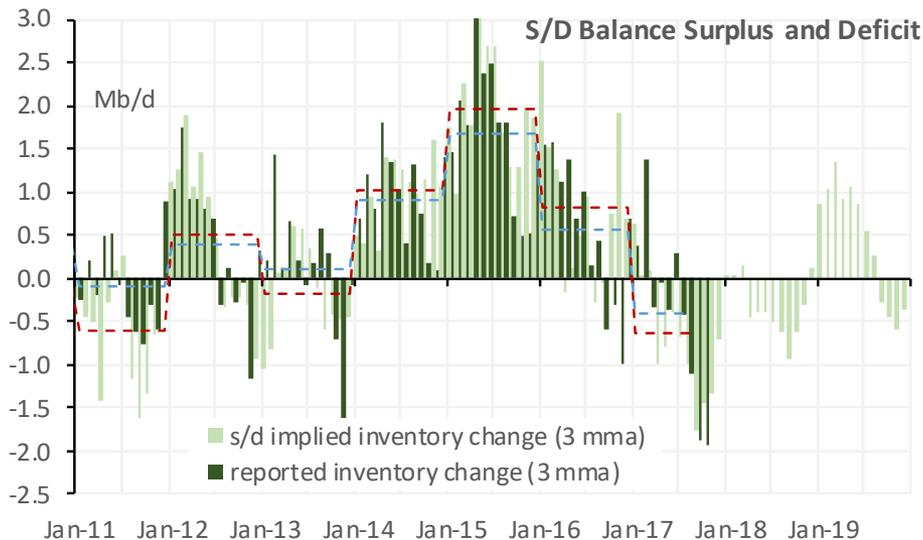


Part of our job is to assess how shifting supply and demand drive significant inventory changes – which directly affect price formation

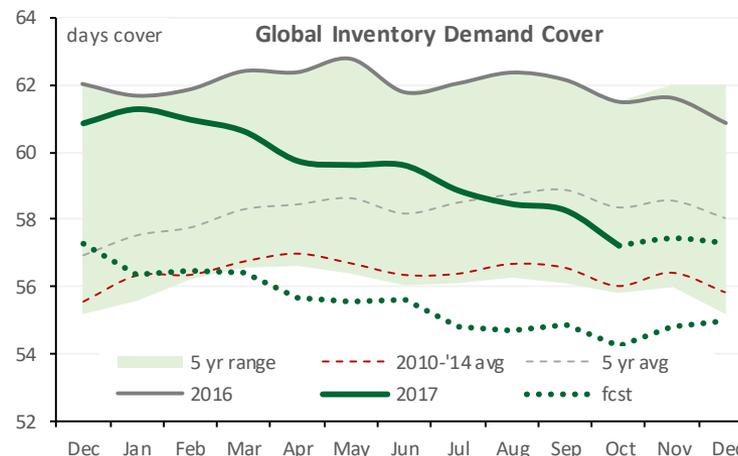


SUPPLY / DEMAND BALANCES: ART AND MESSAGE

THE DATA: Even the best numbers on oil demand and supply are of poor quality – they lag, have gaps and are prone to revisions. And they measure the wrong things too.



Our balances work. They foretell big further inventory draws. Inventory is already back down to normal, however. **Opec will likely overtighten things.**

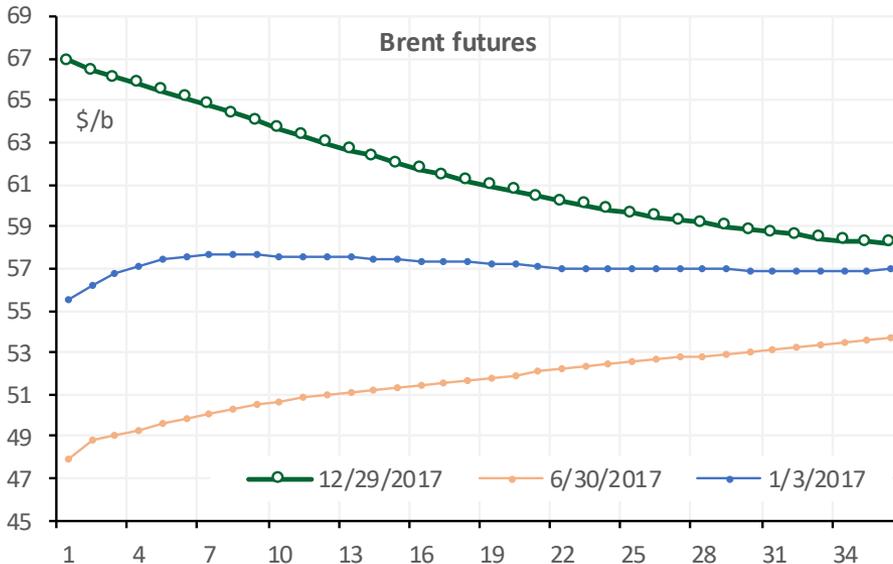


SHAPE SHIFTING OIL-FUTURES: BRENT CURVES “TORQUED” AROUND LAST YEAR

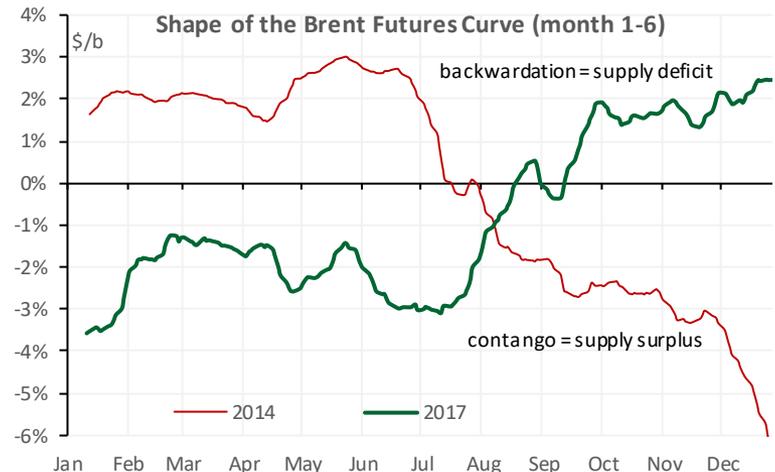
The front of the Brent curve reacts like a whip-end to NT fundamentals

- In 2017, as the global balances shifted into deficit, the short end of the Brent curve pivoted around Arguably three quarter (\$15 of the \$47/b to \$67) of the H2-2017 price rally was about the NT shape shift
- The long of the curve is about projected marginal cost of supply and has deflated to ~\$52-58 since 2014
- We built medium-term scenarios (2020-'22) to frame an outlook for the Brent Curve’s pivot-point (36mth contract)

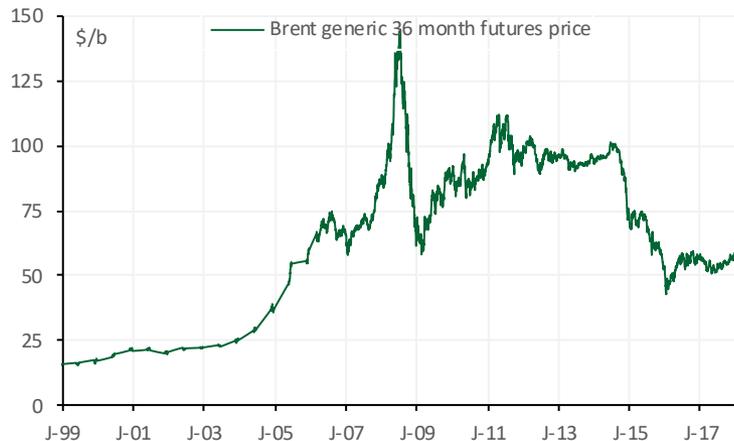
We think there is value at the long-end; the market thinks not.



Big swings in supply/demand fundamentals -> lead to big swings in inventory -> lead to shifts in the front of the futures curve. We track structure of mth 1-6, **which are the best signals on the direction of prompt futures prices.**



PRICE ANCHORS: LONG DATED FUTURES / EXPECTATIONS



Far out futures prices tend to reflect “new normal”

In the bad old days (1986 through late-'03) \$20/b was the norm

- Properly pricing markets emerged only in the 1980s
- Opec had strenuously held on to official prices in the low \$30s for too long from the late 1970s through the early 1980s. Stagflation and recessions were seared in memory: “\$30 oil = unsustainable”

Spare capacity is drained, costs inflate the anchor comes into play

- After demand growth drains spare capacity from the system [Opec had 17 Mb/d of spare capacity in 1986, today it's less than 2.0 Mb/d, similar to the level reached in 2003] the EM supercycle of the last decade drags expectations for oil prices up as well
- Liquidity of long-dated oil futures grows tenfold, as prices inflate to near \$30 in late 2003; \$40 in late '04; and \$60 in late '05.
- Fears of scarcity and system bottlenecks created a classic squeeze and a run up through \$140/b by the middle of 2008

High prices post GFC (zero-spare capacity, demand growth and the ‘Arab Spring’) which incubates the US Shale boom and its bust

- Prices subsequently collapse, and within a few quarters US growth momentum fades, US production begins to fall (mom). The other measurable effect of low prices in the shorter run was the sharp downturn in industry spend outside the US.

Current new normal is a one way “Tesla” and “abundance” trade

- Without spare capacity and given looming bottle necks upside risk is creeping back into conversations and debates
- Short-cycle supply governs LT upside potential [cap at \$70, or so]

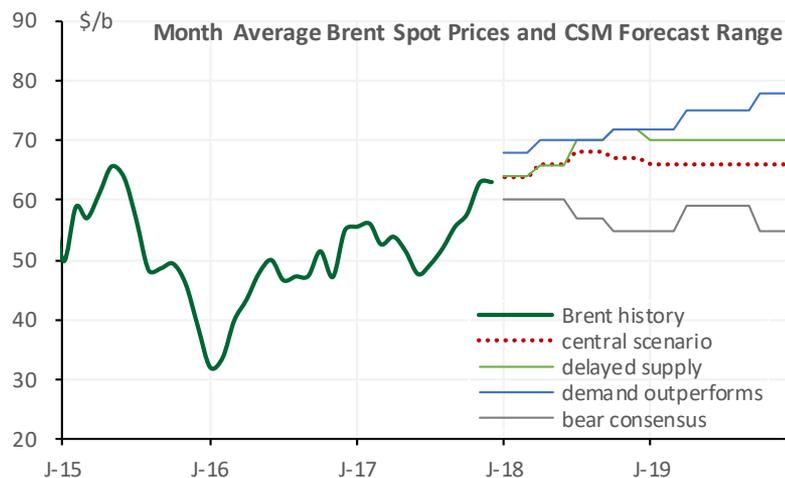
CSM OIL PRICE FORECAST: CENTRAL CASE AND REAL SCENARIOS

Scenario Assumptions

Central case: \$60 WTI in 2018-'19 (monthly averages, narrow range)

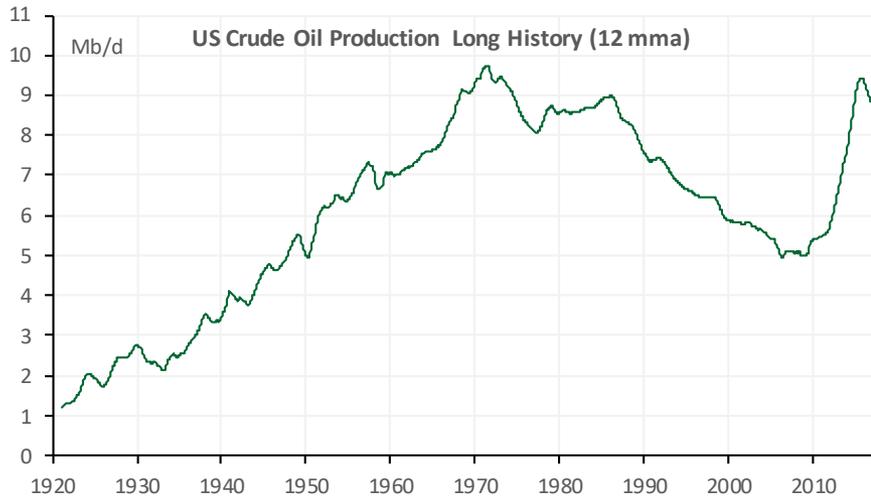
- Extended demand growth -- no recession until 2020 or later;
- Opec cohesion and ongoing co-operation from Russia et al;
- Shale growth accelerates moderately ~1 Mb/d of black oil;
- Nopexus flatlines before turning down; as underlying decline rates are no longer offset by new projects
- In 2019 further support arises from tightening refining capacity – e.g. IMO

The premium of Brent to WTI widened in H2-2017, and we now think that it will remain relatively wide



	annual crude prices			quarterly crude prices			Brent Scenarios			
	Brent	WTI	Diff	Brent	WTI	Diff	Lo-S	Hi-D	B - Cons	
2005	55	57	-1	2016	45	43	2			
2006	66	66	0	Q1-'17	55	52	3			
2007	73	72	0	Q2-'17	51	48	3			
2008	99	100	-1	Q3-'17	52	48	4			
2009	63	62	1	Q4-'17	61	55	6			
2010	80	80	1	2017	55	51	4			
2011	111	95	16	Q1-'18e	64	58	6	64	68	60
2012	112	94	18	Q2-'18e	66	60	6	66	70	60
2013	109	98	11	Q3-'18e	68	62	6	70	70	57
2014	99	93	7	Q4-'18e	67	60	7	72	72	55
2015	54	49	5	2018e	66	60	6	68	70	58
2016	45	43	2	Q1-'19e	66	60	6	70	72	55
2017	55	51	4	Q2-'19e	66	60	6	70	75	59
				Q3-'19e	66	60	6	70	75	59
2018e	66	60	6	Q4-'19e	66	60	6	70	78	55
2019e	66	60	6	2019e	66	60	6	70	75	57

US OIL PRODUCTION GROWTH TAKES CENTER STAGE



US crude oil production grew at a steady clip for 50+ years and famously “peaked” in 1972

- An event that much later spawned the fallacious peak oil theories that rose to prominence last decade

Crude oil production here broadly flatlined through the late 1980s – suspended if you will by new production from Alaska and then the deepwater.

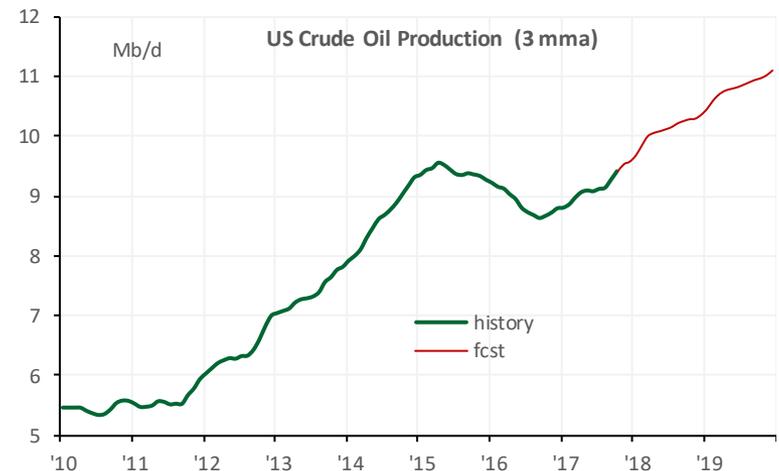
Then came the steady, or “inexorable” decline.

The US Shale industry is turning all this around

Short cycle investments from tight rocks found all across the North American land mass had yielded gas for a few years before similar technology was brought to bear on oil layers.

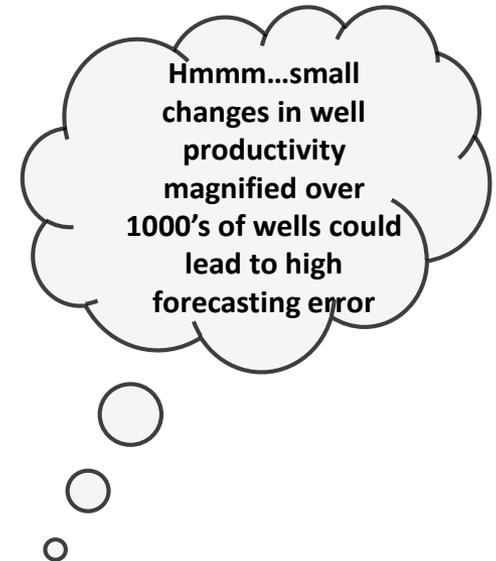
- First from the Eagle Ford and Bakken plays
- And then the Permian Basin plays of West Texas started, More may follow

The US is again the fastest growing oil exporter

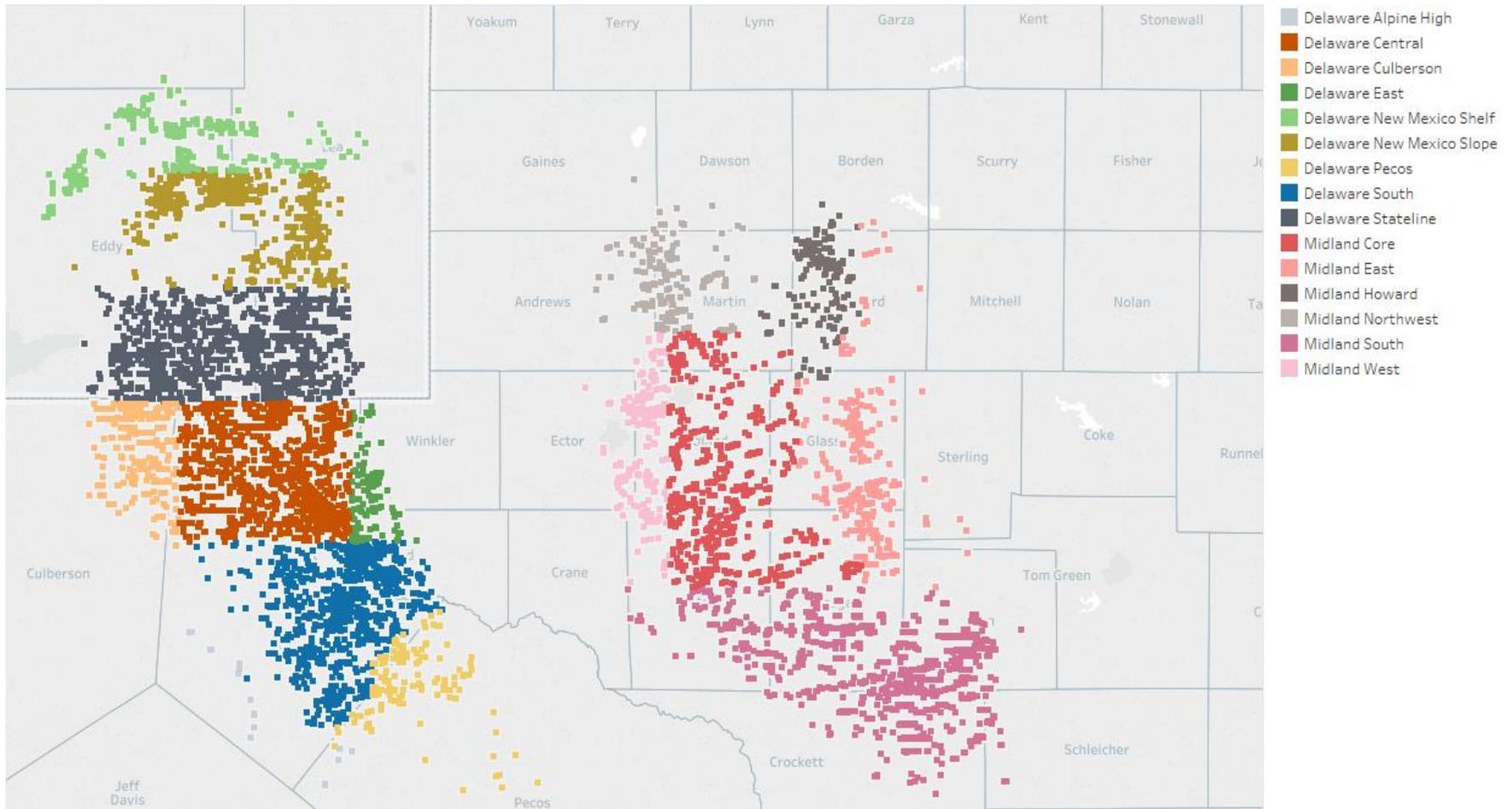


FORECASTING SHALE PRODUCTION : A TRICKY PROBLEM

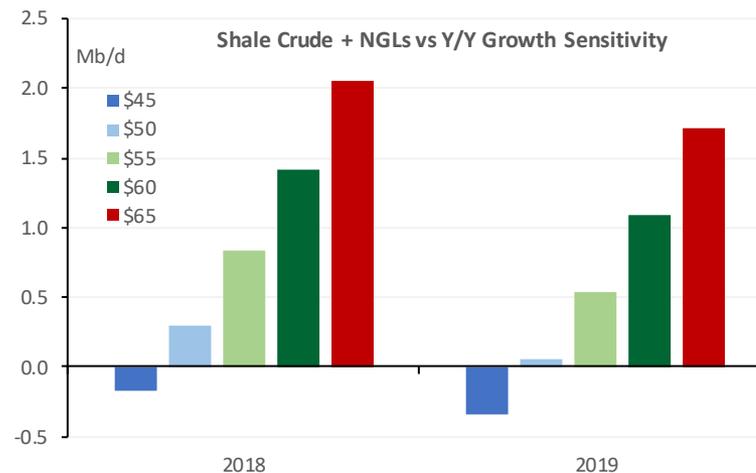
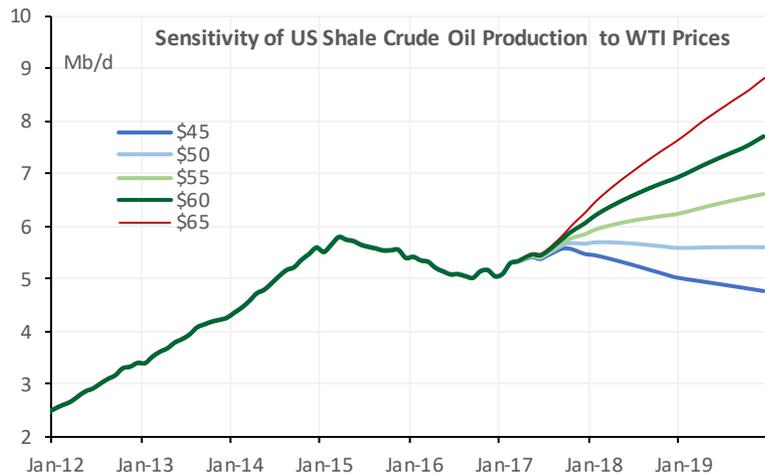
- 800 rigs running in the US key shale basins = 8000+ wells per year
- Shale Growth is a function of
 - Current Well Recoveries
 - Future Technology Improvement
 - Long run unknowns (decline rates, GoR ratios)
 - Cash availability (cash margins, balance sheets)
 - Drilling and completion costs
 - Supply cost inflation
 - Inventory and high-grading
 - Animal spirits (outspend)
 - Development (efficient) vs delineation (inefficient)
 - Infrastructure spending
 - Infrastructure availability
 - The macro environment
 - The global *“Call on American Shale”*
- Shale Models Are Helpful For Scenario *“What-If’s”*



WEST TEXAS PERMIAN BASINS DRIVE FUTURE US OIL GROWTH



SHALE REMAINS PRICE SENSITIVE AND THE COST CYCLE IS TURNING



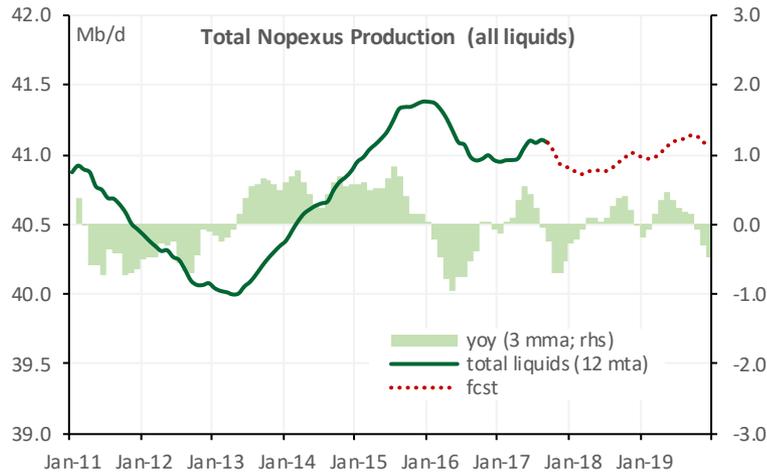
Service costs are rising cyclically, new efficiencies struggle to offset them
Full-cycle economics might become even worse as we move into 2018

Price Scenario	Shale Crude Oil + NGLs				Shale Crude Oil			
	Y/Y Growth (kb/d)		Q4/Q4 Growth (kb/d)		Y/Y Growth (kb/d)		Q4/Q4 Growth (kb/d)	
	2018	2019	2018	2019	2018	2019	2018	2019
WTI								
\$45	-170	-340	-420	-250	-150	-360	-460	-280
\$50	290	60	70	90	180	-50	-60	0
\$55	830	540	640	610	580	350	400	400
\$60	1,420	1,090	1,260	1,110	1,000	760	870	790
\$65	2,050	1,710	1,930	1,700	1,410	1,230	1,380	1,210



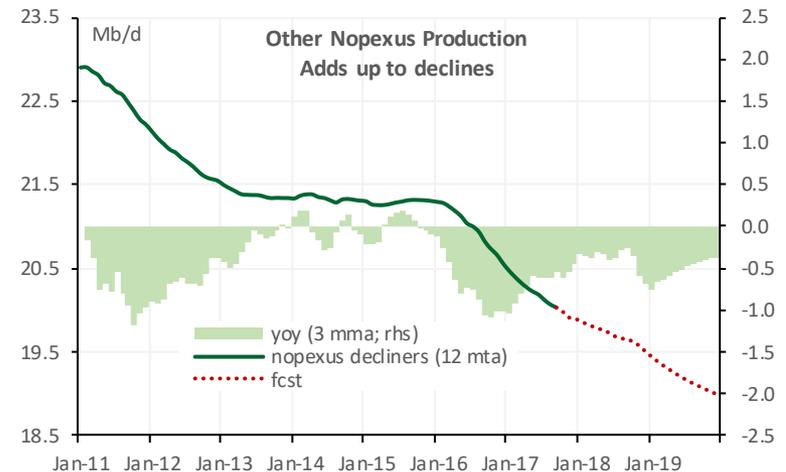
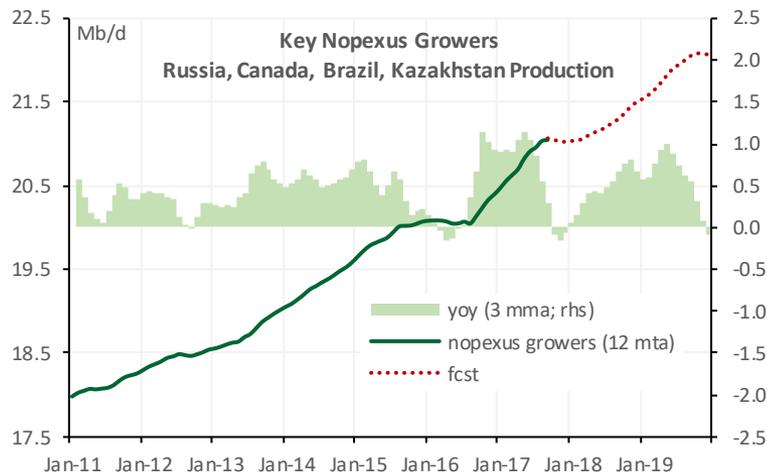
*Does not include test activity, where well was shut-down after completion
Source: Rystad Energy NAGWellCube Premium

NON-OPEC EX US: NOT QUITE TAPPED OUT, BUT STARVED FOR CAPITAL

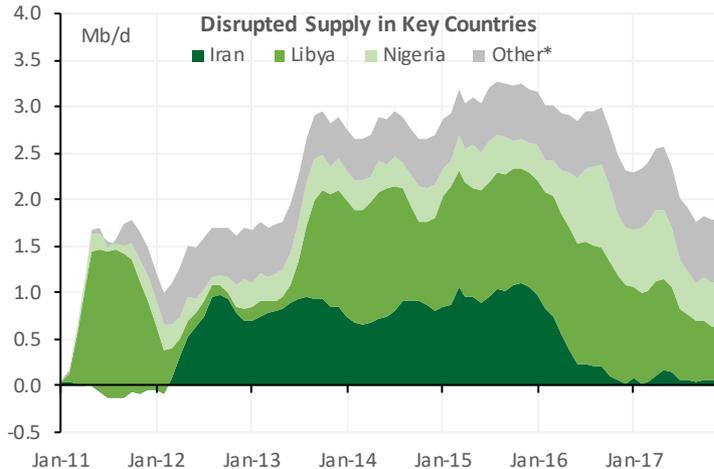


Outside the shale, industry driven oil production hinges on big projects with long, very long, lead-times, which require higher prices and sustained demand

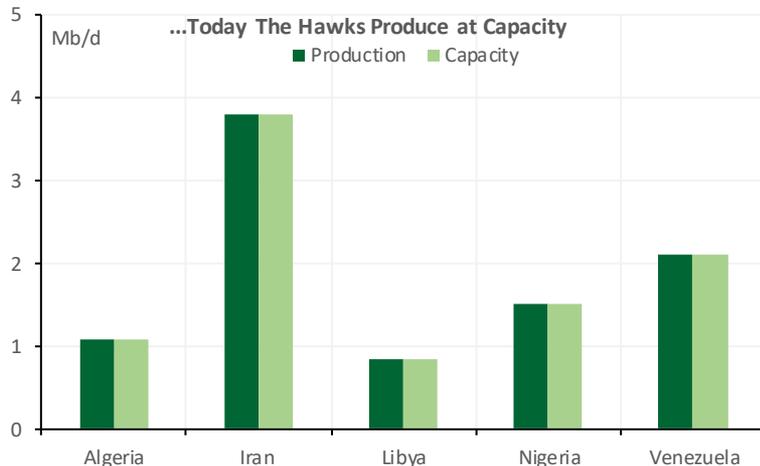
- Most of Nopexus is already declining. The decline has been mitigated by a slew of new projects that recently came online, but were FID'ed in the high price era.
- Of the growers, only Russia and Brazil keep on growing
- Higher prices fund smaller, incremental projects that can/should mitigate declines in producing basins



LESS MENA SUPPLY IS OFFLINE AND OPEC IS EASIER TO MANAGE



*Other includes South Sudan, Sudan, Syria, Yemen

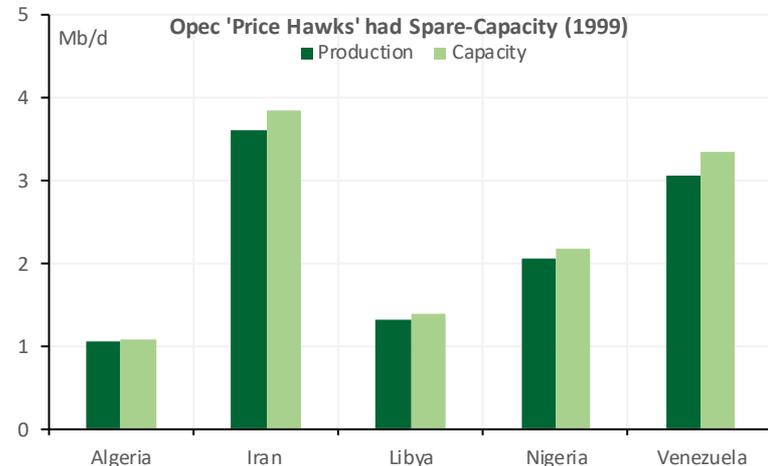


Political risk premiums in oil prices were squashed in the downturn. Arguably, with inventories closer to normal and supply deficits opening up, supply risk matters more.

- After the “Arab Spring” ushered in a new era of instability, and multilateral sanctions cut supply from Iran, ‘disrupted supply rose to ~3 Mb/d
- Currently, less than 2 Mb/d fits in this category

Managing Opec is easier than it was in the 1980s or '90s:

- Now the core of the deal is between Saudi Arabia and Russia, while ensuring Iran does not play a spoiler role.
- Back then, managing Opec was like herding cats, as revenue starved exporters usually cheated on quotas.



POLITICAL RISK: AS WE KNOW IT (SUPPLY), AND THE DEMAND SIDE

The global oil supply chain is running at >98% of capacity utilization, i.e. there is less than 2 Mb/d of spare capacity in the system (probably less). Now consider that a host of sovereign oil producers have either:

- Less than stable governments;
- Oil production basins in or near violent conflicts;
- Unappealing investment climates;

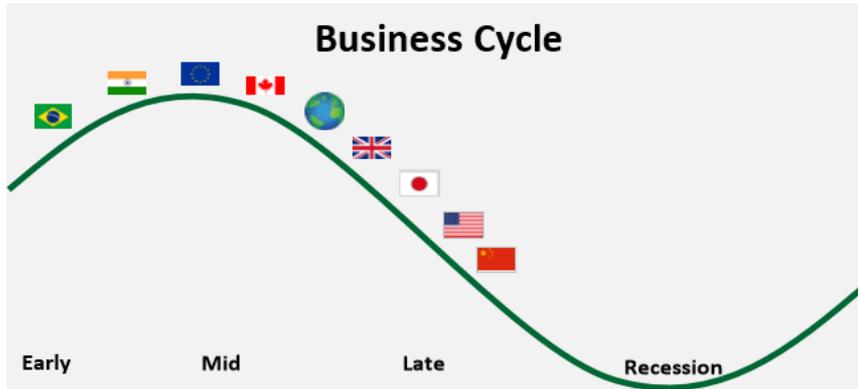
And it's clear that oil markets have to price both supply-disruption risk and risk around future production growth – which is simply not a function of their resource's relative attractive position on a production-cost curve. Three elements of risk:

1. Ranking supply risk individually, high to low: Venezuela, Libya, Nigeria, Iraq, and Iran (sanctions)
2. Big producers with poor (or at least less than attractive) investment climates include the above as well as Kuwait, Indonesia, Angola, Ecuador, Gabon, Algeria and Russia
3. In addition, key Opec members including Saudi Arabia, Iran, Iraq, the UAE, Libya and Nigeria; as well as honorary members of the current production-constraint arrangement (e.g. Russia) are involved in violent conflict in the Middle East (e.g. Iraq, Syria and Yemen) and North Africa (Libya). As such their exports are to a greater or lesser degree vulnerable to attack and/or sanction.

Oil demand prospects hinge on global economic growth, to which there is clearly risk:

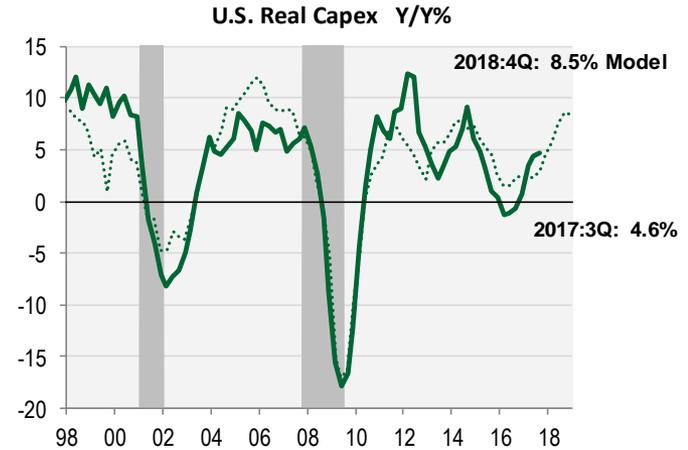
- **First** there is the ordinary risk of recession (global or not);
- **Second** risk of war or cataclysm (e.g. conflict on the Korean peninsula);
- **Third** least well understood is the role of *national policy* (e.g. industrial policy in China or Germany)
 - Back in the 1970s it was a combination of *security-* and *industrial-policy* that took down oil demand in developed economies *structurally*;
 - **Now** it is *environmental-* and *industrial policy* driving the development of and switch to EVs (or NEVs) in the EU and across China and NE Asia; while in the US the opposite is happening.

COINCIDENT GLOBAL GROWTH ACCELERATES



Global Real GDPs Y/Y %
Using PPP**

	Weight**	2017:3Q	2018:4Q e
U.S.	16%	2.3%	3.0%
Eurozone	11%	2.6%	2.5%
Japan	5%	2.1%	1.5%
U.K.	2%	1.7%	1.0%
Other Developed	6%	2.9%	2.5%
Developed	40%	2.4%*	2.5%*
China	16%	6.8%	6.3%
India	7%	6.3%	7.0%
Brazil	3%	1.4%	3.0%
Russia	3%	2.0%	2.0%
Other Emerging	31%	4.6%	3.5%
Emerging	60%	5.1%*	4.6%*
Global	100%	4.0%	3.7%



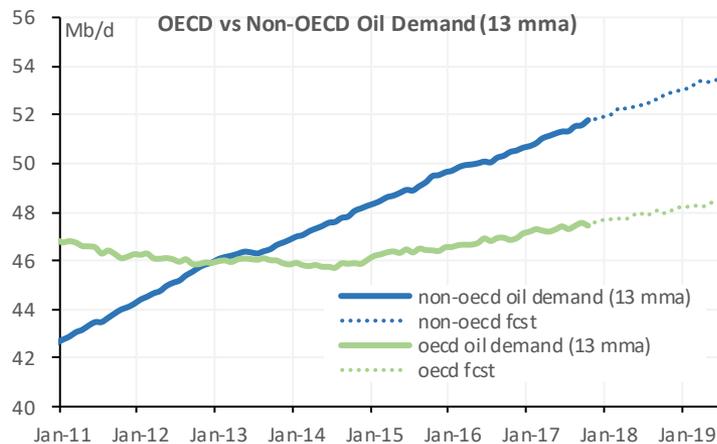
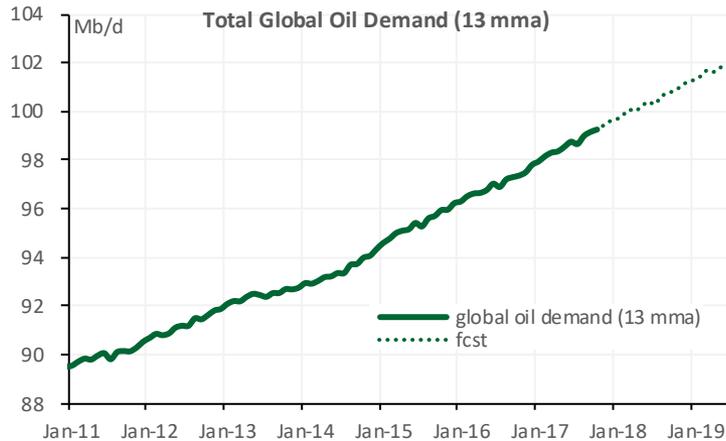
Global Nominal GDPs Y/Y%

	Weight**	2017:3Q e	2018:4Q e
U.S.	16%	4.1%	5.0%
Eurozone	11%	3.9%	3.5%
Japan	5%	2.1%	2.0%
U.K.	2%	3.4%	3.2%
Developed	40%	3.9%*	4.0%*
China	16%	11.2%	9.3%
India	7%	9.5%	10.7%
Brazil	3%	4.3%	6.5%
Emerging	60%	8.6%*	7.7%*
Global	100%	6.7%*	6.2%*

* Wtd. Avg.

** IMF 2013 weights

OIL DEMAND: WITHOUT A RECESSION – MORE, BETTER GROWTH



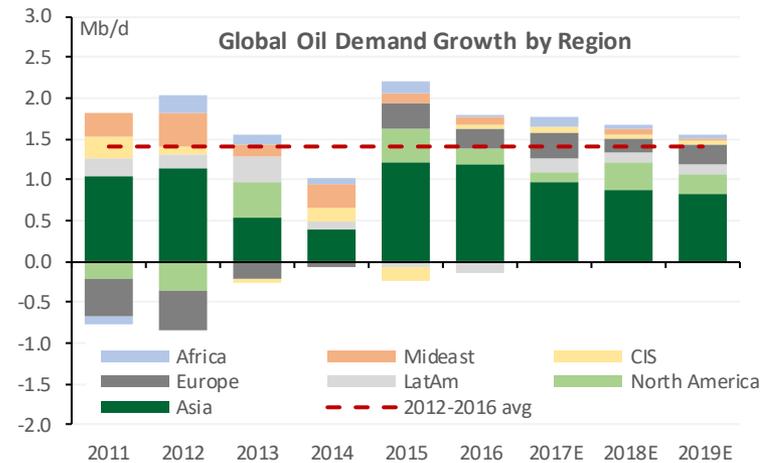
Another year of above trend growth in 2017 (third)

- Another year without significant regional drags on total global oil demand (see below)

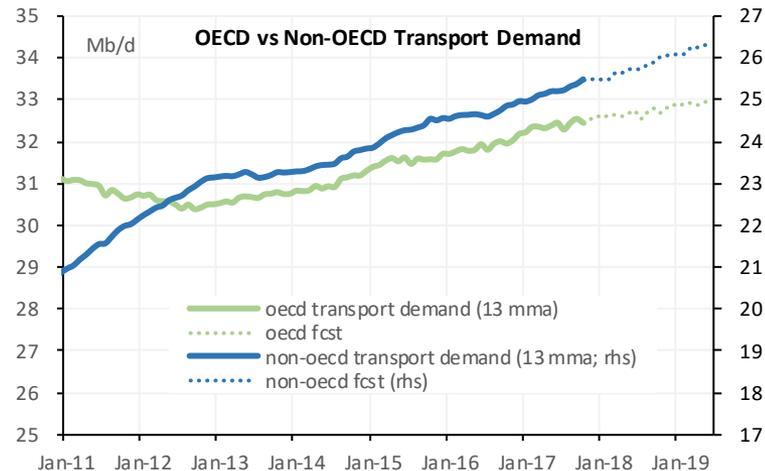
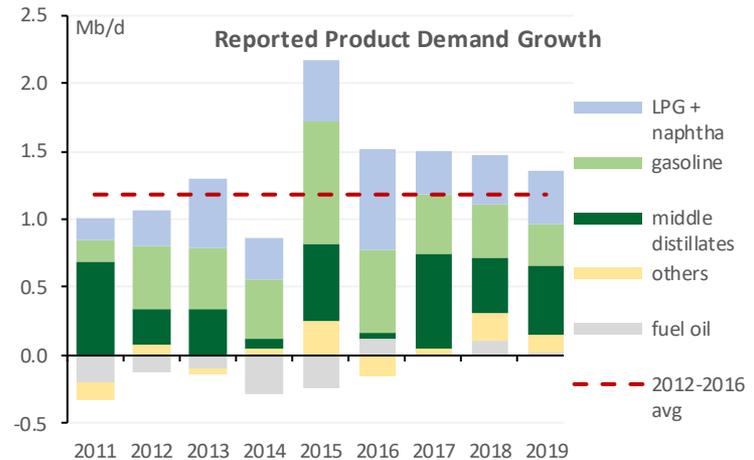
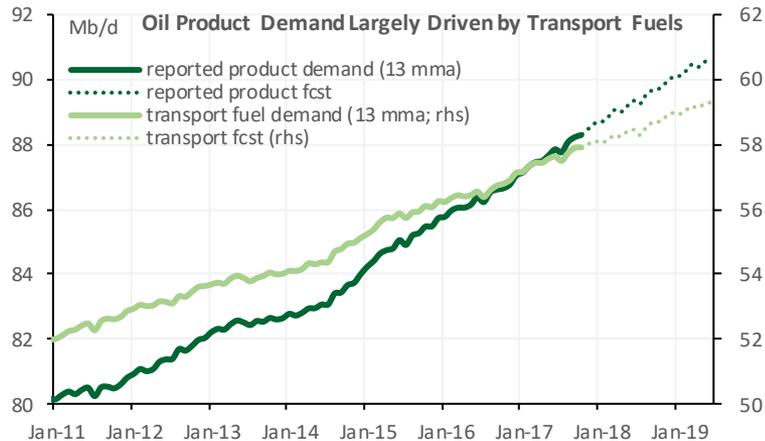
DM cyclical upturn again compensates for EM deceleration

- After North America's recovery of oil demand growth, which started in 2013, Europe's growth has been a "surprising" tailwind for the third year in a row
- DM demand growth extends through 2018 in our view

The 100 Mb/d milestone seems to be in reach



TRANSPORT FUELS: DEMAND GROWTH CRITICAL TO REFINERS



Incremental demand for gasoline, diesel and jet kero is especially significant since manufacturing these products nearly always involves refining crude oil – in contrast, growing consumption of lighter liquids (e.g. LPG or ethane) is often supplied by NGL producers and condensate splitters

- In 2016, for instance, refiner margins underperformed when consumption of the core products grew by much less than 1 Mb/d ...

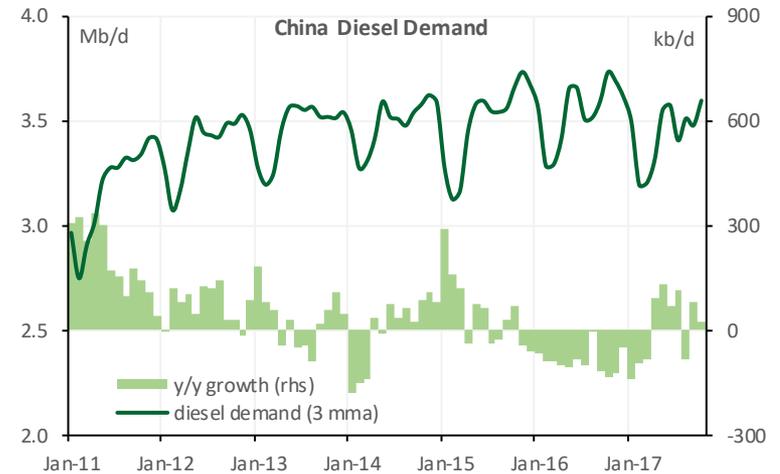
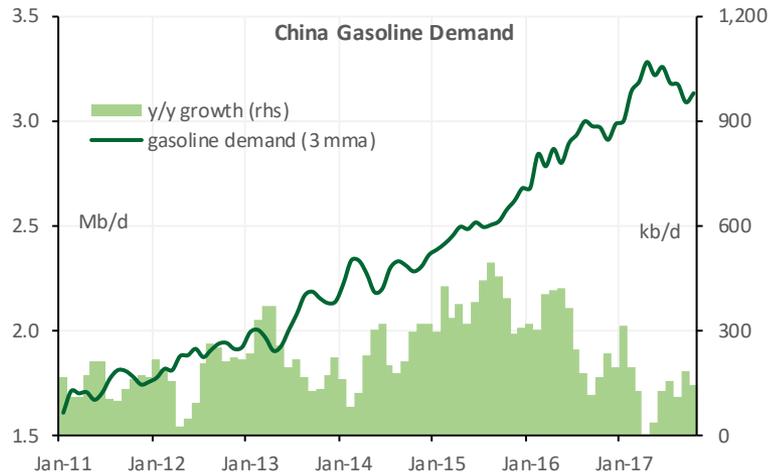
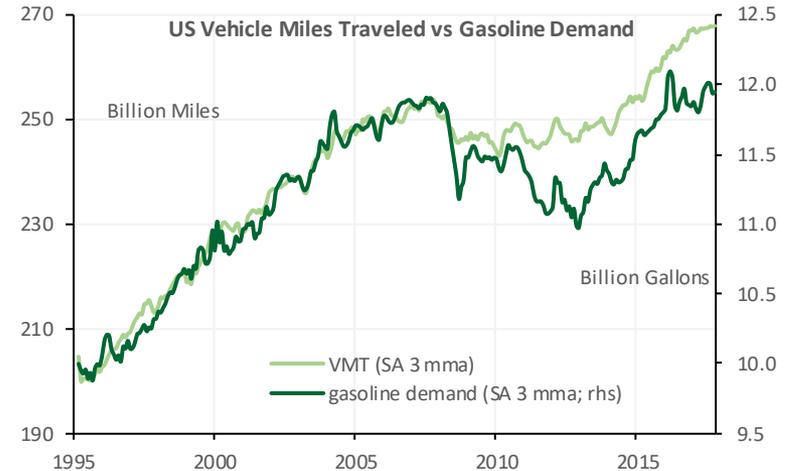
While road-transport fuels and jet kero drive much of total oil demand growth, they are also the target of the next wave of substitution (e.g. electric vehicles)

A FEW FUN FACTS ON CONSUMERS IN CHINA AND THE USA

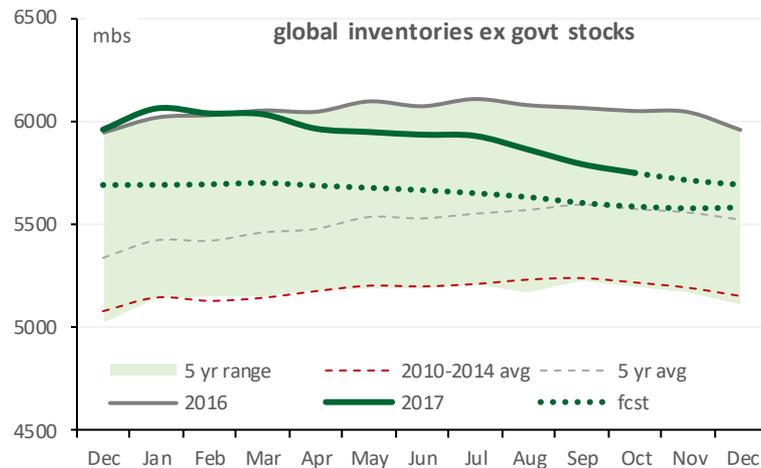
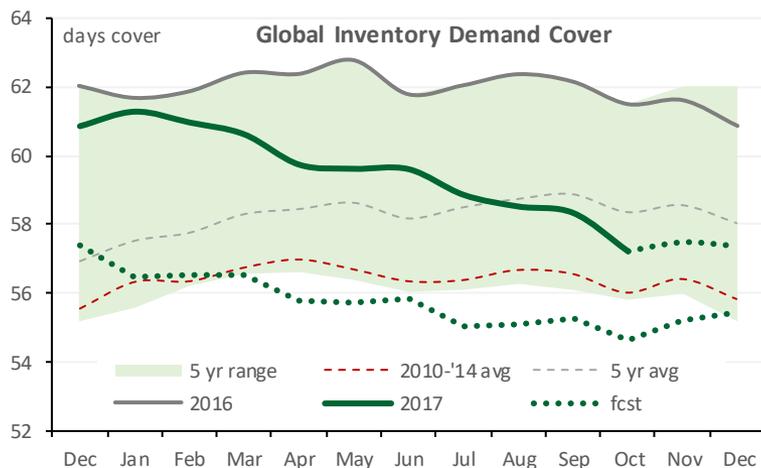
US vehicle miles travelled began to turn higher in 2013 - and a new trend in rising US gasoline consumption followed, with eroding efficiency gains also providing a boost.

In China, the rise of the consumer (and car sales) has provided a steady tailwind for gasoline demand, offsetting lackluster growth in diesel the last few years.

Diesel demand in China is finally growing again Globally diesel demand growth was flat in 2016. This year diesel reaccelerated to match gasoline demand growth, putting more stress on the refining system.

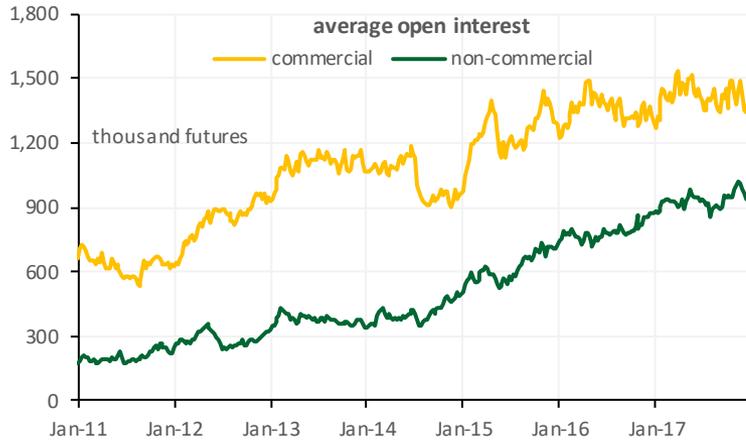
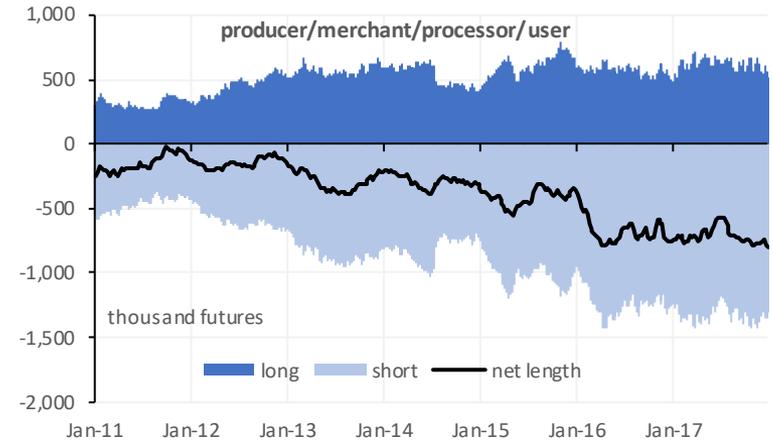
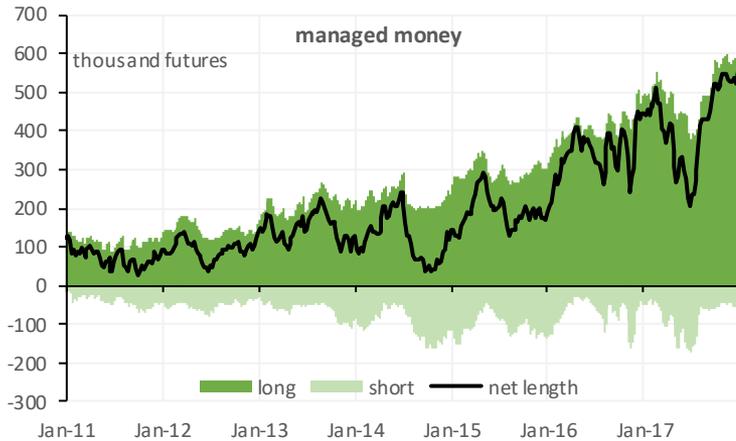


NEAR TERM GLOBAL OIL BALANCE

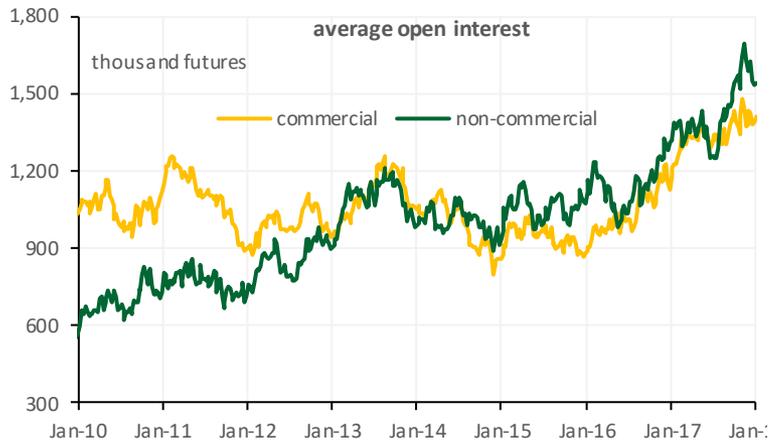
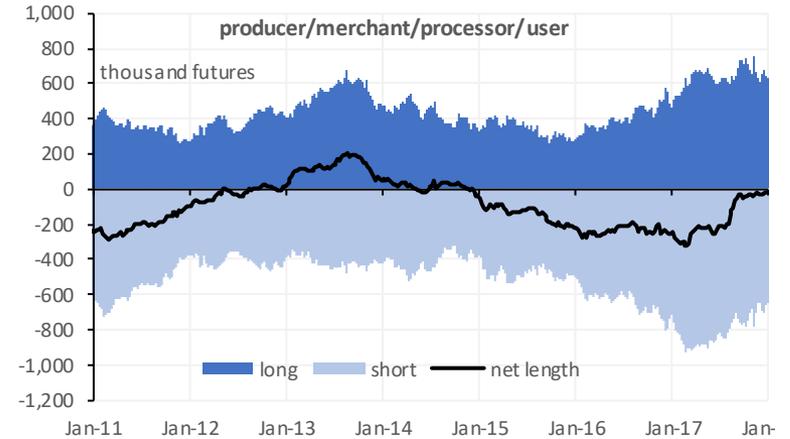
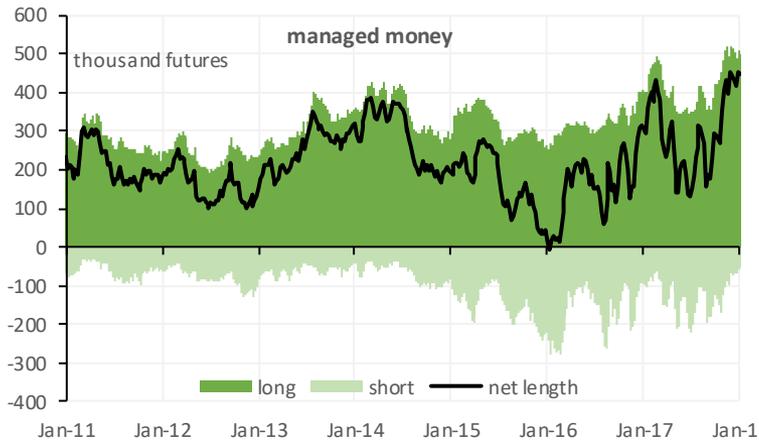


Global Oil Balances	2014	2015	2016	Q1-'17	Q2-'17	Q3-'17	Q4-'17	2017	Q1-'18	Q2-'18	Q3-'18	Q4-'18	2018	2019
Supply	94.3	97.2	97.7	97.2	97.6	98.4	98.2	97.9	99.1	99.6	100.4	101.0	100.0	102.3
Opec	37.2	38.6	39.8	39.1	39.3	39.8	39.2	39.3	39.6	39.7	40.1	40.6	40.0	41.2
Opec crude	31.3	32.2	33.0	32.4	32.6	33.1	32.6	32.7	32.9	33.0	33.4	33.9	33.3	34.4
yoy	-0.3	0.9	0.8	-0.3	0.1	0.1	-1.1	-0.3	0.5	0.4	0.3	1.3	0.6	1.1
Non Opec	54.4	55.9	55.2	55.5	55.5	55.9	56.3	55.8	56.8	57.1	57.5	57.7	57.3	58.4
yoy	2.3	1.5	-0.7	0.0	0.9	0.8	0.5	0.6	1.3	1.6	1.7	1.3	1.5	1.1
US crude	8.8	9.4	8.9	9.0	9.1	9.3	9.6	9.2	10.0	10.1	10.3	10.4	10.2	10.9
yoy	1.3	0.7	-0.6	-0.2	0.3	0.6	0.8	0.4	1.0	1.0	1.0	0.8	0.9	0.7
Demand	93.4	95.4	97.0	97.1	98.8	99.8	99.2	98.8	98.9	100.4	101.4	101.0	100.4	102.0
yoy %	1.0%	2.1%	1.7%	1.2%	2.3%	2.0%	1.7%	1.8%	1.9%	1.5%	1.6%	1.8%	1.7%	1.6%
Non-OECD	47.7	48.9	50.1	50.2	51.8	52.2	51.4	51.4	51.2	52.9	53.3	52.6	52.5	53.6
yoy	1.3	1.3	1.2	0.9	1.2	1.7	1.3	1.3	1.1	1.1	1.1	1.2	1.1	1.1
OECD	45.8	46.4	46.9	47.0	47.1	47.6	47.8	47.4	47.7	47.5	48.1	48.4	47.9	48.4
yoy	-0.4	0.7	0.5	0.2	0.9	0.3	0.4	0.5	0.7	0.4	0.5	0.5	0.5	0.5
Implied Inventory Change	0.9	1.8	0.7	0.1	-1.3	-1.4	-1.0	-0.9	0.1	-0.8	-1.1	0.0	-0.4	0.3
Reported Inventory Change	1.0	1.7	0.4	1.4	-0.4	-1.1								

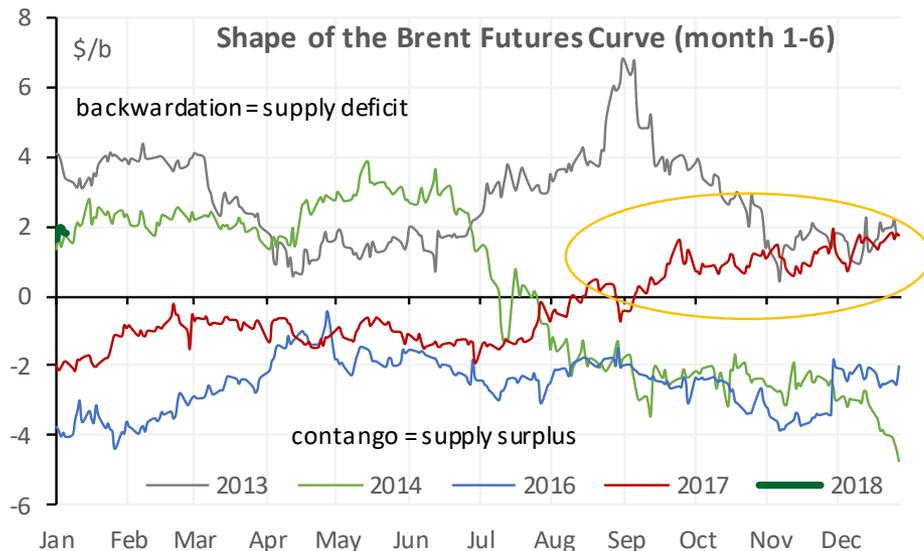
BRENT MANAGED MONEY NET LENGTH NEAR RECORD



ICE+NYMEX WTI MANAGED MONEY NET LENGTH ALSO HIGH



STILL VALID: A KEY MARKET SIGNAL, AND US WEEKLIES

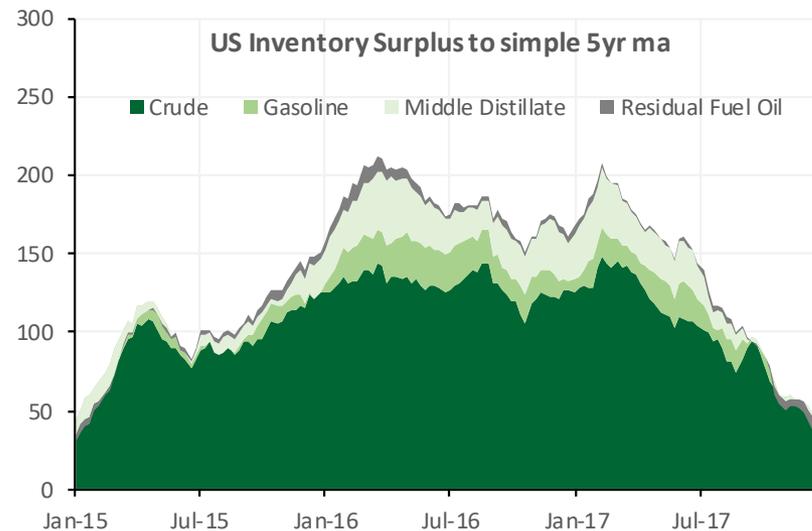


On any given day, oil prices can be jolted for many different reasons, but over time fundamentals matter the most. So we pay real attention when futures curves change shape.

IF our view is broadly correct THEN the Brent backwardation should broadly stay in place this winter.

Separately, the large nominal surplus of crude oil in the US inventory should keep on shrinking.

SO, if the backwardation switches to a contango, or the US surplus of inventory reflates we will get really worried really fast



FIVE YEAR OUTLOOK: SHALE ALONE CANNOT BALANCE THE MARKET AT \$60/B

million barrels per day	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Call on Shale and FIDs									11.7	14.5	17.6
yoy									0.6	2.9	3.1
Demand	91.2	92.5	93.4	95.4	97.0	98.8	100.4	102.0	102.5	103.7	104.8
yoy	1.2	1.3	0.9	2.0	1.6	1.8	1.7	1.6	0.5	1.2	1.1
Supply	91.6	92.2	94.3	97.2	97.7	97.9	100.0	102.3	103.5	103.5	102.9
yoy	2.3	0.6	2.1	2.9	0.5	0.1	2.2	2.3	1.1	0.0	-0.6
Shale Crude*	2.1	3.0	4.1	4.8	4.5	5.0	6.1	7.1	8.3	9.4	10.5
yoy	0.8	0.9	1.1	0.7	-0.3	0.5	1.1	0.9	1.3	1.1	1.0
Shale NGLs*	2.0	2.2	2.5	2.9	3.1	3.3	3.7	4.0	4.4	4.8	5.1
yoy	0.3	0.2	0.3	0.4	0.1	0.2	0.4	0.3	0.3	0.4	0.4
Non-Opec ex Shale ex FIDs	49.1	49.6	50.5	50.9	50.4	50.3	50.2	50.1	49.5	48.1	46.4
yoy	-0.4	0.5	0.9	0.4	-0.5	-0.1	-0.1	-0.1	-0.6	-1.4	-1.7
Russia	10.6	10.8	10.8	11.0	11.2	11.2	11.2	11.5	11.7	11.8	12.0
yoy	0.1	0.1	0.1	0.1	0.3	0.0	0.0	0.3	0.2	0.2	0.2
Brazil	2.5	2.5	2.8	3.0	3.0	3.2	3.4	3.7	3.8	3.8	3.7
yoy	0.0	0.0	0.3	0.3	0.0	0.2	0.2	0.3	0.2	0.0	-0.1
Canada	3.7	4.0	4.3	4.4	4.5	4.8	5.0	5.1	5.1	5.0	4.9
yoy	0.2	0.3	0.3	0.1	0.1	0.3	0.3	0.0	0.0	-0.1	0.0
North Sea**	2.9	2.7	2.8	2.9	3.0	3.0	3.1	3.0	3.0	2.8	2.5
yoy	-0.3	-0.2	0.0	0.2	0.1	0.0	0.1	-0.1	0.0	-0.1	-0.3
Other LatAm***	5.0	5.0	4.9	4.7	4.4	4.1	3.9	3.8	3.5	3.2	2.9
yoy	0.0	0.0	0.1	0.0	-0.1	0.1	0.0	0.0	-0.3	-0.3	-0.3
Asia	8.8	8.8	8.9	9.0	8.6	8.3	8.1	7.9	7.6	7.2	6.7
yoy	0.1	0.0	0.1	0.1	-0.3	-0.3	-0.2	-0.2	-0.3	-0.5	-0.5
Africa	1.7	1.7	1.8	1.8	1.7	1.7	1.7	1.7	1.5	1.4	1.3
yoy	-0.3	0.0	0.1	0.0	-0.1	0.1	0.0	0.0	-0.1	-0.1	-0.1
Other	13.9	14.1	14.3	14.2	14.0	13.9	13.8	13.5	13.3	12.8	12.5
yoy	-0.2	0.2	0.2	-0.1	-0.2	0.0	-0.1	-0.3	-0.2	-0.4	-0.3
Opec Crude	32.8	31.6	31.3	32.2	33.0	32.7	33.3	34.4	34.6	34.5	34.3
yoy	1.3	-1.2	-0.3	0.9	0.8	-0.3	0.6	1.1	0.2	0.0	-0.3
Mideast Crude	22.8	22.4	22.6	23.6	25.0	24.6	25.2	26.3	26.7	27.0	27.1
yoy	0.4	-0.4	0.2	1.0	1.4	-0.4	0.6	1.1	0.5	0.3	0.1
Other Crude	10.0	9.3	8.7	8.6	8.1	8.1	8.1	8.1	7.9	7.5	7.1
yoy	0.9	-0.8	-0.6	-0.1	-0.5	0.0	0.0	0.0	-0.3	-0.4	-0.4
Opec NGLs	5.7	5.9	5.9	6.4	6.8	6.6	6.7	6.8	6.7	6.7	6.6
yoy	0.4	0.2	0.1	0.4	0.4	-0.1	0.1	0.1	-0.1	0.0	-0.1
inventory (million barrels)											
end year level	6,780	6,841	7,208	7,832	7,988	7,861	7,756	7,918	8,269	8,190	7,499
end year surplus****	-54	-58	106	596	489	154	-40	111	379	241	-509

*\$60/b WTI; \$2.85/MMBtu Henry Hub

**UK and Norway

***Includes Mexico

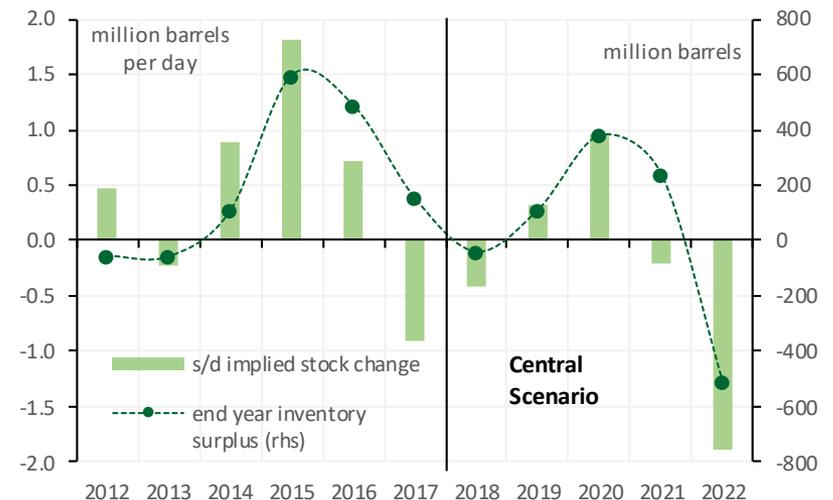
****Based on commercial inventory demand cover relative to 2010-2014 average

In our central scenario, 2019-20 looks a bit soft. By 2021-22, the picture is more bullish and shale has trouble keeping up with demand growth and Nopexus declines.

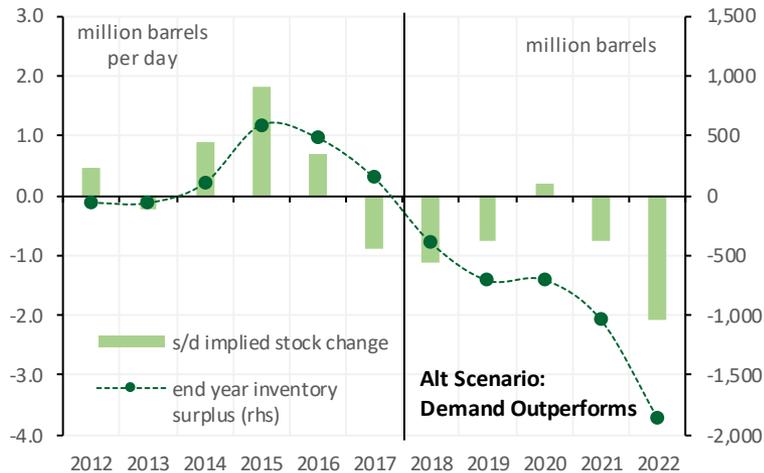
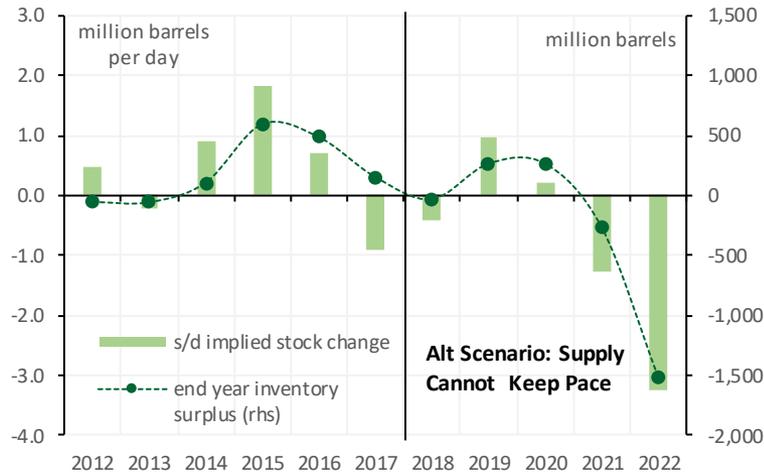
Additional Nopexus project sanctions are required (and fast) to balance the market in 2022.

Key assumptions in our central scenario include:

- Demand recession in 2020
- Opec production rises in 2018-19, then stays roughly flat as decliners balance growers
- No production for the next 5 years from yet to be sanctioned Non-Opec ex shale new projects
- Shale grows ~1.5 Mb/d pa (\$60 WTI pace of growth)

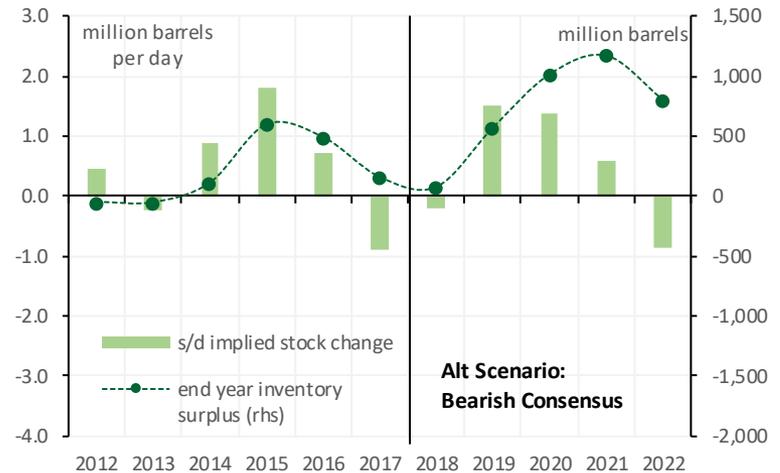


MEDIUM TERM SCENARIO ANALYSIS: DEMAND IS KEY

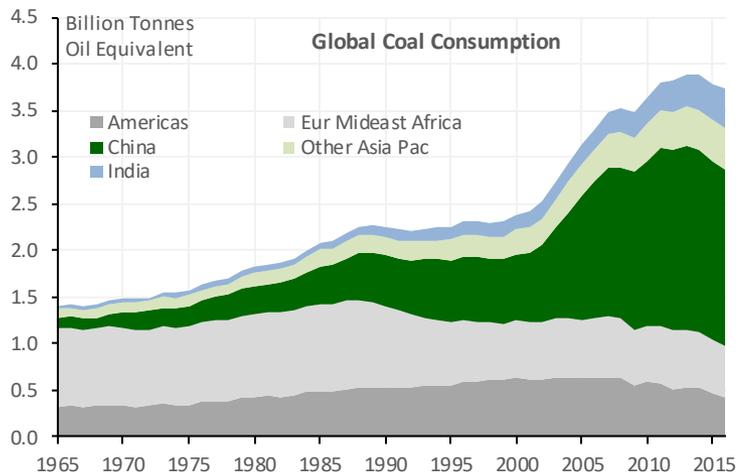
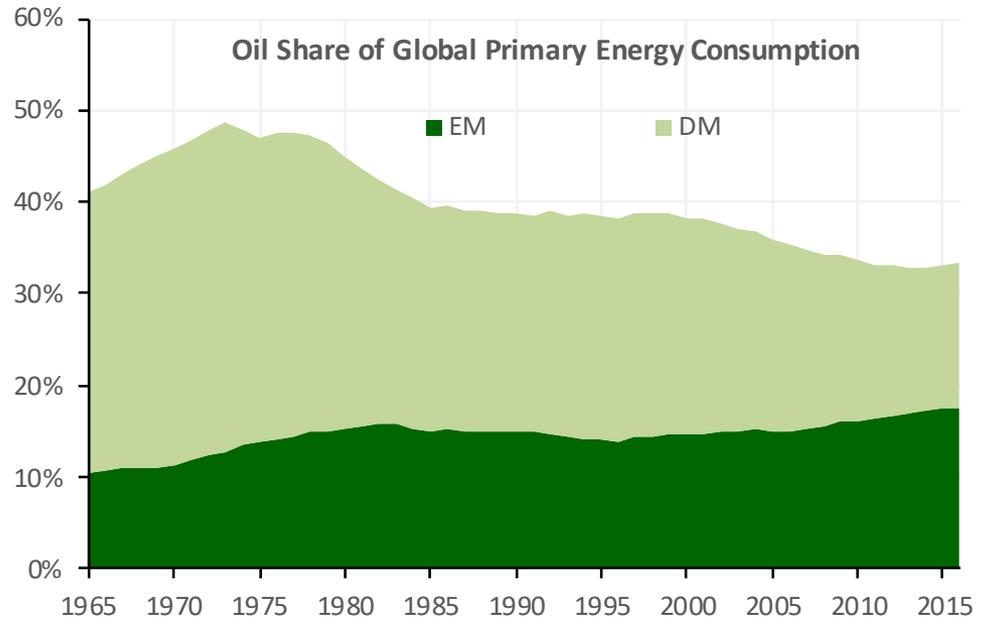
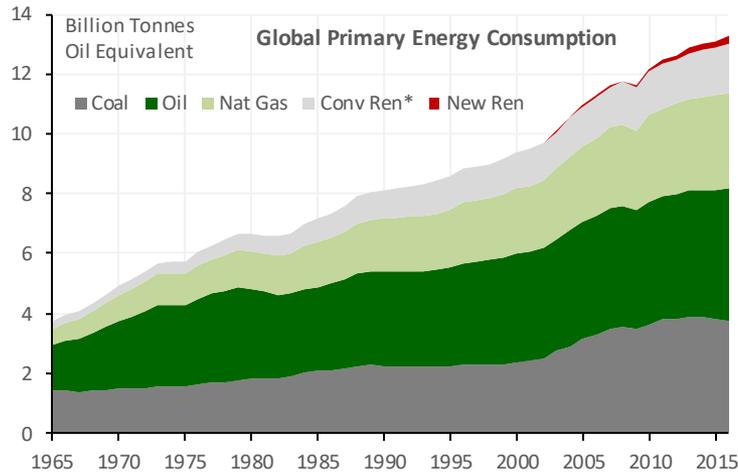


In addition to our central scenario, we consider three alternative scenarios for the 2018-2022 balances.

- In the upper left, Opec production underperforms, balanced by an earlier recession (2019 instead of 2020). The picture is moderately bullish relative to our central scenario.
- In the lower left, demand outperforms and Opec boosts production somewhat to compensate. A large supply deficit opens up and an extremely bullish scenario emerges.
- In the bottom right, demand underperforms by ~800 kb/d on average over 5 years. Markets wind up oversupplied.



PEAK OIL DEMAND: COAL MAYBE DEAD, BUT OIL VERY MUCH ISN'T YET



HOW WE THINK ABOUT FUTURE OIL PRICES

