THE OXFORD INSTITUTE FOR ENERGY STUDIES

Global Oil Markets - Current Developments and Future Prospects

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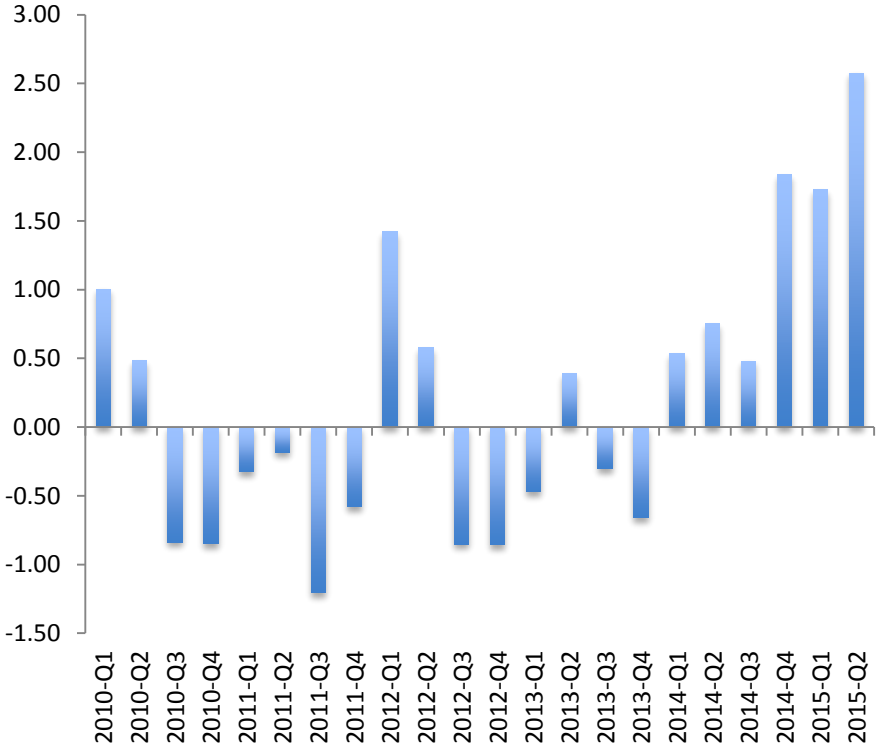
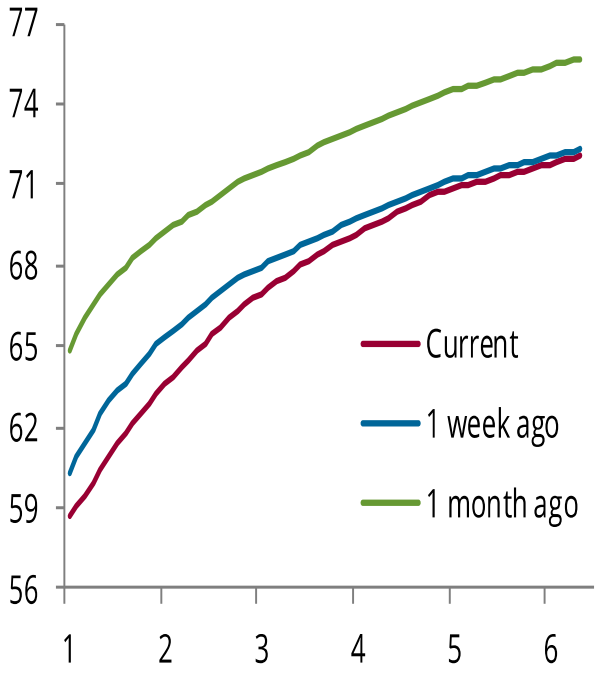
PRESENTED AT THE BANK OF ENGLAND, LONDON, 17 JULY 2015

Supply-Demand Imbalances Reflected in Large Stock-builds

EIA Estimates of Stockbuilds, mb/d



Brent Forward Curve as of July 13, 2015



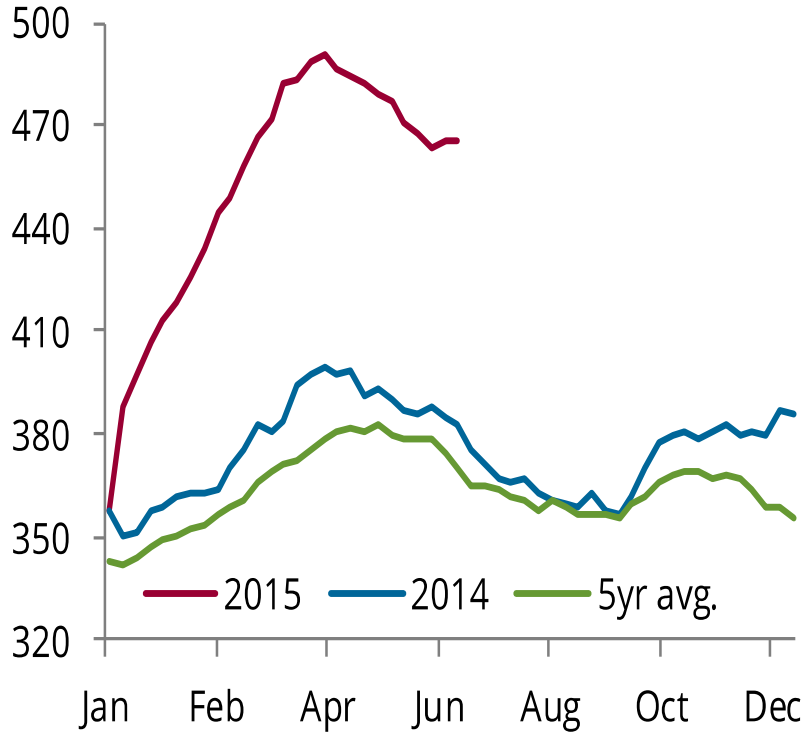
Supply-demand imbalances have resulted in large stock builds; since the beginning of 2014, there has been a stock-build in almost every month

It is excess supplies that puts downward pressure on the front end of the term structure causing the forward curve to shift to a contango to provide incentive for over-ground storage

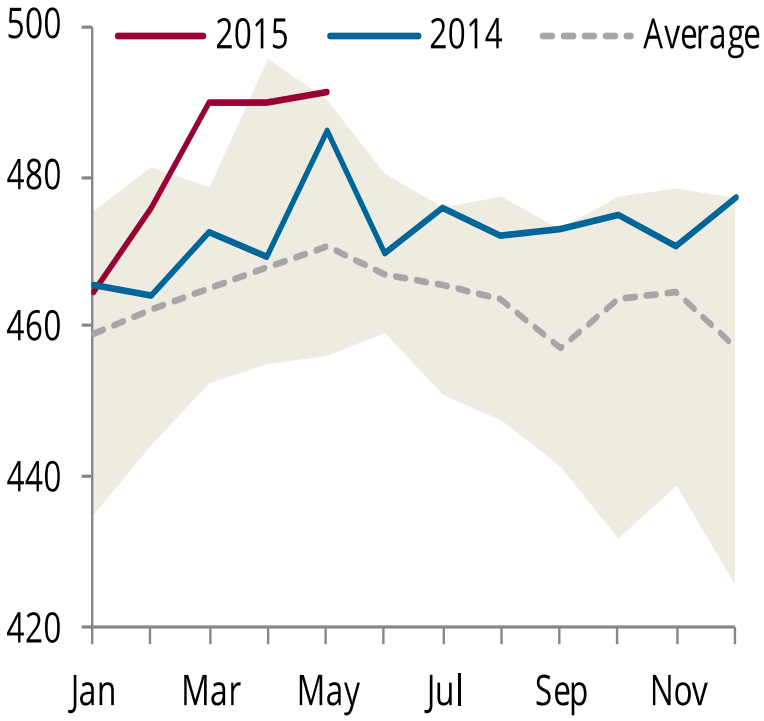
Source: Energy Aspects, EIA, Reuters

Stocks in the US and Europe Have Reached A Record High

US Crude Oil Stocks, mb/d



Total EU16 crude oil stocks, mb

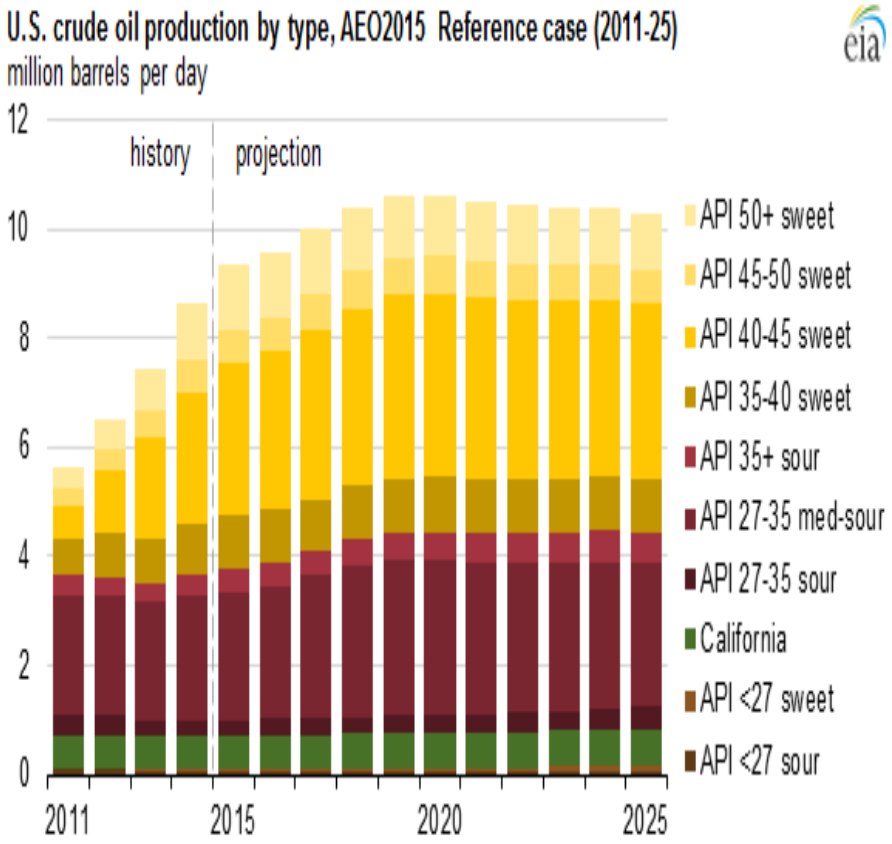


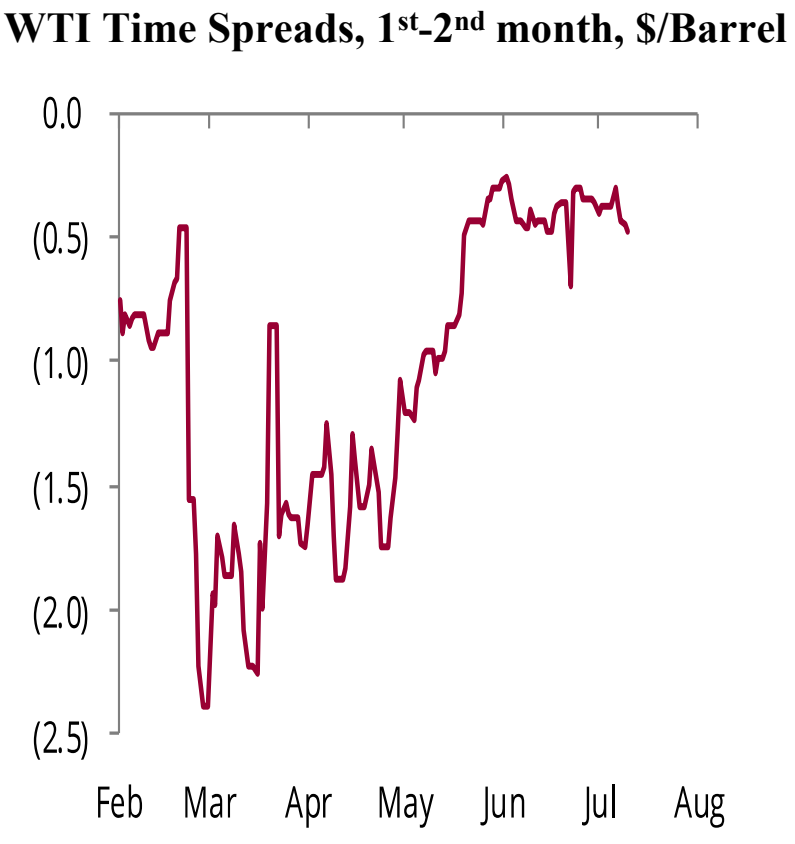
Stocks in the US has risen sharply as it is one of the few locations with available storage capacity

In Europe, stocks have reached a record level with limited room for further on-land storage

Source: Energy Aspects

Builds are Mainly in Light Sweet Crude and in the US yet the WTI Time Spreads Tightening





The 'glut' is mainly in light sweet crude as most of the increase in US shale production is light and super light and refineries globally have become more complex

Yet US crude prices remain relatively strong relative to Brent and WTI time spreads have shown signs of strength

Source: Energy Aspects, EIA, Bloomberg

The Supply-Demand Imbalance and the Stock-Build

OPEC Feedback Mechanism Lost

Total OPEC Output, mb/d

Saudi Arabia Oil Output, mb/d

In the absence of OPEC cuts (and supply disruption), the only mechanism to clear excess supplies is through supply and demand responses to price movements

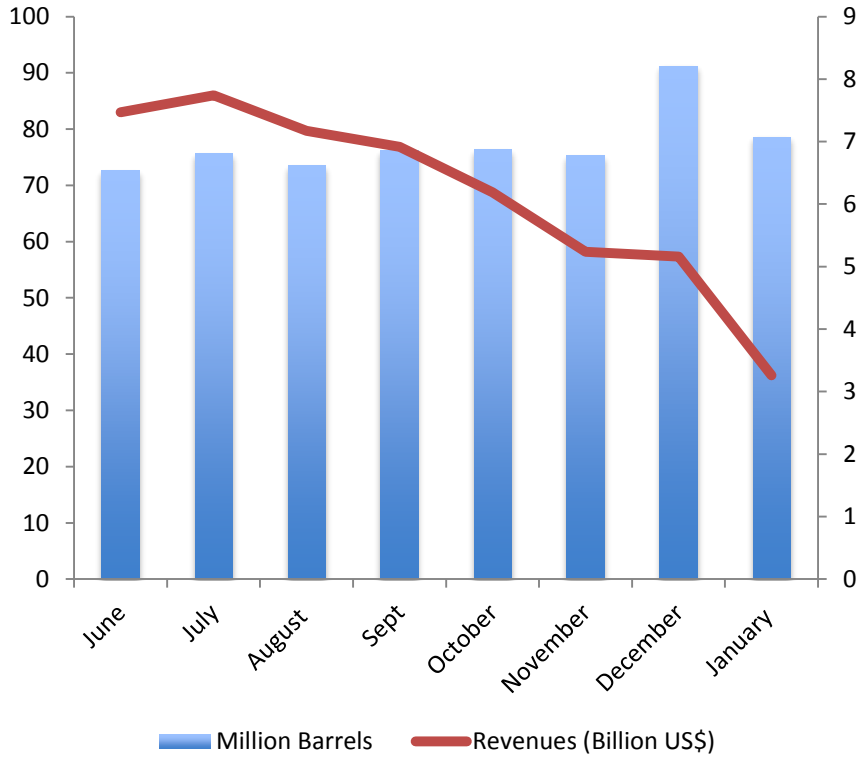
Saudi Arabia producing at above 10 mb/d with exports reaching record levels

Source: Energy Aspects, MEES

Key Producers Increasing Output to Boost Revenues

Iraqi Oil Output, mb/d

Iraqi Monthly Revenues and Production



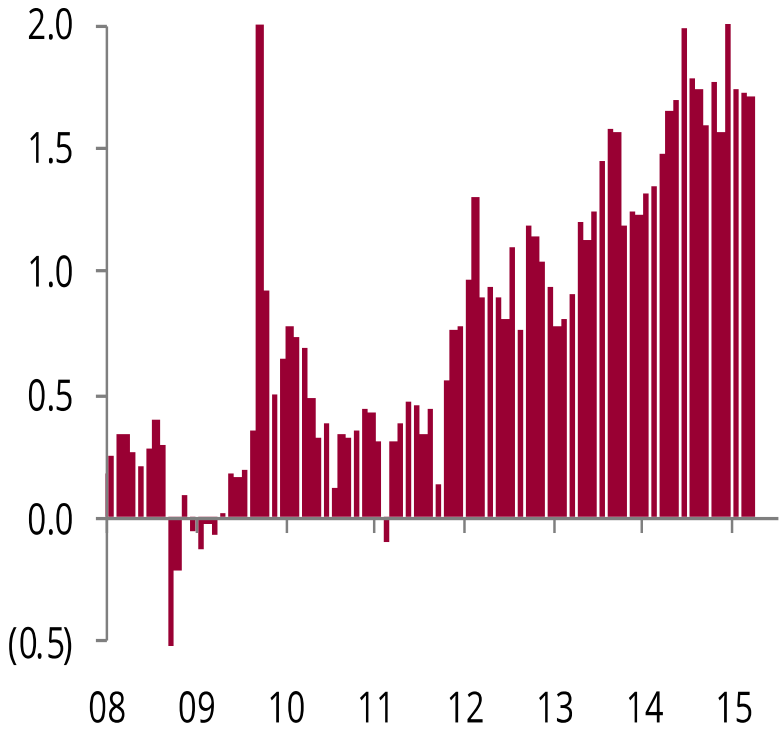
Iraq continues to ramp up production in an attempt to boost its revenues

But so far this has proved to be self-defeating with the increase in production being offset by lower prices

Source: Energy Aspects, Iraqi Ministry of Oil

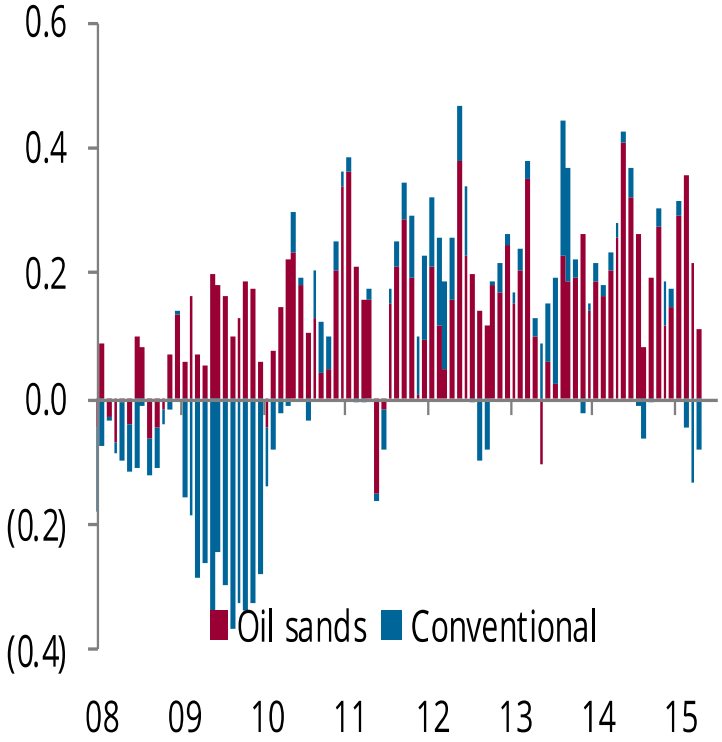
Non-OPEC Supply Growth Concentrated in US and Canada

US Crude Output, y/y change, mb/d



US growth has been phenomenal with annual crude oil supply growth of 1.2 mb/d in 2014

Canadian Oil Production, y/y change, mb/d

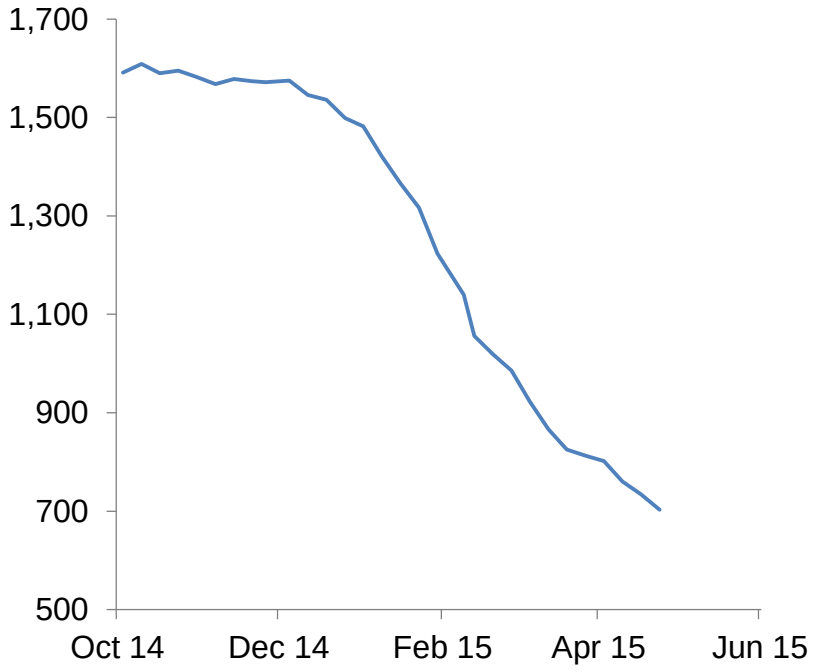


In Canada, growth in production from oil sands offsets the declines from conventional fields

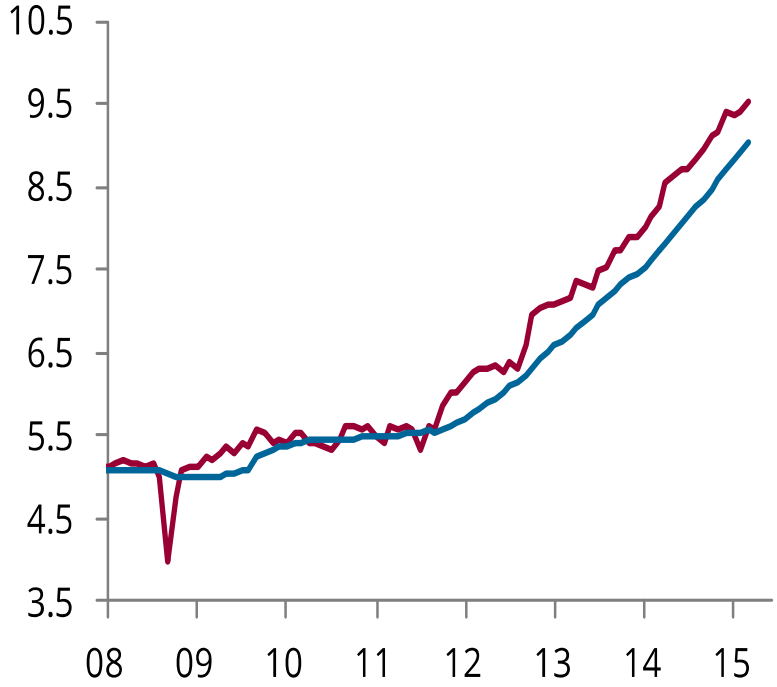
Source: Energy Aspects, EIA

US Shale Responds to Low Prices but no big Dent in Production Yet

US Rig Count



US Crude Output and 12 month average, mb/d

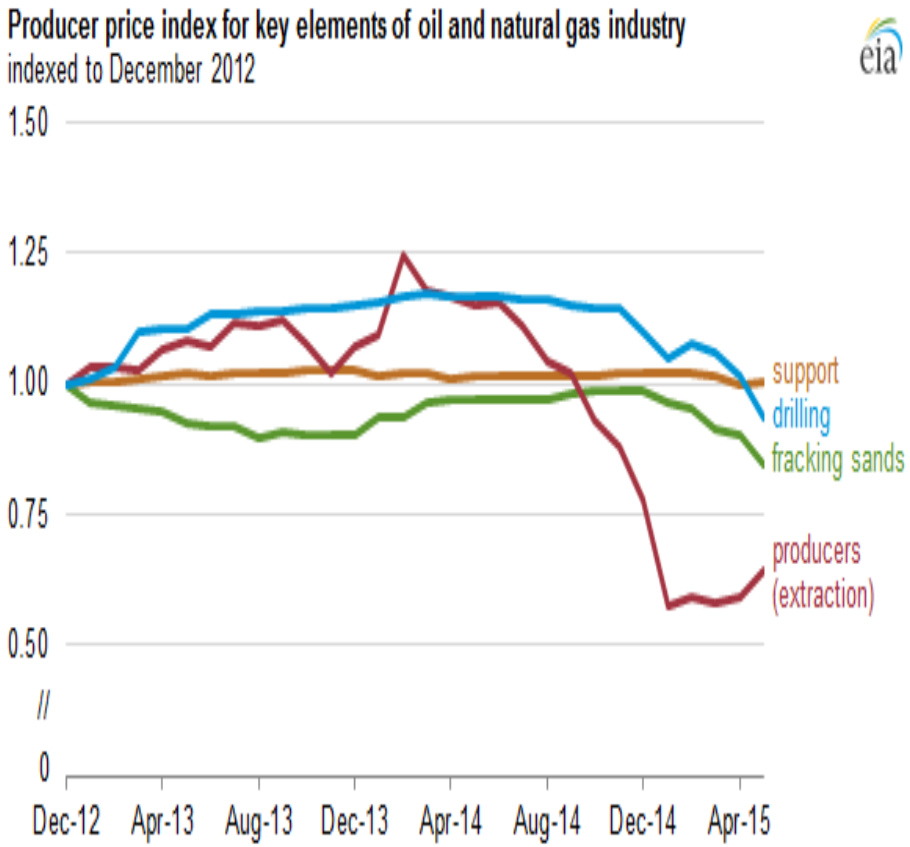


US shale supply has been responsive to lower prices as reflected in the sharp fall in the number of rigs and cuts in capex of US shale producers

But production continues on its upward trend; the distribution of oil rig productivity is highly skewed with lower yielding rigs being shed first and remaining rigs being targeted towards productive 'sweet' spots

Source: Energy Aspects, EIA

US Shale More Resilient than Originally Thought



Baken Oil Output, mb/d

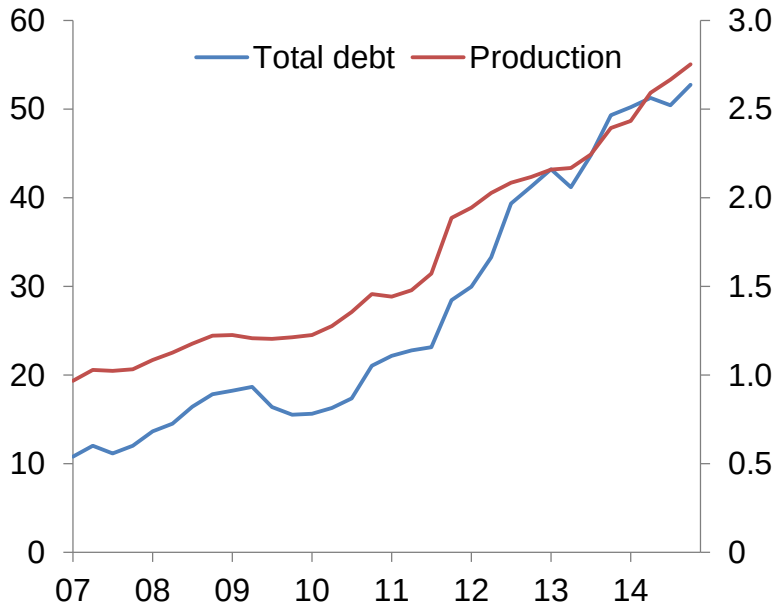
US shale has proven to be more resilient than originally expected with efficiency improvements and lower costs of services reducing the break-even cost

But declines rates are high and the expectation is that growth in production from new wells will not be able to offset the decline rates at one point

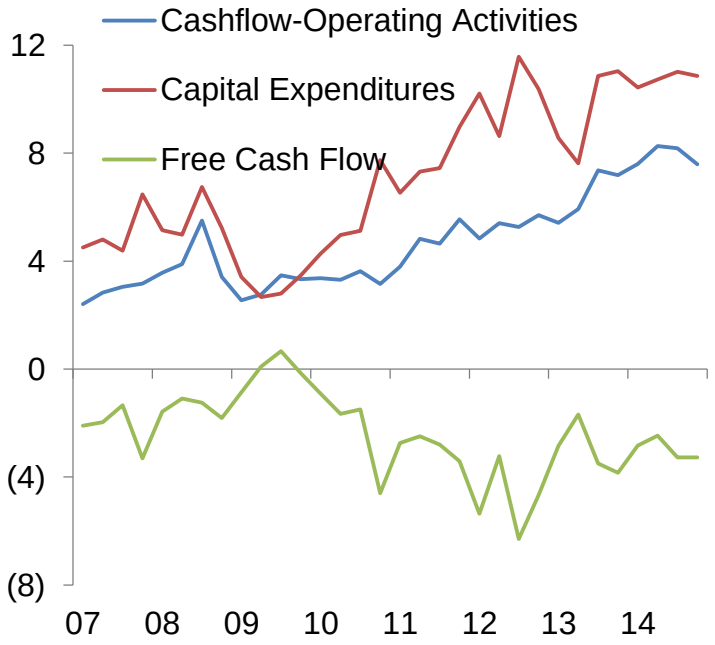
Source: Energy Aspects, EIA

But US Shale is not only about Production Economics

Production and debt
Debt (LHS), $ billions, Production (RHS), mboe/d



US shale company cashflows
$ billions



For US shale, it is not only about production economics but also financial leverage as increase in US output has been associated with increase in total debt of US shale producers

Despite negative free cash flows, financing has not yet proven to be disruptive force as US shale producers have been able to secure finance

Source: Energy Aspects, Company Reports

US Shale Investors Continue to Raise Finance but at a High Cost

Year-to-date debt issuance in US E&P sector

Company	Description	Coupon	Maturity	Face value	Rating	
					S&P	Moody's
Crown Rock LP	Senior notes	7.75	15 Feb 2023	350	B	Caa1
Antero Resources	Senior notes	5.63	1 Jun 2015	750	BB	Ba3
Laredo Petroleum	Senior notes	6.25	15 Mar 2015	350	B	B2
Comstock Resources	1st lien	10	15 Mar 2020	700	B+	Ba3
Newfield Exploration	Senior notes	5.38	1 Jan 2026	700	BB+	Ba1
Energy XXI Gulf	2nd lien	11	15 Mar 2020	1,450	B	B2
Rice Petroleum	Senior notes	7.25	1 May 2023	400	B-	B3
Whiting Petroleum	Senior notes	6.25	1 Apr 2023	750	BB	Ba2
Consol Energy	Senior notes	8	1 Apr 2023	500	BB	B1
Endeavaor Energy	Senior notes	8.13	15 Sep 2023	300	B	B3
Kosmos Energy	1st lien	7.88	1 Aug 2021	225	CCC+	NR
Breitburn	Senior notes	9.25	1 May 2020	650	--	--
Matador Resources	Senior notes	6.88	15 Apr 2023	400	B-	B3
Total				**7,525**		

High yield energy bonds declined from their high levels but remains elevated

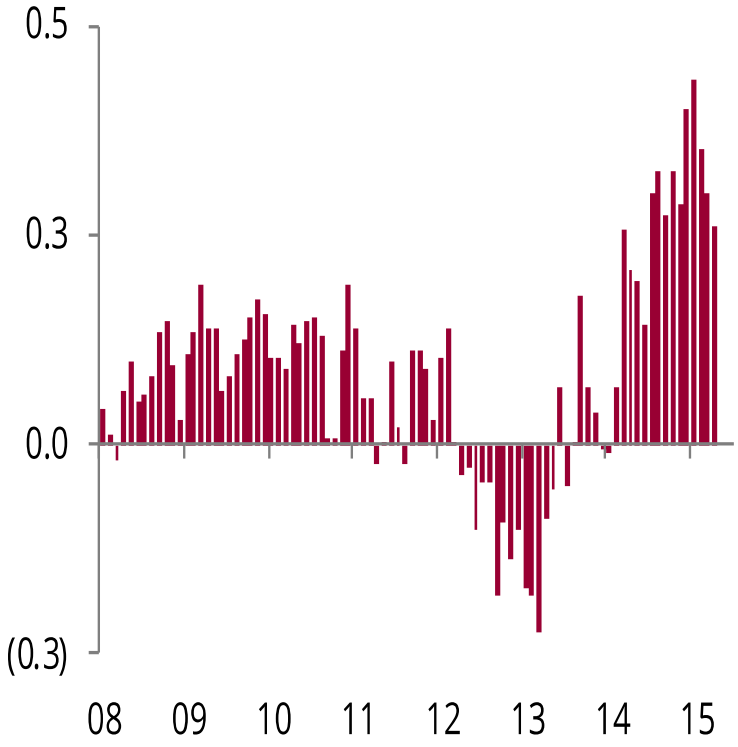
US shale producers managed to roll-over debt but this has come at a high cost

Source: Barclays, FT, Energy Aspects

Non-OPEC Supply Outside North America

Non-OPEC Liquid Supply Outside the US, mb/d

Brazilian Oil Production, mb/d



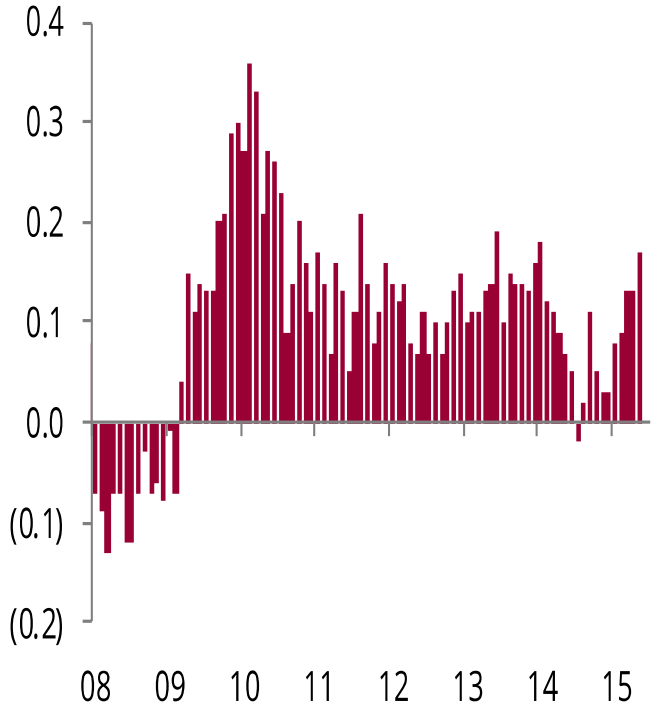
In non-OPEC (ex-North America), record investment in the past few years reversed the annual declines in 2011 and 2012

In 2014, Brazil was the main contributor to non-OPEC supply growth outside North America

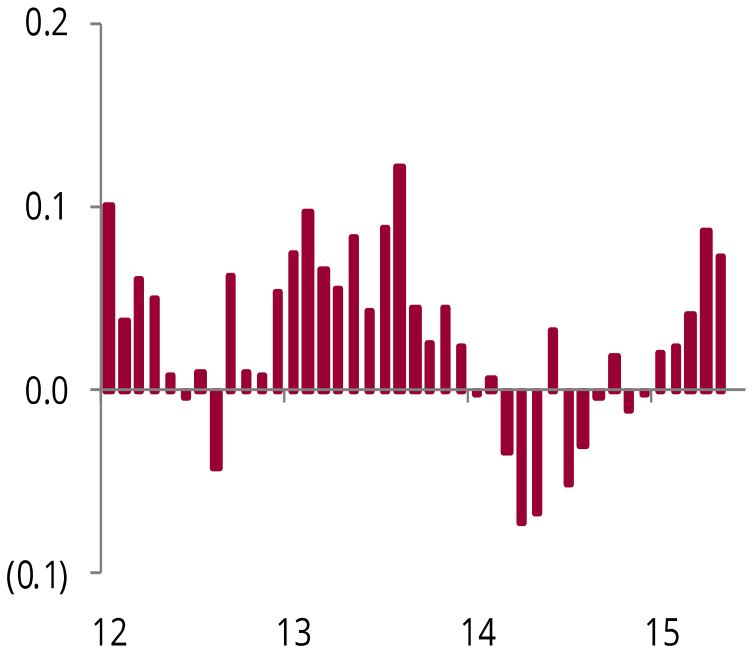
Source: Energy Aspects, EIA

Non-OPEC Supply Outside North America

Russian Oil Output, y/y change, mb/d



Colombian Oil Output, y/y change, mb/d



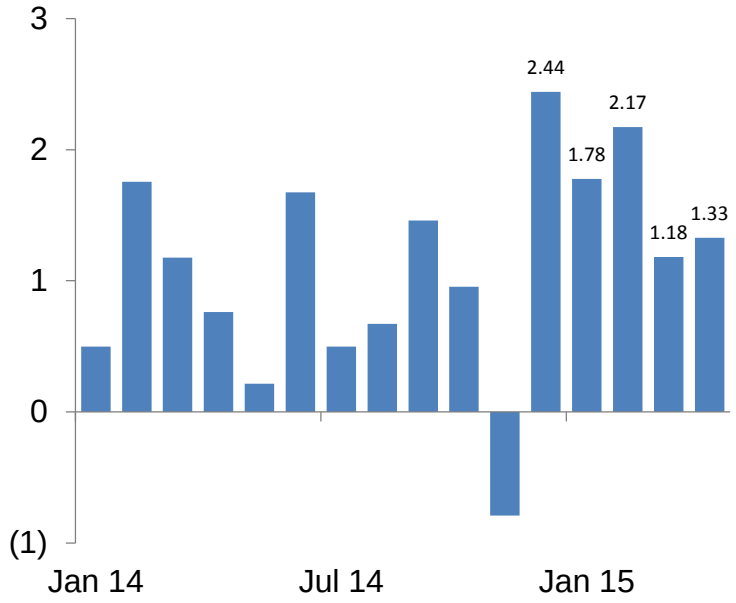
Russian production continues to rise y/y helped in large part by the devaluation of the Ruble

So has Colombian oil output despite the decline in the number of rigs

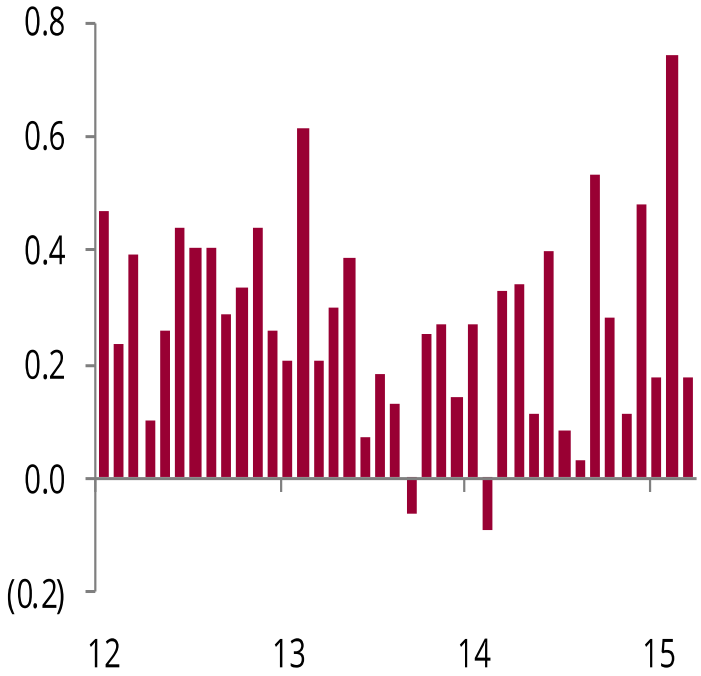
Source: Energy Aspects, EIA

Global Demand Growth Has Surprised on the Upside

Global Oil Demand, y/y change, mb/d



Asian Gasoline Demand, mb/d



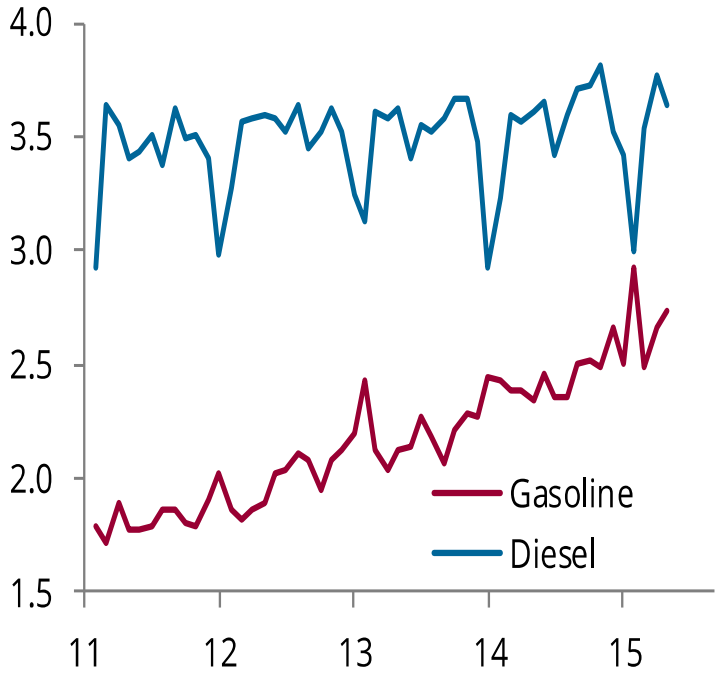
Demand growth has been stronger than initially expected driven in part by cheaper prices and as a result the overhang in 2015 is likely to be less than the consensus

With the light end of the barrel leading the growth in global demand

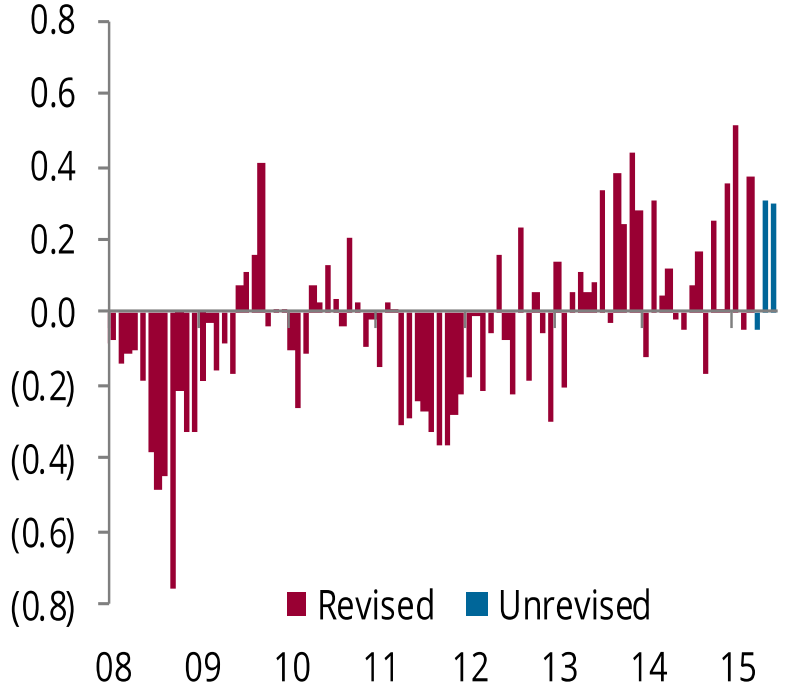
Source: Energy Aspects,

Gasoline Demand Leading the Momentum

Chinese Gasoline and Diesel Demand, mb/d



US Gasoline Demand, y/y, mb/d



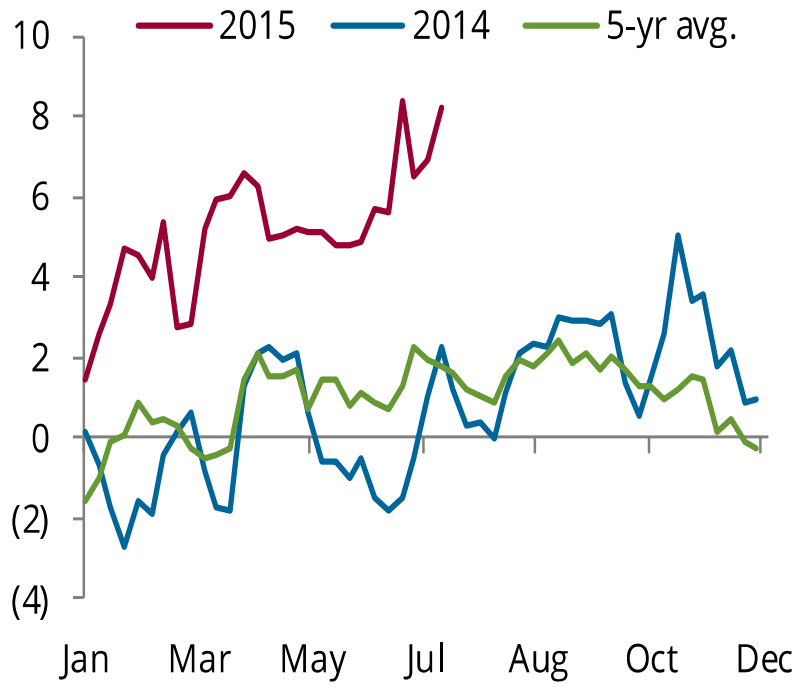
In China, gasoline demand has outperformed that of diesel as the economy continues to rebalance from investment towards consumption

So has gasoline demand in the US which has been rising as Americans are driving longer distances

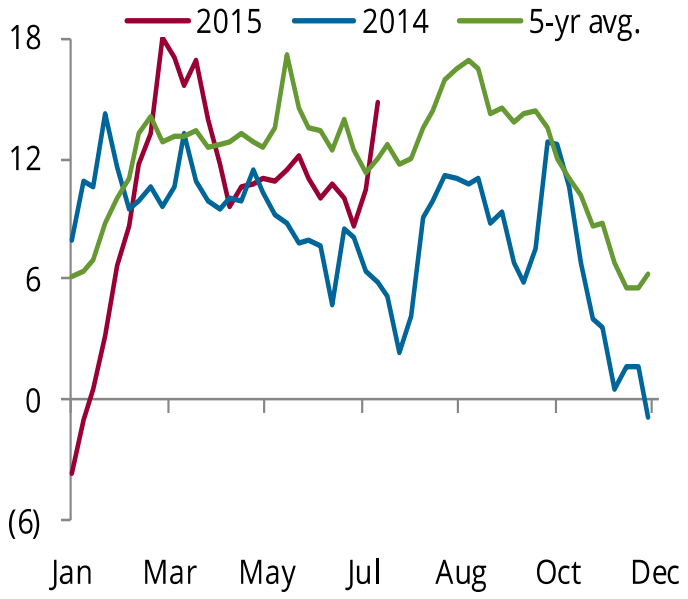
Source: Energy Aspects, China Customs, EIA

Against all Odds, Refining Margins Have Been Strong

Brent Cracking, $/barrel



WTI Cracking, $/barrel



Refining margins in Europe (against all odds) have been quite healthy due to cheap crude and higher gasoline prices encouraging runs

So have refining margins in the US which are running at record level though margins have fallen below the 5-year average

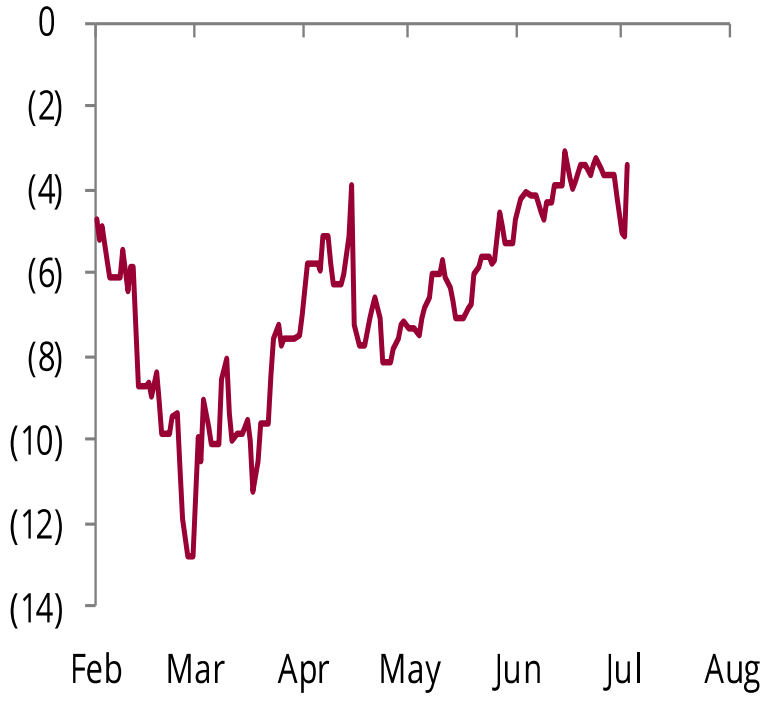
Source: Energy Aspects,

The Process of Clearance Also Matters

The Clearance of Backed WAF Barrels

Brent-Dubai Spreads, $/Barrel

Brent-WTI Spread, $/Barrel



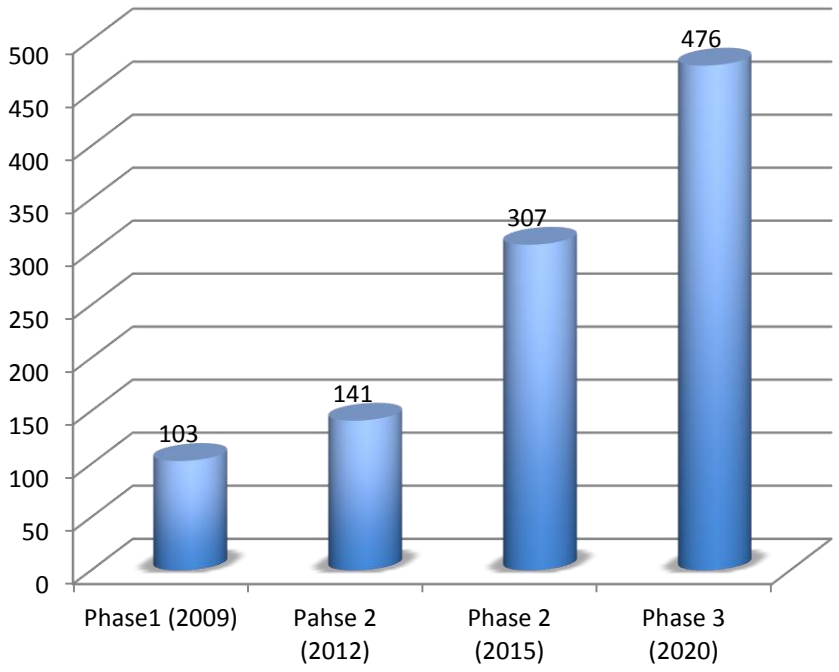
With WAF barrels being pushed back from the US, the clearance is taking place mainly in Europe putting downward pressure on the Brent structure

But if European refineries can't clear the barrels, then the glut has to be shifted into the US or Asia; the time spreads will adjust to allow this arbitrage to work

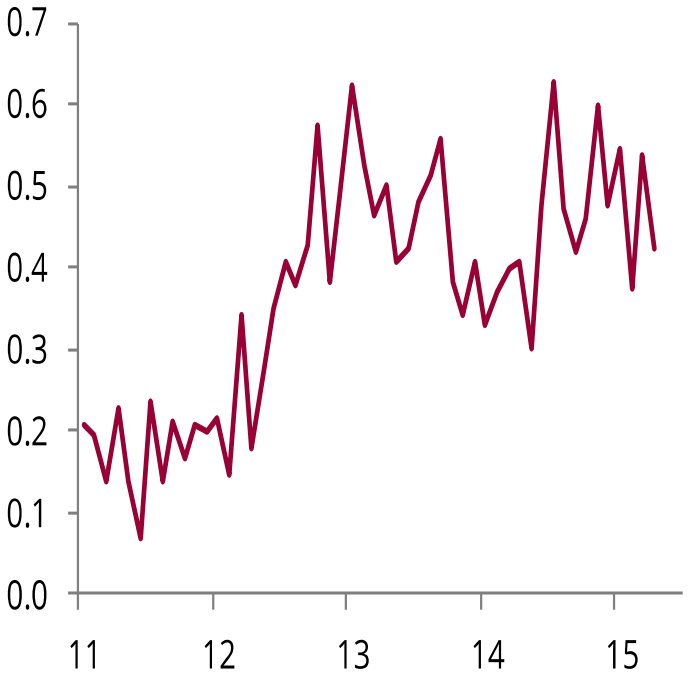
Source: Energy Aspects, Reuters

Clearing Barrels in Asia

China's SPR, million barrels



Indian Imports from Venezuela, mb/d



Chinese demand for storage is a key dynamic in the market absorbing large part of the glut; the speed at which new storage facilities are brought on-line will impact how quickly the glut is cleared

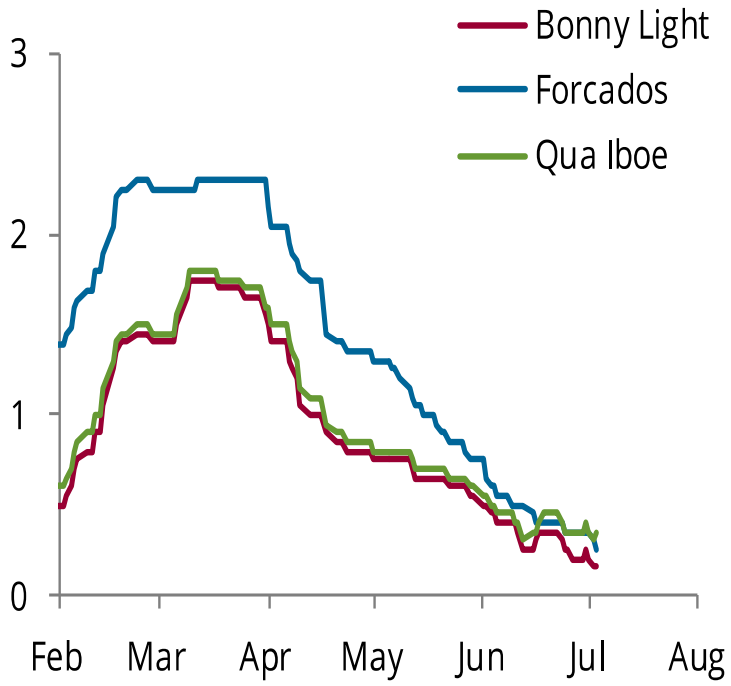
Asian refineries have more flexibility given the large investments in more complex refineries and hence choice is no longer confined to light sweet crude

Source: Energy Aspects,, Media Reports

Moving the Glut to the US and Impact on Differentials

US Crude Imports of Nigerian Crude

Nigerian Differential to Dated Brent, $/Barrel



The WTI-Brent arbitrage could allow some of the West African (WAF) crude to reach the US

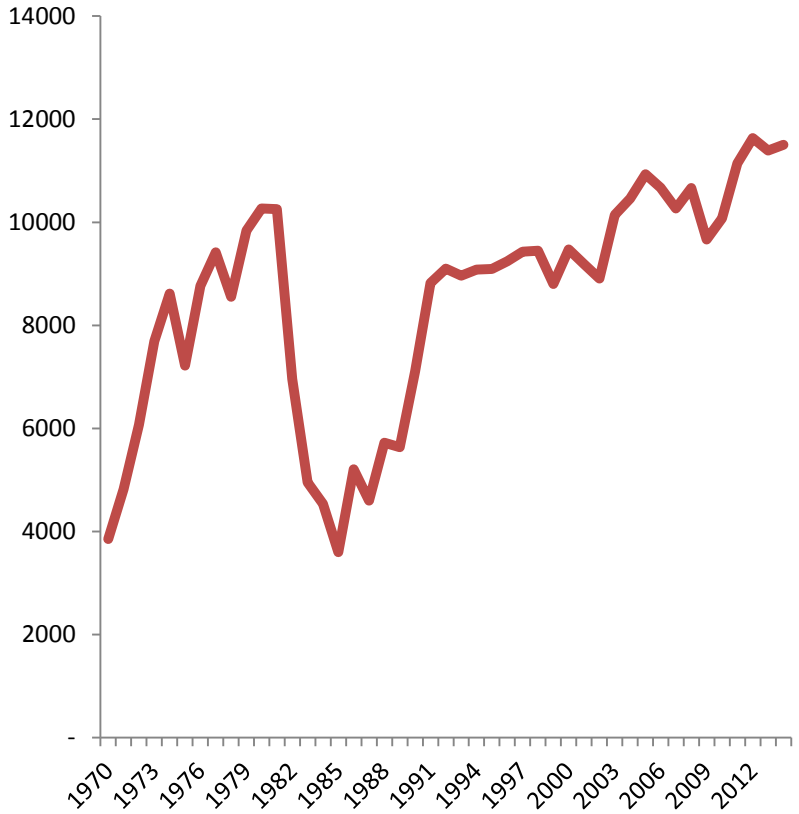
But eventually, the Brent structure and physical differentials will feel the greatest impact

Source: Energy Aspects, EIA

Will OPEC Clear the Excess Supplies?

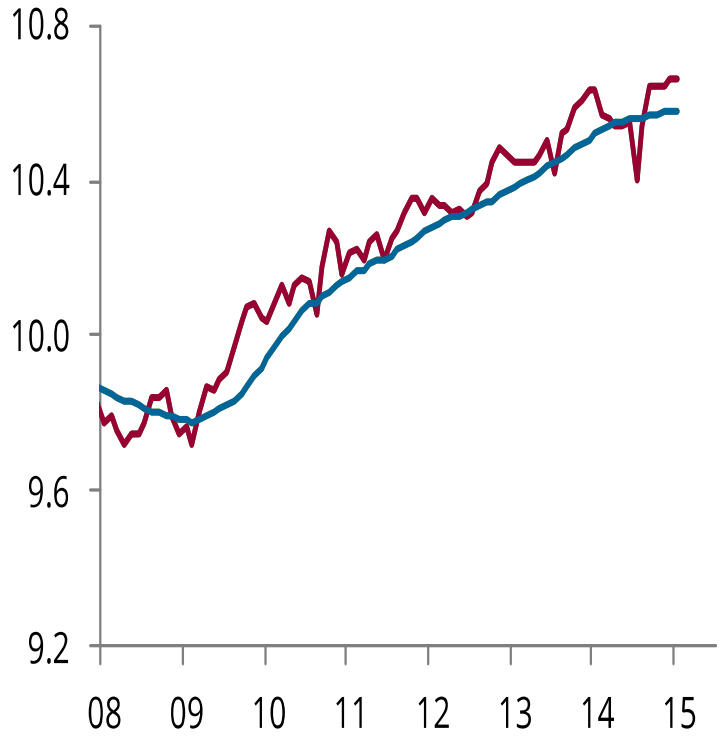
Saudi Arabia not Opposed to Cuts but Cuts Have to be Collective

Saudi Arabia Oil Production, mb/d



From the supply side, Saudi Arabia is not willing to cut output unilaterally and it has been difficult to reach a consensus on a collective cut within OPEC

Russian Oil Production, mb/d

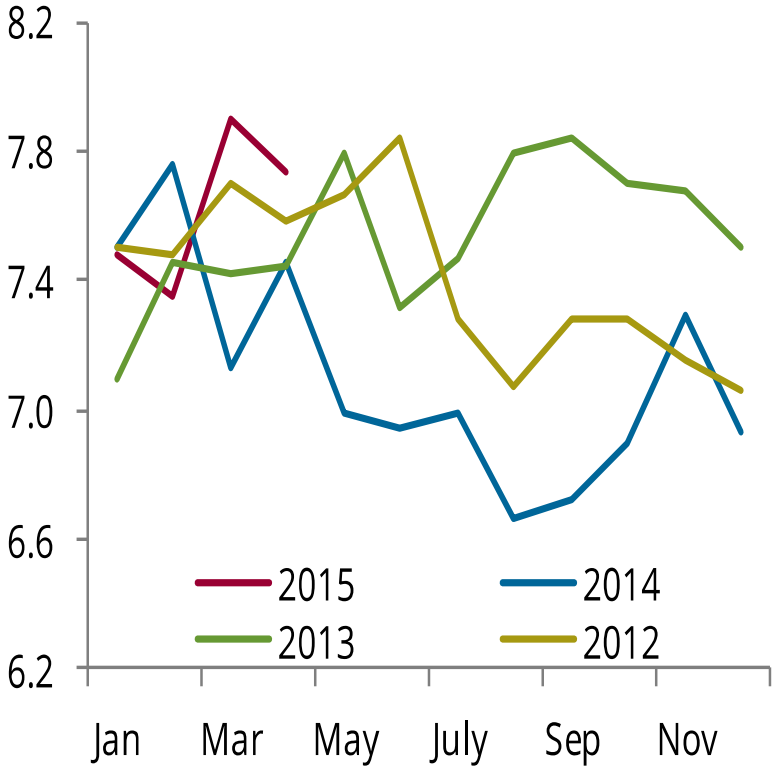


Unlike 1998, reaching an agreement with non-OPEC producers to cut has not been successful so far

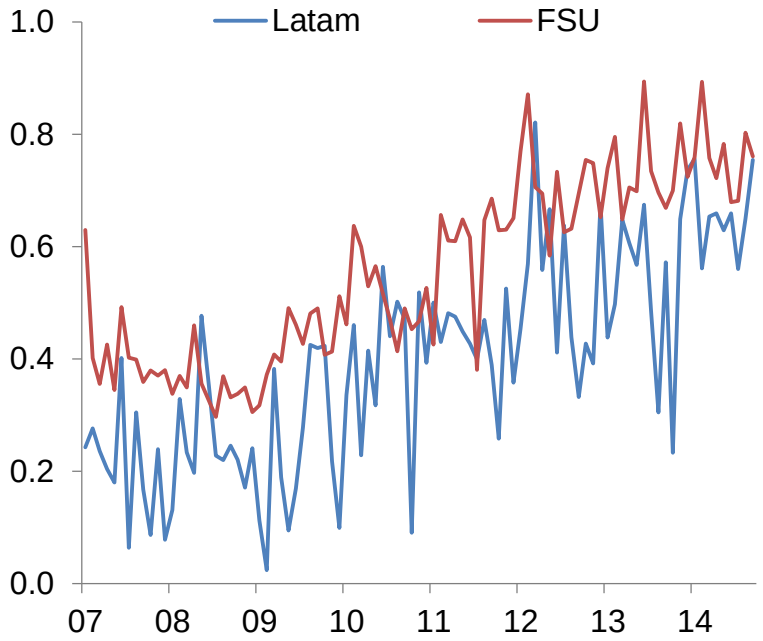
Source: Energy Aspects,BP

Market Share Matters

Saudi Arabia Monthly Exports, mb/d



Latin American and FSU exports to China, mb/d



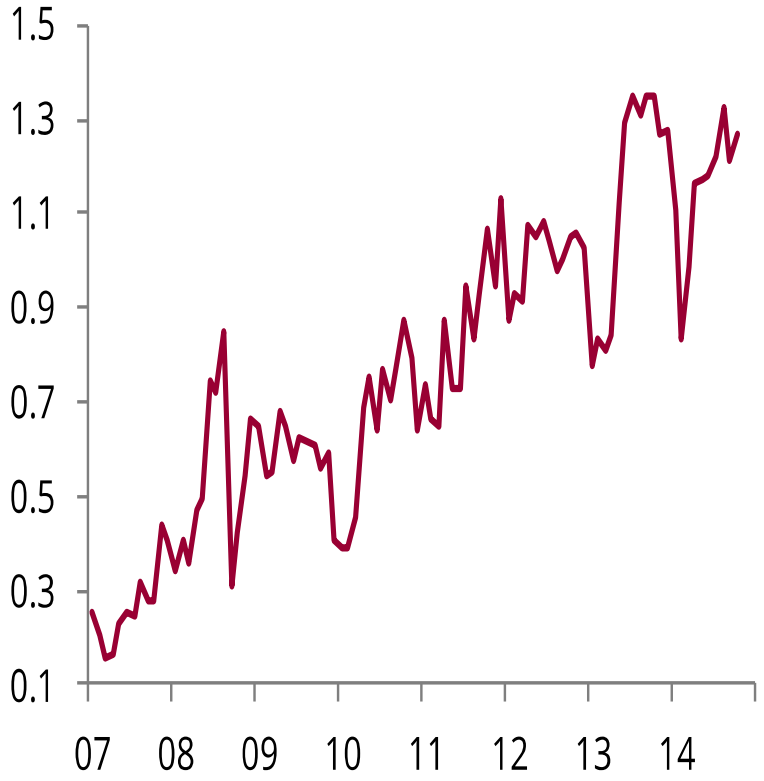
In the absence of collective cut, Saudi Arabia is seeking market share and maintaining exports above a certain level

Especially that competition in key markets has intensified as more and more exports are being directed to Asia

Source: Energy Aspects, JODI

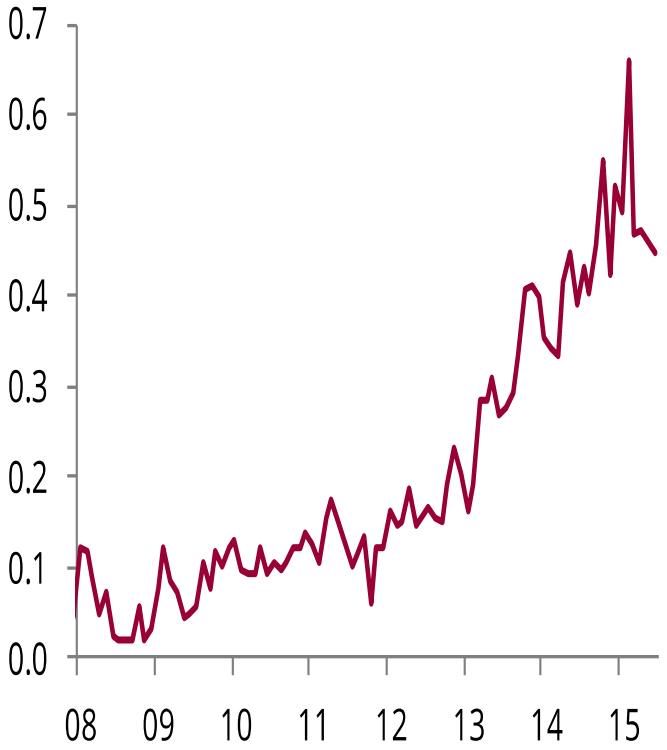
Competition not only confined to crude but also products

US Distillate exports, mb/d



US turns into world's largest exporter of diesel as refineries in the US take advantage of the cheap crude and higher margins

Propane Exports, mb/d

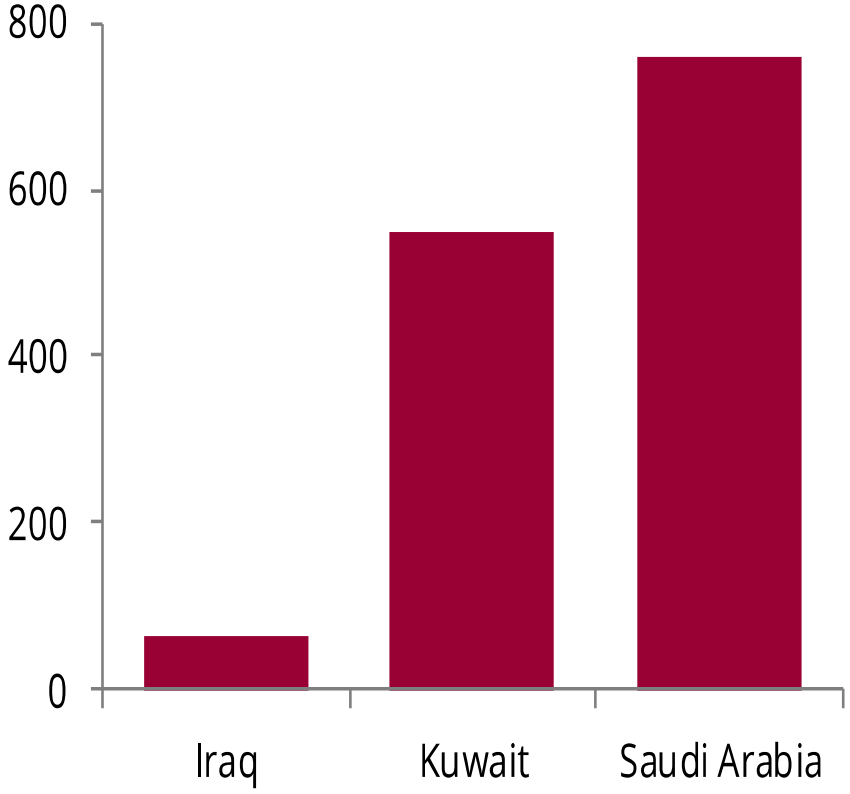


LPG exports have also risen fast as US NGL production continues to increase and as export infrastructure is put in place

Source: Energy Aspects, EIA

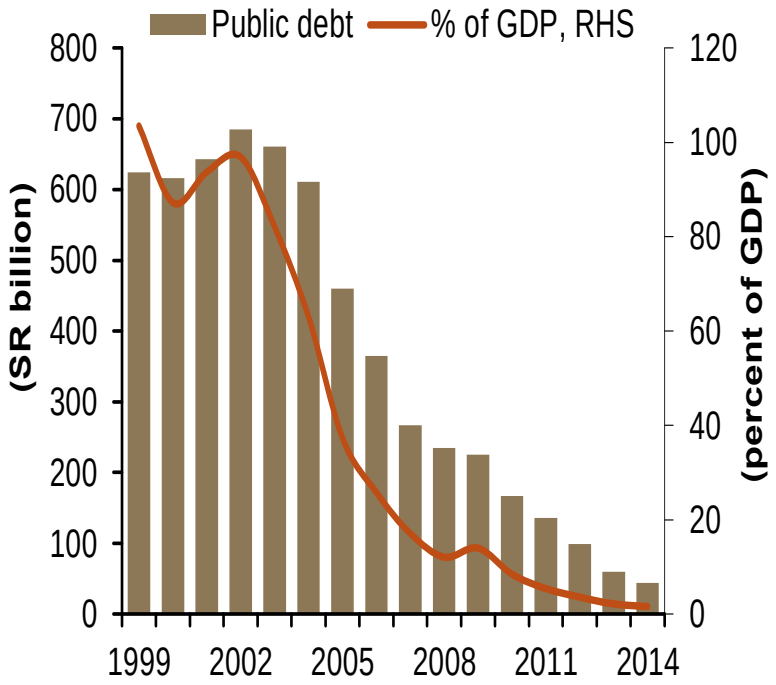
Core GCC in Better Position to Withstand Lower Oil Prices

Government Reserve Funds, Billion US$



Saudi Arabia (and other core GCC) has the financial resources to withstand a lower oil price environment though the drawing down of foreign reserves has been sharp

Saudi Government Debt (% of GDP)

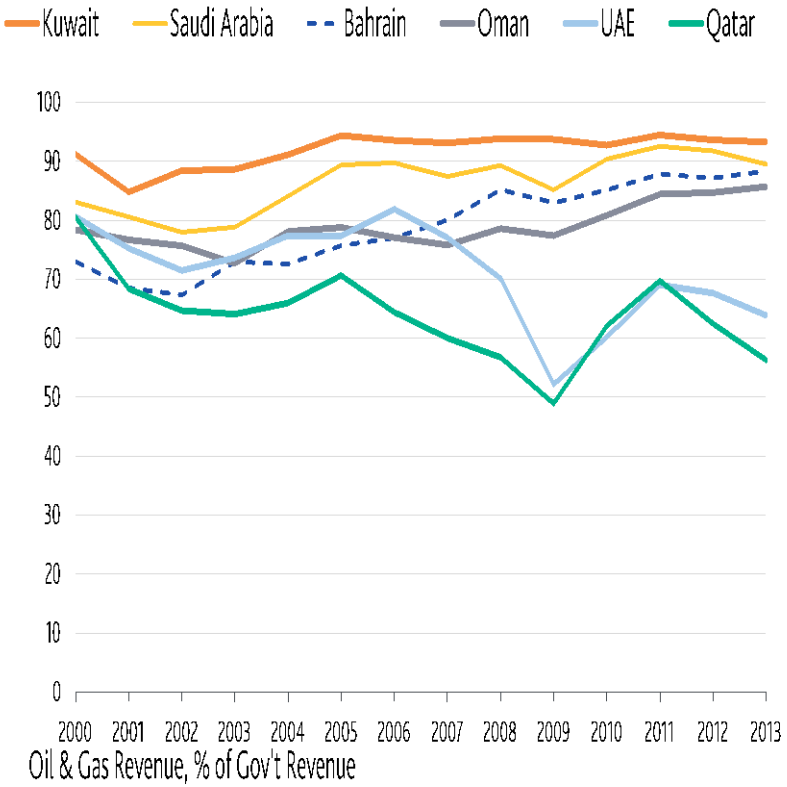


Debt levels have been significantly reduced over the last decade but debt levels are expected to rise

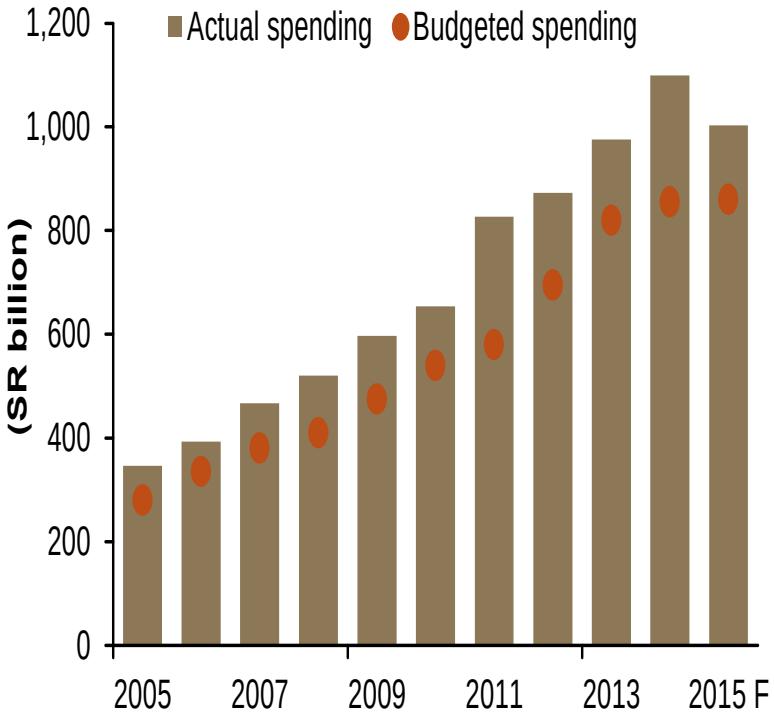
Source: Energy Aspects, JADWA

Revenue Objective Remains Key

Oil & Gas Revenues, % of Gov't Revenue



Saudi Arabia Budgeted versus actual spending



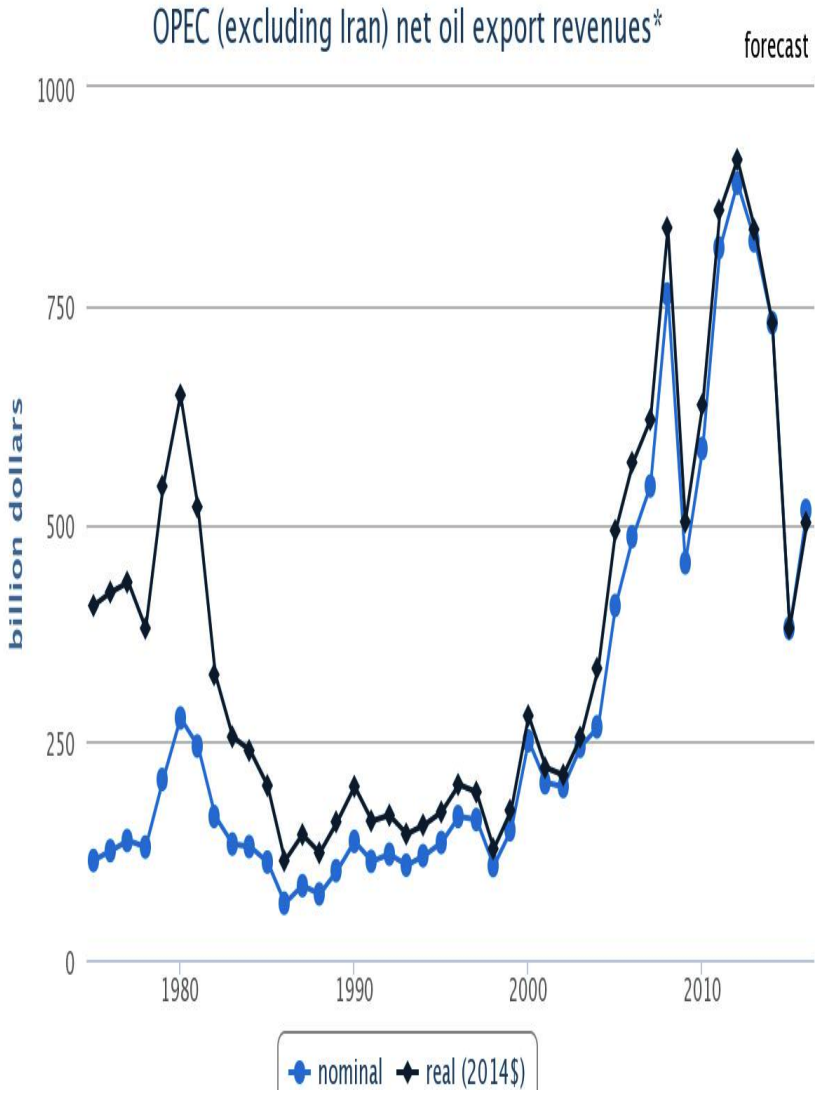
But Saudi economy still relies heavily on oil revenues as attempts to diversify the economic have not been successful so far

and government spending has been on the rise and therefore revenue objective would always feature high in oil policy

Source: Moody's, JADWA

Trade offs and Constantly Evolving Saudi Oil Policy

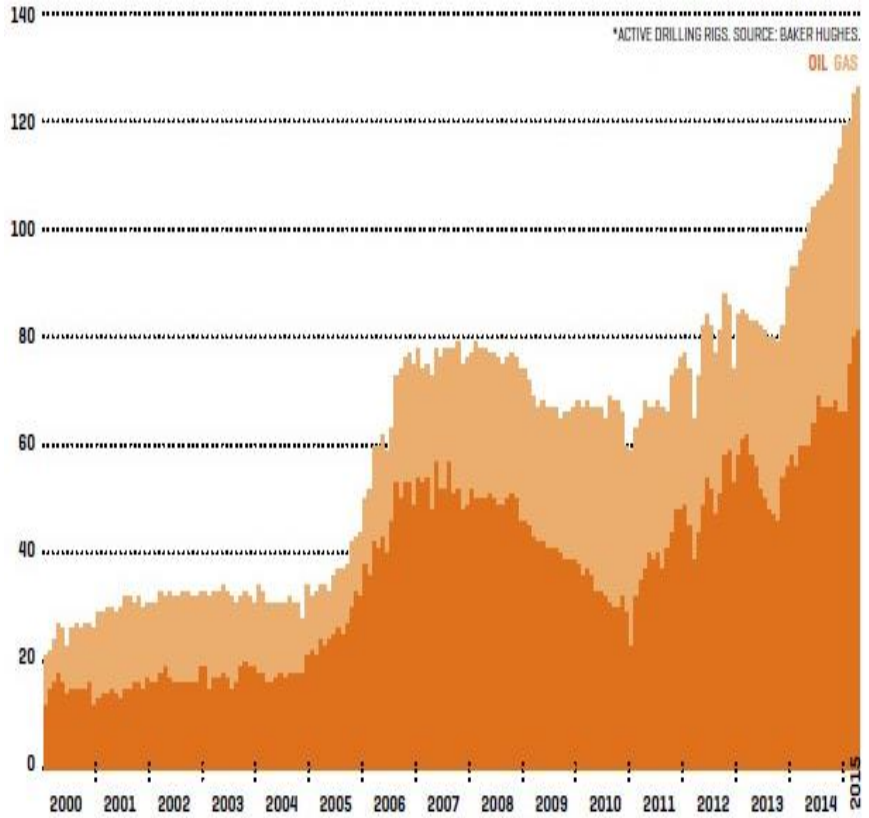
- Trade-off changes over time (depending on market conditions, nature of the shock, behavior of other producers)
- Pragmatic approach
  - 1986: Relevant trade-off in the circumstances of the time favored volume over price
  - 1998: favored price over volume (but agreement on cuts took months to reach)
- With advent of US shale, Saudi Arabia has entered unchartered territory; Still learning about a new source of supply and its responsiveness to price signals which made calculus of trade-off more uncertain
  - As Saudi Arabia learns more about this new source of supply, its policy will adapt accordingly
- ***Keeping market share at whatever cost is not an 'ideological' position and could change depending on market circumstances***



Source: EIA

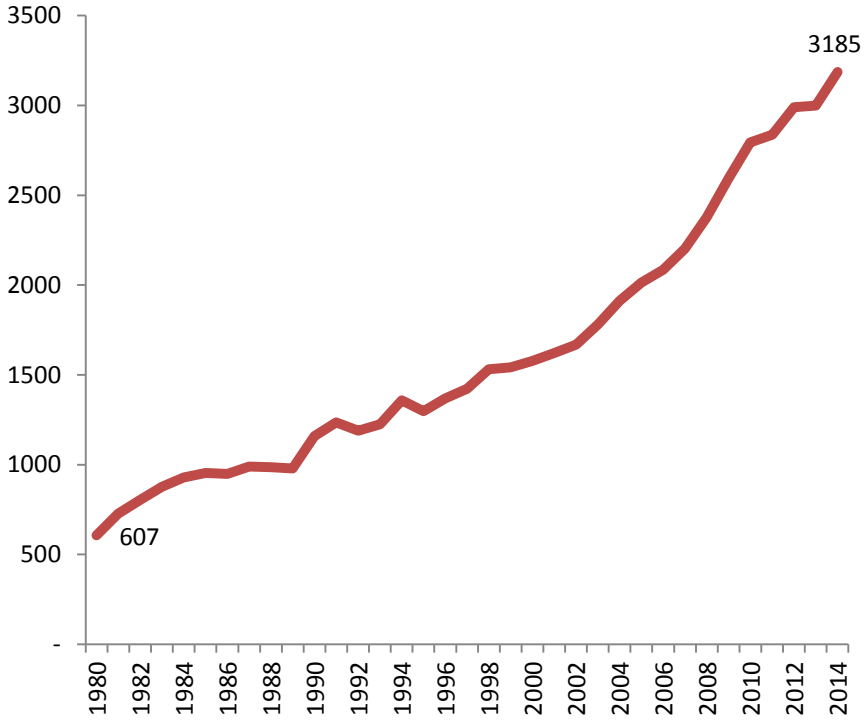
Saudi Arabia Higher Oil Production: The New Norm?

Number of Rigs in Saudi Arabia



Increase in the number of rigs is mainly geared towards maintaining production at above 10 mb/d and not to add new productive capacity

Saudi Domestic Liquid Demand, mb/d

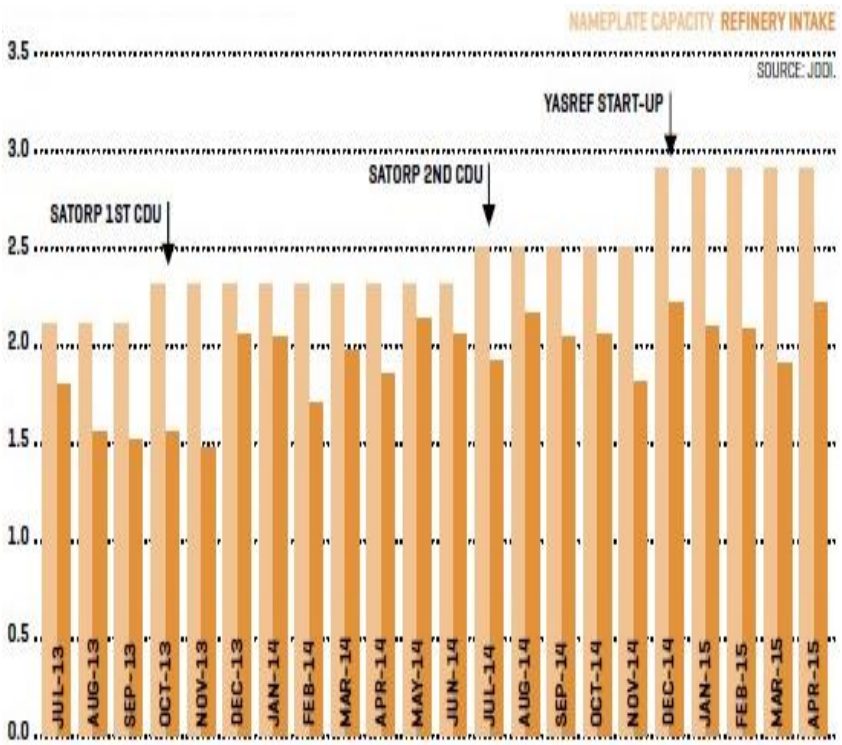


Saudi Arabia reduced flexibility in swinging production both on the upside and the downside due to a number of factors including the rapidly rising domestic demand

Source: MEES, BP

Less Flexibility in Adjusting Production and Diminished Signalling Power

Saudi Arabia Refinery Expansion, mb/d



Fair price for oil is $75-$80 a barrel, says King Abdullah of Saudi Arabia

King Abdullah of Saudi Arabia said in remarks published on Tuesday that a fair price for oil was $75-$80 a barrel.

AFP

12:35PM BST 26 May 2009

Kingdom: $100 a barrel is fair price for oil

Al-Naimi says KSA willing to supply more oil in case of shortage

Landing | Wed Jun 3, 2015 11:01pm BST

OPEC moots $80 as new 'fair' oil price - but will it stick?

VIENNA, JUNE 4 | BY ALEX LAWLER, RANIA EL GAMAL AND DMITRY ZHDANNIKOV

Integrating down the energy value chain to capture value added affecting supply and export decisions

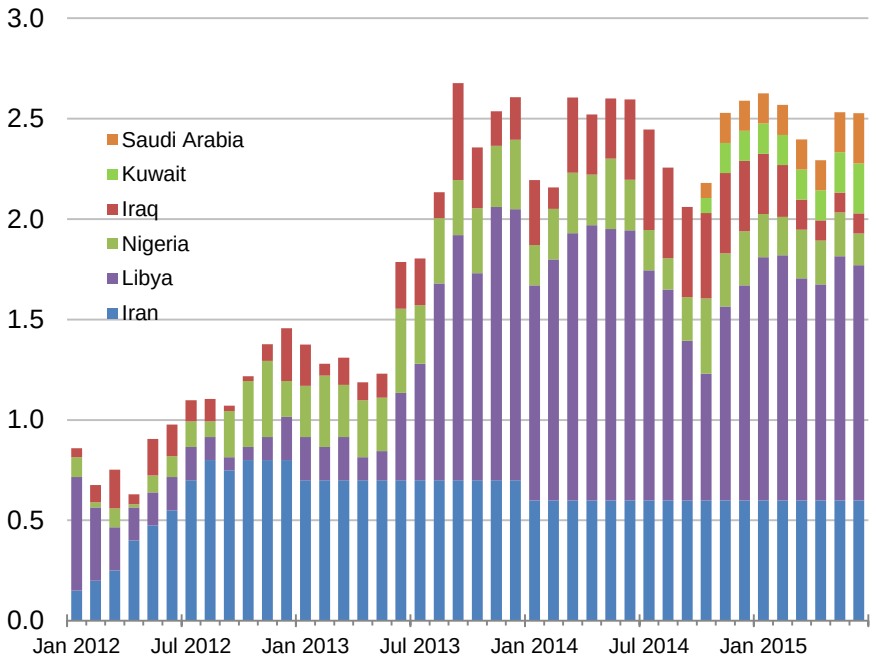
Although Saudi Arabia's policy is not constant, the signals are likely to be less effective in the future

Source: MEES

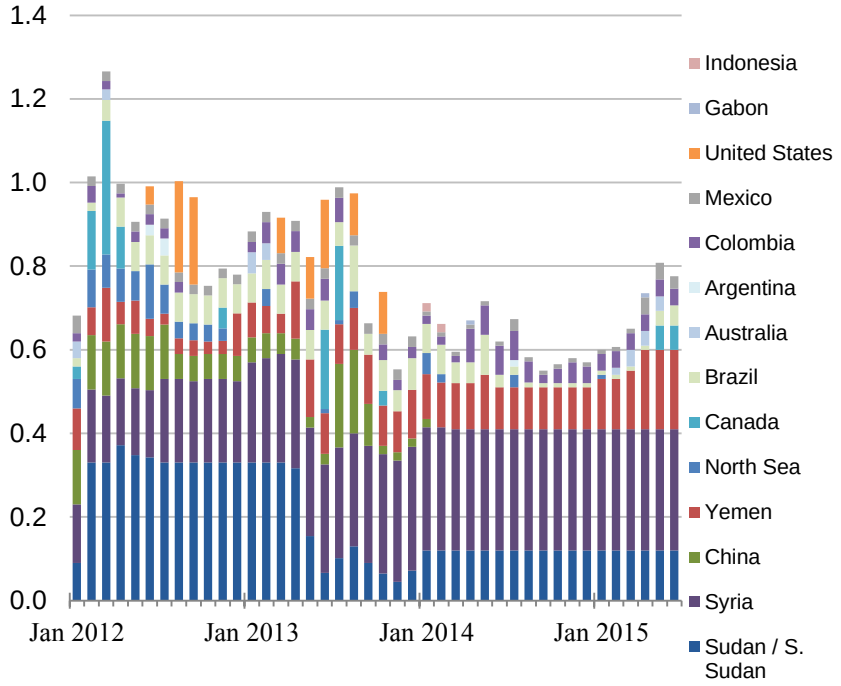
In absence of OPEC cuts, rely on investment and supply-demand responses to clear the glut

Disruption Remain High

Estimated Historical Unplanned OPEC Crude Oil Production Outages, mb/d



Estimated Historical Unplanned Non-OPEC Liquid Fuels Production Outages, mb/d



Disruptions within OPEC remain quite high, but the potential return of key suppliers (particularly Iran) continues to induce uncertainty in the market

Disruption within non-OPEC remain at elevated level with production in countries such Syria, Yemen and South of Sudan coming to almost complete halt

Source: EIA

The Middle East-OPEC Investment Cycle

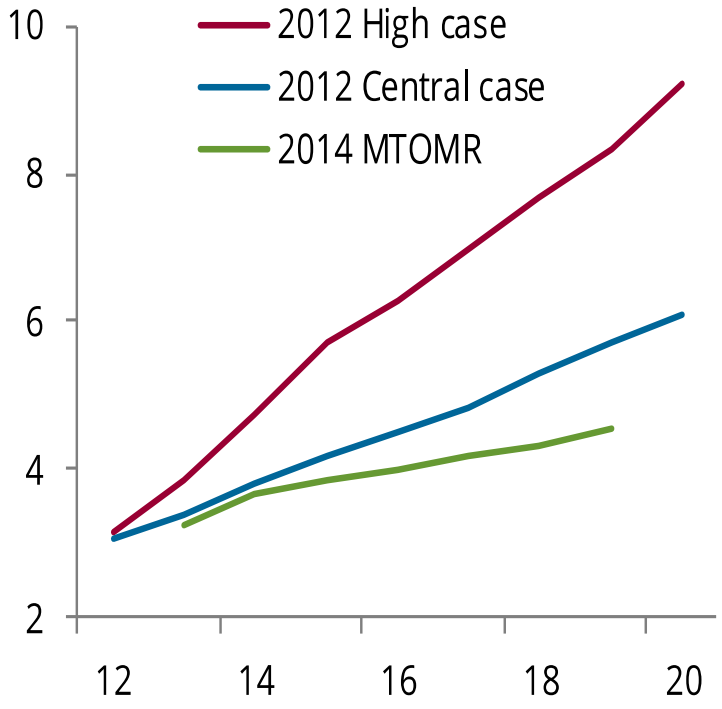
Country	Oil capacity (mb/d)	Oil growth potential	Comments
Saudi Arabia	12.5	High	Investment may be delayed by uncertainty over long-term demand for oil exports.
Iraq	3.3	High	Potential to more than double production, but security, bureaucratic and political hurdles likely to reduce growth.
Kuwait	2.8	Medium	Political uncertainty and restrictions on investment likely to contribute to missing target of 4 mb/d by 2020.
Iran	3.6	Medium	Nuclear deal and the lifting of sanctions needed to unlock growth. Technical issues may slow any increases.
Libya	1.6	Low	Significant reserves, but exploration and production will struggle until political stability amd security returns.
Qatar	2.8	Low	Oil output growth prospects limited. Moratorium on gas projects, but debottlenecking may raise LNG exports.
Algeria	1.2	Low	Substantial decline rates in oil and gas fields; investment prospects remain limited; political stability fragile.
UAE	2.7	Low	Target of 3.5 mb/d production likely to be pushed from 2017 to 2020, limited supply growth prospects.

Within OPEC, increase in future productive capacity is rather limited with only few countries in a position to increase capacity

Source: Energy Aspects,

Meeting Ambitious Targets Proving More Difficult

Iraq Oil Production Forecast, mb/d



Iraqi production forecast revised downwards as over-ground problems continue to plague the oil sector

Kuwait Oil Production, mb/d

Kuwait has ambitious plans to increase capacity to 4 mb/d by 2020 but target unlikely to be met; weak business environment, volatile politics, mature fields, unattractive terms, and recently border disputes

Source: MEES, IEA

Decline Rates Accelerating in Some Mature Areas

Algerian oil production, mb/d

Algeria's oil production falling fast and investment prospects remain limited to reverse declines

Qatari oil production, mb/d

Qatari oil production falling fast with NGLs exceeding crude output

Source: Energy Aspects, MEES

The axe in Capex will Affect the project pipeline outside OPEC

Global Capex by region
$ million

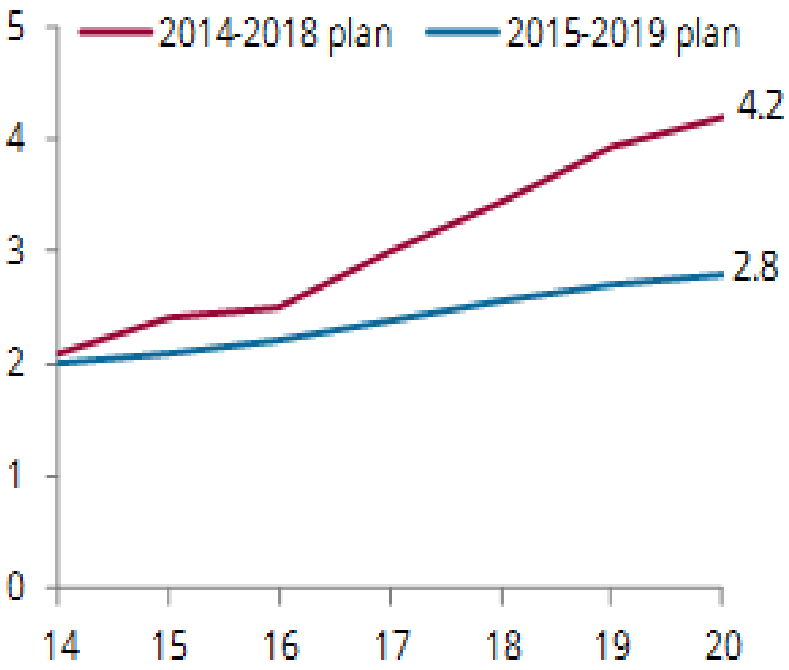
Region	2015E	2014A	2013	+ / -	%
United States	122,426	154,295	142,234	(31,869)	(20.7%)
US Independents Intn.	*15,458*	*22,731*	*22,842*	*(7,273)*	*(32.0%)*
Canada	33,691	38,270	37,773	(4,579)	(12.0%)
Mexico	23,000	24,600	21,600	(1,600)	(6.5%)
Asia Pacific	102,676	118,219	116,286	(15,543)	(13.1%)
Majors International	104,271	112,724	112,400	(8,453)	(7.5%)
Russia/FSU	44,020	47,897	44,428	(3,877)	(8.1%)
Latin America	48,215	56,188	51,193	(7,973)	(14.2%)
Europe	41,542	48,416	41,728	(6,874)	(14.2%)
Middle East	40,565	40,745	35,790	(180)	(0.4%)
Africa	17,955	20,417	22,666	(2,462)	(12.1%)
Other	9,500	11,850	16,500	(2,350)	(19.8%)
International	408,744	456,456	440,991	(47,712)	(10.5%)
Global Capex	**603,319**	**696,352**	**665,440**	**(93,033)**	**(13.4%)**

Global Capex was around $700 billion in 2014, so a 13% decline would be nearly $100 billion. This will see projects, particularly deepwater and capital intensive ones, getting deferred and even cancelled, tightening future balances.

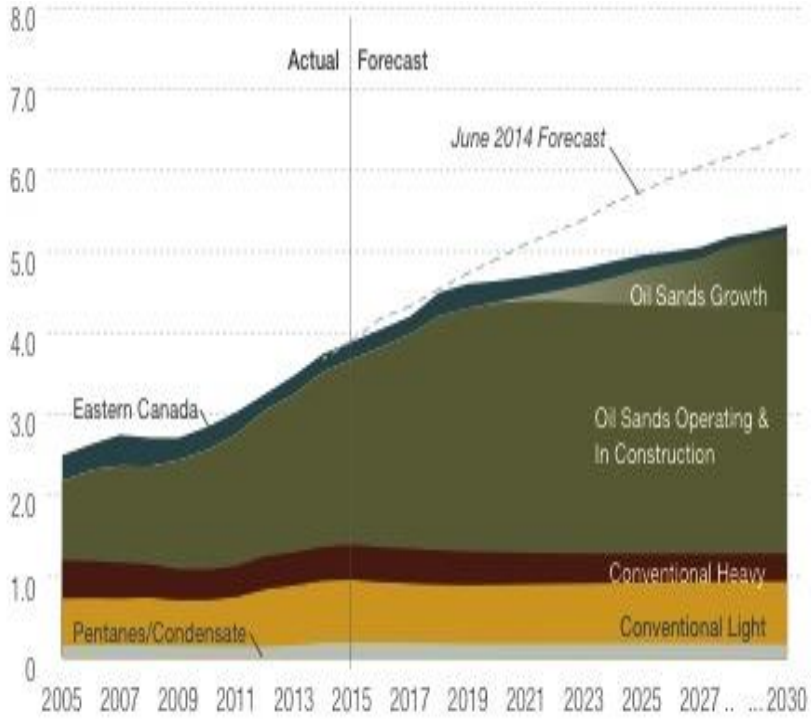
Source: Company data, Energy Aspects analysis

The Non-OPEC Investment Cycle Outside the US

Petrobras Production Forecast, mb/d



Canada Production Forecast, mb/d



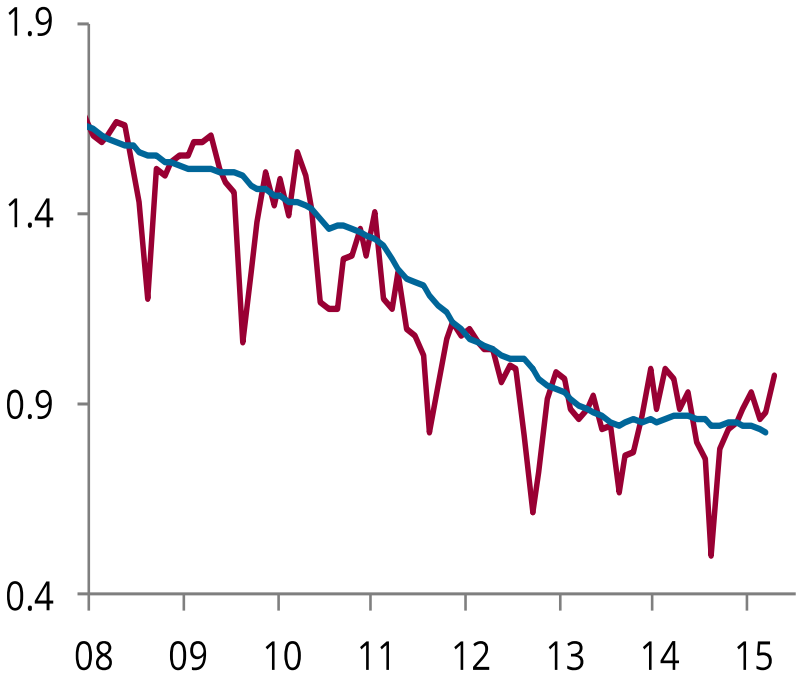
Some of the key growth centers such as Brazil are already feeling the pinch

And Canada's oil production has been revised downward substantially as many projects get postponed or cancelled

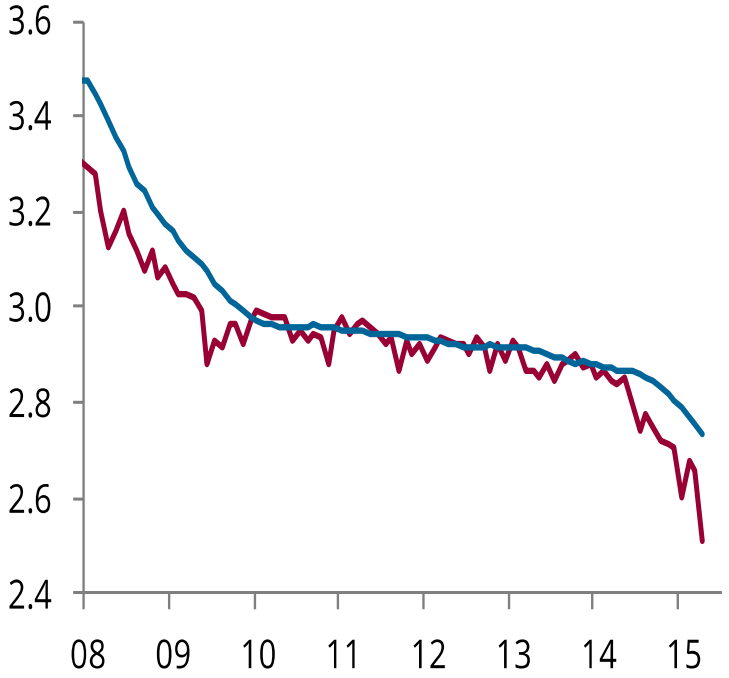
Source: Energy Aspects, Petrobras, Canadian Association of Petroleum Producers

The Non-OPEC Investment Cycle Outside the US: The Decline Rates

UK Liquid Production, mb/d



Mexico Oil Production, mb/d



The decline rates in some of the mature areas such as the UK will accelerate in a low price environment

While in Mexico large investments are needed to reverse the heavy declines

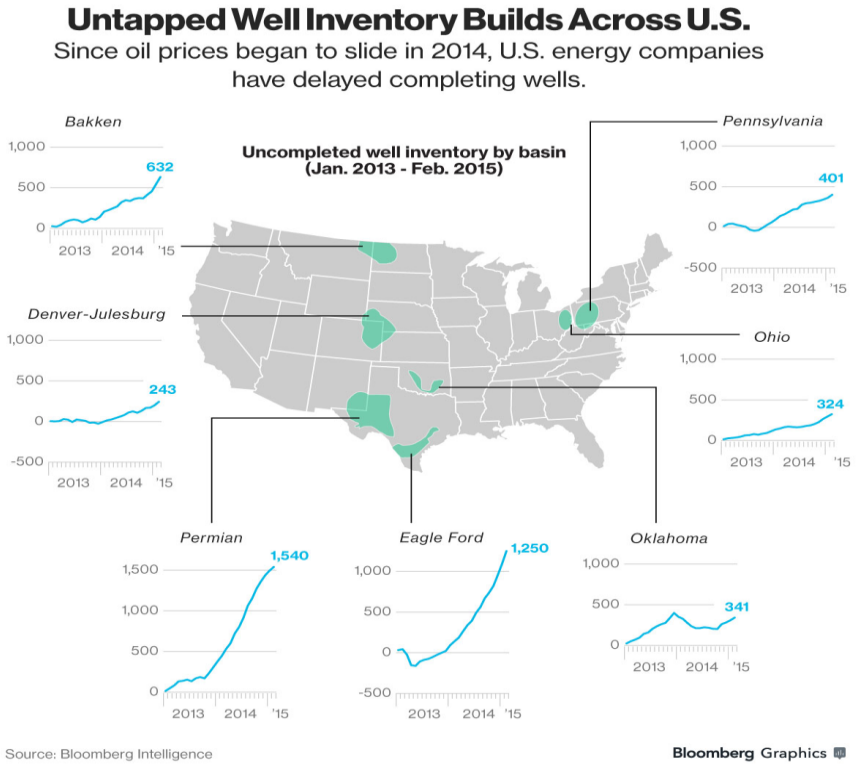
Source: Energy Aspects, Petrobras, Canadian Association of Petroleum Producers

US: The Short Investment Cycle

US Independents 2015 Capex
$ bn

	Basin	2014 Capex	2015E Capex	% chg.
Anadarko	Global	9.2	6.8	(26)%
EOG Resources	Eagle Ford / Permian	8.1	6.4	(21)%
Marathon Oil Corp	Global	5.5	4.4	(20)%
Encana Corp	Permian / Eagle Ford	2.6	2.8	10%
Continental Resources	Bakken/SCOOP	4.6	2.7	(41)%
Concho Resources	Permian	2.6	2.0	(23)%
Oasis Petroleum	Bakken	1.4	0.8	(44)%
Halcon Resources	Eagle Ford / TMS	1.4	0.8	(45)%
Rosetta Resources	Permian / Eagle Ford	1.2	0.8	(38)%
Linn Energy	California / E. Texas	1.6	0.7	(53)%
WPX Energy	Williston / San Juan	1.4	0.7	(48)%
Sanchez Energy	Eagle Ford	0.9	0.6	(28)%
PDC Energy	Niobrara / Utica	0.6	0.6	(13)%
Denbury Resources	USGC / Rockies	1.1	0.6	(50)%
Laredo Petroleum	Permian	1.1	0.5	(52)%
Carrizo Oil & Gas	Eagle Ford / Niobrara	0.6	0.5	(26)%
Stone Energy	GoM / Marcellus	0.9	0.5	(49)%
Diamondback Energy	Permian	0.5	0.4	(4)%
Matador Resources	Permian / Eagle Ford	0.6	0.4	(39)%

Drilled but Unfracked Wells on the Rise



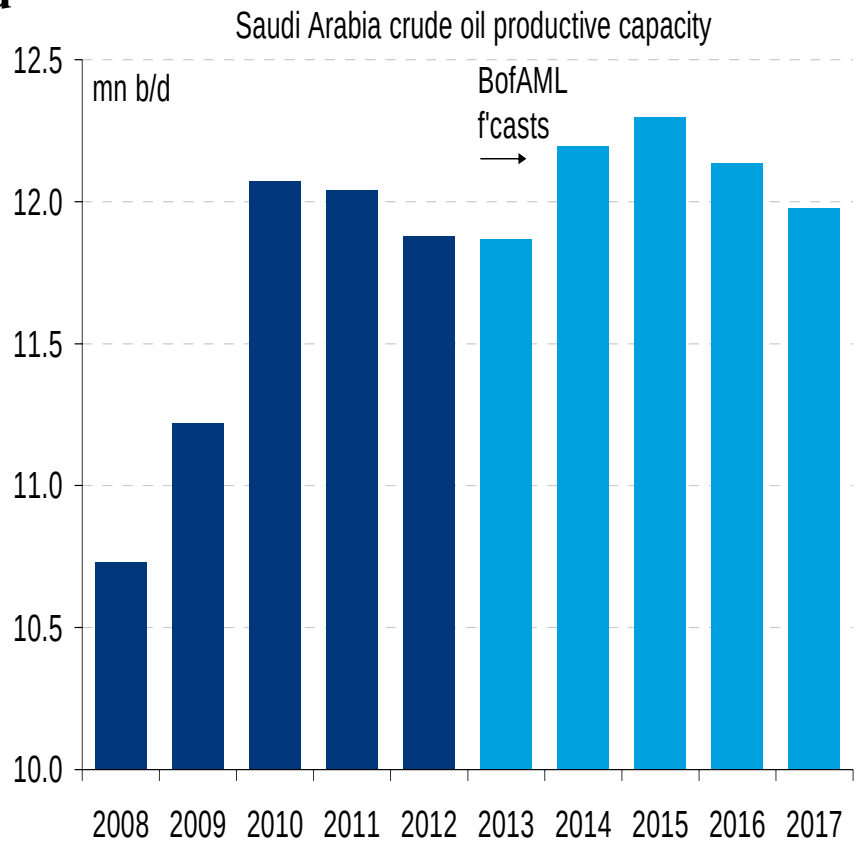
The US supply is still likely to respond the fastest, as cuts in capex translate into lower drilling and the impact of high decline rates dominates

But uncertainty about how quickly US production can come back if prices rise above a certain threshold

Source: Energy Aspects, Bloomberg

The Issue of Spare Capacity

EIA estimate of OPEC Surplus Capacity, mb/d



Source: IEA, BofA Merrill Lynch Global Commodities Research

In 1980s, spare capacity exceeded 10 mb/d; Oil system much bigger now, but estimated surplus capacity stands at less than 2 mb/d; under-ground vs over-ground storage matters

Source: EIA, BOFA Merrill Lynch Global Commodities Research

In an environment of high uncertainty, Saudi Arabia unlikely to increase productive capacity

Conclusions (1)

- It is important to be clear about causality: it is supply and demand imbalances which cause stocks to rise and for the shape of the curve to switch to contango
- High level of stocks will continue to put downward pressure on oil price and on time spreads; until stocks are drawn-down, price recovery will be capped
- Pressure will be mostly felt on light crudes and the Brent structure given that the North Atlantic (ex-US) has become the clearing destination for light sweet cargoes
- OPEC cuts remain most effective mechanism to clear excess supplies
- Saudi policy is not constant and Saudi cuts should not be excluded but the bar to implement the cut has risen + less flexibility to adjust output + the power of signaling has reduced
- Perception of the loss of supply feedback to clear markets affects market sentiment, increasing volatility and increasing the risk premium in investment in energy projects

Conclusions (2)

- Clearing excess supplies through supply and demand adjustment to lower prices is subject to uncertainty and lags
- So far demand growth has done most of the work, though it has not been strong enough to absorb all the glut
- The supply response is yet to come but the supply has become more varied and the nature of the investment cycle has changed
  - US shale: Short term investment cycle; production responsive to oil price; distinction between capex and opex difficult; financing issues; new business model
  - GOM, non-OPEC outside the US: Long-term investment cycle; less responsive to prices; high capex, low opex; relatively high cost producers;
  - Middle East: Long term investment cycle; relatively low cost producer; less responsive to prices; constrained by non-economic barriers; downstream integration
- The outcome of these combined investment cycles on output is yet to be seen
- Key question: If non-OPEC outside the US falters and OPEC investment does not materialize, can US shale fill the potential gap?