OIL FINANCING AND HEDGING – SESSION II
5TH JOINT IEA-IEF-OPEC WORKSHOP

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BNP PARIBAS COMMODITY MARKETS STRATEGY

BNP PARIBAS

The bank for a changing world

15 March 2016

1. **Hedging in oil markets:**
    - **Who hedges, how and why**
    - **Common hedging instruments and their P/L profiles**
    - **Liquidity, options and swaps**
2. **Financing in commodity markets:**
    - **Basic means of finance**
    - **Break-even prices in oil production**
    - **Production and financing: US shale oil boom**
3. **Concluding remarks**

OIL HEDGING - WHO DOES WHAT

- Both oil consumers and producers can hedge price exposure, typically one to two years out.
- Different financial instruments can be used to hedge price exposure including futures, swaps and options. Impact on the price of oil in futures markets is variable. Options are a preferred means to hedge for a host of reasons, including mark-to-market or credit conditions.
- Stylised facts: Oil producers tend to use WTI to hedge their energy price risk. Oil consumers use Brent. However, combinations can be commonly found whereby producers use formulas to hedge (Mexico) that can involve a combination of crude oils and products.
- Cost of hedging when using options typically shows that downside protection is more expensive than upside protection (relative option pricing shows a ‘skew’). One reason is that consumers are not subject to the financing constraints that producers face – less pressure to hedge. As such, demand for downside risk protection is greater that for upside protection. Producers also sell calls options to finance put option purchases.
- Banks (and others) that offer hedging solutions to oil consumers and producers in turn hedge these transactions, warehouse the risk, or do a combination of both. What hedge providers decide to do may impact the price of oil in the futures market.

HEDGING OBJECTIVES FOR PRODUCERS

DAY-TO-DAY OPERATIONAL HEDGING	EVENT-DRIVEN HEDGING
PRICE CERTAINTY ■ Smooth price fluctuations and their impact on earnings and cash generation ■ Business continuity and stability - long term strategic planning and management ■ Comparative advantage **REDUCE EARNINGS VOLATILITY** ■ Reduce uncertainty by fixing costs/revenues or setting a min/max price level ■ Mitigate pressure on management to meet short-term earnings expectations ■ Provide investors with lower risk and volatility investment **SECURE LOAN FINANCING** ■ Provide creditors with certainty of debt coverage ■ Decrease debt risk and potentially lower borrowing costs ■ Potentially impact debt ratings positively ■ Hedging can be embedded with financing (interest rate edging)	**M&A ACTIVITY** ■ Lock in M&A deal economics ■ Secure M&A deal financing **EXPENDITURE** ■ Protect value creation from new expenditures

BASIC HEDGING STRATEGIES

Hedging Tools	Description	Benefits	Potential Costs
Fixed for Floating Swap for producers	Enables Client to eliminate their price exposure, protecting themselves from a rise or fall in oil prices. To do this Client , enters a swap with a bank and receive a fixed rate in return for paying the floating market rate	No upfront premium Full protection against any price drop	Forgone benefit from rising prices. Mark-to-market
Call/Cap for consumers	In purchasing a call option /cap, the Client is effectively buying insurance against higher prices. Client pays an upfront premium for protection from prices above the specified strike price.	Client is able to retain 100% of the downside if market prices decline (minus premium paid for the cap)	Client must pay an upfront premium for upside protection (deferred premium payment possible).
Put/Floor for producers	In purchasing a put option, Client is effectively buying insurance against lower prices. Client pays an upfront premium for protection from prices below the specified strike price.	Client is able to retain 100% of the upside if market prices rise (minus premium paid for the floor)	Client must pay an upfront premium for downside protection. (deferred premium payment possible).
Zero Cost Collar (Call and Put) for producers and consumers	**Consumers:** Collars involve buying a call and offsetting the premium by selling a put option struck below the market. **Producers:** Collars involve buying a put and offsetting the premium by selling a call option struck above the market. **Producer:** Same protection as a Put, however, some of its upside is sold away to finance the Put purchase	No premium is paid. **Consumer** upside risk is capped and is allowed to ride the market down to the put strike that it sells. **Producer** downside risk is capped and is allowed to ride the market up to to the call strike that it sells	**Consumers** lose the full benefit of falling prices below the floor put option strike price. **Producers** lose the full benefit of rising prices above the call option strike price.
Three-ways for producers and consumers	Similar idea to a Zero Cost Collar, but **consumer** would sell an additional call with a strike above the existing collar to generate extra-financing. A **producer** would sell an additional put with a strike below the existing collar to generate extra-financing.	No premium paid. **Producers:** Participation in a downside trend down to the level of the strike of the sold Put option	**Consumers** are exposed to prices above the upper call level and below the below the floor of the put option. **Producers** are exposed to prices below the lower put level and above the upper the call optrion

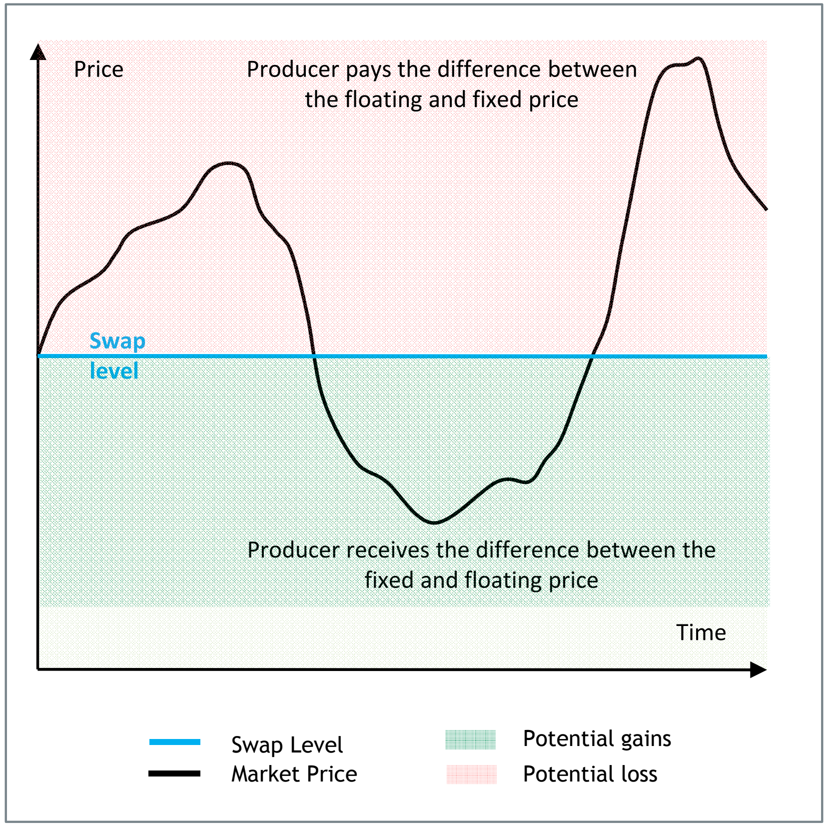
OTHER HEDGING INSTRUMENTS FOR PRODUCERS

Hedging Tools	Description	Benefits	Potential Costs
Put Spread for producers	Put option combination Insurance against lower prices … limited to a certain level	Discounted premium compared to a Put purchase Participation in a downside trend down to the level of the strike of the sold Put option	Upfront premium payment
Asian Put Daily for producers	Buying an Options strip Daily comparison between the Reference price and the Put strike All the gains will be paid at the settlement date	Full protection against any price drop 100% of the price decline can be captured above the strike (minus the premium	Upfront premium payment
American Producer Accumulator (APA)	Accumulation of daily sell at a price above market as long as certain market conditions are met: Market price stay in a range Range is defined as strike level on the upside and KO on the downside	Upper price all the way up to the strike level The daily averaging reduces the risk linked to a range bound market	The pricing is doubled up at expiry if the settlement price is above the strike level of the APA Risk of being hedged up to 200% of the initial exposure
Participating swaps	Swap price higher than Market Swap price Swap allows client to pick up a specific % of an upside movement in the market	100% protection upside Participation in upside trend Limited premium or ZC strategy depending the Swap price	Swap price lower than market price

Note that whenever the hedger is short an option position to generate finance, he/she becomes exposed to market risk. Purchase only of an option is the closest form to basic insurance – maximum loss is limited to the premium paid.

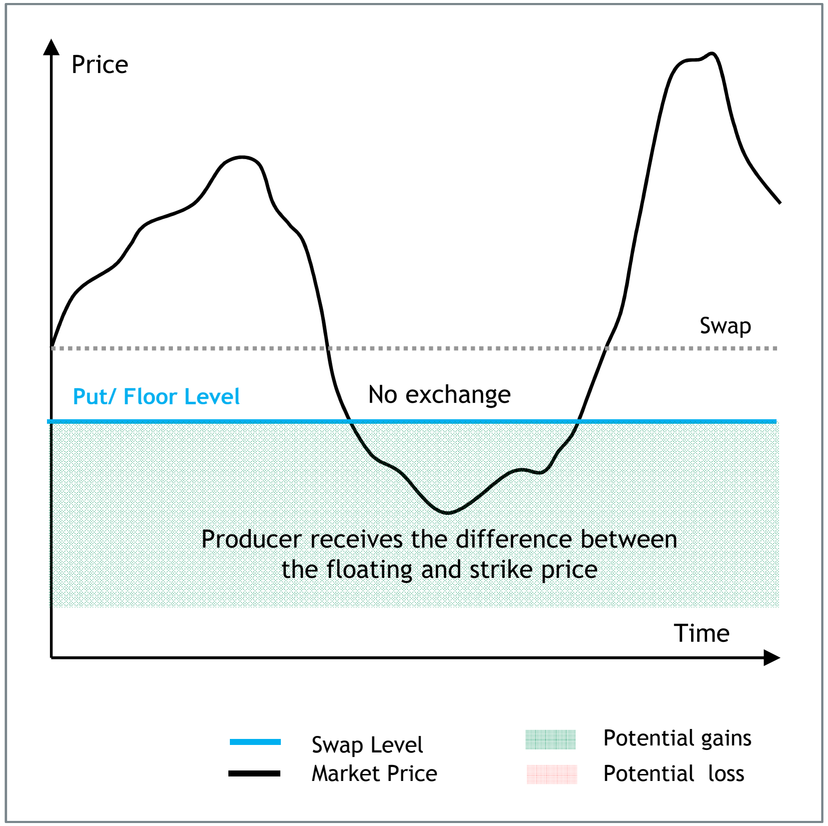
SELECTED HEDGING PROFIT/LOSS PROFILES FOR PRODUCERS (I)

Fixed Price Swap



For Indicative / illustrative purposes only

Put option / floor



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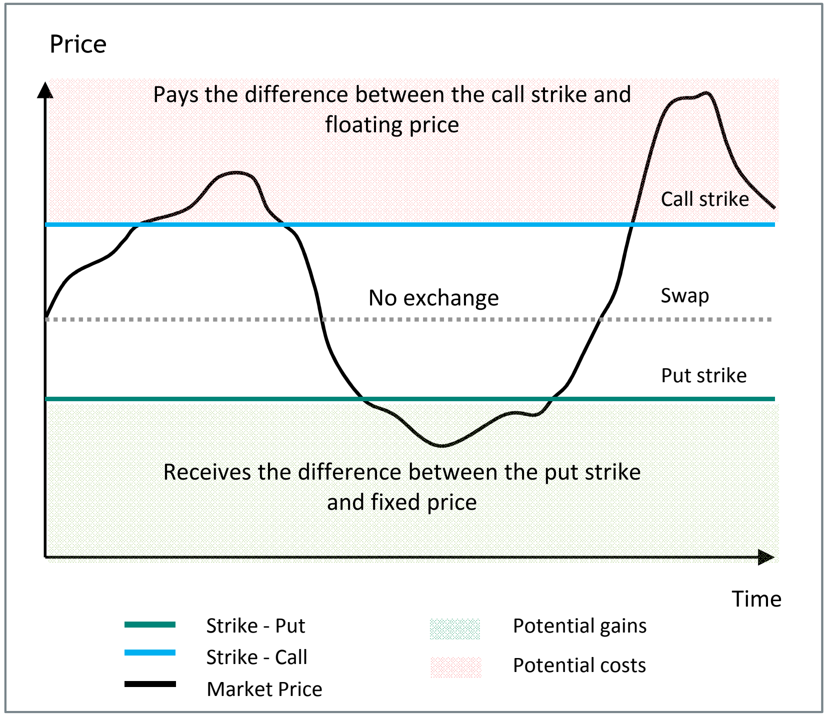
Swap level set at the current price level. With swaps, producers exchange uncertainly of a floating price for the certainty of fixed price. Put options in these examples are out-of-the money.

SELECTED HEDGING PROFIT/LOSS PROFILES FOR PRODUCERS (II)

Zero Cost Collar



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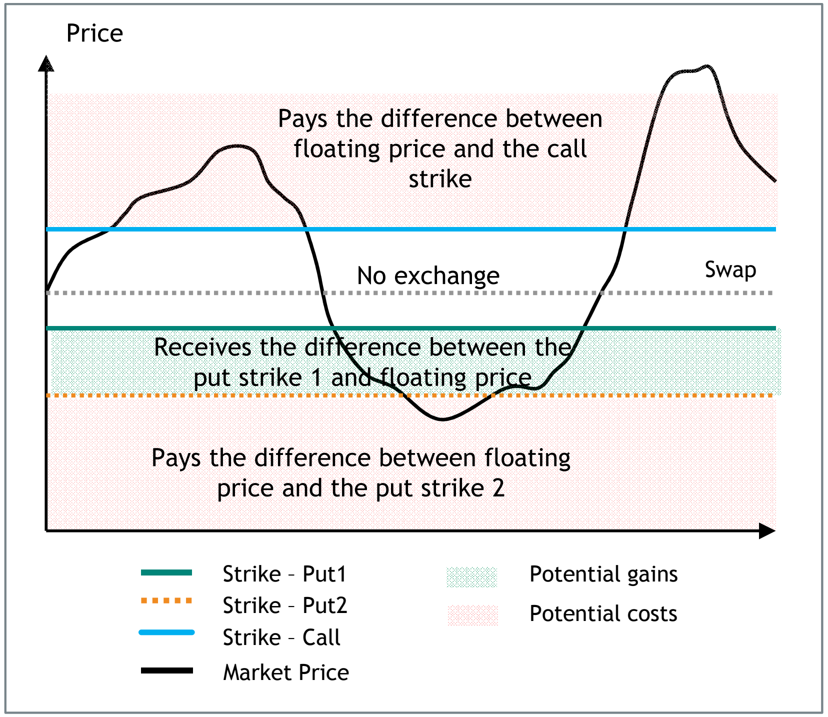
Three way: collar + short put



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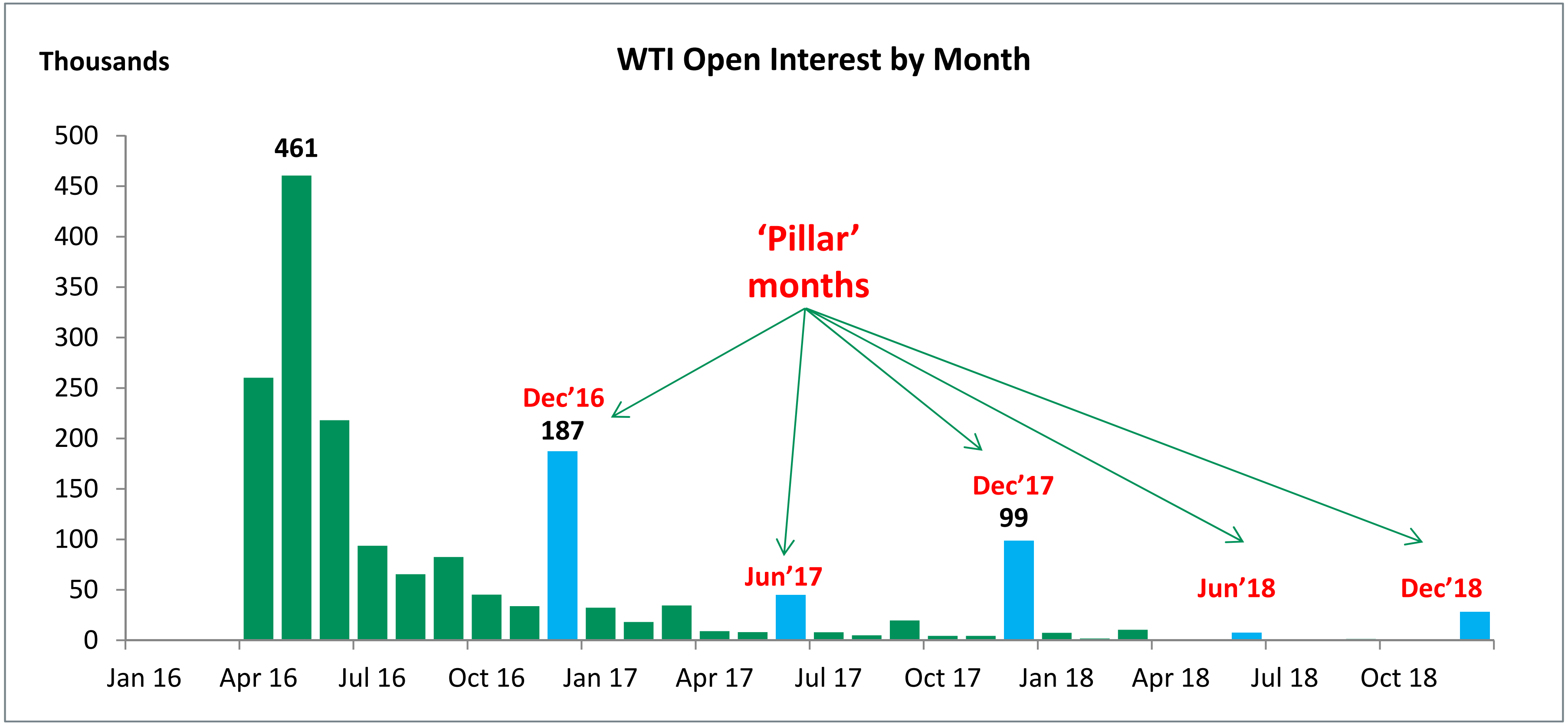
Options in these examples are bought and sold out-of-the money.

COST OF HEDGING: IMPLIED VOLATILITY OF PUT VS CALLS

Out of the money (OTM) Put options are almost systematically higher priced than their equivalent OTM Call options. Implied volatility of OTM puts > implied volatility of OTM calls.

PILLAR MONTHS – THE BUILDING BLOCKS OF HEDGES



Source: Bloomberg, BNP Paribas at 10/03/16

Hedge providers face limited liquidity to offload the risk of their trades – they need to use pillar months to hedge a calendar exposure.

<u>June</u> and <u>December</u> months are the pillar months in the oil markets – hedging activity will necessarily take place in these months.

SWAPS AND OPTIONS: STYLISED HEDGE PROVIDER'S VIEWPOINT

Swaps:

- When a **corporate client sells a swap** to a hedge/swap provider, the hedge provider inherits a one-for-one exposure to the transaction. To hedge the transaction, the hedge provider will needs to take a position in the futures market equivalent to the total volume of the transaction if he wishes to completely eliminate his exposure.

- **Hedging an oil swap for calendar 2017**: the hedge provider becomes ' long' the calendar year after a trade with a producer.
  - Because the individual futures months of 2017 do not have sufficient liquidity (see previous slide), the hedge provider needs to offset his position by initially going short the exposure in the nearest liquid contract: Dec'16.
  - **The hedge provider will progressively shift out of his short Dec'16 position into the 2017 months as these contracts progressively become more liquid**. The hedge provider will go long pillar month time spreads such as Dec'16/Dec'17 and Dec'16/Jun'17 – buying the Dec'16 contract and selling the pillar 2017 contract.

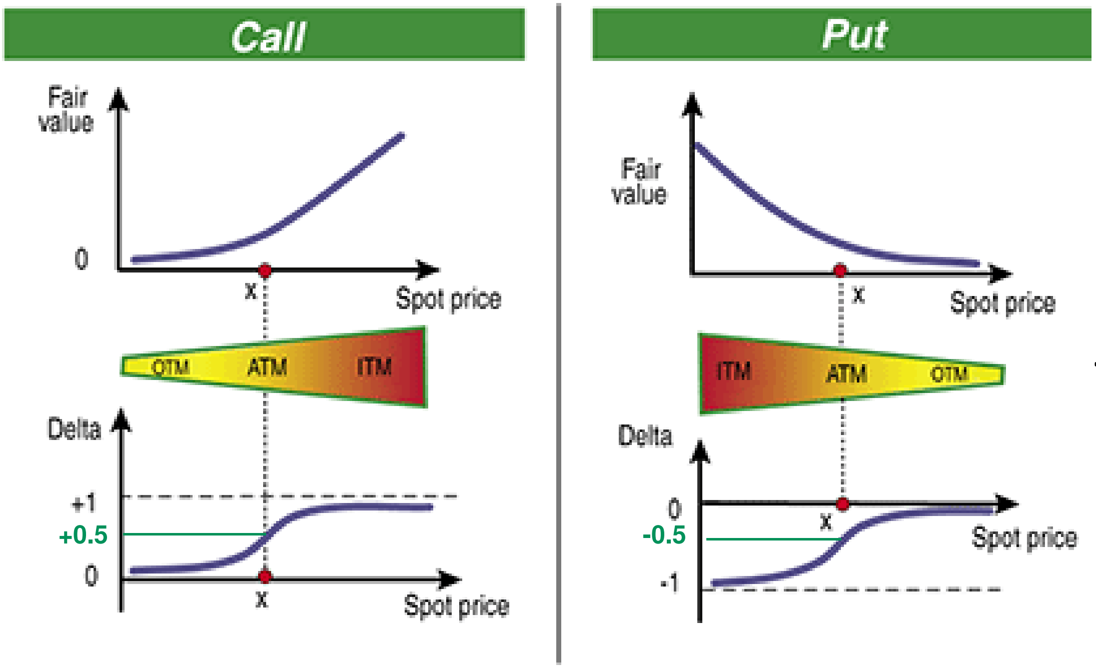
Options:

- When a **corporate client buys an option**, the strike price of that option can be at the current prevailing price (at-the-money), but more often, it will be away from the market price (out-of-the money) as it is cheaper. **Exposure to the transaction for the hedge provider is not one-to-one (as in swaps) but in proportion to the <u>'delta'</u> of the option**. If an at-the-money option has delta of 0.5 , the hedge provider will <u>initially</u> need to take a position in the futures equivalent to only <u>half</u> of total volume of the transaction. If the delta is 0.25 (out-of-the money), then only a <u>quarter</u> of the size needs to be hedged initially. **But the delta of an option changes over time**, so the futures position of the hedge provider will need to be adjusted accordingly.

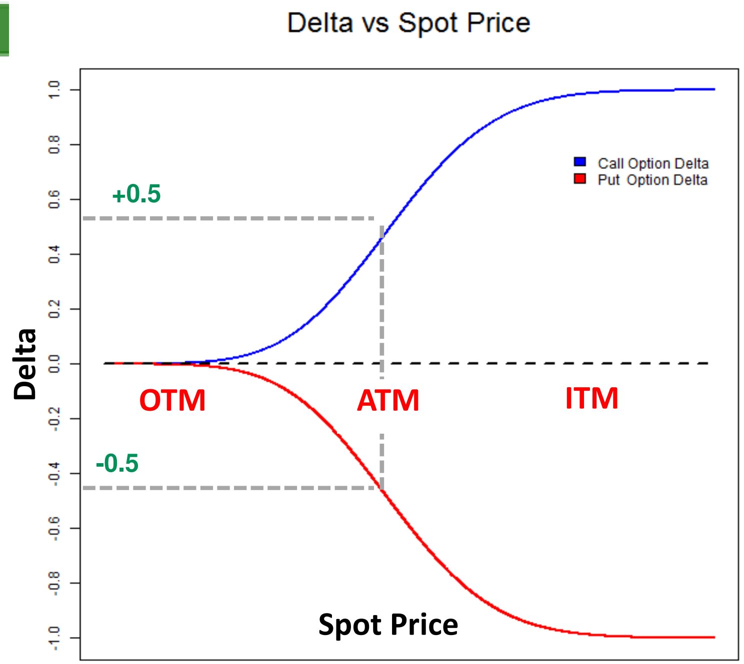
- As with swaps, a futures position will be taken on pillar months. It is rare that the hedge provider can hedge his short option position by immediately buying an equivalent option in the market in the same size. Sometimes, the hedge provider will find an option with a near enough strike price, and will later on adjust his position by buying/selling put options spreads.

DELTA OF AN OPTION VS. SPOT PRICES

- Delta is the CHANGE in the option's premium for a unit change in the underlying's prices (in the case of oil, the underlying is the futures contract).
- Delta can also be also be thought intuitively in terms of the probability that an option will end in-the-money. If the probability is high, the hedge provider will need to take a larger position on the futures market to offset his risk. In contrast, if the delta of an option is low, the hedge provider can take a small position on the futures market to offset his risk



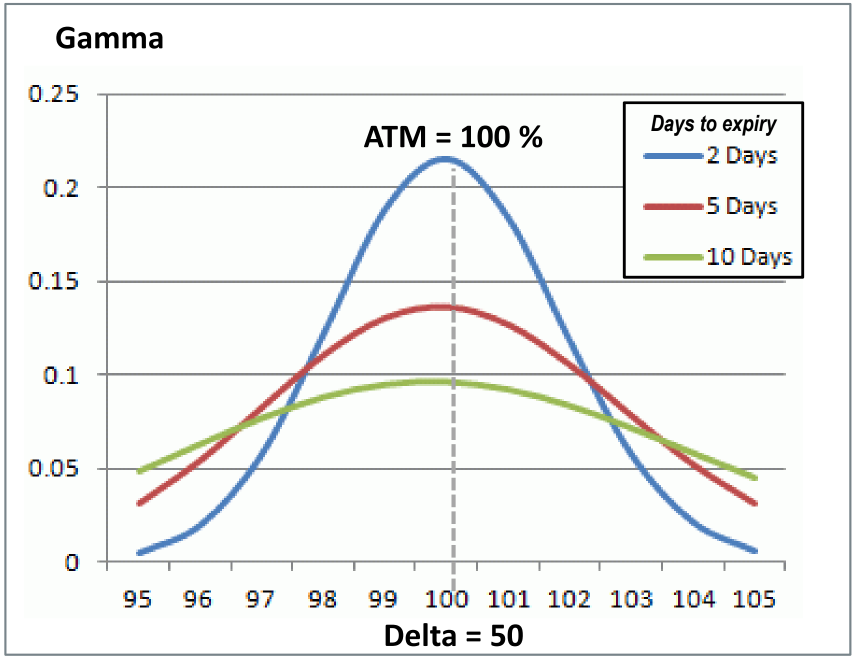
Source: published in the January 2012 issue of Technical Analysis of Stocks & Commodities magazine, by Giorgos Siligardos



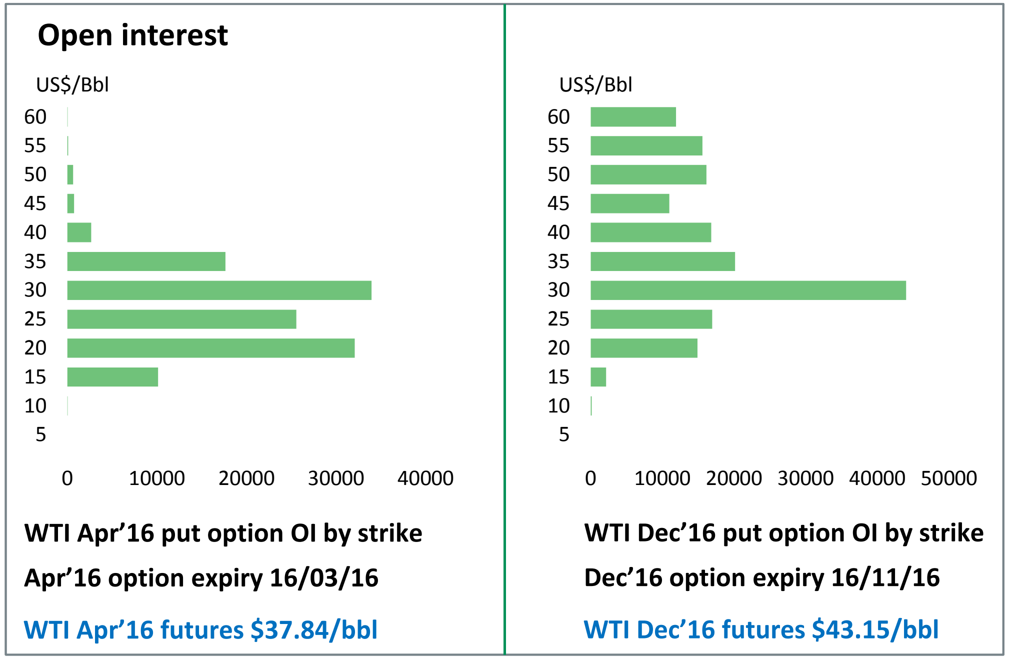
Source: Zerodha

- An option with a strike price that is at-the-money (current price) has 50/50 'chance' of realising its strike and thus has a delta of 0.5. An option that has lower probability of realising its strike price has a low delta (delta < 0.5).
- For an option that is already in the money (delta > 0.5), its premium (value) becomes more correlated with the underlying future price.

GAMMA: MIND THE TRAP …



Source: http://www.optiontradingtips.com/options101/weekly-options.html



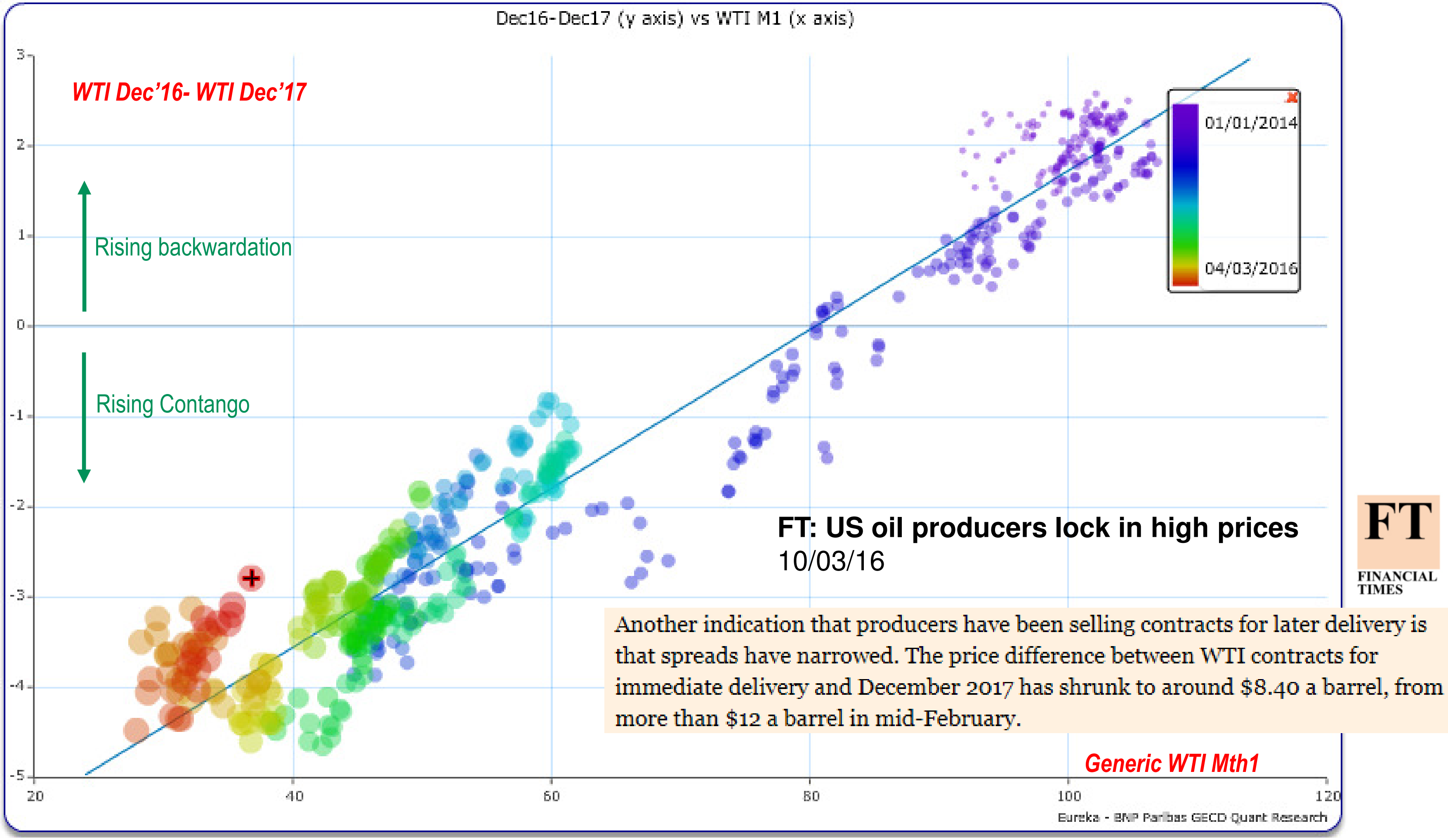
Source: Bloomberg, BNP Paribas at 10 March 2016

The gamma of an option indicates how fast the delta of an option will change in response to a 1 point move in the underlying. Gamma is higher for an option that is at, or near the money. The gamma also rises the closer the option is to its expiry date. Gamma of an option will dictate how quickly hedge providers that sell an option will need to adjust their futures hedge position.

As we approach expiry of an option on an oil futures contract, if the underlying's futures price is near a strike level where there is a sizeable open interest, there is likely to be greater futures buying/selling activity by the hedge provider than the seller of the option with that strike. This hedging activity in turn, can potentially add to upward/downward momentum of the price of futures until expiry of the option – this is sometimes referred to as negative gamma trap.

Other parameters to consider.
Prevailing volatility conditions will also affect the activity of hedge providers.

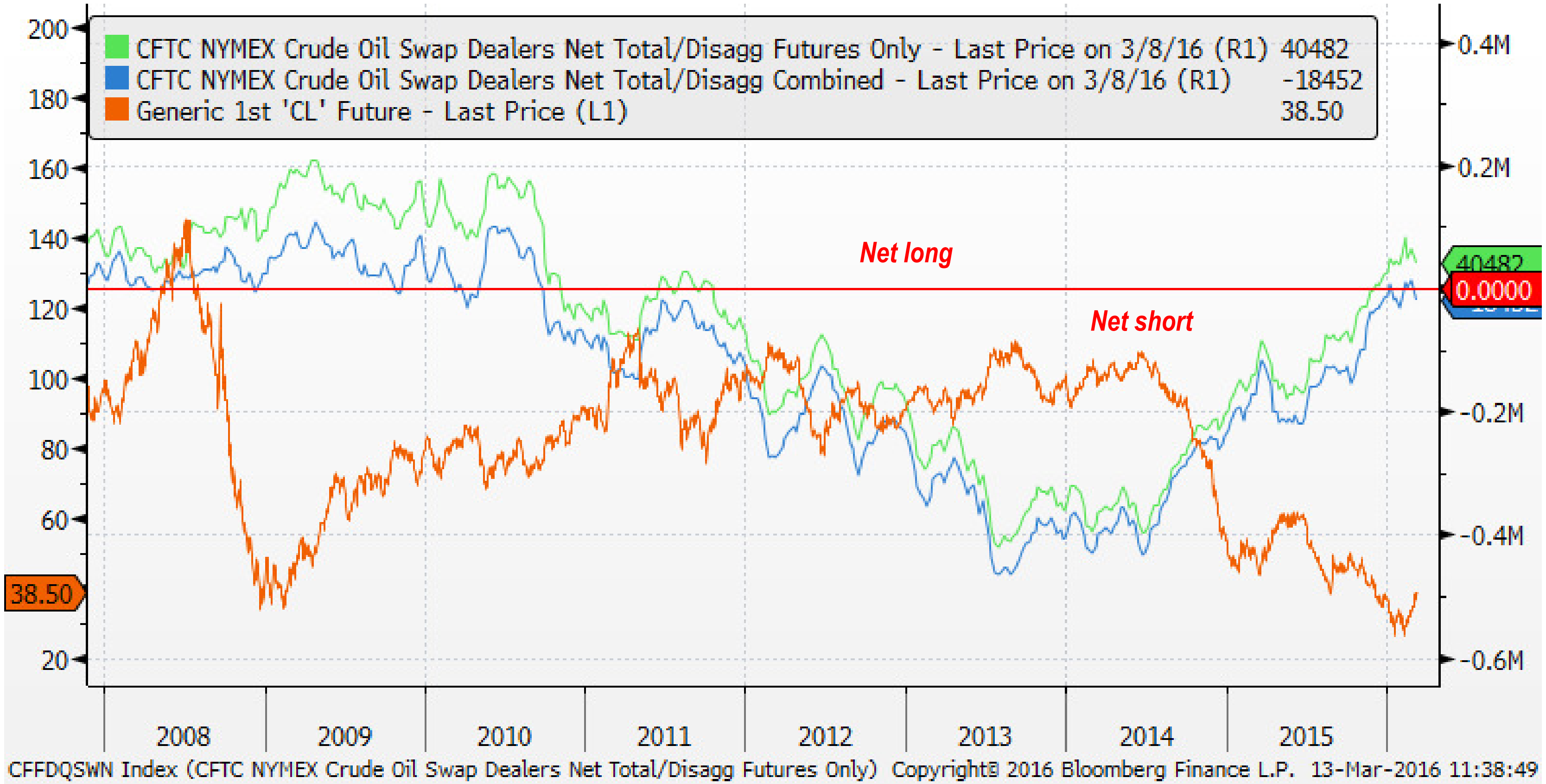
WTI: FRONT TO DEC'16/DEC'17 SPREADS



As the prompt price rises, the back of the curve also rises to levels that can attract producer hedging. When this happens, we observe that longer dated December (pillar) month spreads tend to strengthen (i.e. the contango becomes shallower or moves into backwardation).

HEDGE PROVIDERS POSITIONS – DIFFICULT TO MEASURE/INTERPRET

Commitment of traders report on swap dealer positions on the NYMEX WTI contract:



A "swap dealer" is an entity that deals primarily in swaps for a commodity and uses the futures markets to manage or hedge the risk associated with those swaps transactions.
The swap dealer's counterparties <u>may be speculative traders</u>, like hedge funds, <u>or traditional commercial clients</u> that are managing risk arising from their dealings in the physical commodity.

In 2015-2016, the net short futures position of swap dealers was falling with a decline in price – how can we explain it: Are producers not hedging with the lower prices, waiting for a rebound? Are funds becoming long as they believe that prices reach a bottom? Or a combination? We can't tell.

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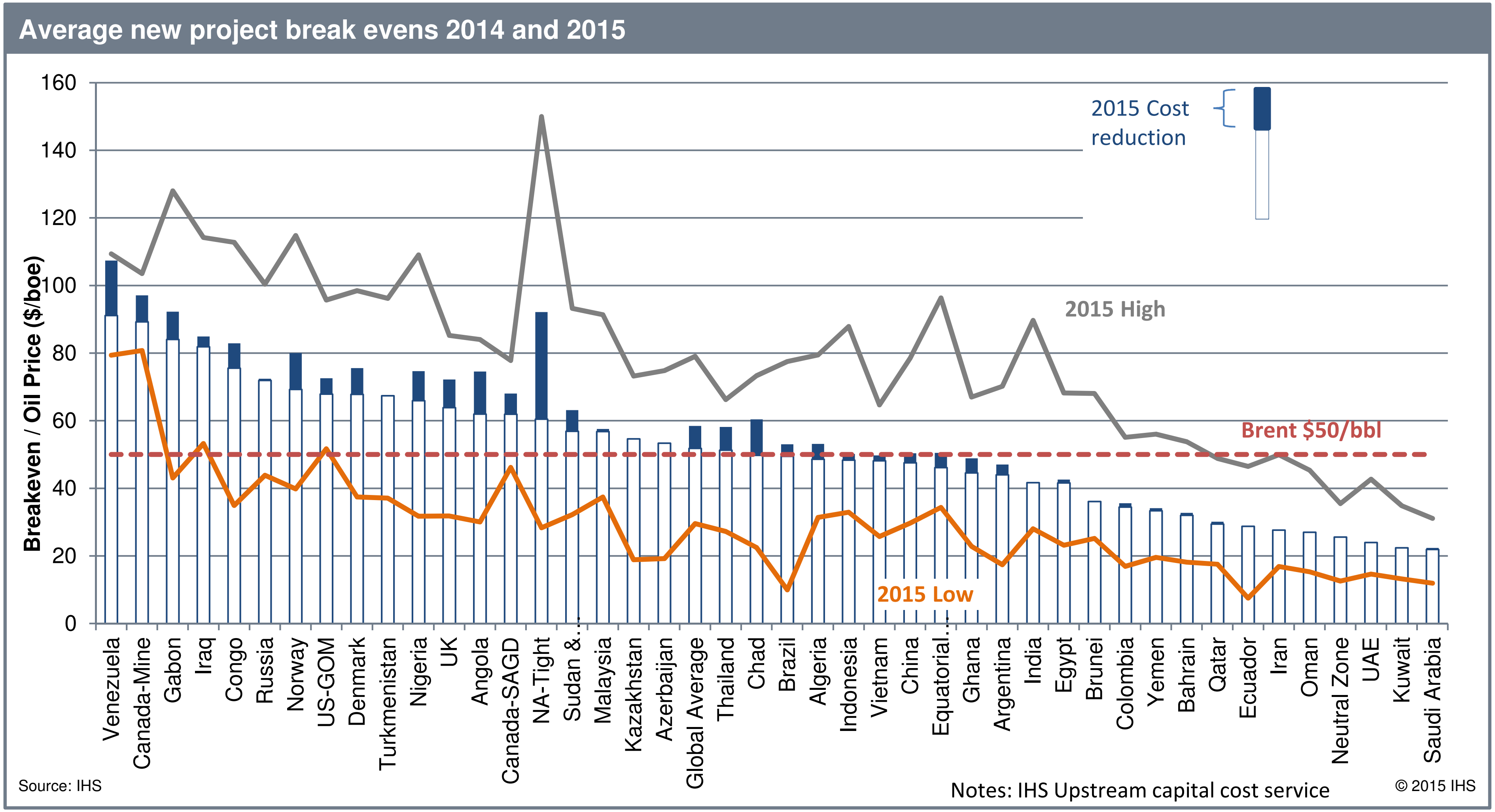
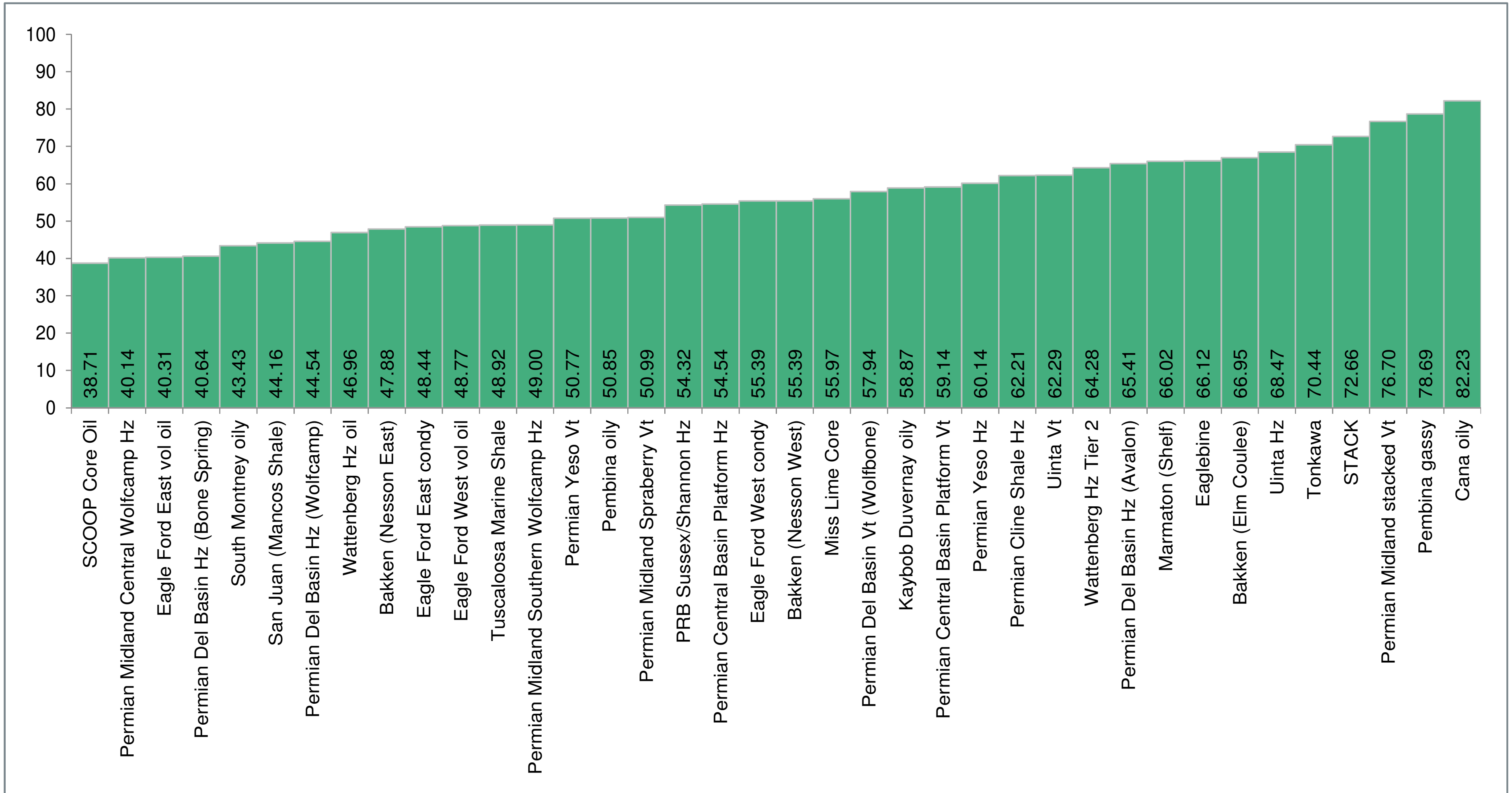
WORLD FULL CYCLE BREAKEVENS



Source: IHS December 2015

US OIL SUPPLY: FULL-CYCLE BREAKEVEN COSTS

North American break-even costs ($/bbl full life cycle)



Source: Bloomberg Finance, August 2015

VARIOUS SOURCES OF FINANCING FOR PRODUCERS

- **Reserve base lending**: Often referred to as 'borrowing base' financing. Loans are collateralised by the asset that will be developed. This is a type of financing where a loan is effectively secured by the by the yet-to-be-developed reserves of oil or gas. The facility is repaid using the proceeds that derive from the sale of oil that will come into production. Before the loan facility can take place, legal, financial and technical due diligence by the lender must be carried out.
- **Re-determinations**: Twice a year (spring/autumn), banks will assess the economic viability of the oil & gas reserves of companies in order to determine how much credit they are prepared to extend.
- **Lending & forward hedging**: Banks may ask that future production be hedged against future cash flow as a prerequisite to extending a loan facility. This reduces the cost of borrowing as the ability to service debt is secured.
- **Debt capital markets:** Producers issue debt in capital markets. There I no obligation to hedge but the cost of issuance will depend on the ratings of agencies such as Fitch, S&P or Moody that examine strength of the company’s balance sheet, its leverage ratios, and its cash flow.
- **Private equity**: Investors provide capital to the oil company by investing in shares with a view that capital gains and/or dividends will provide a superior return to that of fixed income instruments.

BANK EXPOSURE TO OIL SECTOR IN THE PRESS (I)

Last updated: January 15, 2016 7:10 pm

Big US banks reveal oil price damage

Ben McLannahan and Alistair Gray in New York

Three of the biggest US banks revealed the damage wrought by a plunging oil price this week, disclosing big jumps in costs for bad energy loans and fears of contagion in other portfolios.

Citigroup, the fourth biggest by assets, said on Friday morning that it had recorded a 32 per cent rise in non-performing corporate loans in the fourth quarter from the previous year, mainly related to its North American energy book. Wells Fargo, the number three by assets, said net charges came to $831m in the period, up from $731m in the third, mainly due to oil and gas.

A day earlier JPMorgan Chase, the number one, said it was "watching closely" for spillover effects. If oil stayed around present levels of $30 a barrel, it said it would be forced to add up to $750m to reserves this year — which is roughly one-third of the benefit it expects from higher net interest income.

The disclosures are a symptom of the crash in crude, which has caused big producers to slash spending, tipped smaller companies into bankruptcy and prompted bank strategists to outdo each other with ever-gloomier predictions.

More

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BANK EXPOSURE TO OIL SECTOR IN THE PRESS (II)

CNBC

Just how much oil pain is coming for the banks?

Jake Novak | @jakejakeny
Wednesday, 20 Jan 2016 | 2:09 PM ET

A just-released Goldman Sachs report lists the answers to the following questions about how much the financial sector and the oil markets are intertwined:

How much have the big banks funded in outstanding debt to the oil & gas sector?

Bank of America leads the list with $21.3 billion. Citigroup is next at $20.5 billion. Wells Fargo is third at $17 billion. JP Morgan Chase is at $13.8 billion. Morgan Stanley is at $4.8 billion, PNC Bank has $2.6 billion and US Bancorp is at $3.1 billion.

How much is that, as a percentage of the bank's total loans?

Morgan Stanley leads the way at 5%, followed by Citi at 3.3%, Bank of America at 2.4%, Wells Fargo at 1.9%, JP Morgan Chase at 1.6%, PNC at 1.3%, and US Bancorp at 1.2%.

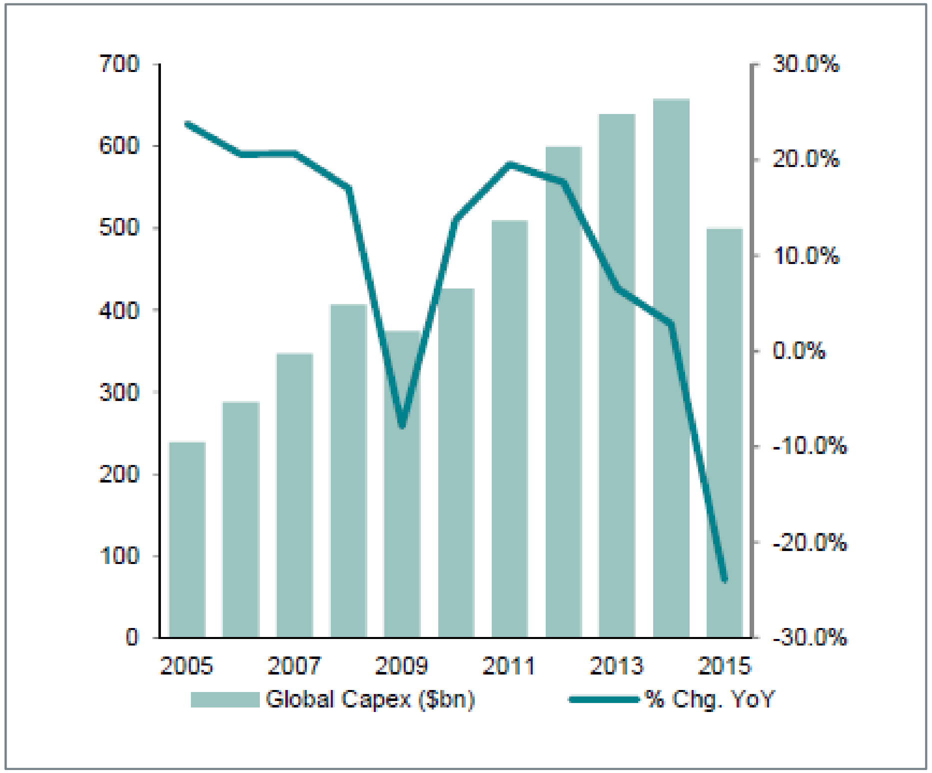
Which banks have stowed away the most reserves relative to their oil exposure?

Wells Fargo leads the way here with 7.1% of the value of its exposure in reserve. US Bancorp is second with 5.4%, and JP Morgan Chase is third with 4%. Morgan Stanley, Citi, and PNC are all at 3% and Bank of America has 2.3% in reserve.

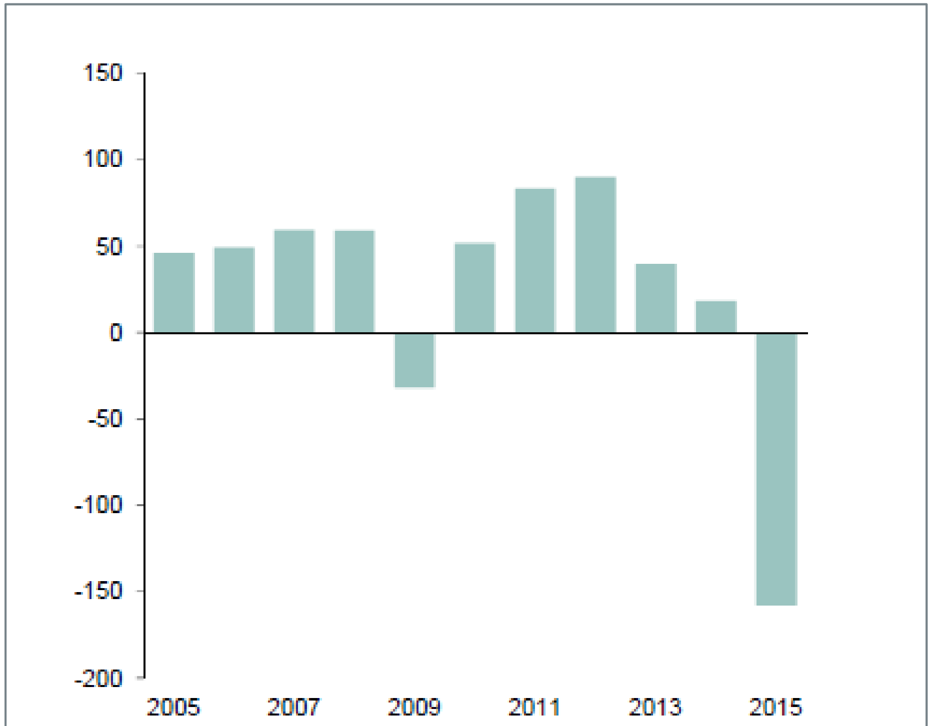
As for Goldman Sachs itself, CFO Harvey Schwartz would only say the company has $10.6 billion in total oil sector exposure.

GLOBAL CAPEX REDUCTIONS LEAD TO PROJECT DEFERRAL OR CANCELATION

Global Capex ($bn) vs % Change y/y



Change in Global Capex y/y (%)

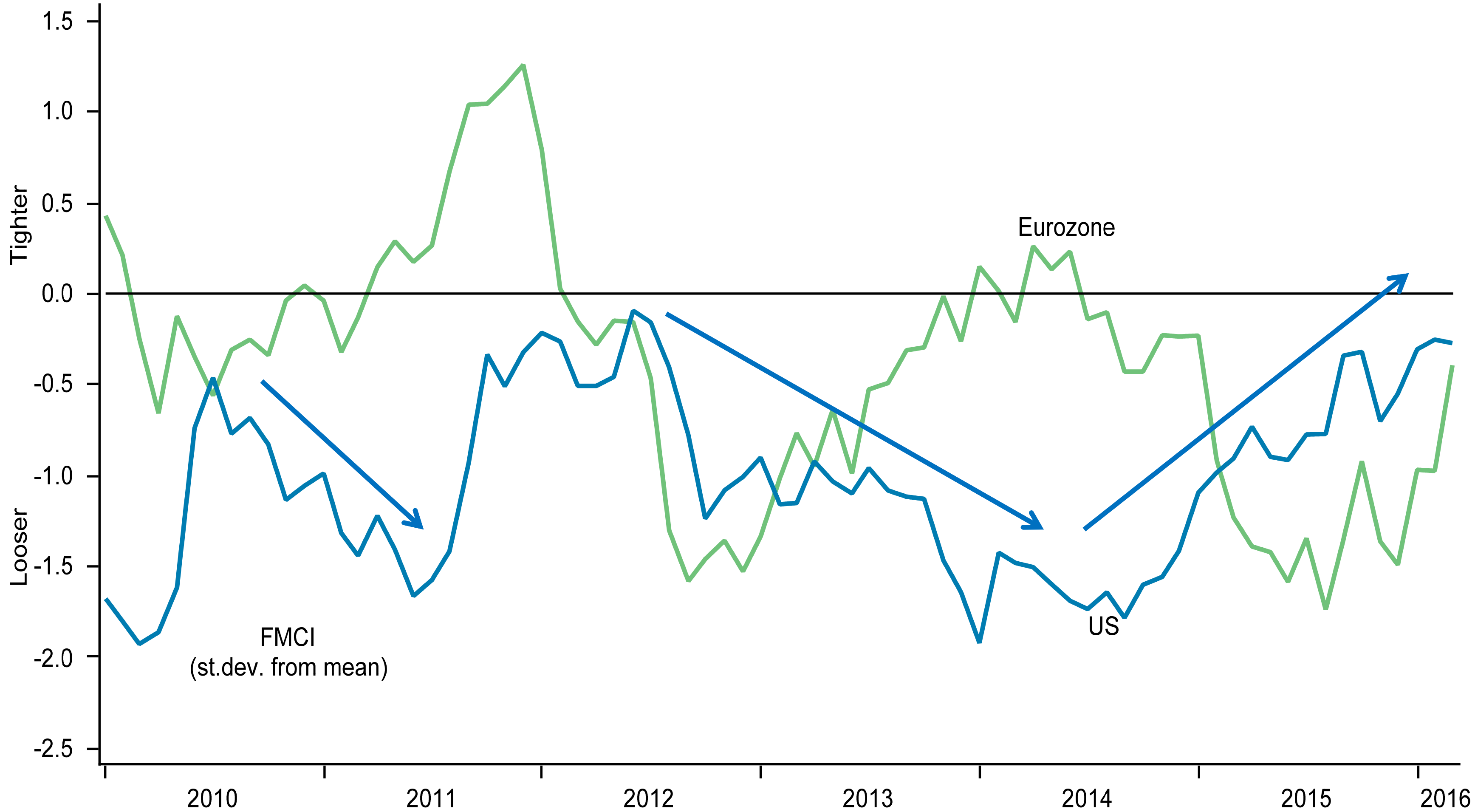


Source: Exane BNP Paribas (15/12/15)

Substantial reductions in spending have resulted in the cancellation or postponement of a number of major projects, even some that have passed the 'Final Investment Decision' stage. Exane BNP Paribas estimates that potentially 20 Bboe has been displaced from a diverse range of onshore, shallow-water and deep-water projects.

Oil's collapse has delayed $380 billion worth of investment on 68 major upstream projects, according to industry consultant Wood Mackenzie Ltd. The developments account for about 27 billion barrels of oil equivalent and about 2.9 million barrels a day of production is being deferred to early next decade, according to the Jan. 12 report. Deepwater projects will be hit the hardest and account for more than half of new project deferrals, it said.

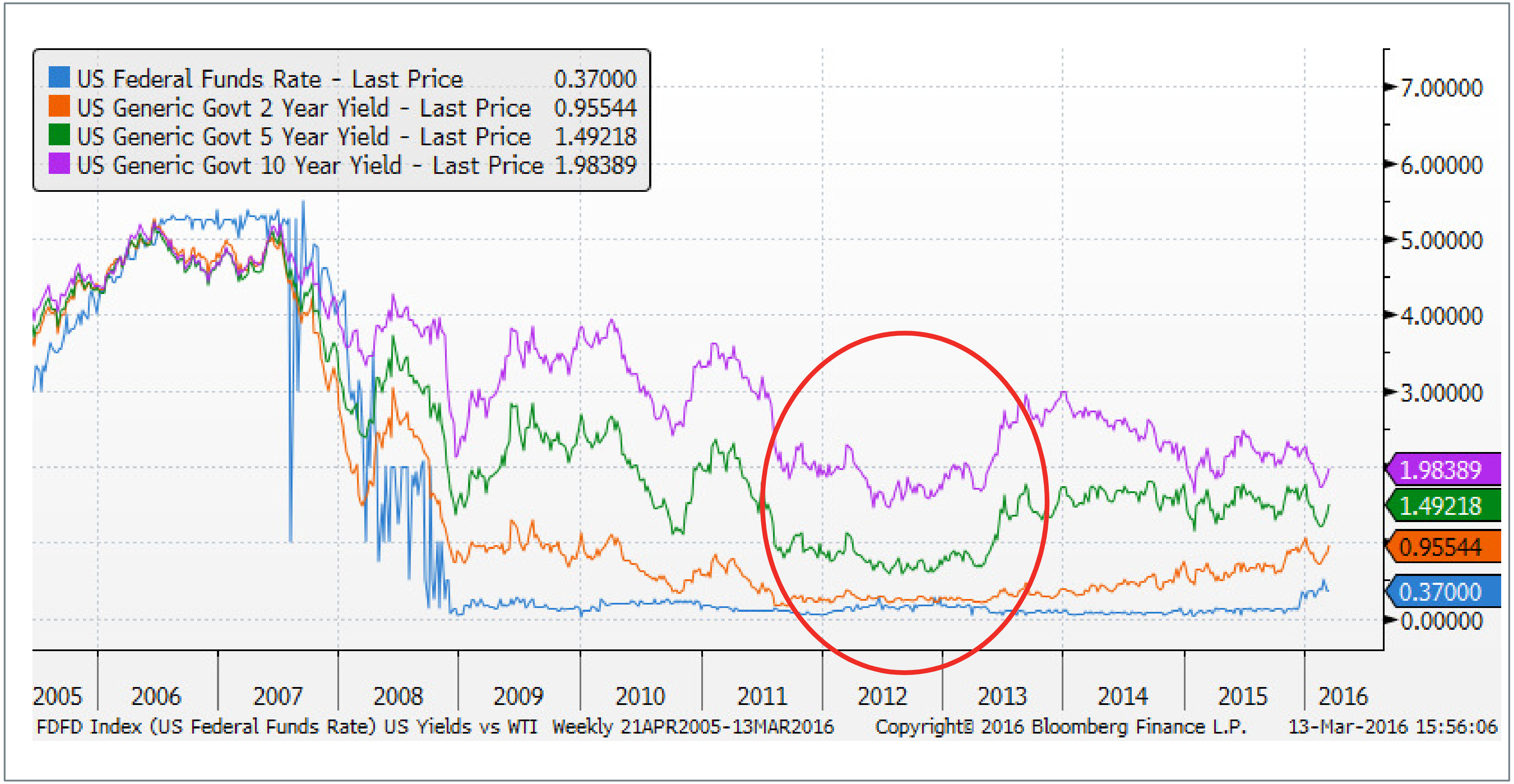
FINANCIAL AND MONETARY CONDITIONS (FMCI)



US financial and monetary condition have been tightening since mid-2014, even as the Fed kept rates at the zero bound. The tightening stems from a stronger dollar

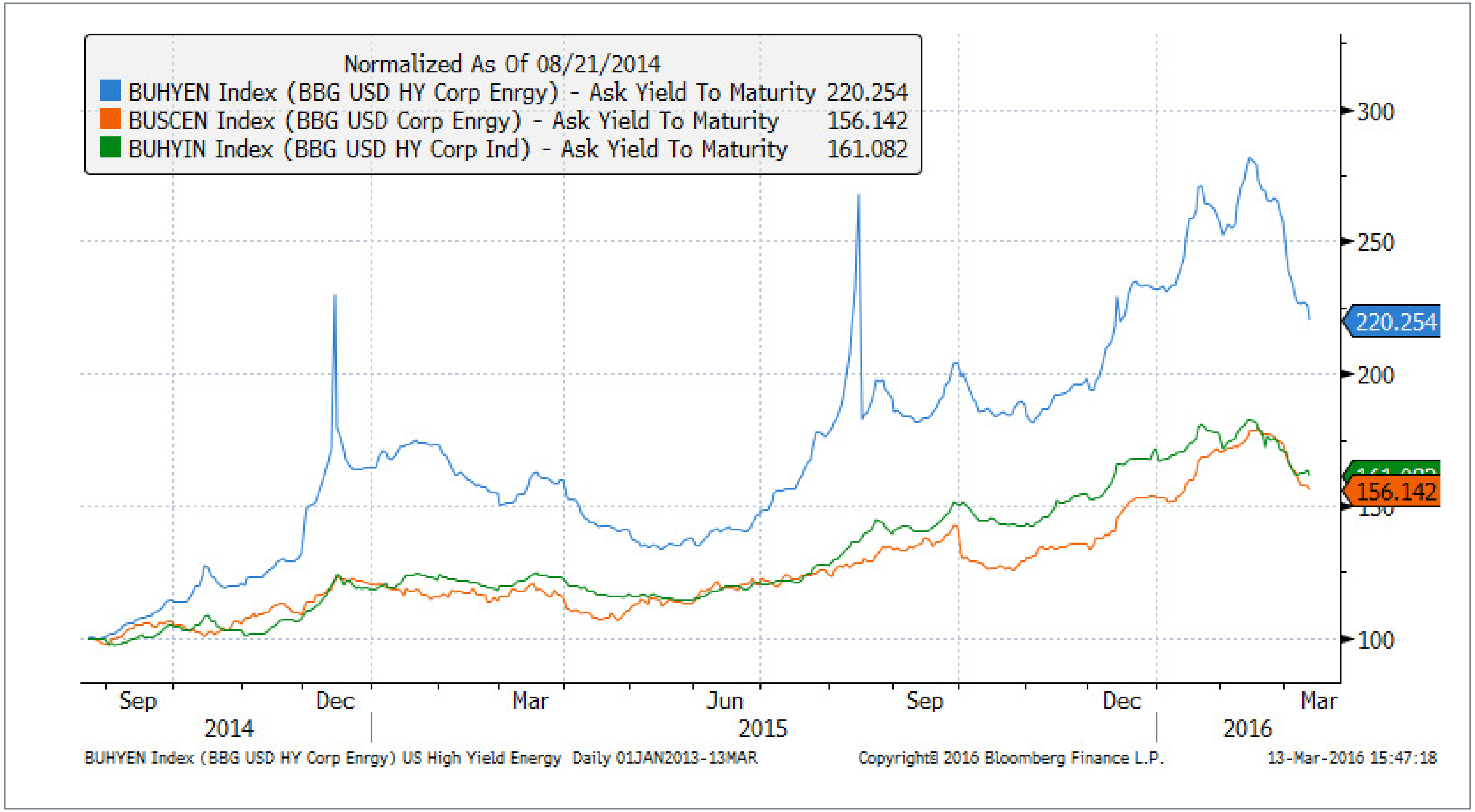
LOOKING FOR YIELD – OIL COMPANIES LOOKED GOOD IN 2011-2014

US Fed funds rate vs US treasuries:



Between 2011 and mid-2014, oil traded in a narrowing range with Brent at times above $100/bbl and volatility falling to historic lows. High and stable prices - along with the assumption OPEC would support prices - made oil an attractive asset, given lows yields elsewhere.

COST OF ISSUANCE – US ENERGY HIGH YIELD VS INDUSTRIALS



Cost of raising capital for the energy sector through debt issuance has risen strongly since 2014, making this source of financing less attractive for oil companies.

Rating Actions Taken On 20 U.S. Investment-Grade Exploration & Production Companies After S&P Revises Price Assumptions.

- **We updated our oil price assumptions on Jan. 12, revising down Brent prices to $40 per barrel (/bbl) for the remainder of 2016, $45/bbl in 2017, and $50/bbl thereafter.**
- **We now believe many major oil and gas companies' current and prospective core debt coverage metrics are likely to remain below our rating guidelines for two or three years as the industry adjusts to lower prices.**

- **Chevron Corp.** Corporate Credit Rating Lowered To AA-/Stable/A-1+ From AA/Negative/A-1+
- **EOG Resources Inc.** Corporate Credit Rating Lowered To BBB+/Stable/A-2 From A-/Stable/A-2
- **Apache Corp** Corporate Credit Rating Lowered To BBB/Stable/A-2 From BBB+/Stable/A-2
- **Devon Energy Corp** Corporate Credit Rating Lowered To BBB/Stable/A-2 From BBB+/Negative/A-2
- **Hess Corp** Corporate Credit Rating Lowered To BBB-/Stable/-- From BBB/Stable/--
- **Marathon Oil Corp** Corporate Credit Rating Lowered To BBB-/Stable/A-3 From BBB/Stable/A-2
- **Murphy Oil Corp** Corporate Credit Rating Lowered To BBB-/Stable/-- From BBB/Negative/--
- **Continental Resources Inc.** Corporate Credit Rating Lowered To BB+/Stable/-- From BBB-/Stable/--; Recovery Rating '3' (high end of the range) assigned.
- **Southwestern Energy Co** Corporate Credit Rating Lowered To BB+/Negative/B From BBB-/Stable/A-3; Recovery Rating '3' (low end of the range) assigned.
- **Exxon Mobil Corp** 'AAA' Corporate Credit Rating Placed On CreditWatch With Negative Implications; 'A-1+' Short-Term Rating Affirmed
- **ConocoPhillips** 'A' Long-Term And 'A-1' Short-Term Corporate Credit Ratings Placed On CreditWatch With Negative Implications
- **Newfield Exploration Co** 'BBB-' Corporate Credit Rating Placed On CreditWatch With Negative Implications
- **Anadarko Petroleum Corp** 'BBB' Corporate Credit And 'A-2' Short-Term Ratings Affirmed; Outlook Revised To Negative From Stable
- **National Fuel Gas Co** 'BBB' Corporate Credit Rating And 'A-2' Short-Term Ratings Affirmed; Outlook Revised to Negative From Stable.
- **Noble Energy Inc.** 'BBB' Corporate Credit Rating Affirmed; Outlook Revised To Negative From Stable
- **Occidental Petroleum Corp** 'A' Corporate Credit Rating And 'A-1' Short-Term Rating Affirmed; Outlook Stable
- **EQT Corp.** 'BBB' Corporate Credit Rating Affirmed; Outlook Stable
- **Cimarex Energy Co** 'BBB-' Corporate Credit Rating Affirmed; Outlook Stable
- **Pioneer Natural Resources Co** 'BBB-' Corporate Credit Rating Affirmed; Outlook Stable

Source: S&P 01/02/16

PRIVATE EQUITY TO THE RESCUE?

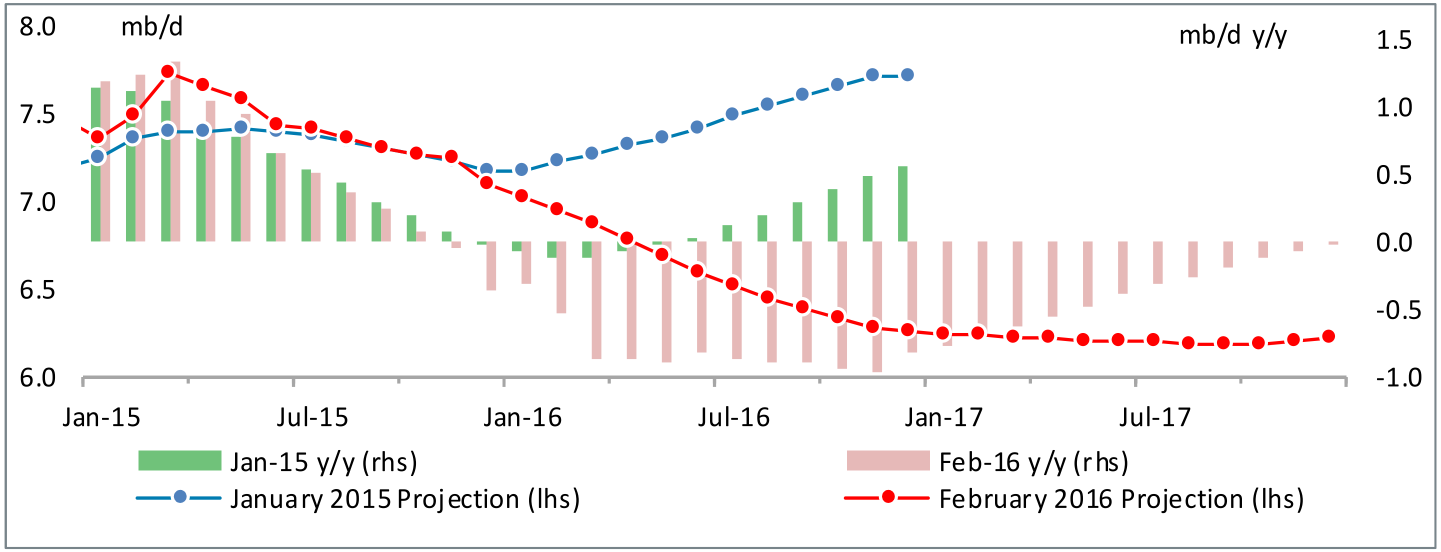
Battered U.S. Oil Firms Raise Most in Equity Sales Since ‘99

(2016-03-02 13:27:37.909 GMT)

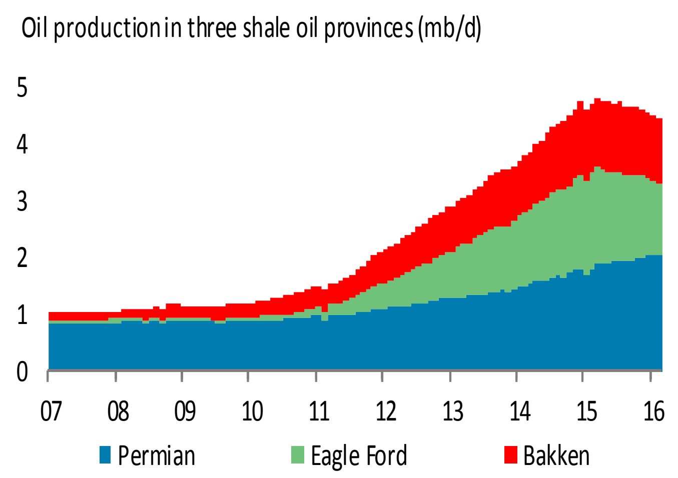
- **(Bloomberg)** Wall Street investors are throwing a lifeline to the embattled U.S. energy sector. U.S. oil and gas companies from Marathon Oil Corp. to Weatherford International Plc have announced **plans to raise about $9.2 billion in new equity, the most year-to-date since at least 1999**, according to data compiled by Bloomberg.
- "Billions of dollars of dilutive equity continue to roll in with seemingly no end in sight," Houston-based oil investment bank Tudor, Pickering, Holt & Co. said in a research note. Until only a few weeks ago, bankers, executives and investors had assumed the capital markets were closed to the energy sector (…). Then, in early January, a handful of companies with assets in the prized Permian Basin in Texas successfully tested the waters. Now "the window is clearly open" for almost everybody, Tudor, Pickering, Holt & Co. said.
- Some of the biggest names in American energy, including Hess Corp. and Devon Energy Corp., have each offered more than $1 billion in new equity, while smaller companies like QEP Resources Inc. and Synergy Resources Corp. have also managed to successfully raise funds. The equity raising could resonate beyond the U.S. oil-patch and Wall Street, as fresh capital could lead to higher spending and a shallower drop in U.S. oil production than currently expected, and hence to a longer period of low oil prices.
- John Hess, chief executive officer of Hess, said he wanted extra cash to maintain a strong balance sheet, and equity offerings are more receptive than debt with the Bank of America/Merrill Lynch High Yield Energy Index rising to a record effective yield of 21 percent on Feb. 11. "So now, we had this additional development cost," Hess said at the Credit Suisse summit. **"You know what’s going on in the debt markets. Debt markets have basically seized up for high yield."**

US SHALE OIL: DEVELOPED WITH THE HELP OF LEVERAGE & HIGH PRICES

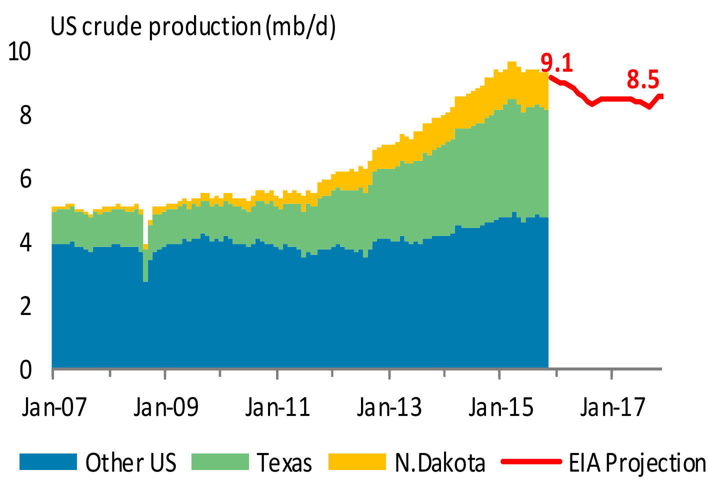
Changes in EIA's projection of Lower 48 crude oil production



The 3 major oil shale plays total oil production



US crude oil production by state



Source: EIA Short Term Energy Outlook (January 2015 and February 2016)

1. Hedging in oil markets:
   - Who hedges, how and why
   - Common hedging instruments and their P/L profiles
   - Liquidity, options and swaps
2. Financing in commodity markets:
   - Basic means of finance
   - Break-even prices in oil production
   - Production and financing: US shale oil boom
3. Concluding remarks

CONCLUDING REMARKS

- Impacts of hedging activity are mostly on longer dated tenors of the curves in pillar months.
- Impact of hedging depends on the type of instruments used to hedge, liquidity and volumes. Equally, it also depends on: how, by how much and when hedge providers choose to offload their risk.
- Finance is necessary for the development of reserves and to ensure future supply.
- Finance may or may entail hedging, depending on who is providing the capital.

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