

Oil & Gas Hedging and Golf

A Bank Engineer's Perspective

September 5, 2018



A Fairchild's sign on FM 361 looking northwest. Bits of cotton from the 2012 harvest lie along the roadside.



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My Early Concepts on Golf & Hedging

GOLF

Dumb Game

1. Not a real sport
2. Can play injured
3. Lack of physical exertion
4. Horseshoe level
5. Play at any age



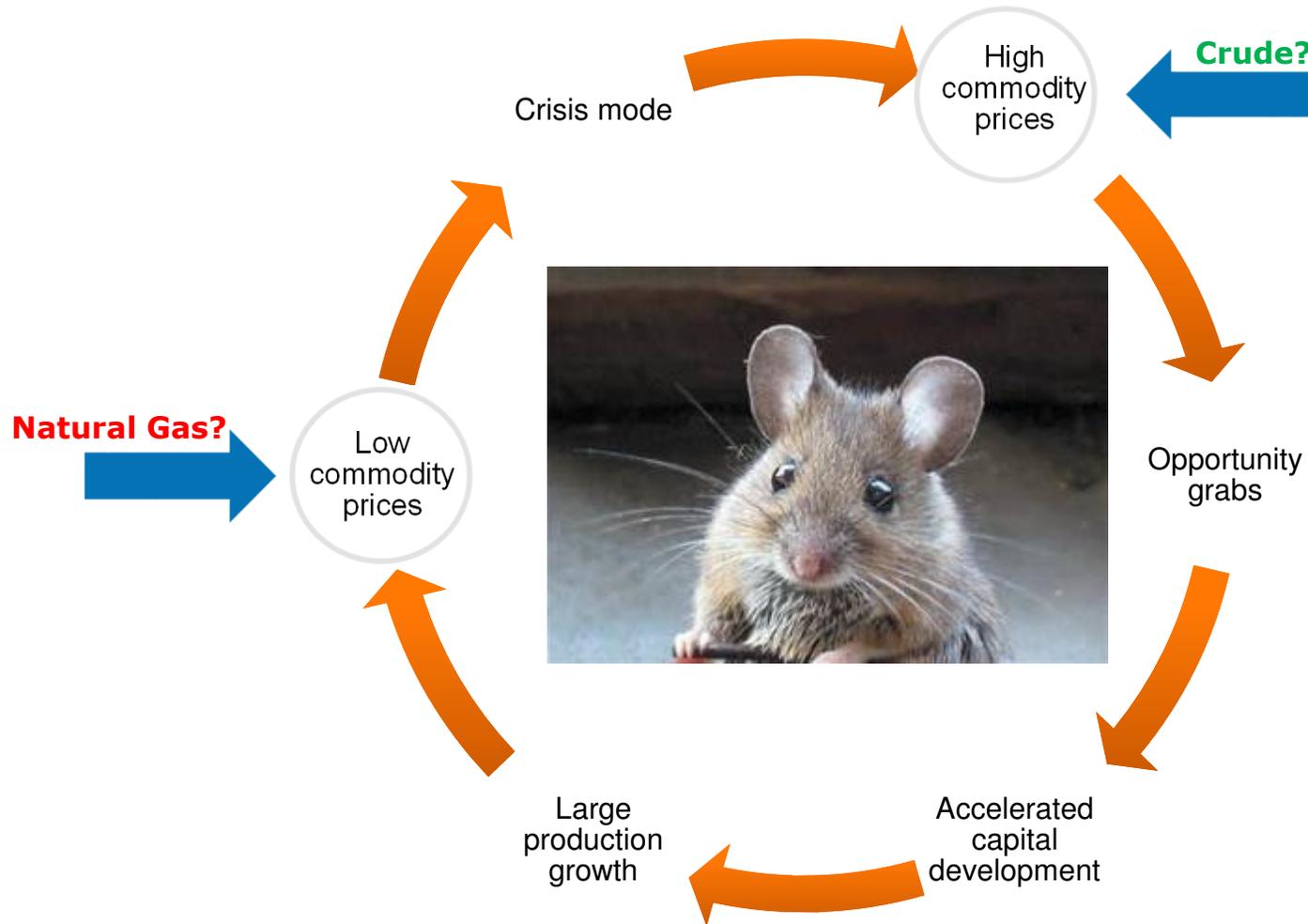
OIL & GAS HEDGING

Dumb Financial Tool

1. Not a real strategy
2. Can give up upside
3. Lack of real work
4. Ponzi scheme level
5. The age of peak oil theory



Upstream Oil & Gas Treadmill – Do we learn from price cycles?



Five Questions – Audience Participation

1. Will crude prices be higher in September 2019?
2. Will crude prices be lower in September 2019?
3. Will natural gas prices be higher in September 2019?
4. Will natural gas prices be lower in September 2019?
5. Do the majority of E&P companies have a long-term strategy?

Fall 2014 Case Histories - A Tale of Three Companies

| Company | A | B | C |
|------------------------|-------------------|-----------------|-----------------|
| Structure | Public | Private | Public |
| Development Program | Mostly Horizontal | Mostly Vertical | Mostly Vertical |
| 1P Development Quality | Tier 1 | Tier 1 | Tier 1 |
| PNC Syndicated RBL | Client | Client (2016) | Client |
| Liquid Production | 82% | 83% | 78% |
| Horizontal Expertise | High | Low | Low |
| Total Debt to EBITA | ~4.0 | ~3.0 | ~4.0 |
| Hedge Strategy | n/a | Long Term | Short Term |
| <i>Liquid Volume</i> | | High | Moderate |
| <i>Relative Value</i> | | High | Moderate |



A Tale of Three Companies – 2018 Score Card?

| Company | A | B | C |
|------------------------|-------------------|-----------------|-----------------|
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| Company | A | B | C |
|-----------------------------------|---|---|---|
| (A) Strong growth? | | | |
| (B) Borrowing base decreases | | | |
| (C) Borrowing base increases | | | |
| (D) Asset sales | | | |
| (E) Bankruptcy | | | |
| (F) Sold company | | | |
| (G) Aggressive horizontal program | | | |

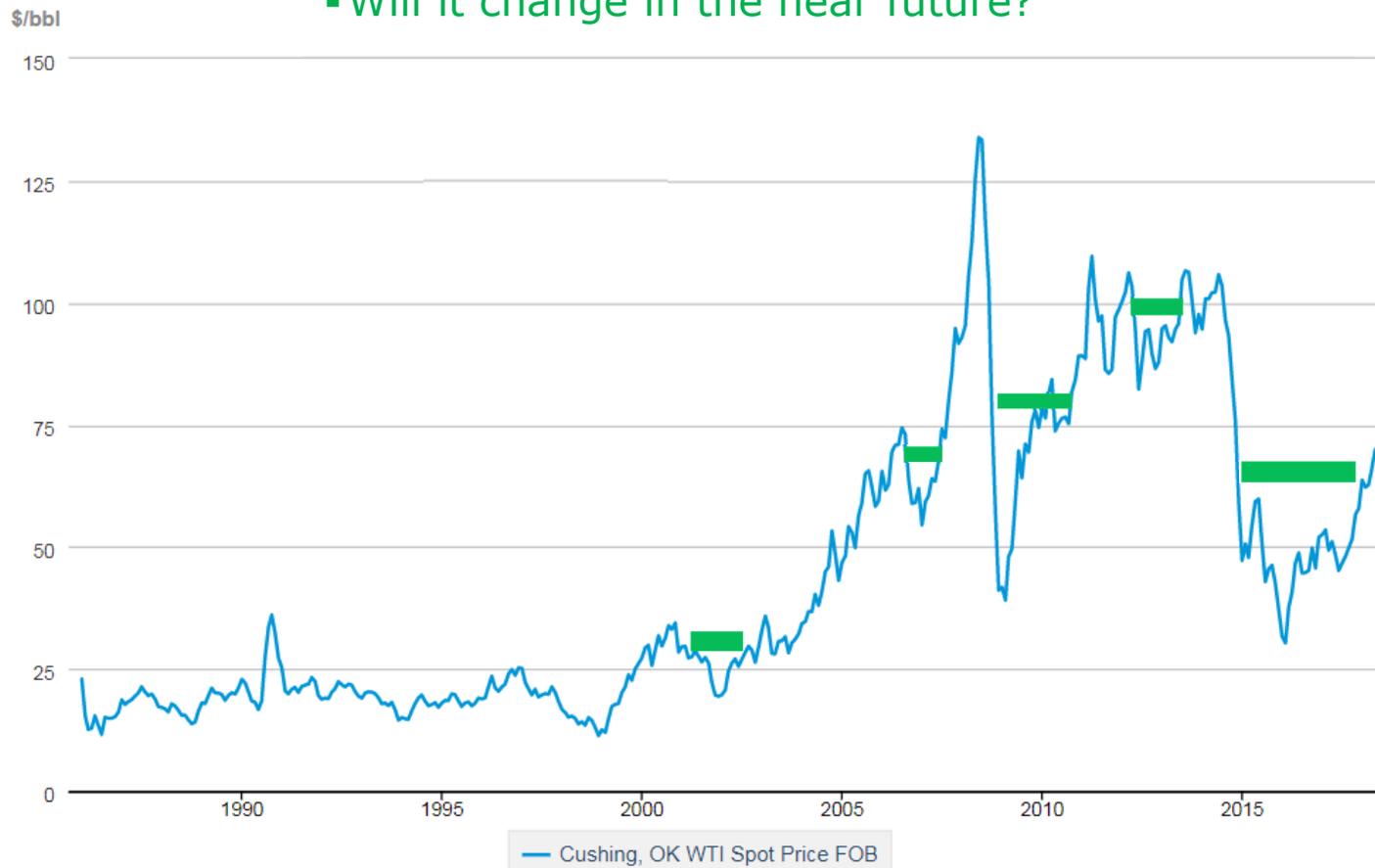
Oil Producers Under-Hedged going into 2015

PNC Secured Loan Portfolio Sampling

- Only ~20% of oil-focus companies had significant PDP hedge coverage
- While ~90% of the gas-focus companies had PDP hedge coverage

Historical crude cycles typically last one to three years

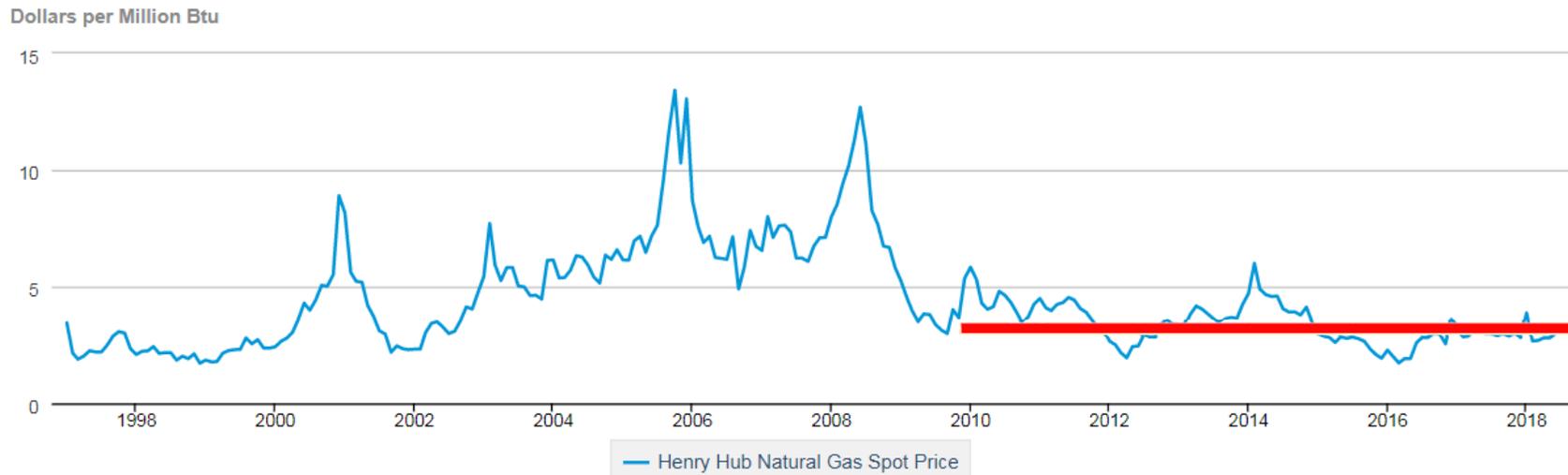
- What are the reasons?
- Will it change in the near future?



 THOMSON REUTERS Source: U.S. Energy Information Administration

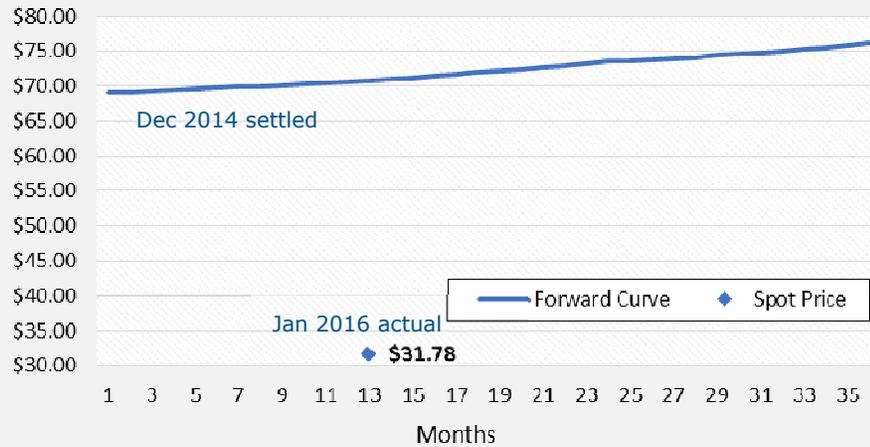
Since 2009 natural gas prices have been (mostly) flat lining

- What are the reasons?
- Will it change in the near future?

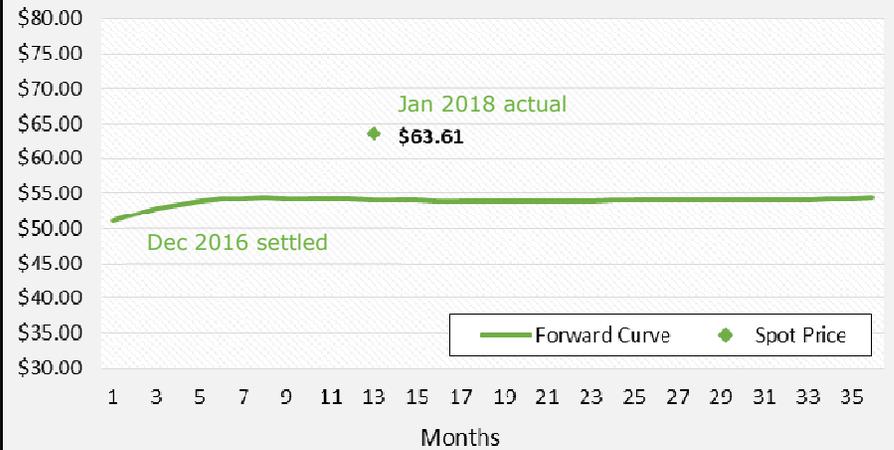


How Good Are Our Price Forecasts?

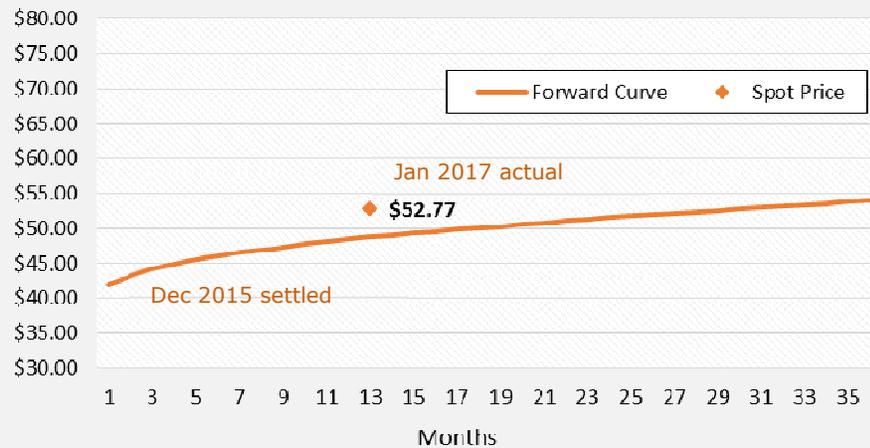
Comparison of Futures Settled vs Actual Spot WTI Prices 2015



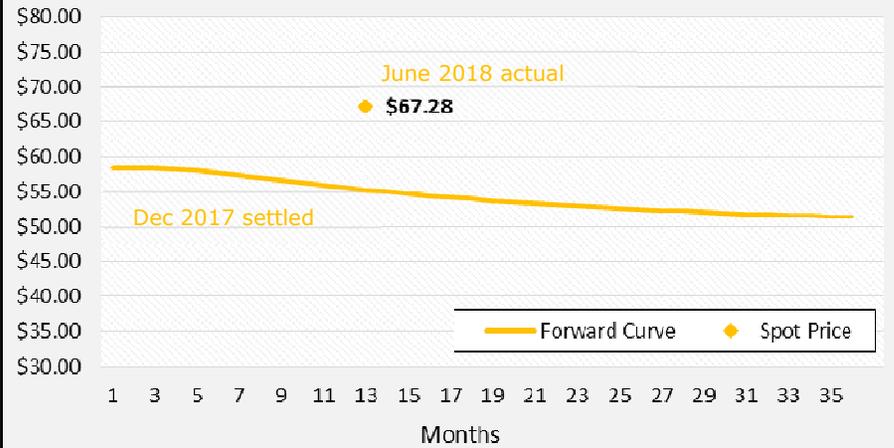
Comparison of Futures Settled vs Actual Spot WTI Prices 2017



Comparison of Futures Settled vs Actual Spot WTI Prices 2016



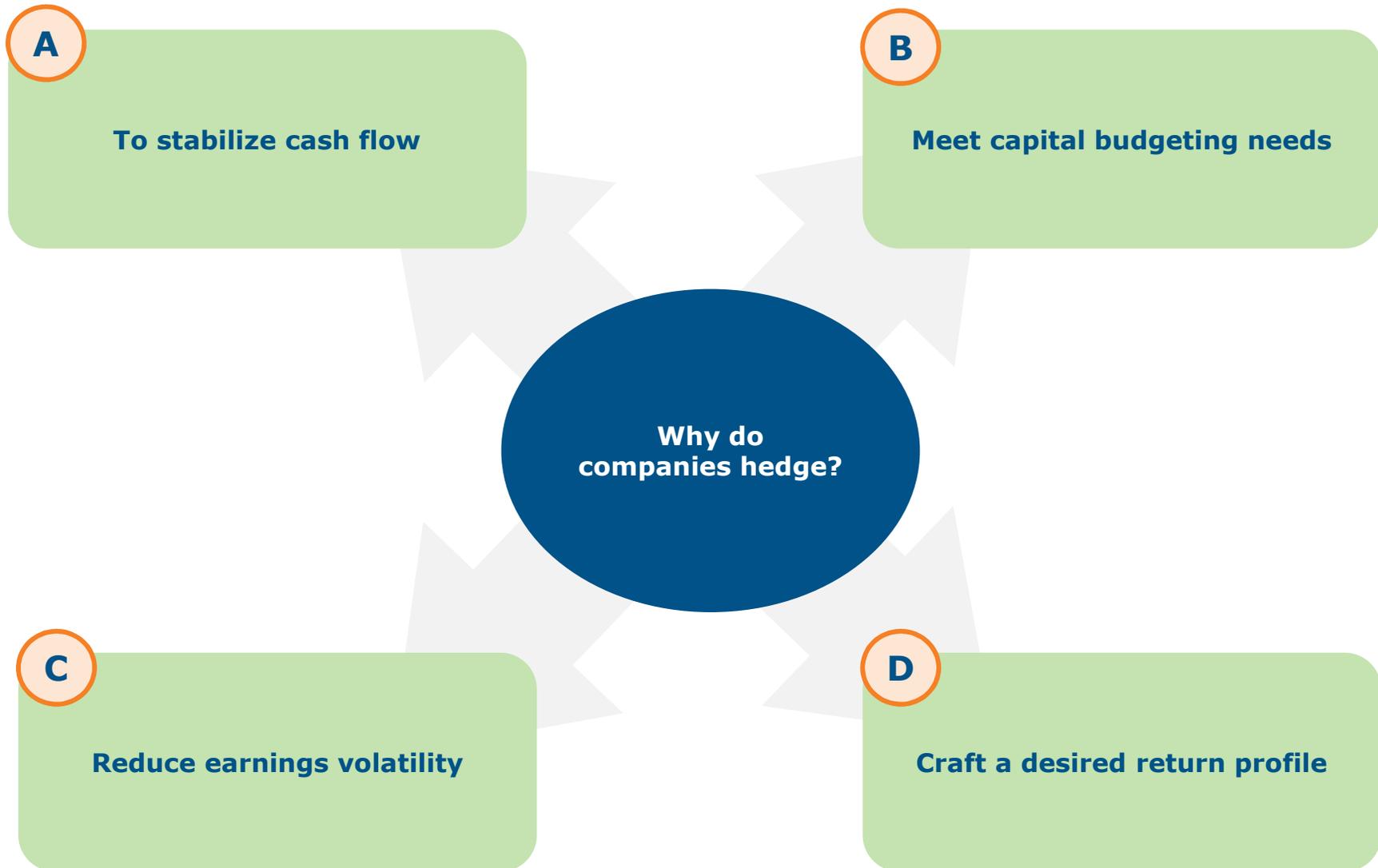
Comparison of Futures Settled vs Actual Spot WTI Prices 2018



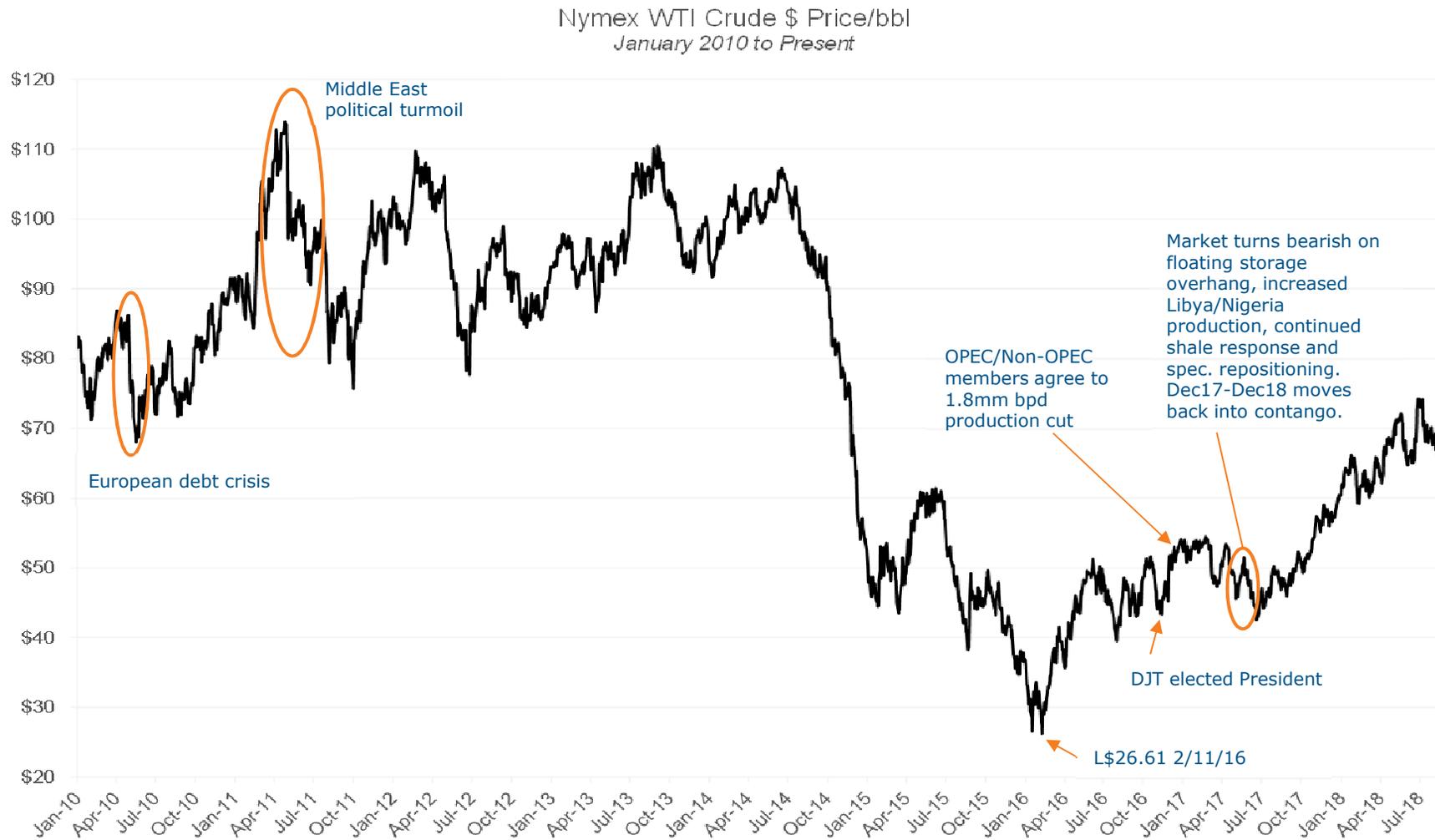
What have we discussed so far?

- Early in my life golf was on par with horseshoes.
- Hedging was a Ponzi scheme originating from a New York Cabal.
- Our industry is cyclic (or at times just sickly).
- We are SOL (sure of losing) in predicting oil and gas prices.
- The cycles last typically 1-3 years, dependent on multiple factors.
- Maybe hedging could be a useful development/financial tool, but why and how?

Reasons to Hedge



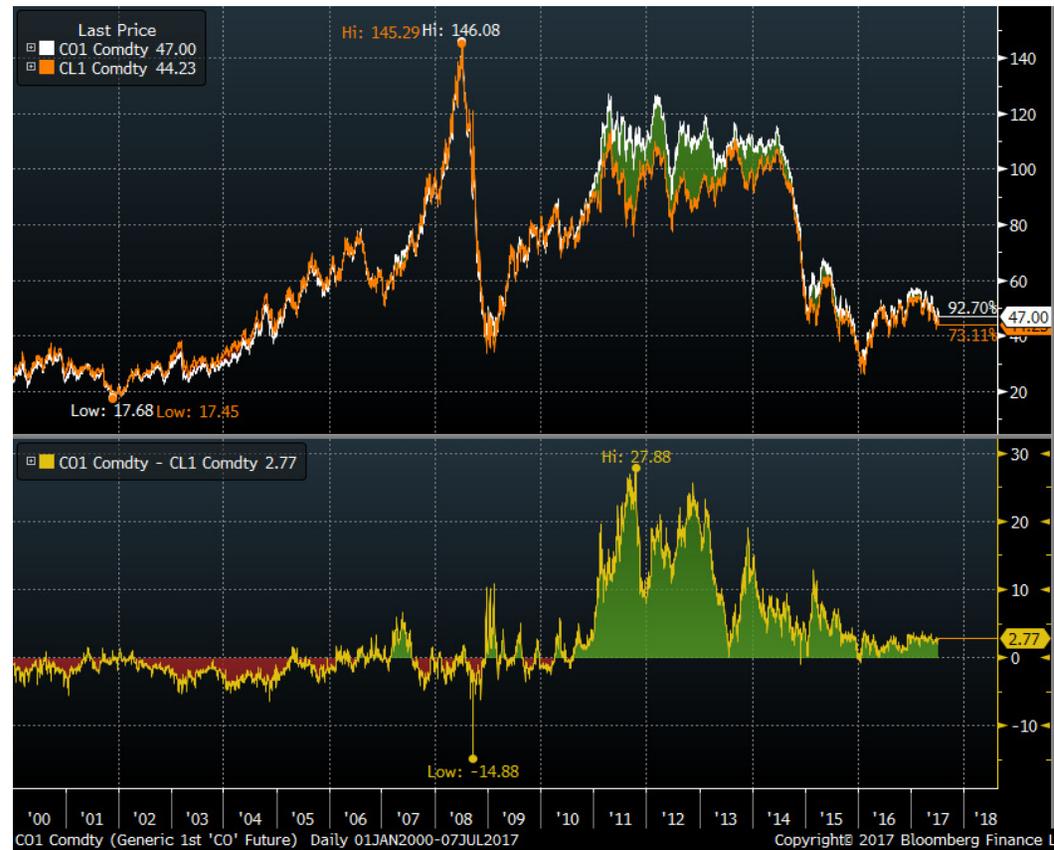
Nymex WTI Crude Price History



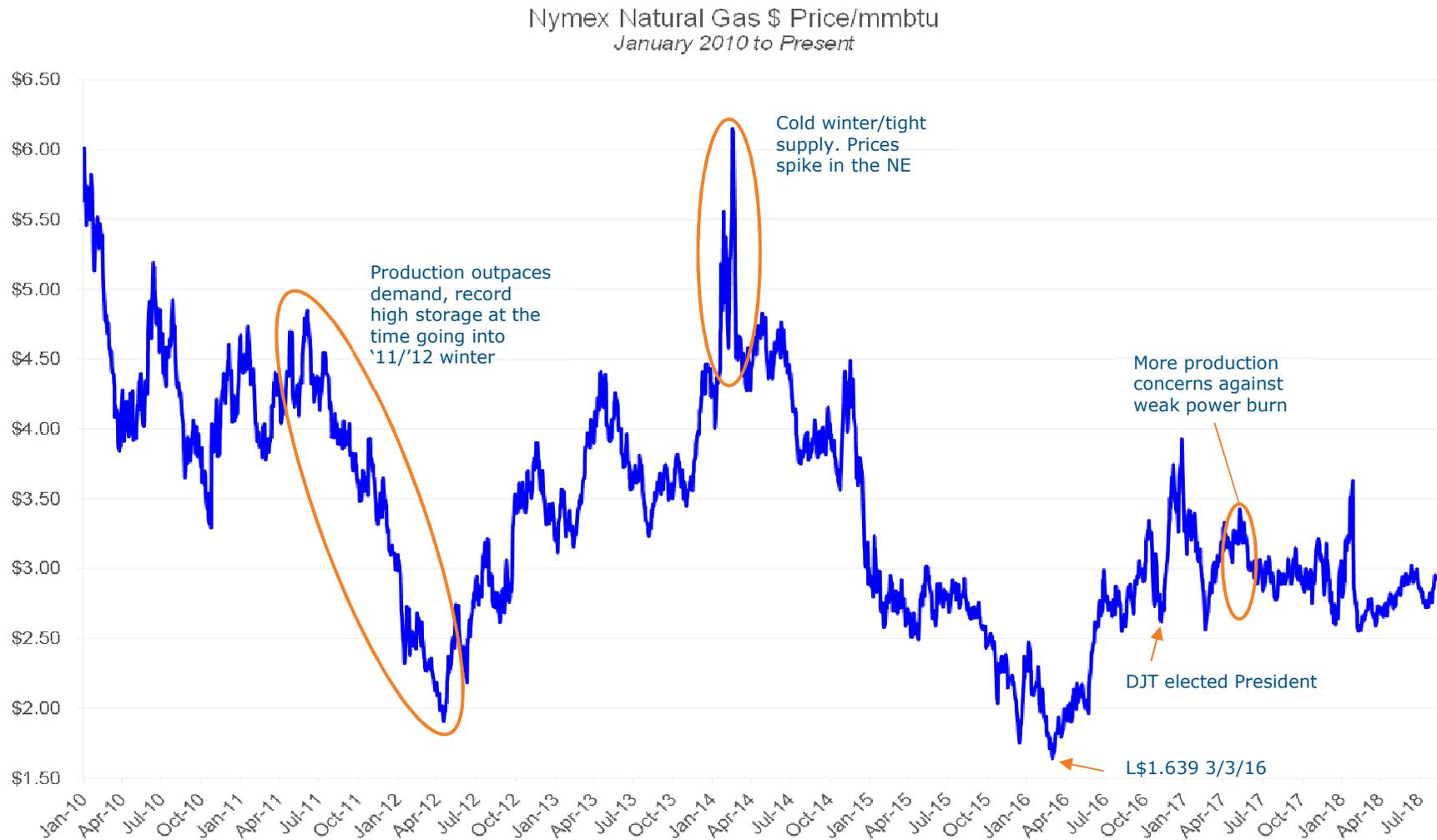
- After topping \$100/bbl in 1H2014, prompt prices began a rapid descent, bottoming in the mid \$20s in early 2016.
- This price movement highlights the importance and value of a disciplined hedging program.

WTI vs. Brent Crude Oil

- West Texas Intermediate (“WTI”) and Brent crude oil are the two most liquid crude price benchmarks in the world. The molecular compositions of WTI and Brent are similar (WTI API = 39.6, Brent API = 37.5) and are both traded in financial and physical markets. WTI is the key benchmark for US producers and refiners while Brent is the primary pricing point for ex-US E&P and downstream companies.
- While the chemical makeup of both benchmarks are similar, Brent crude oil is currently trading at a premium (+\$) to WTI. The price differential between the two benchmarks is not constant and will fluctuate with supply and demand economics at the hubs which may be influenced by OPEC production cuts, import-export legislature, US dollar strength, trade arbitrage, etc.
- For example, WTI traded at a significant discount to Brent in 2011 due to a US shale driven supply glut at Cushing. Although global crude oil demand was firm, Cushing lacked available capacity to transport crude away from the hub towards Gulf Coast refiners. This forced the cash market to trade at a deep discount to Brent in order to incentivize consumption to alleviate oversupply concerns. WTI traded as much as \$27/bbl below Brent in October 2011 before tightening back to the \$2-3 range we see today beginning when the US lifted the export ban in December 2015.
- The Brent vs. WTI spread has widened some over the past few months as OPEC cuts have largely affected supply stocks abroad while US shale continues to increase production.



Nymex Henry Hub Natural Gas Price History



- The shale revolution has transformed the natural gas market, shifting expected supply and demand fundamentals significantly.
- The supply glut sent Henry Hub gas to a low of \$1.64 in early 2016. Mild winters and continued elevated production has kept prices well below historical highs and smoothed volatility.

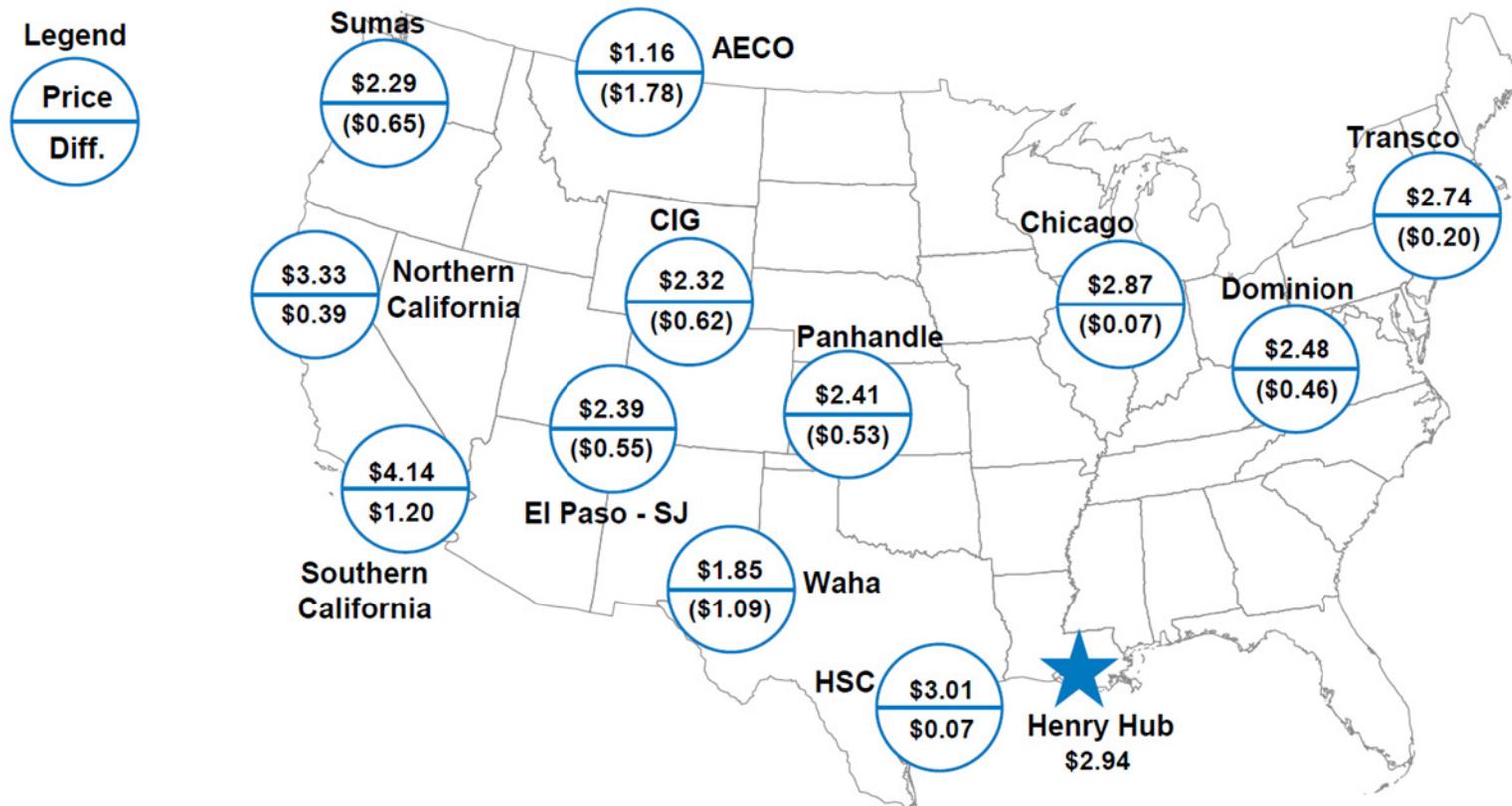
Natural Gas Pricing Dynamics

- Henry Hub is a natural gas delivery hub in Louisiana. NYMEX registered Henry Hub in 1990 as the delivery point for natural gas futures contracts due to its location and existing infrastructure at the time.
- While Henry Hub is the “primary” contract, natural gas is delivered on a network that spreads across the United States. These locations are referred to as basis points.
- Each basis point is its own market and trades at a premium or discount to Henry Hub based on local supply and demand as well as pipeline constraints and broader market flows.
- A schematic is highlighted on the following page.

Natural Gas Pricing Dynamics

- Basis point differentials vary widely across the US. For example, on August 10 Dominion traded 46c below Henry Hub while Northern California traded 39c above. This can be explained in part by available infrastructure capacity. Appalachia continues to increase natural gas production and is takeaway constrained. This has led to a supply overhang and price discount vs. Henry Hub. In contrast, the West Coast is geographically isolated from interstate delivery pipelines and receives much of its production intrastate or via imports. Given the supply constraints, Northern California trades at a premium to Henry Hub.

NATURAL GAS PRICING & DIFFERENTIALS TO HENRY HUB (\$ / MMBTU) – AS OF 10-AUG-18



| Source: BMO Commodity Products Group, Bloomberg

Trading Natural Gas Basis

- Major North American Gas Trading Locations

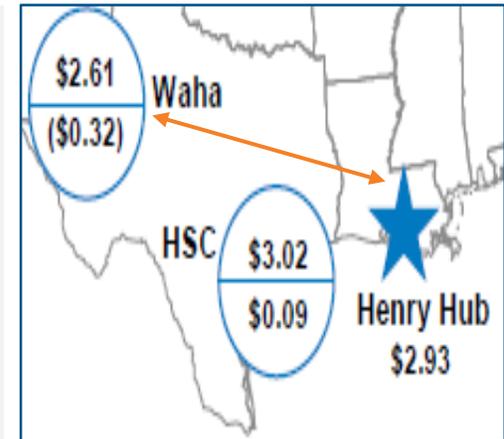


Source: API, "Understanding Natural Gas Markets" 2014

BASIS

COMPONENTS OF A BASIS TRADE

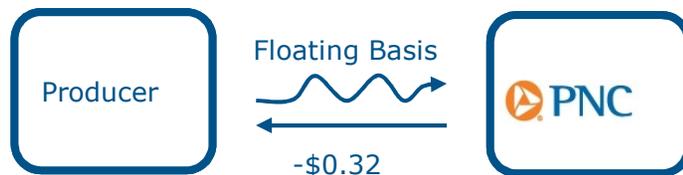
- If a company hedges its price risk at Henry Hub only, it is exposed to basis risk if it takes delivery at another location.
- For example, if a company has gas delivery at Waha, the basis differential at Waha will be unhedged unless the company manages this risk with either:
 - A. A fixed price swap at the basis location, or
 - B. A basis swap.



A. A fixed price swap at a basis location is a Nymex hedge with an embedded basis swap.

$$\text{For example, Waha} = \text{Henry Hub } \$2.93 - \text{Basis Swap } \$0.32 = \$2.61 \text{ fixed}$$

B. Alternatively a company can manage its basis risk independently by entering into a basis swap. In this instance the basis point risk is eliminated but the general risk (the Henry Hub risk) remains.



Basis Settlement Example

| | |
|---|---------------|
| At contract initiation, the Nymex price is: | \$2.93 |
| The Waha price is: | <u>\$2.61</u> |
| For a Nymex - Waha price differential of: | \$0.32 |

| | |
|--|--------|
| To hedge the basis risk, a producer enters into a basis swap, paying: | \$0.32 |
|--|--------|

Scenario 1: Nymex Henry Hub Price Increase 10c

| | |
|---|-----------------|
| Nymex increases \$0.10: | \$3.03 |
| Waha remains unchanged: | \$2.61 |
| Producer Receives Nymex - Waha on Swap: | \$0.42 |
| Producer Pays Fixed Basis: | <u>(\$0.32)</u> |
| Net Settlement on Swap: | \$0.10 |
| <hr/> | |
| Producer's Realized Price: | \$2.71 |
| Nymex - Waha Differential: | \$0.32 |

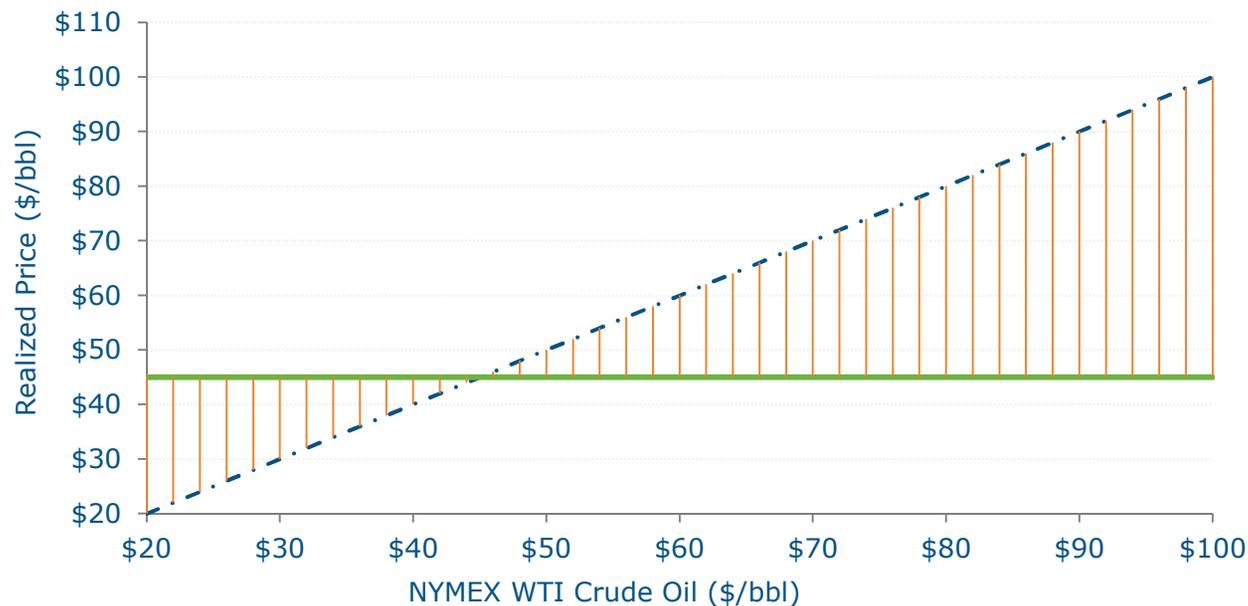
Scenario 2: Nymex Henry Hub Price Decreases 10c

| | |
|---|-----------------|
| Nymex decreases \$0.10: | \$2.83 |
| Waha remains unchanged: | \$2.61 |
| Producer Receives Nymex - Waha on Swap: | \$0.22 |
| Producer Pays Fixed Basis: | <u>(\$0.32)</u> |
| Net Settlement on Swap: | (\$0.10) |
| <hr/> | |
| Producer's Realized Price: | \$2.51 |
| Nymex - Waha Differential: | \$0.32 |

SWAPS

SWAPS

- Allow producers to “lock-in” prices by exchanging floating monthly crude or gas prices received at the wellhead for a fixed price over the life of the swap contract. As producers are naturally long the molecules in the ground, the hedge is to short, or sell, a percentage of production forward.
- **Advantage:** Fixed price certainty, eliminating downside price risk.
- **Disadvantage:** Loss of upside participation.

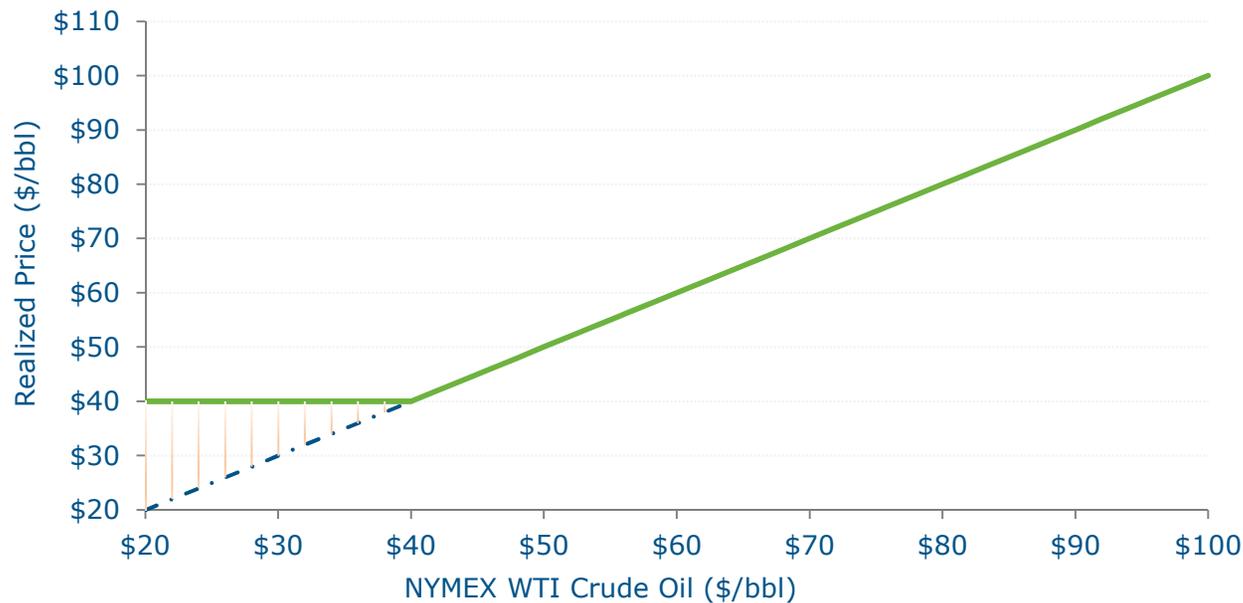


- Producer sells a \$45 fixed swap (receives fixed from hedge provide, pays floating).
- Producer receives settlement when prompt WTI is < \$45, pays settlement when WTI > \$45.

PUTS

PUTS

- Allow producers to set a floor price over the life of the contract. The producer purchases the put and has the right to exercise the option in the event the settlement price falls below the contract's strike price.
- **Advantage:** Producer maintains upside participation and owns the option which may have value depending on market conditions.
- **Disadvantage:** Up-front cost to purchase the option and may never be exercised (insurance).

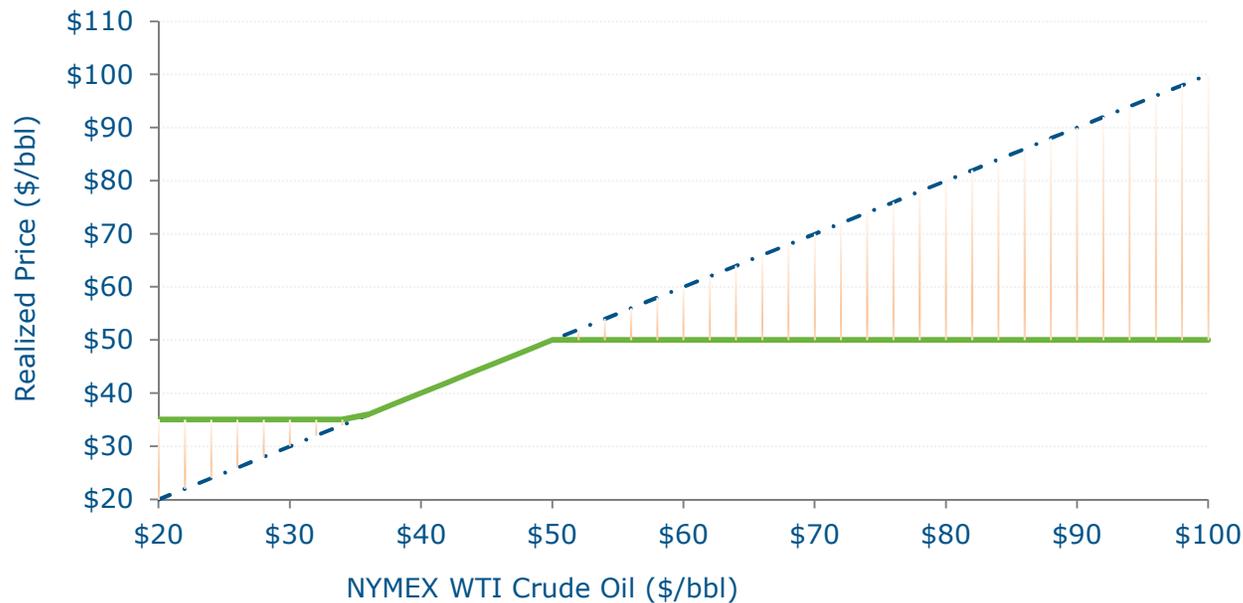


- Producer purchases a \$40 put.
- Producer will exercise the option and receive a settlement when WTI is $< \$40$. No settlement will occur when WTI is $> \$40$.

COLLARS

COLLARS

- Like puts, collars set floor prices. And in effort to maintain some upside participation and create a zero-cost transaction (no upfront premium due), a producer also writes/sells a higher strike call (short call premium offsets the purchase price of long put).
- **Advantage:** Producer can achieve price protection at zero cost as well as maintain some upside participation up to the short call strike.
- **Disadvantage:** Loss of upside participation above the sold call level.

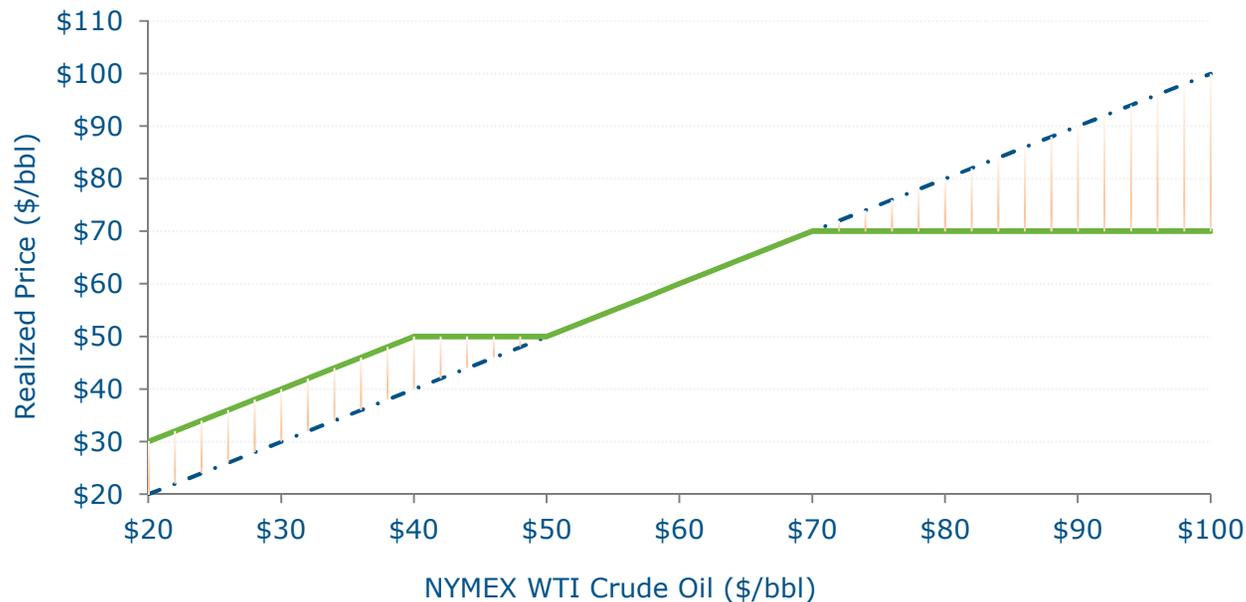


- Producer purchases a \$35 put, sells a \$50 call.
- Producer receives the difference between \$35 and WTI when the price is $< \$35$. Producer pays the difference to the hedge provider when $WTI > \$50$. No settlement occurs when $\$35 < WTI < \50 .

THREE-WAY COLLARS

THREE-WAY COLLARS

- Three-way collars provide producers with enhanced upside participation. The producer will purchase a put, **sell a lower strike put** and sell an above market call. Proceeds from the short put position are used to set the call strike higher than what could be achieved with a regular two-way collar structure given the same level of put protection. The producer is long a put spread and short a call.
- **Advantage:** Producer can obtain a wider collar band than a regular two-way collar.
- **Disadvantage:** If the market price moves below the short put strike, the producer receives the market price plus the difference between the long put and short put strikes.

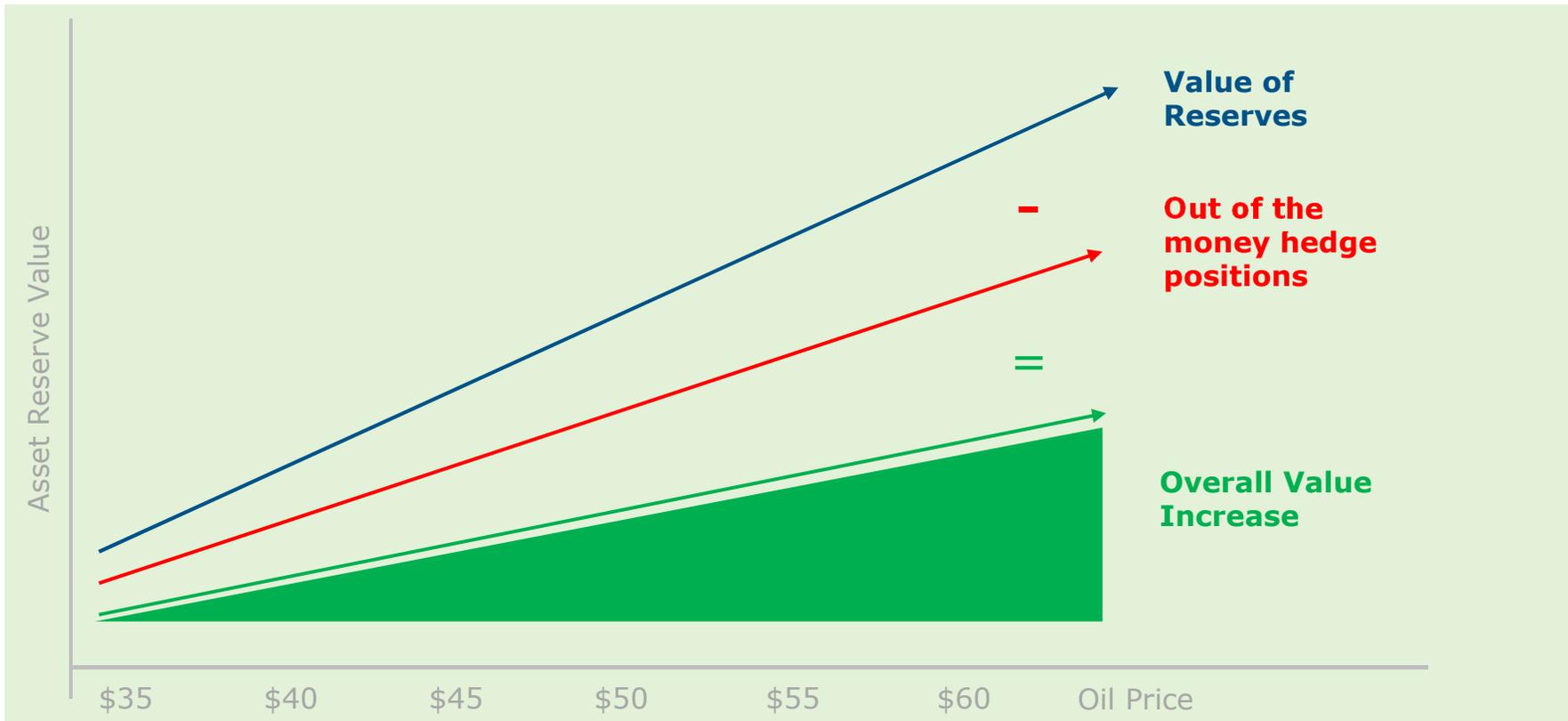


- Producer purchases a \$50 put, **sells a \$40 put**, and sells a \$70 call.
- Producer receives the difference between \$50 and WTI if price < \$50. Producer pays the difference when WTI < \$40. Producer pays the difference when WTI > \$70. No settlement occurs when \$50 < WTI < \$70.

A Unique Aspect of Commodity Hedging

PRODUCER HEDGING CREDIT PROFILE

- Right way risk is a credit attribute of producer hedging.
- The predicate is that as prices rise and hedge providers have marked-to-market exposure to the company (in-the-money to the hedge provider), the credit profile of the company has improved.
- Why is this the case?



PNC Commodities Desk

STEP 1

Documentation and trading line approvals

Documentation includes ISDA Master and Schedule, Credit Support Annex (if applicable) and other Dodd-Frank Provisions. Each document must be negotiated and signed before any trades may be executed.

Trading lines need to be approved by internal credit teams and derivative exposures are monitored daily.

STEP 2

Trade Execution

Once documentation and trading lines are in place, the sales desk is able to trade.

Trades are initiated over the phone or via instant messaging platforms

Producer: "Where are you bid in Cal18 NG?"

Swap Dealer: "Sure, size?"

Producer: "1d"

Swap Dealer: "\$3.00 bid (mids +0.01) on 1/d of Cal18 Nymex NG LD swap"

Producer: "Done"

Swap Dealer: "Done"

STEP 3

Desk Risk Management

When a trade is executed, the swap dealer's trading desk immediately hedges the trade exposure in the market with futures, an off-setting trade, or warehouses the risk depending on the economics.

STEP 4

Trade Capture

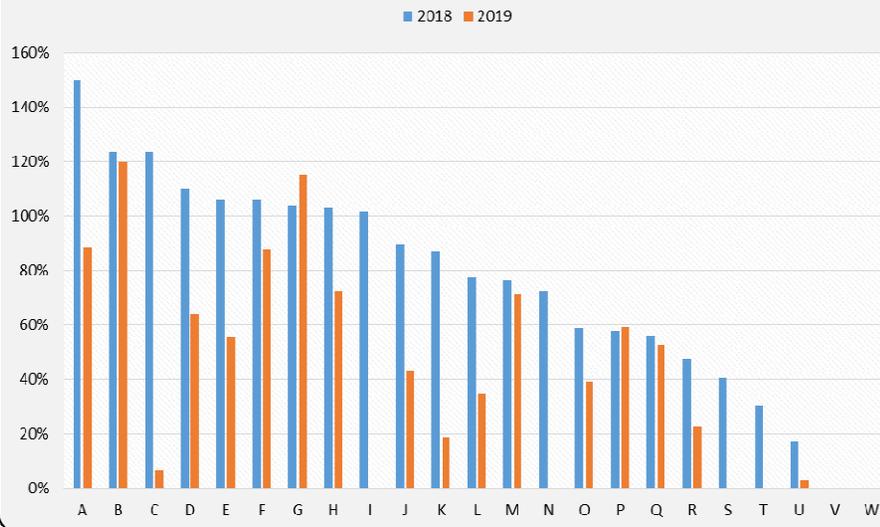
The trade is then booked in our internal systems and confirmed by the producer and swap dealer using a trade confirmation letter.

Monthly settlements, audit requests and valuation statements are all handled by our Payments and Confirmations teams.

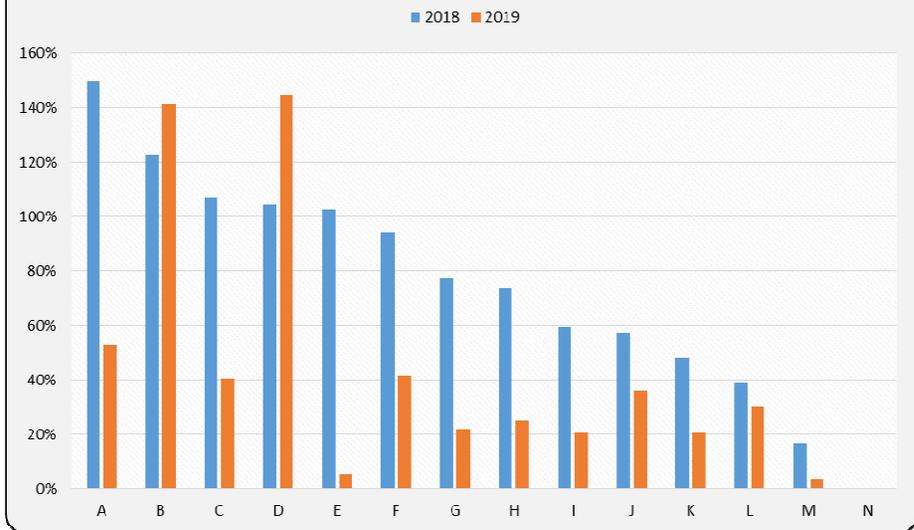
2018 Portfolio First Lien RBL - Hedged Companies (2018-2019)

We have gotten better as an industry on hedging; but we can always do better:
 1) consistency; 2) tactical instruments; and, 3) coverage.

Oil Weighted Companies: Hedge % of PDP Volume Sampling



Gas Weighted Companies: Hedge % of PDP Volume Sampling



Four Decades Later - My Concepts on Golf & Hedging have changed

GOLF

Smart Game

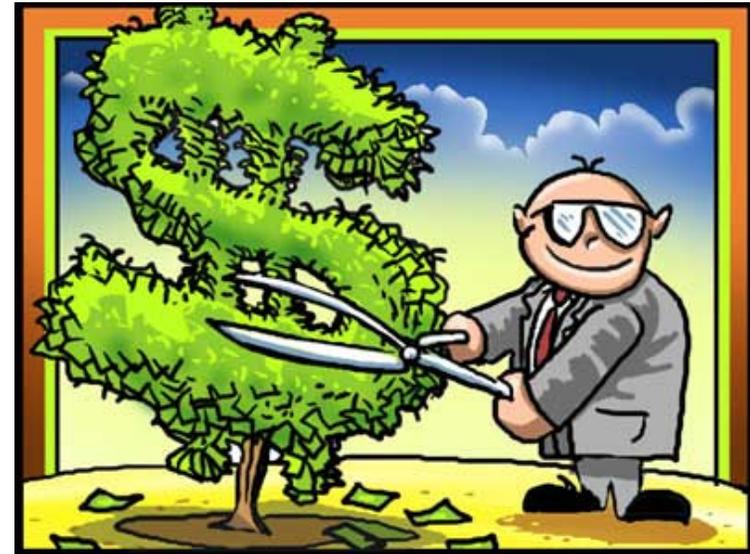
1. Not a real sport . . . ha, small ball, long stick, 350 yds
2. Can play injured . . . so what, I am still vertical
3. Lack of physical exertion . . . You kidding, 100 °F, 100% humidity
4. Horseshoe level . . . see no. 1 above
5. Play at any age . . . sounds good to me



OIL & GAS HEDGING

Smart Financial Tool

1. An essential strategy
2. Can craft to stay in business
3. Work smarter not harder
4. Balance risk-reward
5. The age of supply/demand uncertainty



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| Debt to EBITA | Moderate | Low | High |
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| Liquid Volume | | High | Moderate |
| Relative Value | | High | Moderate |



A Tale of Three Companies – What was the outcome?

| Company | A | B | C |
|-----------------------------------|---|---|---|
| (A) Strong growth? | | ✓ | |
| (B) Borrowing base decreases | ✓ | | ✓ |
| (C) Borrowing base increases | | ✓ | |
| (D) Asset sales | ✓ | | ✓ |
| (E) Bankruptcy | | | ✓ |
| (F) Sold company | ✓ | | |
| (G) Aggressive horizontal program | | ✓ | |