The State of the Energy Markets

February 2015

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The Disclaimer

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Energy is both a Global and a Regional Market

All politics are local, but some energy markets are global

- Energy markets include a diverse set of products that are traded globally and regionally
  - Major Regional Markets
    - Natural Gas
    - Electricity (Power)
    - Coal
    - Emissions
  - Major Global Markets
    - Crude & refined products
    - Liquefied Natural Gas

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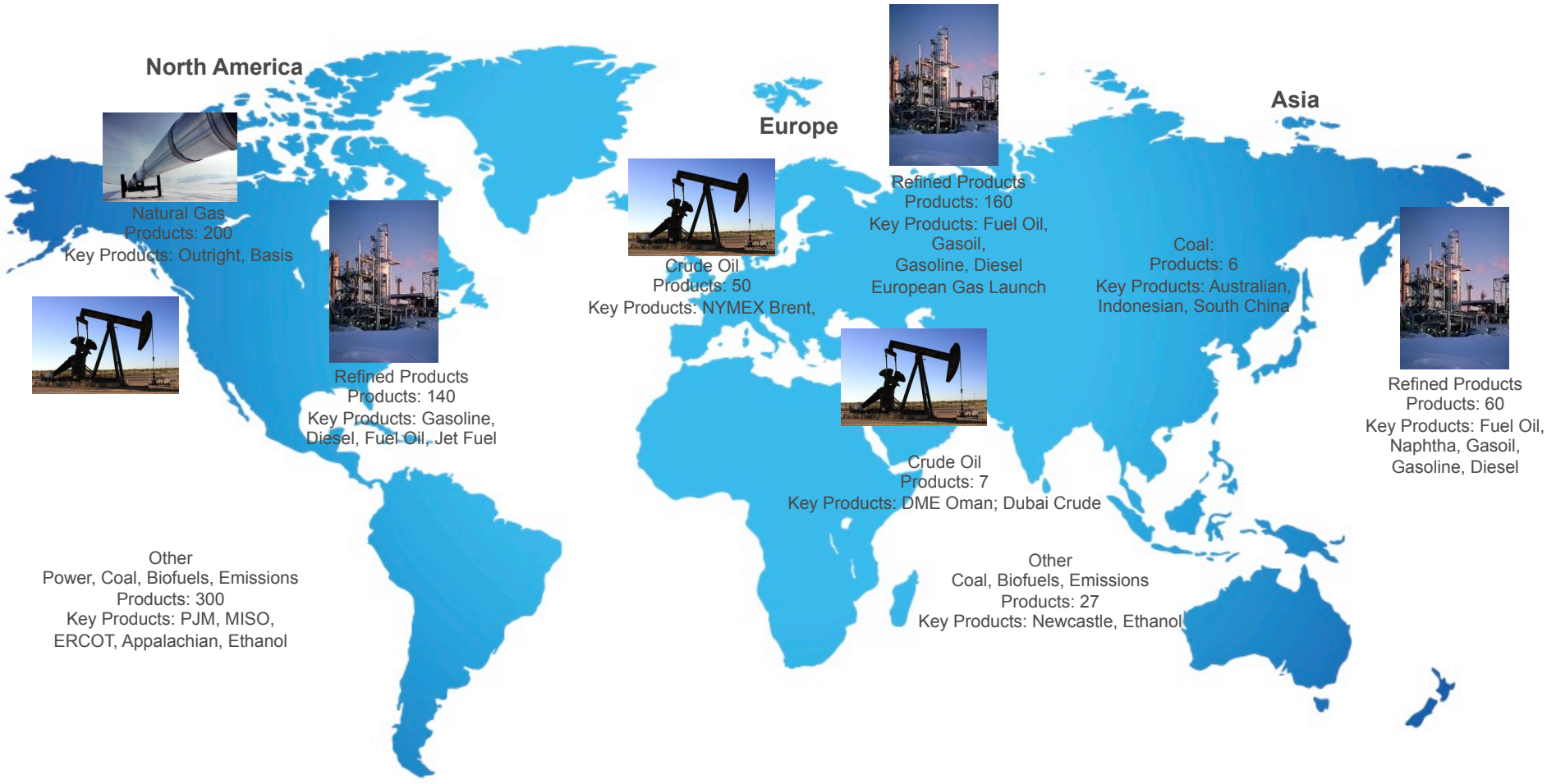
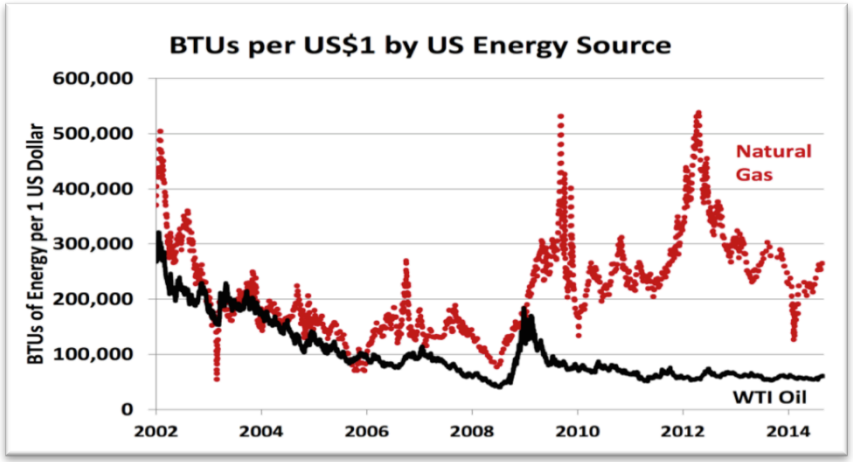
Major Global Energy Markets

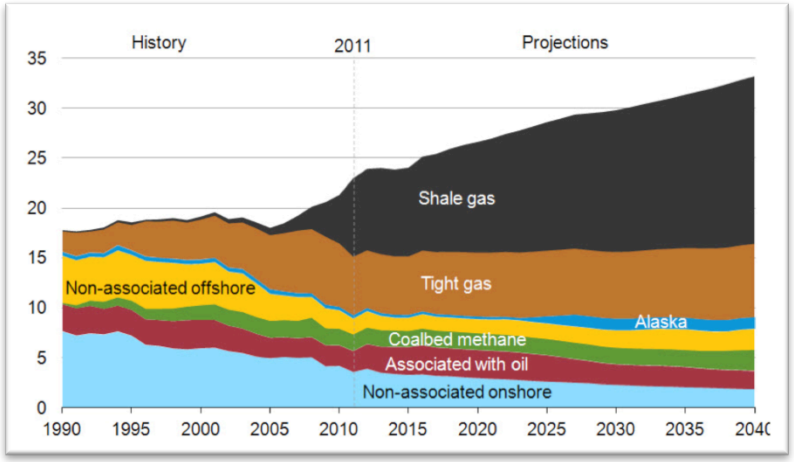


CME Group alone has more than 15 markets with 1200+ products

Major Trends Driving Significant Market Changes
US Natural Gas Revolution is Changing Energy Markets



Source: Bloomberg Professional for prices, CME Economics Research for BTU conversion.



Source: Energy Information Administration

- US crude oil production has expanded by just over 50% since 2005
- US natural gas production has risen by about 30% since 2005

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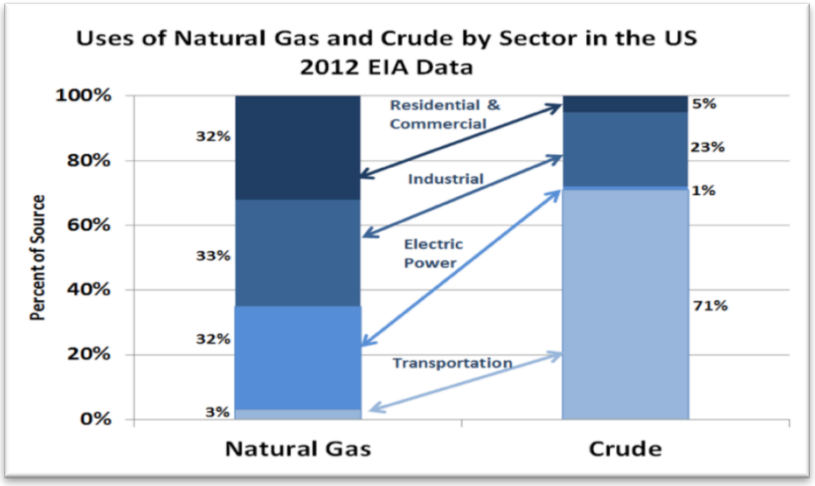
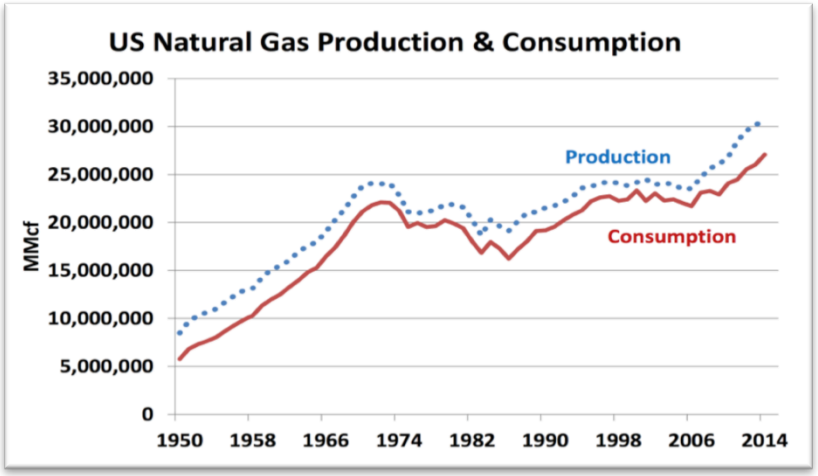
Shifting Market Dynamics



Source: Energy Information Administration



Source: Energy Information Administration

- Since 2005, US consumption of refined petroleum products and crude oil has declined by 14-percent
- In that same period, natural gas consumption has risen by 23-percent

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LNG – Globalizing Natural Gas

- LNG is beginning to globalize the natural gas revolution
- World trade in LNG more than tripled over the last 15 years - 10Bcf/d in 1997 to nearly 32Bcf/d in 2011 (CAPP, January 2014)
  - 136 Existing Terminals
  - 32 Under Construction
  - 43 Planned (globalInginfo.com)
- LNG is helping countries decrease their energy dependence on neighboring countries' pipelines and supply
  - As example, Lithuania recently development its first LNG terminal. Prior to the development of the terminal, the country was 100% dependent on Russia's Gazprom for gas supplies
    - The new LNG terminal and the shale gas revolution have changed the game forever, while "countries still addicted to the pipeline only will not grow fast," said Dalia Grybauskaite, President of Lithuania, WEF (Jan 21, 2015)

Saudi Arabia is investing heavily in natural gas development to support growing demand and to shift away form liquid fuels to *enable the export* of more oil.

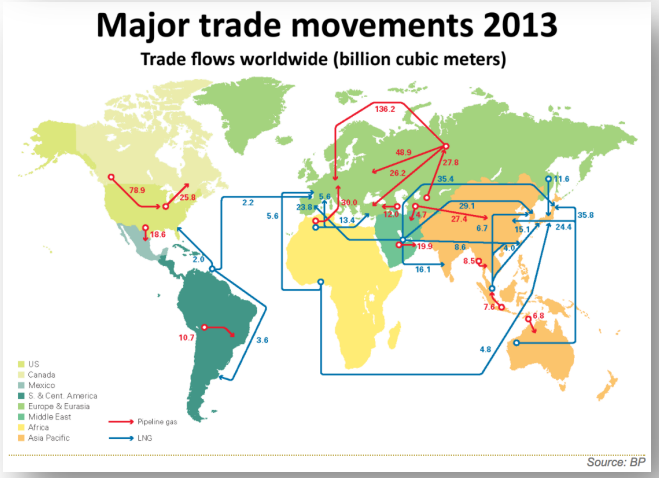
- Khalid A Falih, Saudi Aramco, Chief Executive, WEF (Jan 21, 2015)

Oil vs. LNG markets

	Oil industry	LNG industry
Age of industry	150 years	50 years
Number of sellers	Many	Relatively few
Number of buyers	Many	Relatively few
Term of typical transaction	Daily, weekly, monthly, yearly	Multiple years
How traded	Commodity markets, private sales	Mostly private sales, some spot
Futures / options markets	Yes	No
Average daily value of exports, 2013	$4 billion	$500 million
Largest market	Transportation	Power, heating
Scale of market	International	Regional
Spot market	Large, very active	Small, but growing
Cost of typical tanker	$100 million	$200 million to $250 million
Size of fleet	More than 4,000 tankers	Less than 400 tankers
Destination flexibility	Wide open	Little flexibility
Shipping percentage of market price*	1 or 2%	Up to 25%

** Summer 2014 prices*

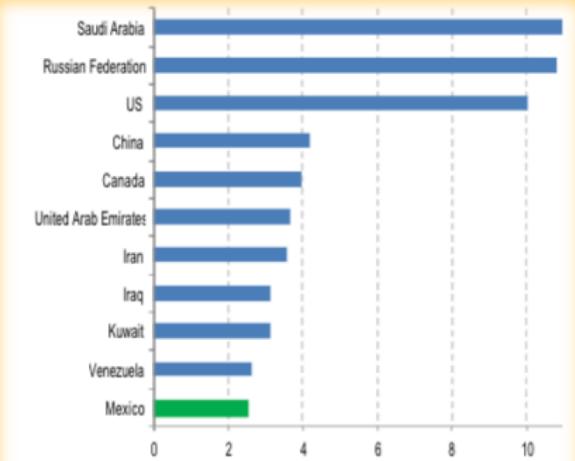
Source: Office of the Federal Coordinator research



The Global Commodity – Crude Oil

- Arguably, the most important commodity in the world today is crude oil
  - In 2013 global consumption was greater than 90 billion barrels a day
  - Key component in modern life (from plastics to transportation)
  - Oil dominates politics in many parts of the world
- Two key global indexes
  - Western Texas Intermediate (WTI)
    - Physically settlement (Cushing, OK)
  - Brent
    - Cash settlement based (North Sea)
- Traded as futures and options contracts
  - Priced in US$/barrel
  - Standard contract size is 1,000 barrels/contract
  - Most contracts do not go to physical delivery

Top 11 Oil Producing Countries



Source: BP's Statistical Review of World Energy 2014 Workbook.

Oil Shock

"What is perhaps most surprising is that people are surprised that we are going through a downturn in the oil markets."

- Khalid A Falih, Saudi Aramco, Chief Executive, WEF (Jan 21, 2015)

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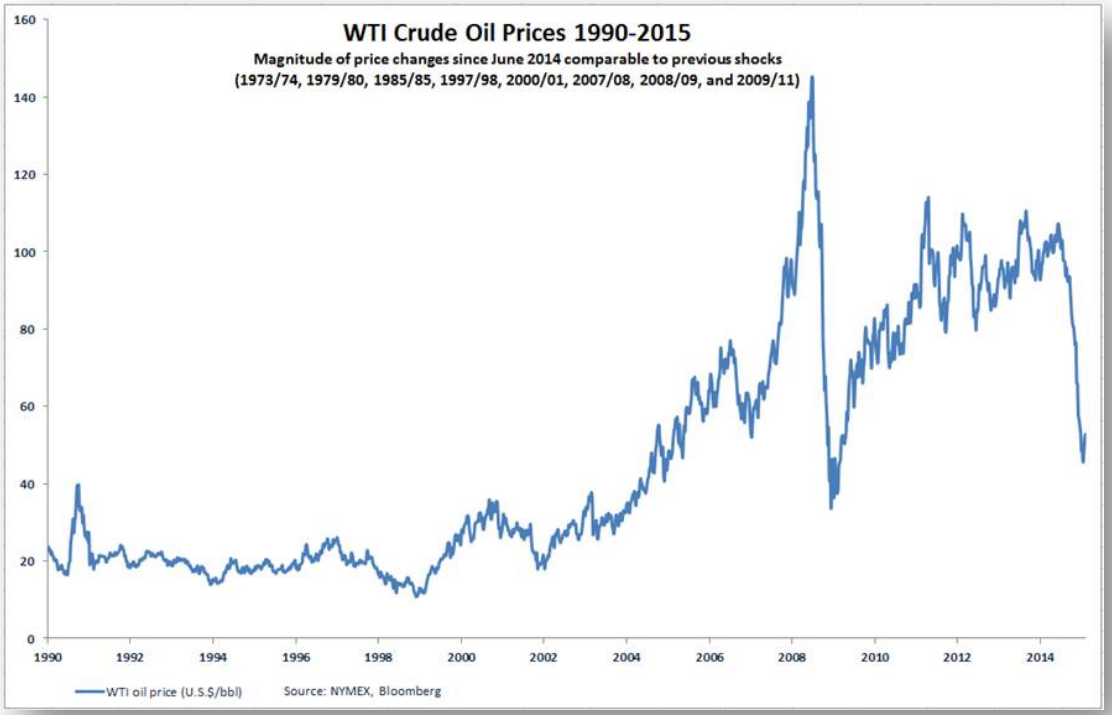
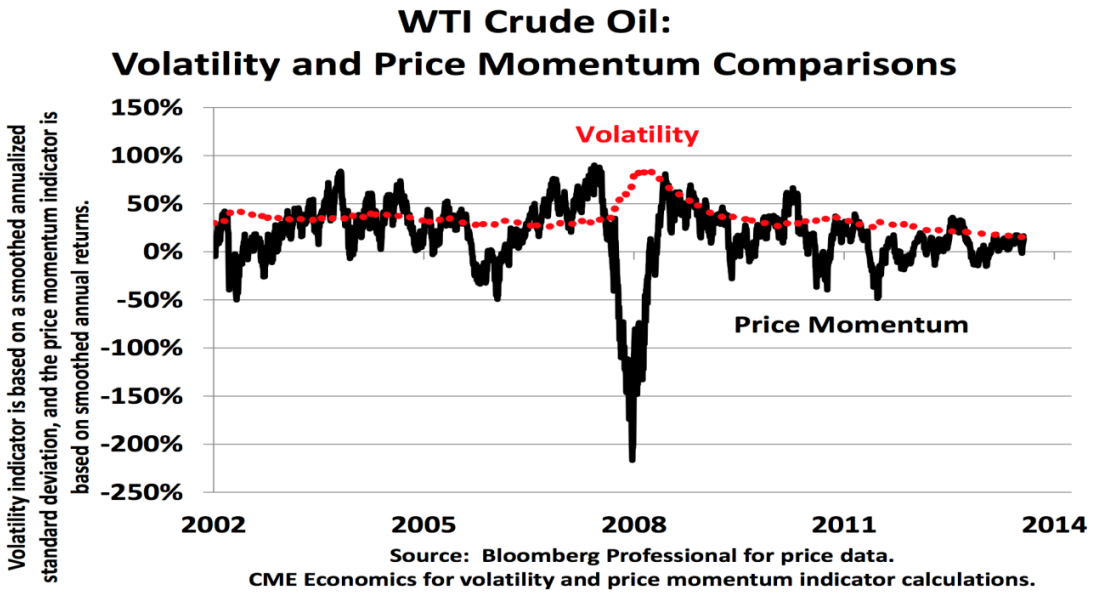
Oil Shock



What Happened?

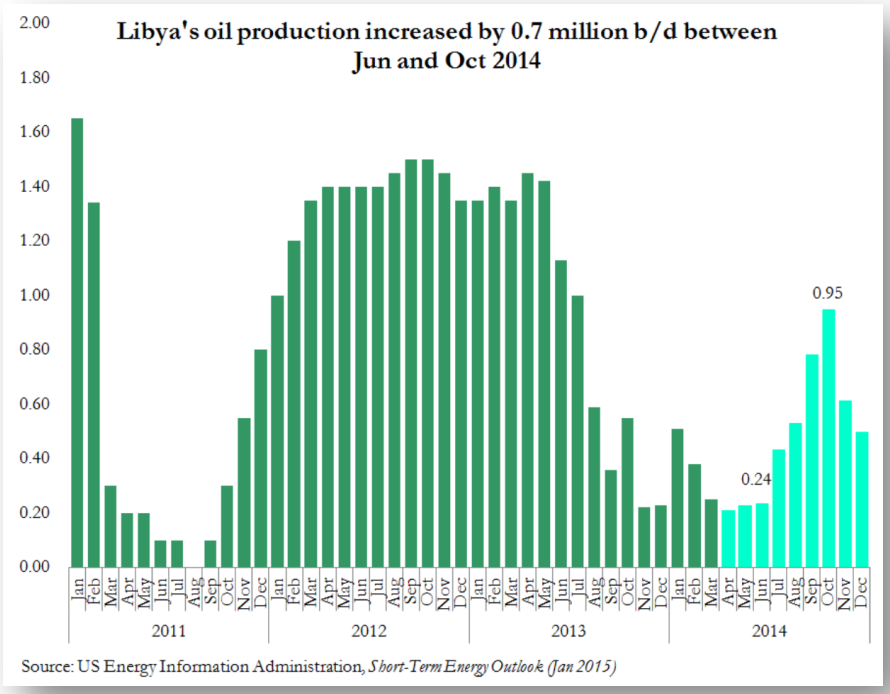
Oil Shock



Years of low volatility in a historically volatile commodity

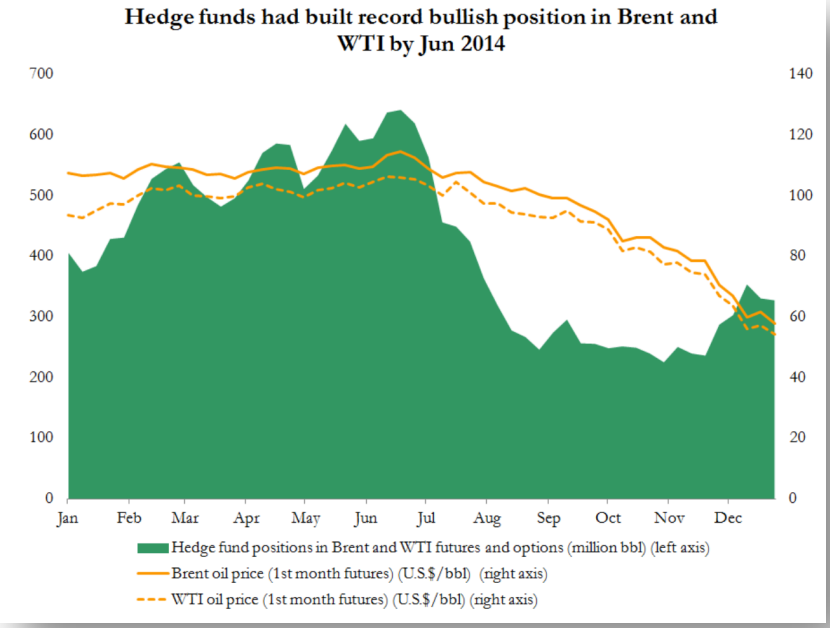
Oil Shock: Resumption of Exports from Libya

- Supply had dropped to 250Kb/d from a peak 1.5 Mb/d
- June 2014: many analyst and traders thought Libya's output would completely stop. **That was false.**
- June 19: two tankers pulled into Libya and began loading 1.3B, signaling a staggering increase in exports (over next 3 months 700Kb/d increase)



Oil Shock: Hedge Funds Dropping Long Positions

- By June hedge funds had record long positions (650M)
- According to John Kemp, Reuters, funds believed Libyan and other geopolitical risks in the region (esp. ISIS in Iraq) would continue to hinder supply
- When it became clear that ISIS was not going to be able to take the Iraq oil fields, funds liquidated positions
- Over the next 3 months hedge fund positions in oil reduced by the equivalent of about 450M barrels



Source: John Kemp, Reuters

Oil Shock: US Shale Revolution

- US oil production has risen by 4B/b/d since 2009
- Increases of 1Mb/day in 2013 and 2014 in the US (largest increases on record)
- For example in North Dakota's Bakken (0b/d in 2005 to ~200Kb/d in 2010 and 1.2Mb/d in 2014) adding 1M barrels a day to the global market
- Bakken, Eagle Ford, and Permian Basin Shale plays accounted for about 95% of the 4Bb/d increase that happened in the US

Oil Shock: Demand Destruction

- United States consumption of petroleum products peaked in 2005
  - Mandatory substitution (ethanol)
  - Greater efficiency (smaller cars)
  - Jim Hamilton at UC California claims advanced economies' oil consumption has reduced by about 8mb/d more than if the current trend in 2005 had continued
- Emerging markets filled the gap – until they didn't!
  - Significant increase in emerging economies' oil consumption (especially in China) helped keep the market in balance
  - However, it left the market dependent on those emerging markets
- In 2014 the emerging markets growth began to look vulnerable

Major Drivers in the Oil Shock

1. Technological advances that greatly increased physical supply (especially in the US and Canada)
2. Hedge funds reversing their positions
3. Increased Libyan exports
4. ISIS driven away from Iraq's oil fields
5. Demand destruction
    1. Reduction in advanced economies' consumption
    2. Curtailment in growth of emerging economies demand

Convergence of physical and paper supply coupled with reduction in demand put significant downward pressure on the price of oil

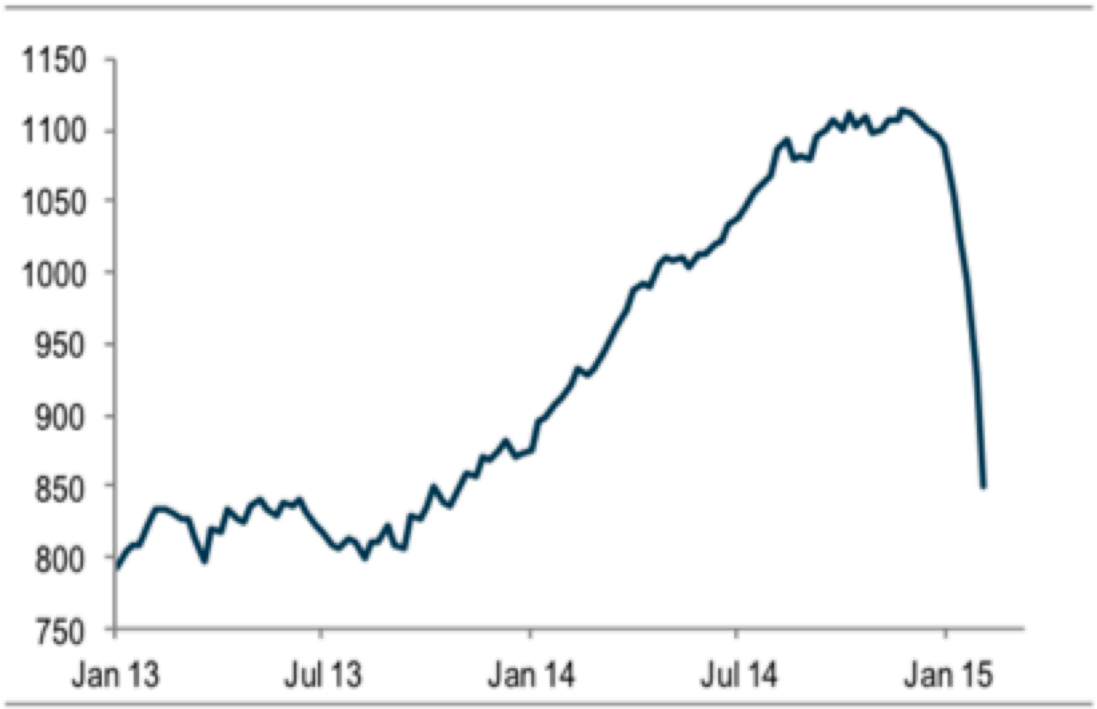
Future Price Direction: Conflicting Views

- There are strongly conflicting views on the future price of oil:

1. Supply surplus will continue to drive prices lower
   - At the extreme, such views predict a move down as low as USD $10/bbl

2. The other view is that the short-term supply will dissipate quickly, and evolve into market tightness in the second half of 2015
   - The extreme bullish views suggest oil will trade above its 2014 high

Future Price Direction – Changes in Supply

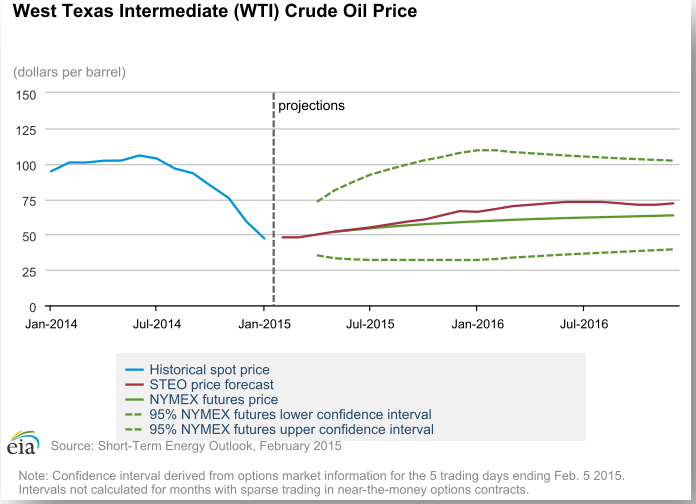


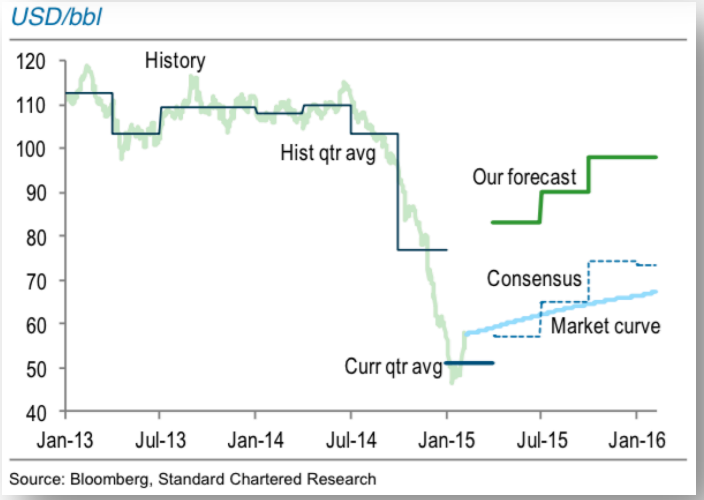
Source: Baker-Hughes, Standard Chartered Research

Huge drop off in the number of wells being drilled in the United States

Future Price Direction?

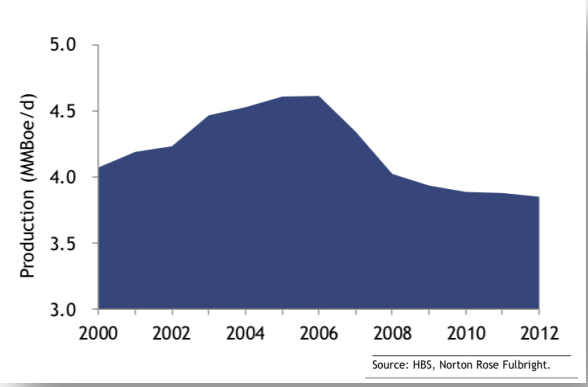
- “They may fall more, perhaps even as low as $10 to $20.” - Gary Schilling (Bloomberg, February 18, 2015)
- OPEC’s Secretary General Abdell El-Badri warned that oil has the potential to climb to $200 per barrel in the future due to the lack of investment in new supply. (Bloomberg, January 2, 2015)
- “We remain in the camp that this oil price move is more of a head-fake and is part of the crude oil bottoming process. We fully expect to see crude retreat once more before we’ll be convinced the bottom has been set.” (Wells Fargo Analyst Report, 2/15)

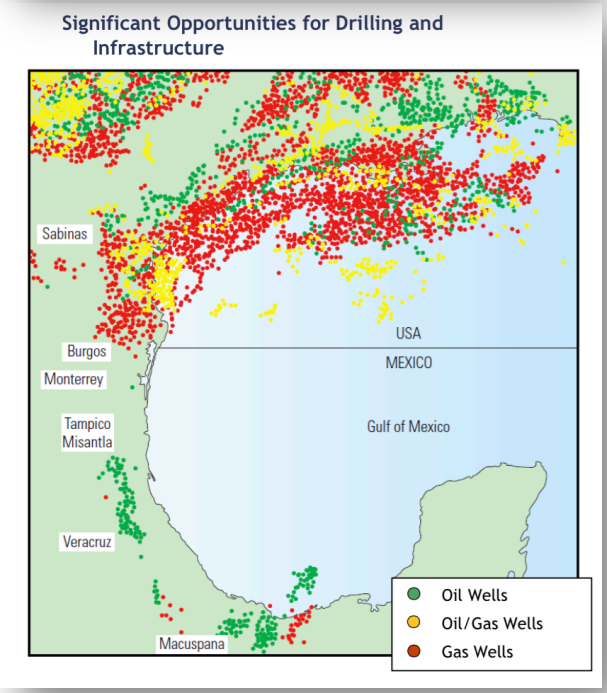




Mexico's Energy Reform & Price Changes in the Global Markets

- **Amendment to the Mexican Constitution** broadly opened domestic energy markets to competition. This should lead to:
  - **Expanded development** - Greatly enhances Mexico's ability to participate in the energy revolution in Canada and the US driven by improved drilling technologies
  - **Expanded pipelines** - Drive investment in oil, gas, and LNG infrastructure increasing reliability and initially bringing more *imports* of natural gas to Mexico)
  - **Increased exports** – Utilization of new drilling technologies will lead to increased outputs of oil (and in the long run natural gas/ LNG)
  - **Gasification of the electric grid** – Likely to greatly increase the transformation of the power grid (leading to lower wholesale electricity costs)
- **But, what about the price drop?**
  - **Impact on the Government budget**
    - Recent 60-percent price reduction will impact government revenues
    - At current market prices, increased volumes will not likely cover government revenue shortfalls
  - **Cost savings for domestic energy users**
    - Power costs could drop by as much as 75-percent
    - Natural gas cost savings could significantly reduce manufacturing costs

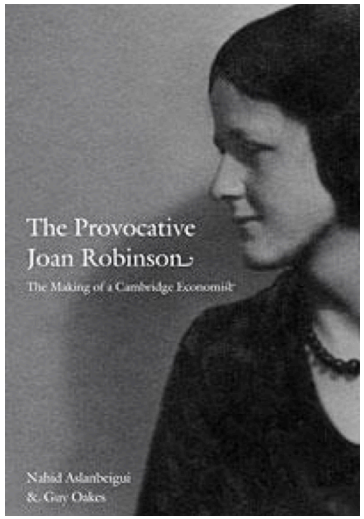




A Couple of Finishing Thoughts

- The impact of shale gas is just starting to be felt around the world
  - Gasification of power plants coupled with renewables will continue to have a profound impact on regional power markets
  - The Henry Hub natural gas index will likely become even more important as a global benchmark
- LNG will help link regional energy markets
- Oil will remain the primary global energy market for the foreseeable future
  - It is not clear where the bottom is for the oil market
  - While Brent and WTI are likely to be the main global energy benchmarks for oil, other regions may grow in importance

"There is no such thing as a normal period of history. Normality is a fiction of economic textbooks."
-- Joan Violet Robinson
(1903-1983)



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Thank You

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