April 10, 2015

"Oil and the U.S. Economy"

Yale Alumni in Energy Seventh Annual Conference

PINE BROOK

The Rise of Petro America: 2009-2014

- U.S. oil production increased by nearly 3.7 million B/D and total liquids production increased by nearly 4.9 million B/D and now approximates 11.7 million B/D

- The increase in U.S. liquids production accounted for a direct boost to GDP approximating $175 - $200 billion per year at historical prices (all import substitution)

- Increased GDP accompanied by 1.5 - 2 million new jobs

- Reduced reliance on imported oil so that in 2014, the U.S. imported about 27% of its petroleum, down from 57% in 2009

The Rise of Petro America: The Goldilocks Years

- The rise in tight oil production took place against a background of growing global demand and shrinking non-U.S. supplies
- Prices remained robust and at a level in excess of that needed to create new sources of supply
- Increased tight oil constituted the majority of new supplies in the world oil market
- The real price of oil continued to be high in the face of growing supplies
- The economics of the major unconventional plays improved every year as the industry learned how to drive down drilling and operating costs

Reality Sets In: The Second Half of 2014

- Why did a 1 million B/D "oversupply" in a 93+ million B/D market result in prices falling 60%?

- No "New News"
  - In 2013, OPEC called for a 2 million barrels a day reduction to balance the world markets at its target price of $90/barrel
  - Global inventories were not overflowing –and are still ample

- Lots of speculation
  - War on U.S. shale/Russia and Iran
  - Saudi focus on market share
  - Change in the structure of the oil market

- Financial market overwhelmed physical market

A Perspective on Volatility: Short Run

- There is no “economic floor” to short-term oil prices; the marginal cost to produce from existing wells ranges from $1 to $20 per barrel

- **The question should be**: why are crude prices not substantially lower today given that over a million barrels per day are going into storage?

- A 50% reduction in rig count is required to halt growth in 2015

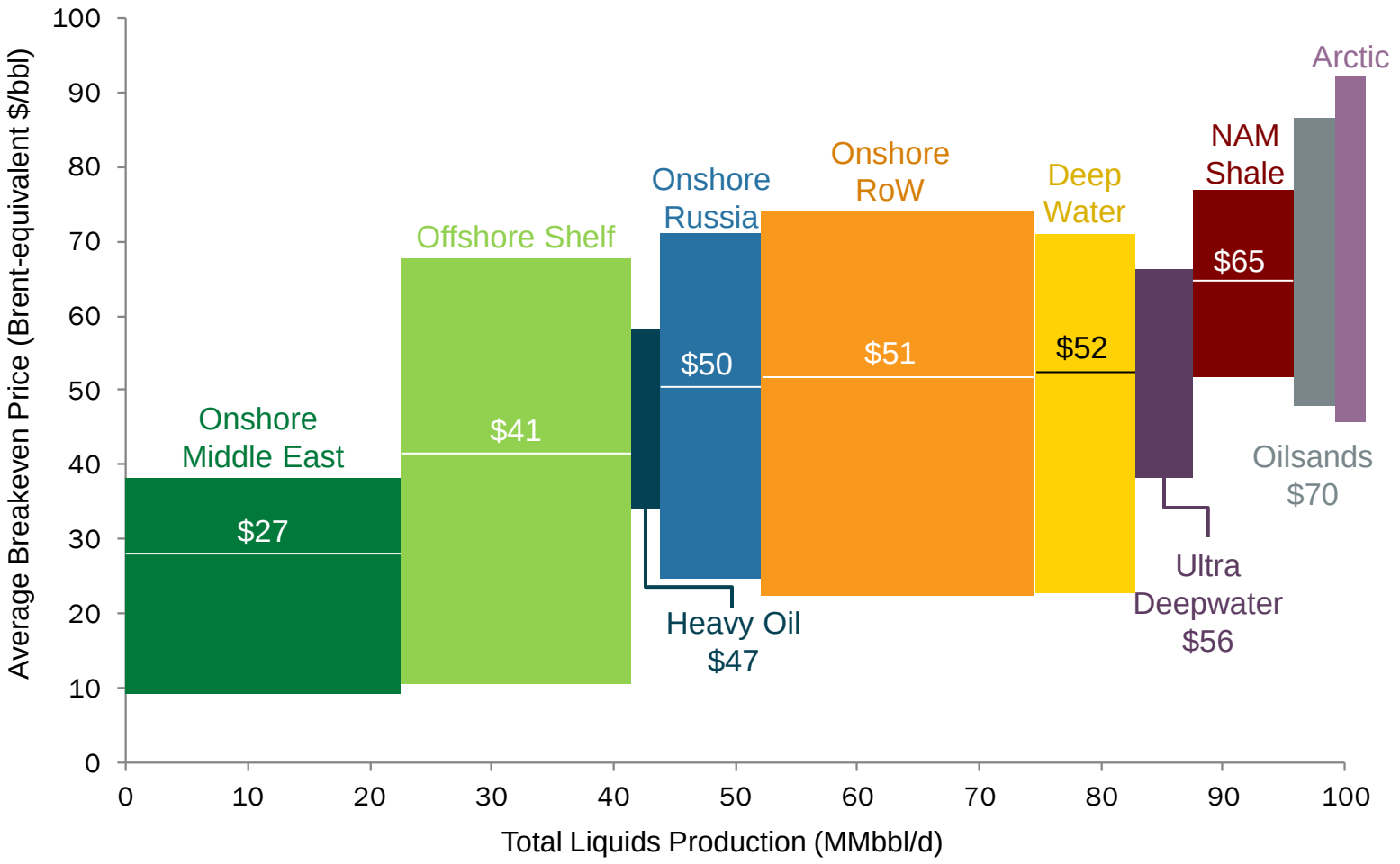
- U.S. oil production is unlikely to decline in 2015 and is likely to be flat in 2016

A Perspective on Volatility: Long Run

- In the long run, prices have to be high enough to encourage new supplies to be brought to market as global demand continues to grow and existing wells deplete
- North American Unconventional Oil Production continues to be the resource which will balance the market over the long term
  - World market could balance in the $60-80 range
  - This range allows robust economic growth
- Problem: OPEC needs a higher price to meet the “social costs” of production

Global Supply Curve: Shales Needed to Meet Demand

Global Marginal Breakeven Oil Supply Curve



Source: Morgan Stanley.

What Does the U.S. Supply Curve Look Like?

- The required price for North American Unconventional Production varies with how much production is needed to balance the world's oil market

- Not all basins are the same

- Cost is a fluid concept
  - Service costs are very responsive to changes in activity
  - Play economics are very responsive to changes in service costs

Prices and Costs Adjust to Protect the Margin

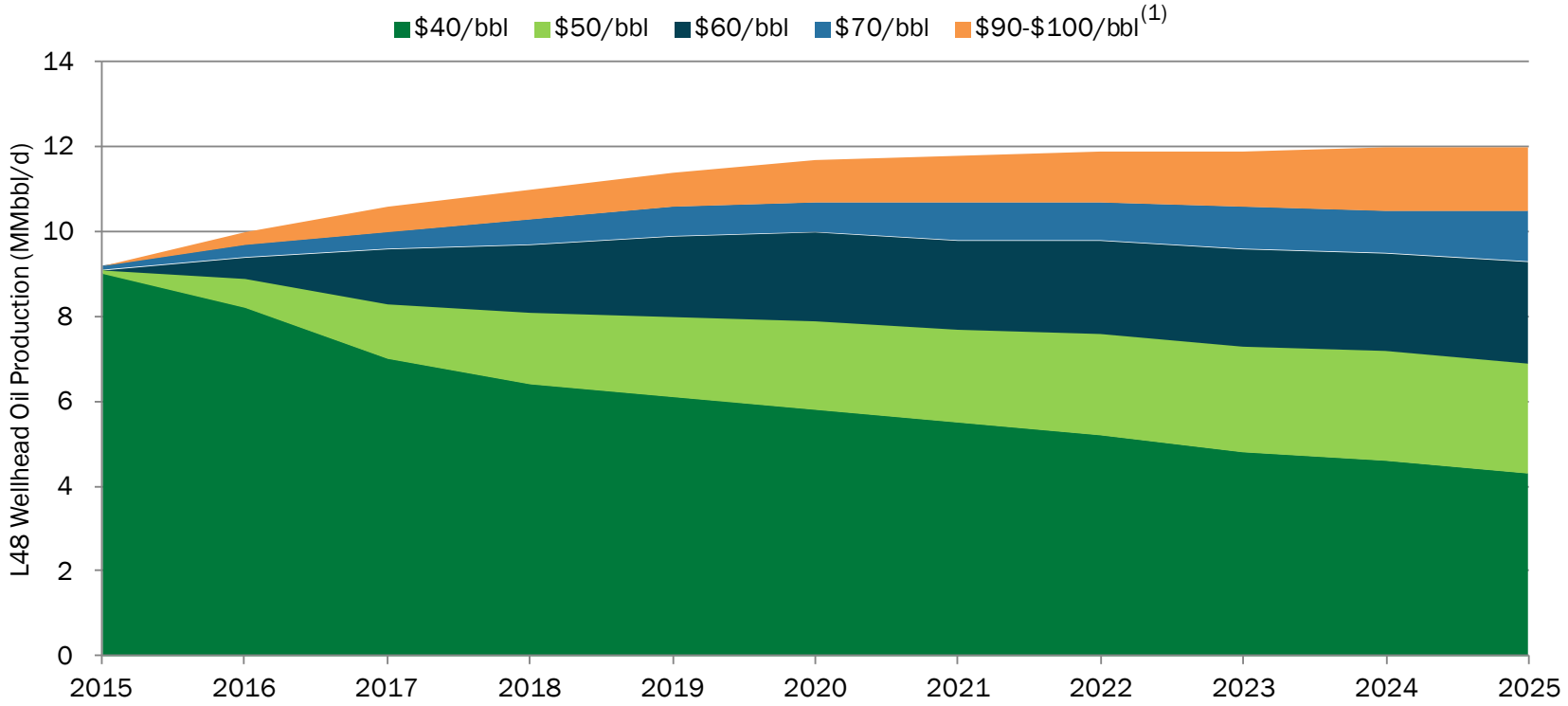
	$60/bbl	$80/bbl	$100/bbl
Half Cycle IRR Sensitivities			
Current Costs	14%	33%	57%
Adjusted Service Costs(1)	27%	56%	94%
Full Cycle IRR Sensitivities			
Current Costs	11%	26%	46%
Adjusted Land + Service Costs(2)	21%	45%	76%

Note: "Current Costs" economics are as of September 2014 and assume $8 million well cost and $5,000/undeveloped acre acquisition cost.

(1) Assumes $6.4 million well cost (~80% of base case)

(2) Assumes $6.4 million well cost (~80%of base case) and $4,000/undeveloped acre acquisition cost.

U.S. Supply Curve: Another Perspective (ITG Lower 48 Forecast)



Lower 48 Production Forecast At Various WTI Prices, MMbbl/d (Assuming 20% Reduction in D&C Costs)												
	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
$90-$100/bbl	8.1	9.2	10.0	10.6	11.0	11.4	11.7	11.8	11.9	11.9	12.0	12.0
$70/bbl	8.1	9.2	9.7	10.0	10.3	10.6	10.7	10.7	10.7	10.6	10.5	10.5
$60/bbl	8.1	9.1	9.4	9.6	9.7	9.9	10.0	9.8	9.8	9.6	9.5	9.3
$50/bbl	8.1	9.1	8.9	8.3	8.1	8.0	7.9	7.7	7.6	7.3	7.2	6.9
$40/bbl	8.1	9.0	8.2	7.0	6.4	6.1	5.8	5.5	5.2	4.8	4.6	4.3

Source: ITG.

Methodology: ITG created production forecasts and ran WTI sensitivities for over 300 regions in the L48. In regions that generate less than a 10% IRR at a given WTI price, ITG models a gradual drop in the rig count to zero over a 12-month period. ITG assumes a 6-month delay in the production response to a change in the rig count to account for spud-to-sales times and backlog wells. The model runs $3.50 NYMEX flat and accounts for a 20% reduction in D&C costs.

(1) $90-$100/bbl WTI case does not assume a reduction in D&C costs. All other cases assume a 20% reduction in D&C costs.

Three Possible Outcomes

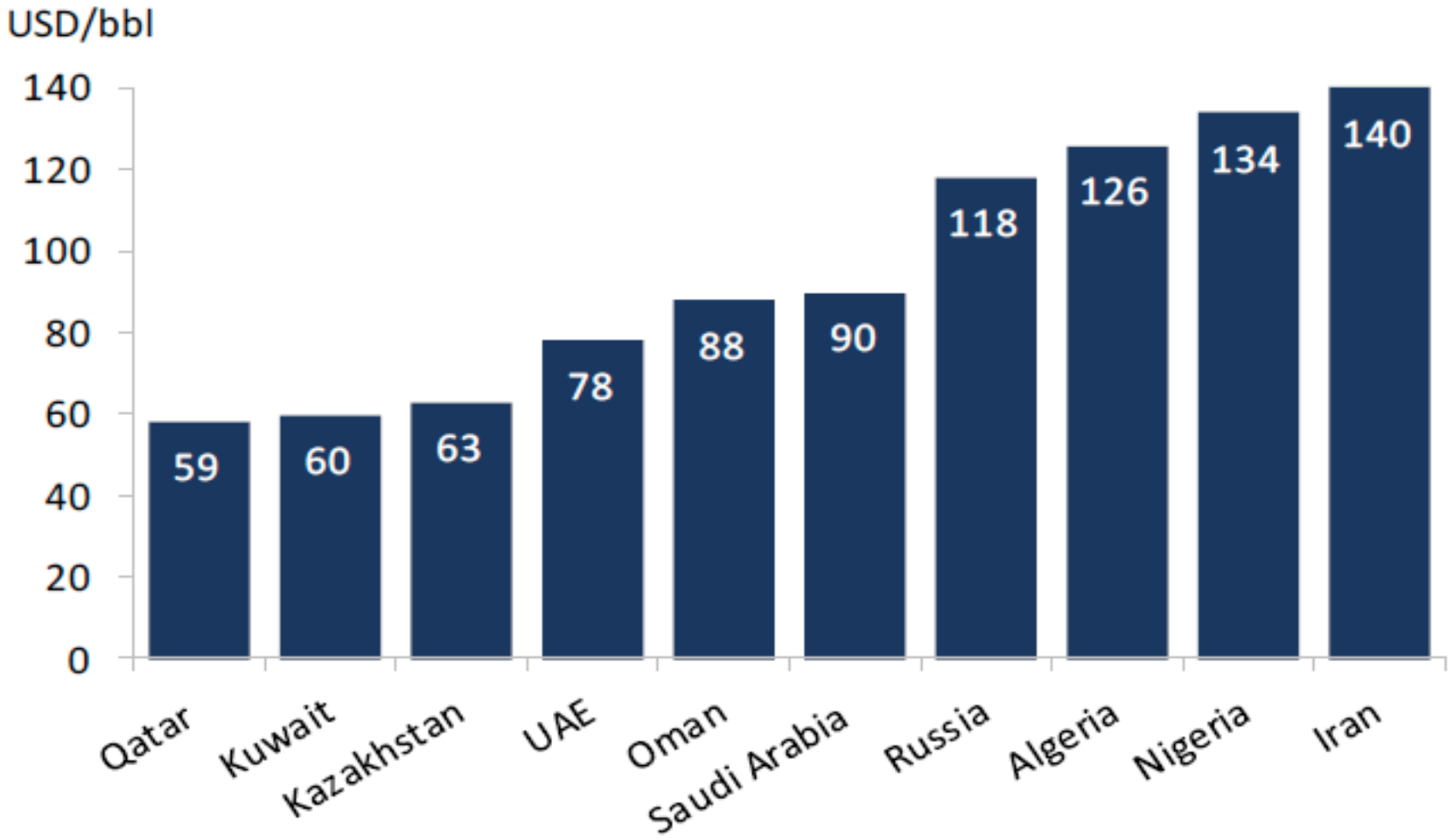
- The call on North American shale is permanently reduced
  - Fewer wells are required to maintain supplies
  - Service costs down for an extended period
  - Prices stay in the $60-70/barrel range
  - Long-term problem for OPEC

- Demand recovers /traders' perceptions change and prices quickly return to $80+
  - U.S. activity resumes and prices fall again

- OPEC succeeds in eliminating non-shale production and maintains prices in the desired range

OPEC Needs High Oil Prices

Government Budget Breakeven Prices

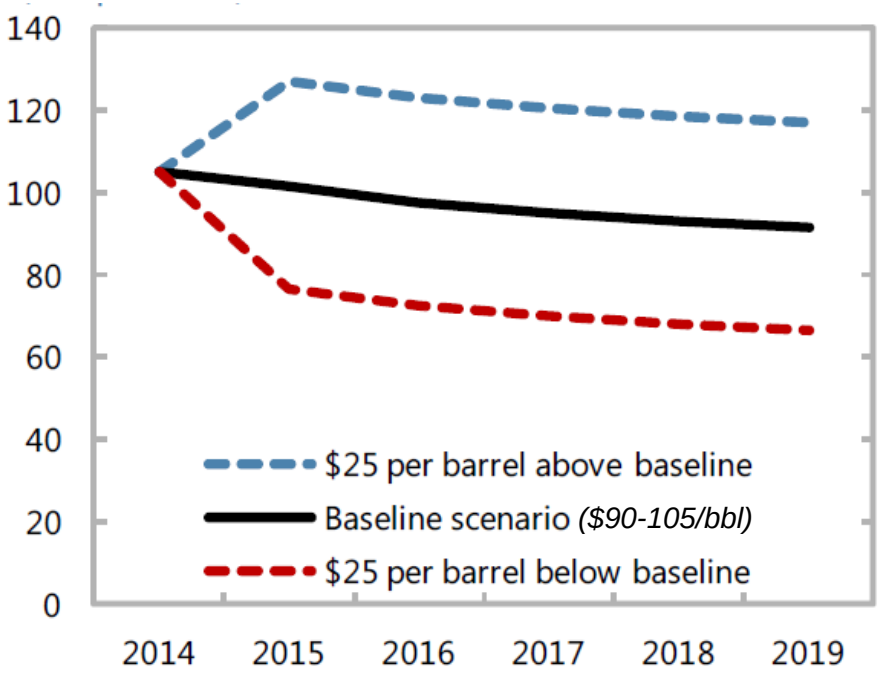


Source: Pareto Securities.

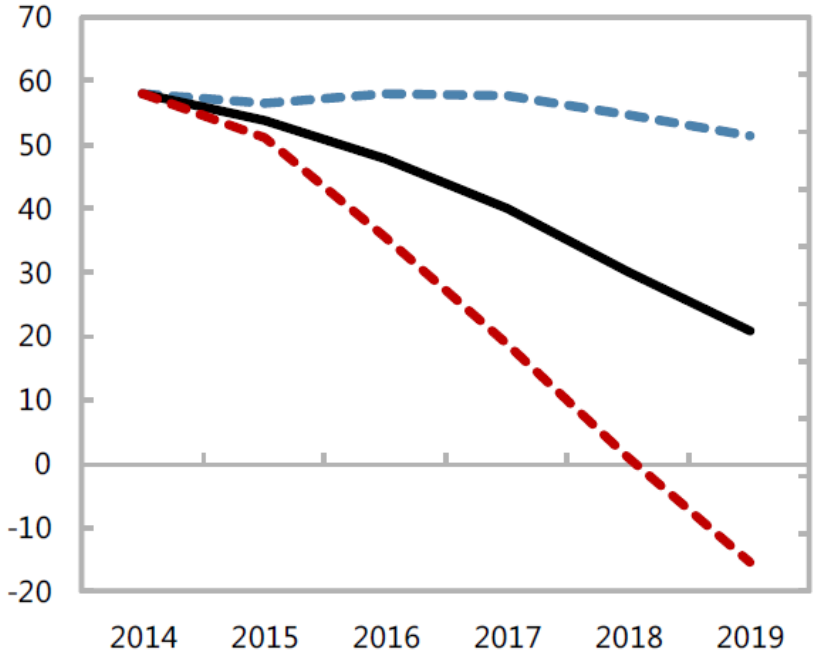
Saudi Arabia Cannot Last Forever

- Following the Arab Spring, Saudi Arabia announced ambitious social spending plans to maintain civil content. This increase in government spending resulted in a corresponding increase in fiscal breakeven prices, from $78/bbl in 2012 to $89/bbl in 2013.
- Currently, the IMF forecasts that Saudi Arabia will run a fiscal deficit in 2015, which will grow to 7.5% of GDP by 2019.
- To maintain its long-term social spending plans, Saudi Arabia requires high long-term oil prices. If prices remain at levels $25 below the IMF's reference case of $90-105/bbl, government reserves will be depleted by 2018.

Oil Prices ($/bbl)



Government Deposits at SAMA (% of GDP)[1]



Source: International Monetary Fund.
(1) The Saudi Arabian Monetary Agency (SAMA) is the central bank of Saudi Arabia.

Investment Options: Upstream Sector

- Exploration and Development
  - Need to replace 3+mmboe/d in domestic production
  - Wellhead economics must adjust to make this happen
  - Need to be top decile in operations and top quartile in geology
  - Risk assets trading at a discount
  - Very few companies can finance growth internally

- Buying production
  - Very efficient even in today's environment
  - Priced at 10% with prices at or above the strip
  - Essentially, an expensive option on a price recovery

- Distressed Debt/Assets
  - Where the herd of smart money has already headed
  - Everybody wants the low risk/high return assets

What Does "A New Normal" Mean to the U.S Economy?

- $50 per barrel price reduction in imported oil is $100 billion boost to GDP

- Price reduction on 12 million B/D of domestic production is complicated
  - Do consumer real incomes rise to offset lower profits of producers?
  - Do governments borrow to replace lost tax revenues and, if so, does this borrowing crowd out other investments?

- Net benefit from price reduction on total consumption is unclear
  - In theory, this is equivalent to a $350 billion stimulus package
  - Do consumers spend or save their savings and do governments monetize their lower revenues?

- Will the call on U.S. production be 5 or 10+ million B/D? This is perhaps the most important question, as each 1 million barrel of day reduction in domestic production is a $15-30 billion reduction in annual GDP

What Does a $50 Decrease in Oil Prices Mean Globally?

- Macro Economists will tell you that there should be no net change to aggregate demand from a reduction in prices
  - Lower incomes in producing countries offset by higher incomes in consuming countries
  - Overall, a zero sum game

- Real world impact very complicated
  - Very different impact on producers and net importers
  - Net impact on global aggregate demand is not clear
  - Net exporters likely to maintain expenditures by spending savings or borrowing
  - Impact on financial markets from reduced need to recycle petrodollars may result in lower interest rates
  - Consuming countries will see some reduction in reported inflation
  - A golden opportunity to reduce fuel subsidies in the developing world
  - Deflation fears seem unwarranted unless policy makers mistake a decrease in costs as a demand-induced reduction in prices
  - Likely winners are the U.S. and China