Energy & the Economy: Predicting the Unpredictable

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The Future Relationship of Energy to the Economy Depends Highly on the Unpredictable.

- Changes in Industry Structure
- Introduction of New Institutions
- State, National, and International Environmental Policies
- Political Preferences
- Interaction of Governments and Traders
- Exercise of Market Power
“One of the greatest tragedies in life is the murder of a beautiful theory by a gang of brutal facts.”
Changes in Industry Structure
Are Key to Price Development.

- The DESERTION of the United States by multinational oil companies opened the door to the fracking revolution.
  - Large oil fields, thought to be exhausted, were sold to independents.
  - Entrepreneurial firms such as Mitchell Energy introduced new techniques to boost output.

- The sale of refineries to independents in the US broke the last monopolistic clamp firms such as Shell and Exxon held on the US market.
  - Independent refiners are not “price takers” in the crude market.
  - These firms have developed a monopsonistic hold on domestic production that cannot be broken by removing the crude oil export ban.
  - Multinationals saw their dream of a large LNG market in the US destroyed by other entrepreneurs.
No Model Predicted This Development. It Is Not Clear that Any Model Could.

- Hotelling’s view was shown to be wrong.
- Adelman’s prediction that “there is no fixed stock of resources” was proven correct.
- Improvements in technology to 2014 boosted production more than 25 percent above predicted levels. Further changes in technology could cause even greater surprises.
New Institutions Further Disrupt the Outlook.

- Turnovsky showed that futures markets flatten supply curves, undermine monopoly, and lower prices.
- US energy markets confirmed his hypotheses.
- EIA predicted US crude production of six million barrels per day in 2013. Actual output was eight million barrels per day.
  - The surprise was due entirely to the efforts of independent companies.
  - These companies were big hedgers (see Table A1).
Forecasts of US crude oil production have been dramatically revised.

- However, forecasters see this as a transitory event.
- EIA and IEA, influenced primarily by those holding conventional views, see this as a short-run aberration.
- The failure to understand the nature and rate of technical advances condemns these views to be wrong.

Eleven years from now, someone will ask, “How did they fail to foresee coming shifts.”

Future supply surprises will affect oil price development.
EIA Forecast for US Crude Oil Production in 2005 vs. Actual Developments

The Hypothetical Future: EIA 2014 Forecast for US Crude Production vs. Actual Developments and “2025” EIA Forecast

Source: US EIA Annual Energy Outlook 2014; PKVerleger LLC.
Political Preferences Can Affect Market Trends

- Decisions by regulators and politicians – as well as their insensitivity to market conditions – have real impacts on supply and demand.
  - Continued European support for large multinationals and opposition to fracking have reduced potential non-OPEC supply.
  - Europe’s rush into low-sulfur diesel in 2008 when light sweet crude was in short supply caused crude prices to jump from $75 per barrel to $125.

- US ethanol mandates have displaced one percent of global crude supply.
Weekly ULSD Crack, 2007 to 2014

Source: PKVerleger LLC.
Ethanol Blended into US Petroleum Markets after 2007 Passage of EISA, 2007-2013

Source: US EIA.
Unpredictable Responses by Governments and IEA Cause Unpredictable Permanent Changes.

- IEA members and now other countries have accumulated large strategic stocks.
  - These stocks now account for 24 percent of global inventories.
  - Strategic stock accumulations accounted for one-third of 2013 global inventory increases.

- Plans to use these stocks have never been clear. The inept response by IEA nations following the 2011 Libyan collapse prompted commercial parties to hold (hoard) more stocks.
Exercise of Market Power Is Critical.

- Energy market analysis has focused historically on three key players exerting market power: OPEC, multinational oil companies, and utilities.

- Market power today is concentrated differently in the US. Refiners and some natural gas consumers enjoy the type of power John D. Rockefeller once held. Their control comes from their
  - ownership of rail cars,
  - refusal to make long-term commitments to pipelines, and
  - access to low-cost natural gas.

- Approval of oil exports or even construction of the Keystone XL will not break this control. Producers are no better off than farmers.
Assessing the Impact of These Uncertainties

- The impact of these “surprises” can be assessed with a very small model tying global stocks to the movement of Dated Brent prices.
- We have developed two versions of the model.
  - The first uses total global stocks.
  - The second uses global commercial stocks.
  - Both rely on lagged dependent variables.
- Both models fit the data well.
- We then simulate the models from 2005 using forecasts, not the actual lagged values.
Evolution of Global Commercial Stocks under Three Scenarios

Source: PKVerleger LLC.
Days of Global Commercial Inventory Coverage under Three Scenarios

Source: PKVerleger LLC.
Impact of Surprises

- The increase in shale production lowered prices by as much as $40 per barrel assuming oil-exporting countries did not respond by cutting output.
- The renewable fuels mandate reduced prices by as much as $30 per barrel assuming no OPEC response.
- The change in private inventory management following the IEA’s inept response to Libya has raised the price level $20 per barrel.
Actual Dated Brent Prices vs. Predicted Brent Price for Base Case and No US Fracking Scenarios

Source: PKVerleger LLC.
Actual Brent Prices, Predicted Brent Prices, and Predicted Brent Prices without Renewables

Source: PKVerleger LLC.
Actual Dated Brent Prices vs. "But-For" Prices Had Oil Markets Believed in Energy Policy Officials' Competence

Source: PKVerleger LLC.
Have These Policy Surprises Affected Economic Growth?

- Hamilton, Kilian, and the White House Council of Economic Advisers (CEA) have all written on the impact of oil price changes on GDP.
  - CEA has recently summarized these views.
  - The impact depends on the share of imports in GDP.

- The research is asymmetric. There are no studies that examine the economic impact resulting from the lower prices attributed to supply-side benefits from ethanol use or fracking.
  - Logic dictates, though, that there should be some symmetry.
  - If symmetry applies, the positive economic impact from fracking and ethanol use may exceed the economic cost of the 2008 price increase.
Estimated Cumulative Effect of a Ten-Percent Oil Price Shock on GDP

Source: CEA.
Do Energy Prices Really Matter?

- The transcripts of the June 24 and 25, 2013, Federal Open Market Committee meetings suggest that price changes for oil or other energy goods may be less important than we believe.
  - Chairman Bernanke noted that the 1973 price increase had very different and large impacts than subsequent increases because inflation expectations were not well anchored then.
    - Core inflation rose six percentage points in the 1970s while oil added five percent.
    - Average hourly earnings rose two percent and compensation almost four percent.
  - Bernanke suggested that price increases since 2003 have had a negligible effect on inflation because they have not passed through.
- Most of the comments by economists published in Brookings’ 2009 volume reinforce Bernanke’s view.
“Asians and Europeans study entrepreneurialism. Americans practice it!”
World Strategic Crude Stocks as a Percentage of Total Global Crude Stocks

Source: PKVerleger LLC.
Inverse Days of Commercial Supply vs. Dated Brent Price, January 2003 to November 2013

Source: PKVerleger LLC.
Actual Dated Brent Price vs. Predicted Brent Price Based on Inverse Days of Supply, January 2005 to November 2013

Source: PKVerleger LLC.
Table A1. Crude Oil Production Hedging by Nine Independent Companies in 2009 and Q3 2013 (Million Barrels)

<table>
<thead>
<tr>
<th>Firm</th>
<th>2009</th>
<th>2013:Q3</th>
</tr>
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<tbody>
<tr>
<td>EOG</td>
<td>0.4</td>
<td>35.4</td>
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<tr>
<td>Cabot Oil and Gas</td>
<td>1.6</td>
<td>1.1</td>
</tr>
<tr>
<td>Continental Resources</td>
<td>6.0</td>
<td>6.7</td>
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<tr>
<td>Chesapeake Energy</td>
<td>0.3</td>
<td>28.0</td>
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<tr>
<td>Occidental Petroleum</td>
<td>4.1</td>
<td>59.2</td>
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<tr>
<td>Pioneer Natural Resources</td>
<td>19.0</td>
<td>15.3</td>
</tr>
<tr>
<td>Whiting Petroleum</td>
<td>30.1</td>
<td>46.1</td>
</tr>
<tr>
<td>Apache</td>
<td>28.8</td>
<td>38.0</td>
</tr>
<tr>
<td>Total</td>
<td>90.3</td>
<td>229.8</td>
</tr>
<tr>
<td>Total per Day</td>
<td>0.25</td>
<td>0.63</td>
</tr>
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Note: Chesapeake excludes exit options.
Source: The Brattle Group; PKVerleger LLC.
ULSD Crack vs. Dated Brent Price during the 2007-2008 Price Run-up

Source: PKVerleger LLC.
Monthly Global Commercial and Strategic Inventories of Crude Oil and Products, January 2003 to November 2013

Source: PKVerleger LLC.
Estimated Unplanned OPEC Crude and Non-OPEC Liquid Fuels Production Outages, January 2011 to April 2014

Source: US EIA; PKVerleger LLC.