The Oil Markets:
A Practitioner’s View

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The Oil Markets: Let the Data Speak for Itself*

A. The Role of Price

B. The Fundamentals: Oil Supply-and-Demand Data

C. Preliminary Conclusions: Data Transparency

D. The Technicals: The Interaction Effect Between Traders and Price

* Based on Till (2008b).
The Oil Markets:
Let the Data Speak for Itself

E. The Role of Currency and Store-of-Value

F. Holbrook Working’s Principles

G. Conclusion
A. The Role of Price

**Difficult Storage Situation**

- A commodity’s price moves in the direction that is needed to elicit a supply-or-demand response that will balance a commodity market.

- For a number of commodities, storage is impossible, prohibitively expensive, or producers decide it is much cheaper to leave the commodity in the ground than store it above ground.
A. The Role of Price

Difficult Storage Situation

- For commodities with difficult storage situations, *price* has to do a lot (or all) of the work of equilibrating supply and demand, leading to very volatile spot commodity prices.

- In the case of oil, it is prohibitively expensive to store more than several months worth of global consumption.
A. The Role of Price

*Dynamic Interplay*

- There is a dynamic interplay between an oil product’s price and its supply-and-demand situation.

- With the onset of Hurricane Katrina, the price of gasoline rallied 18% in four days before falling back about the same amount fifteen days later.

*Source: Till (2006a).*
B. The Fundamentals

Difficult Supply Situation (as of August 2008)

Thousands of Barrels Per Day

Angola and Ecuador included in OPEC throughout
Regional Totals exclude biofuel growth

<table>
<thead>
<tr>
<th>Region</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
</tr>
</thead>
<tbody>
<tr>
<td>North America</td>
<td>-85</td>
<td>-140</td>
<td></td>
</tr>
<tr>
<td>Europe</td>
<td>-245</td>
<td>-310</td>
<td>-385</td>
</tr>
<tr>
<td>Middle East</td>
<td>-81</td>
<td>-72</td>
<td>-70</td>
</tr>
<tr>
<td>FSU</td>
<td>523</td>
<td>211</td>
<td>284</td>
</tr>
<tr>
<td>Latin America</td>
<td>178</td>
<td>225</td>
<td></td>
</tr>
<tr>
<td>Asia</td>
<td>67</td>
<td>202</td>
<td>274</td>
</tr>
<tr>
<td>Africa</td>
<td>14</td>
<td>49</td>
<td>1</td>
</tr>
<tr>
<td>Total Non-OPEC Supply Growth (kb/d)</td>
<td>425</td>
<td>454</td>
<td>663</td>
</tr>
<tr>
<td>Global Biofuels (kb/d)</td>
<td></td>
<td>302</td>
<td>336</td>
</tr>
<tr>
<td>OPEC NGLs (kb/d)</td>
<td></td>
<td>142</td>
<td>318</td>
</tr>
</tbody>
</table>

B. The Fundamentals

Expanding Demand (as of July 2008)

International Energy Agency (IEA): Demand growth is no longer coming from the US and Europe, but from China, India and the Middle East.

- Because their disposable incomes had been growing so fast and because of subsidies, high oil prices did not have a major impact on demand growth.

B. The Fundamentals

Expanding Demand (as of August 2008)

Thousands of Barrels Per Day

B. The Fundamentals

Expanding Demand (as of December 2007)

- “The two lower lines are the Energy Information Administration’s (EIA’s) high-growth case for China and India.
- 2007 estimates are from the EIA.”

B. The Fundamentals

Non-OECD Data

- One difficulty that the IEA admits to is that it is primarily an OECD organization in a world where non-OECD countries are now of crucial economic importance, especially in assessing oil demand trends.
B. The Fundamentals

Non-OECD Data (as of August 2008)

- “The IEA is forecasting China’s oil demand will average 8 million barrels a day this year, and then reach 8.4 million barrels a day in 2009.”

- “Part of the problem is a lack of data on stock levels, which makes it hard for analysts to determine whether there is a big enough inventory build in China to weigh on demand.”

B. The Fundamentals

Non-OECD Data (as of August 2008)

• “The International Energy Agency stuck by its forecast that China’s oil demand would grow 5.6% on year in 2008, but said the Olympics, power shortages and possible policy moves meant there was considerable risk regarding the outlook.”

• “At present despite having gone through half the year, China’s demand remains remarkably opaque, the Paris-based IEA said in its [August 2008] monthly report on the oil market.” [Italics added.]
B. The Fundamentals

Non-OECD Data (as of August 2008)

• “China’s imports of oil products have been surging in recent months, but the IEA said it was unclear whether these volumes were being stockpiled ahead of the Olympic Games …
B. The Fundamentals

Non-OECD Data (as of August 2008)

- … or [were] making up for the substantial loss of production from small refiners. Imports may also have been underpinned by buoyant demand growth fueled by economic growth.”

![Graph showing US and China's Oil Consumption in Thousands of Barrels Per Day (2004 to 2007)]


B. The Fundamentals

Inferences from Price Relationships: Structural Breaks

Chinese Holiday Calendar Example

Source: Based on Till and Eagleeye (2005).
B. The Fundamentals

Inferences from Price Relationships

Gasoline vs. Heating Oil Crack Spreads

July Gasoline vs. Heating Oil Spread Differential
as of the 5th Business Day of June
1985 through 2005

B. The Fundamentals

Inferences from Price Relationships

- Crude in and of itself is not valuable unless it is refined into useful products.

Gasoline Crack Spreads

Data Source: Bloomberg.
B. The Fundamentals

Inferences from Price Relationships

Gasoline Crack Spread Price Changes

Change in Value of August Gasoline Crack Spread from 2/13-to-3/31 of Each Year (1986 to 2008)

Data Source: Bloomberg.
B. The Fundamentals

Inferences from Price Relationships

Heating Oil Crack Spreads

Level of Front-Month Heating Oil Crack Spread (in $ / barrel)
on March 17th of Each Year
(1989 to 2008)

Data Source: Bloomberg.
B. The Fundamentals

Inferences from Price Relationships

Heating Oil Crack Spread in 2008

Data Source: Bloomberg.
B. The Fundamentals

Inferences from Price Relationships

• Commodity-market participants frequently also monitor the levels of the Baltic Dry Index (BDI), …

• … which is “a measure of the cost of shipping raw materials … [and can sometimes be a] good yardstick of commodity … [demand] and, by extension, global economic growth,” according to Gongloff (8/15/08).

Source: Cui (2008).
B. The Fundamentals

Inferences from Price Relationships

- The BDI is managed by the Baltic Exchange in London, which is the global marketplace for brokering shipping contracts.

- This composite shipping index reached its peak level on 5/20/08, indicating extraordinary demand for shipping up until that point, which turned out to be temporary.
B. The Fundamentals

*Other Market Fundamentals: Light Sweet Crude Oil and Strict Environmental Mandates*

- Crude oil spare capacity is concentrated in sour crude oil.
- Instead, it is the availability of light sweet crude oil, on the margin, which is important because of the (current) lack of sufficient complex refinery capacity to produce the mandated U.S. and E.U. fuels from sour crude.

*Source: Verleger (2008a, 2008b).*
C. Preliminary Conclusions: Data Transparency

*Pre-Olympic Stocking*

1. Pre-Olympic stocking may have contributed to 2008’s oil-price spike.

   – Given how finely balanced global oil supply-and-demand had been prior to July 2008, it would be very helpful, going forward, for China’s demand and inventory statistics to become as transparent as those in the OECD, in coordination with the IEA.
C. Preliminary Conclusions: Data Transparency

*Usefulness of Futures Markets*

2. Futures markets provided alert participants with useful, concurrent information on underlying demand in the *opaque* global oil markets.

   – That said, the interpretation of a price relationship is sometimes conditional on a particular state-of-the-world.

   – Fundamental structural changes occur constantly in the commodity markets.
C. Preliminary Conclusions: Data Transparency

Transparency of Reserve and Productive Capacity Information

3. It is clearly not a good state of affairs for oil to have been in such tight balance that:

   a. An extraordinary (and temporary) demand event could have plausibly caused oil prices to increase at such an extraordinary pace; and

   b. Relatively small supply disruptions in well-known unstable parts of the world could (still) cause oil prices to spike to over $250 per barrel, as discussed in scenarios by Blanco and Aragonés (2006).
C. Preliminary Conclusions: Data Transparency

*Transparency of Reserve and Productive Capacity Information*

- Regarding the previous point, and consistent with the theme of data transparency, it would be very helpful if reserve-and-productive-capacity information from key oil exporters were not so *opaque*, as discussed in Khan (2008).

- For example, prior to July 2008, was Saudi Arabia incapable of serving its historical role as swing producer?
D. The Technicals

Extrapolative Behavior in Tight Markets


• There will always be a market clearing price but its level may depend on incidental and not fundamental features of the market.” [Italics added.]
D. The Technicals

*Dynamic Hedging*

- Large-scale industrial consumers had purchased out-of-the-money call options on oil futures contracts to protect against price rises.

- This likely resulted in accelerating dynamic-hedging purchases by bank dealers, as crude oil prices rose.

*Source: Verleger (2007).*
D. The Technicals

Liquidation Pressure

- Commodity markets do not have natural two-sided flow.

- If a commercial market participant needs to initiate or lift hedges, there will be flow, but such transactions do not occur on demand.

Source: Till (2006b).
D. The Technicals

Liquidation Pressure

- The market tends to extract a large premium from a trader during a distressed liquidation with a consequent (but temporary) impact on price.

Source: De Souza and Smirnov (2004).
D. The Technicals

Credit and Risk Environment: All Risky Assets Traded as One

May 10, 2006 through June 13, 2006

"Risk Indicator"
VIX (Equity Implied Vol)* 12%

"Risk Assets"
Percent Change
Bovespa (IBX50) -23.5%
Nasdaq -10.4%
S&P 500 -7.3%
Nikkei -10.4%
Silver -32.4%
Copper -18.2%
Gasoline (RFG) -3.6%

"Safe Havens"
Percent Change
Long Bond 1.8%
Dollar vs. Yen (Long Dollars) 4.5%

* The VIX increased from 11.78% on 5/10/06 to 23.81% on 6/13/06.

D. The Technicals

Credit and Risk Environment

<table>
<thead>
<tr>
<th>Risk Assets</th>
<th>Percent Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bovespa (IBX50)</td>
<td>-2.11%</td>
</tr>
<tr>
<td>Nasdaq</td>
<td>-1.01%</td>
</tr>
<tr>
<td>Nikkei</td>
<td>-1.99%</td>
</tr>
<tr>
<td>Silver</td>
<td>-8.44%</td>
</tr>
<tr>
<td>Copper</td>
<td>-7.26%</td>
</tr>
<tr>
<td>Gasoline</td>
<td>-1.52%</td>
</tr>
<tr>
<td>NZD vs. Yen</td>
<td>-5.32%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>&quot;Safe Haven&quot;</th>
<th>Percent Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Long Bond</td>
<td>0.94%</td>
</tr>
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</table>

Crack Spreads (Refinery Margins)

<table>
<thead>
<tr>
<th>Daily Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gasoline Crack</td>
</tr>
<tr>
<td>Heat Crack</td>
</tr>
</tbody>
</table>

* Absolute level of the VIX (and not change in level as in previous figure.)

Price Change

<table>
<thead>
<tr>
<th>Commodity</th>
<th>Price</th>
<th>Change</th>
<th>% Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>LMAHDS03 Aluminum</td>
<td>2543.00y</td>
<td>-9.00</td>
<td>-0.35</td>
</tr>
<tr>
<td>NGX7 Natural Gas</td>
<td>7.791</td>
<td>-0.046</td>
<td>-0.59</td>
</tr>
<tr>
<td>W Z7 Wheat</td>
<td>688 3/4</td>
<td>-8 1/4</td>
<td>-1.18</td>
</tr>
<tr>
<td>LCV7 Live Cattle</td>
<td>94.600</td>
<td>-1.325</td>
<td>-1.38</td>
</tr>
<tr>
<td>LHV7 Lean Hogs</td>
<td>67.550</td>
<td>-1.025</td>
<td>-1.49</td>
</tr>
<tr>
<td>LMZSDS03 Zinc</td>
<td>3230.00y</td>
<td>-65.00</td>
<td>-1.97</td>
</tr>
<tr>
<td>XBX7 RBOB Gasoline</td>
<td>187.43</td>
<td>-3.95</td>
<td>-2.06</td>
</tr>
<tr>
<td>GCZ7 Gold</td>
<td>665.20</td>
<td>-14.50</td>
<td>-2.13</td>
</tr>
<tr>
<td>CTZ7 Cotton</td>
<td>58.85</td>
<td>-1.33</td>
<td>-2.21</td>
</tr>
<tr>
<td>CLX7 Crude Oil</td>
<td>71.10</td>
<td>-1.73</td>
<td>-2.38</td>
</tr>
<tr>
<td>HOX7 Heating Oil</td>
<td>201.55</td>
<td>-4.99</td>
<td>-2.42</td>
</tr>
<tr>
<td>C Z7 Corn</td>
<td>336 1/2</td>
<td>-8 3/4</td>
<td>-2.53</td>
</tr>
<tr>
<td>LMNIDS03 Nickel</td>
<td>26500.0y</td>
<td>-800.0</td>
<td>-2.93</td>
</tr>
<tr>
<td>SBV7 Sugar</td>
<td>9.16</td>
<td>-0.29</td>
<td>-3.07</td>
</tr>
<tr>
<td>KCZ7 Coffee</td>
<td>119.30</td>
<td>-3.90</td>
<td>-3.17</td>
</tr>
<tr>
<td>BOZ7 Soybean Oil</td>
<td>35.27</td>
<td>-1.25</td>
<td>-3.42</td>
</tr>
<tr>
<td>SIZ7 Silver</td>
<td>12.290</td>
<td>-0.445</td>
<td>-3.49</td>
</tr>
<tr>
<td>S X7 Soybeans</td>
<td>821</td>
<td>-33 1/2</td>
<td>-3.92</td>
</tr>
<tr>
<td>HGZ7 Copper</td>
<td>314.80</td>
<td>-17.40</td>
<td>-5.24</td>
</tr>
</tbody>
</table>

Data Source: Bloomberg
D. The Technicals

Credit and Risk Environment

Dow Jones AIG Commodity Index - Total Return and 3-Month U.S. Treasury Bills
3/3/08 to 3/27/08

E. The Role of Currency and Store-of-Value

Impact of Currency Trends

Data Source: Bloomberg.
E. The Role of Currency and Store-of-Value

Relationship of Euro/$ and Crude Oil (in $)

Source of Graph: Based on Hill (2008).
E. The Role of Currency and Store-of-Value

Relationship of Euro/$ and Crude Oil (in $)

- Oil and Dollar reversal (in July 2008) occurred almost simultaneously.

![Euro / $ vs. Crude Oil (in $)
(6/16/08 to 9/5/08)](chart)

Data Source: Bloomberg.
### E. The Role of Currency and Store-of-Value

**Store-of-Value**

<table>
<thead>
<tr>
<th>Historical Evolution of Harvard Management Company's Policy Portfolio</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td><strong>Equities</strong></td>
</tr>
<tr>
<td>Domestic Equities: 66 40 36 22 12 12</td>
</tr>
<tr>
<td>Foreign Equities: - 18 15 15 11 12</td>
</tr>
<tr>
<td>Emerging Markets: - - 9 9 8 10</td>
</tr>
<tr>
<td>Private Equities: - 12 15 15 13 11</td>
</tr>
<tr>
<td><strong>Total Equities</strong></td>
</tr>
<tr>
<td>66 70 75 61 44 45</td>
</tr>
<tr>
<td><strong>Fixed Income</strong></td>
</tr>
<tr>
<td>Domestic Bonds: 27 15 13 10 7 5</td>
</tr>
<tr>
<td>Foreign Bonds: 8 5 5 4 3 3</td>
</tr>
<tr>
<td>High-Yield: - 2 2 3 3 1</td>
</tr>
<tr>
<td><strong>Total Fixed Income</strong></td>
</tr>
<tr>
<td>35 22 20 17 13 9</td>
</tr>
<tr>
<td><strong>Real Assets</strong></td>
</tr>
<tr>
<td>Commodities: - 6 3 6 16 17</td>
</tr>
<tr>
<td>Real Estate: - 7 7 7 10 9</td>
</tr>
<tr>
<td>Inflation-indexed Bonds: - - - 7 5 7</td>
</tr>
<tr>
<td><strong>Total Real Assets</strong></td>
</tr>
<tr>
<td>- 13 10 20 31 33</td>
</tr>
<tr>
<td><strong>Absolute Return and Special Situations</strong></td>
</tr>
<tr>
<td>Cash: (1) (5) (5) (3) (5) (5)</td>
</tr>
<tr>
<td><strong>TOTAL</strong> 100 100 100 100 100 100</td>
</tr>
</tbody>
</table>

E. The Role of Currency and Store-of-Value

**Store-of-Value**

**Investments in Commodity Indexes (US$b)**

E. The Role of Currency and Store-of-Value

**Store-of-Value**

<table>
<thead>
<tr>
<th></th>
<th>12/31/07</th>
<th>3/31/08</th>
<th>6/30/08</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crude Oil Index Values Measured in Futures [Contract] Equivalents</td>
<td>408,000</td>
<td>398,000</td>
<td>363,000</td>
</tr>
</tbody>
</table>

Excerpt From
Staff Report on Commodity Swap Dealers & Index Traders With Commission Recommendations

Total OTC and On-Exchange Commodity Index Investment Activity

*Source: CFTC (2008).*
F. Holbrook Working’s Principles

Holbrook Working’s
Four Conditions for a Futures Market to Survive and Prosper

1. The contract terms and commission charges must be such as to attract appreciable use of the futures contract for merchandising purposes.

2. There must exist a possibility of attracting enough speculation to provide at least a reasonably fluid market.

F. Holbrook Working’s Principles

*Holbrook Working*

3. Handlers of the commodity must have reason to make substantial use of the futures contracts as temporary substitutes for merchandising contracts that they will make later.

4. There must exist adequate public recognition of the economic usefulness of the futures market.

G. Conclusion

*Holbrook Working*

- Drawing from Working, it will be a matter of public policy to decide whether the use of commodity futures contracts for inflation-hedging purposes is economically useful.

- Assuming that there is increased data transparency in the over-the-counter oil derivatives markets, …

- … one should employ past research by Working, as described by Sanders *et al.* (2008), to determine objectively whether there is excessive speculation (or excessive inflation-hedging.)
G. Conclusion

Tight Balance and Incidental Factors

• There are numerous, plausible fundamental explanations that can arise from any number of incidental factors that come into play …

• … when supply-and-demand are balanced so tightly, especially with light sweet crude oil, and as was the case until July 2008.

• In the short term, it is very plausible for the actions of traders to influence the price of a commodity, especially one that is exhibiting scarcity.
G. Conclusion

*Spare Capacity*

- The natural conclusion to observing that many seemingly inconsequential factors, in combination, could lead to such a large rise in the price of crude oil is …

- … that the market has been signaling a pressing need for an increase in spare capacity in light-sweet crude oil, however achieved, including, unfortunately, demand destruction.
G. Conclusion

**Historical Skepticism on Futures Markets**

- In both the United States and in Continental Europe, there is a long history, dating to at least the 1890’s – the late great era of globalization – of skepticism regarding commodity futures markets, as documented in Jacks (2007).

- Over the past 120 years, two determinations have prevented commodity futures trading from generally being banned or heavily restricted.
G. Conclusion

*Economic Function and Statistical Traditions*

- The first supportive determination has been a general recognition that futures markets serve a legitimate social purpose.

- The second determination has been to base public policy on an objective examination of extensively gathered facts, which are summarized via appropriate statistical measures.

- Based on CFTC (2008), one can say that this tradition has been continuing.
G. Conclusion

*Transparency*

- Finally, all efforts to make data *transparent* on the oil markets, whether regarding supply, demand, or market-participant statistics, are extremely important for making informed public-policy decisions about these markets.
References


References (Continued)


http://docs.edhec-risk.com/mrk/081006/The_oil_markets.pdf
References (Continued)


Hilary Till is a principal of Premia Risk Consultancy, Inc., which advises investment firms on derivatives strategies and risk-management policy.

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Previously, Ms. Till was the Chief of Derivatives Strategies at Putnam Investments and prior to this position was a quantitative analyst at Harvard Management Company.

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Ms. Till serves on the North American Advisory Board of the London School of Economics. In addition, she is a Research Associate at the EDHEC Risk and Asset Management Research Centre (France), http://www.edhec-risk.com. She is also a member of the steering committee for the Chicago chapter of the Professional Risk Managers’ International Association, http://www.prmia.org.


Her work on behalf of the EDHEC Risk and Asset Management Research Centre has been cited in the Journal of Finance and the Journal of Structured Finance as well as being cited by the Bank of Japan, the European Central Bank, the Bank for International Settlements, the International Monetary Fund, and by the U.S. Senate’s Permanent Subcommittee on Investigations.