INTELLIGENT COMMODITY INVESTING: Opportunities and Challenges
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Intelligent Commodity Investing: Opportunities and Challenges

I. The Long View

II. Demand for Energy Investments

III. Portfolio Construction and Inadvertent Concentration Risk

IV. Macro Portfolio Protection

This icon is based on the statue in the Chicago Board of Trade plaza.
Intelligent Commodity Investing: Opportunities and Challenges

V. Risky Asset Deleveraging

VI. The Case of Amaranth

VII. Outlook
I. The Long View

Commodity Prices are Cyclical

Commodity prices are cyclical and move in unison

Shown as the 10-year moving average of y/y % price change.

II. Demand for Energy Investments

Core of a Commodity Program

- The core of a commodity futures program has historically been in energies.

- This is where the scalability is, and this is where the returns of the last six years have predominantly come from in index-based investments.
II. Demand for Energy Investments

The Macro Case

• The macro case for energy-oriented commodity investments has relied on the following three factors:

  (1) adverse supply shocks resulting from the aging energy infrastructure in the U.S. and Europe;

  (2) expanding demand, particularly from China; and

  (3) as a dollar hedge.

Bas-Relief adornment on an utility building at Dearborn and Washington in Chicago.
II. Demand for Energy Investments

The Macro Case

1. Aging energy infrastructure

![Global Refining Capacity Still Squeezed: Spare Capacity Tightened Significantly Since 2002](chart.png)

Sources of Data: BP, DB Global Markets Research.

Note: 2007 is an estimate.

II. Demand for Energy Investments

The Macro Case

2. Expanding Demand

Source of Data: UN COMTRADE.

Source: Cheung and Morin (2007).
II. Demand for Energy Investments

The Macro Case

2. Expanding Demand

“Oil per capita rises rapidly in response to the GDP growth afforded by inexpensive labor, then levels off in a service economy at saturation.”

- “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.”

II. Demand for Energy Investments

The Macro Case

3. Dollar Hedge

M3 Money supply y/y growth vs. Oil price per barrel y/y growth
(10-yr. moving avg. of y/y percent change), since the Fed’s creation in 1913. Note the “super-spikes” in oil after prolonged strong M3 growth.

1975 to present:
Oil +1,212% and M3 +1,020%
II. Demand for Energy Investments

The Macro Case

- The energy complex is historically where the diversification with equity portfolios has come from.

- Non-energy commodities have on average been positively correlated with equities.

Source of Picture: Dubai Mercantile Exchange.
II. Demand for Energy Investments

Performance of Energy Futures Investments

- But passively investing in energy futures contracts is not for the faint-hearted.

- The Goldman Sachs energy (futures-only) sub-index lost -30.6% in 2006.

[Graph showing performance of an investment in the GSCI Energy (Futures-Only) Sub-Index (12/05 to 12/06)]
II. Demand for Energy Investments

*Energy Derivatives Relative-Value Trading*

- Therefore, energy and commodity investors had been drawn to relative-value commodity hedge funds, prior to 2007.

- As discussed in Till (2007a) and Eagleeye (2007), there are potentially profitable opportunities around build/draw cycles in commodity inventories.

- These opportunities tend to be monetized through calendar spreads and processor-margin spreads.
II. Demand for Energy Investments

*Energy Derivatives Relative-Value Trading*

**Average Seasonal Change in Natural Gas Inventories 1994 - 2006**

**Average Seasonal Change in Gasoline Inventories 1998 - 2006**
II. Demand for Energy Investments

*Energy Derivatives Relative-Value Trading*

- For active commodity strategies, expertise in forward curves and storage economics is crucial.

- Feldman and Till (2006) discuss the structural importance of forward curves in commodity investing.

- But even with energy-spread trading, there have been frequent structural breaks over the last 4 years.
II. Demand for Energy Investments

*Structural Breaks*

Relationship of Crude Calendar Spreads to Outright Positions

![Graph showing the relationship between WTI Front-to-Back Spread vs. Front-Month Crude, with monthly data from 12/86 to 12/03. The graph displays the spread (in $ per barrel) against the front-month price (in $ per barrel).]
II. Demand for Energy Investments

*Structural Breaks*

Relationship of Crude Calendar Spreads to Outright Positions: Structural Change

![WTI Front-to-Back Spread vs. Front-Month Crude Monthly Data 1/04 to 4/07](image-url)
II. Demand for Energy Investments

Structural Breaks

Relationship of Crude Calendar Spreads to Outright Positions: Structural Shift Yet Again in July 2007
II. Demand for Energy Investments

*Structural Breaks*

*Structural Rigidities Worsening in Petroleum-Complex Products*

Gasoline Crack (HUCL1)  Heating Oil Crack (HOCL1)

II. Demand for Energy Investments

Structural Breaks

Questionable Reliability of Natural-Gas Calendar Spread Trades

Similar graphic in Petzel (2006).
III. Portfolio Construction and Inadvertent Concentration Risk

Potential Diversification Opportunities, If Can Avoid Inadvertent Concentration Risk

Example of Portfolio Effect When Combining Unrelated Strategies

III. Portfolio Construction and Inadvertent Concentration Risk

*Seasonally-Varying Correlations: Corn vs. Natural Gas Example*

- The graphs in Slides 23 and 24 illustrate how two normally unrelated markets can become temporarily very related.

*Source: Till (2001).*
III. Portfolio Construction and Inadvertent Concentration Risk

*Seasonally-Varying Correlations: Corn vs. Natural Gas Example*

- In July, both corn and natural gas prices are heavily dependent on the outcome of weather in the U.S. Midwest.

*Source: Till (2001).*
III. Portfolio Construction and Inadvertent Concentration Risk

**Impact of Chinese Demand: Copper vs. Platinum Example**

- Platinum and Copper are at risk to a Chinese demand shock.
- In mid-April 2004, there were reports of a more stringent official policy towards industrial loans in China.

![Daily Platinum and Copper Futures Prices (4/15/04 to 4/30/04)](chart)

III. Portfolio Construction and Inadvertent Concentration Risk

Impact of Chinese Demand: Can Crude Oil, Soybeans, and Copper All Become One Trade?

IV. Macro Portfolio Protection

The Relationship Between Commodities and Interest Rates: The Potential for a Macro Hedge

• While a short-term U.S. fixed-income position was an effective hedge for long commodity positions during the aftermath of 9/11/01 …

IV. Macro Portfolio Protection

The Relationship Between Commodities and Interest Rates: Caveat Regarding Dynamic Correlations

• … this was not the case in the aftermath of Hurricane Katrina; gasoline and deferred short-term interest rates became the same trade, both on the upside and the downside.

![Gasoline and Short-Term U.S. Interest Rates Around the Time of Hurricane Katrina](image)

V. Risky Asset Deleveraging

CFTC Study

• A November 2007 CFTC study found that “the relation between the prices of, and the returns on, investable commodity and U.S. equity indices has not changed significantly in the last fifteen years.”

• They also “find no evidence of a secular increase in co-movement between the returns on commodity and equity investments during periods of extreme returns.”

Source: Buyuksahin et al. (2007).
V. Risky Asset Deleveraging

**Bank of Japan Review**

- That said, commodities were clearly not immune from episodes of widespread deleveraging of risky investments during the past two years, …

- … as occurred during May and June of 2006; end-of-February 2007; and again in mid-August 2007, …

- … and which was commented upon by the Bank of Japan (November 2007) in “Monitoring Commodity Markets: From the Perspective of Understanding Global Financial Market Trends.”
V. Risky Asset Deleveraging

May /June 2006 Deleveraging

May 10, 2006 through June 13, 2006

<table>
<thead>
<tr>
<th>&quot;Risk Indicator&quot;</th>
<th>Percent Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>VIX (Equity Implied Vol)*</td>
<td>12.0%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>&quot;Risk Assets&quot;</th>
<th>Percent Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bovespa (IBX50)</td>
<td>-23.5%</td>
</tr>
<tr>
<td>Nasdaq</td>
<td>-10.4%</td>
</tr>
<tr>
<td>S&amp;P 500</td>
<td>-7.3%</td>
</tr>
<tr>
<td>Nikkei</td>
<td>-10.4%</td>
</tr>
<tr>
<td>Silver</td>
<td>-32.4%</td>
</tr>
<tr>
<td>Copper</td>
<td>-18.2%</td>
</tr>
<tr>
<td>Gasoline (RFG)</td>
<td>-3.6%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>&quot;Safe Havens&quot;</th>
<th>Percent Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Long Bond</td>
<td>1.8%</td>
</tr>
<tr>
<td>Dollar vs. Yen (Long Dollars)</td>
<td>4.5%</td>
</tr>
</tbody>
</table>

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

End-February-2007 Deleveraging

Intraday Bonds

Intraday Crude

Intraday Gold

Intraday VIX

V. Risky Asset Deleveraging

8/16/07 Global Unwind

<table>
<thead>
<tr>
<th>Global Unwind</th>
<th>16-Aug-07</th>
</tr>
</thead>
<tbody>
<tr>
<td>VIX (Equity Implied Vol)*</td>
<td>31%</td>
</tr>
<tr>
<td>Risk Assets</td>
<td>Percent Change</td>
</tr>
<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>
<tr>
<td>&quot;Safe Haven&quot;</td>
<td>Percent Change</td>
</tr>
<tr>
<td>Long Bond</td>
<td>0.94%</td>
</tr>
<tr>
<td>Crack Spreads (Refinery Margins)</td>
<td>Daily Change</td>
</tr>
<tr>
<td>Gasoline Crack</td>
<td>$1.05</td>
</tr>
<tr>
<td>Heat Crack</td>
<td>$0.48</td>
</tr>
</tbody>
</table>

* Absolute level of the VIX (and not change in level as in Slide 31.)

Intraday Performance of Commodities Within the Dow Jones AIG (DJAIG) Commodity Index

<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>-0.353</td>
</tr>
<tr>
<td>NGX7 Natural Gas</td>
<td>7.791</td>
<td>-0.046</td>
<td>-0.587</td>
</tr>
<tr>
<td>WZ7 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>LMAHDS03 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>CZ7 Corn</td>
<td>336 1/2</td>
<td>-8 3/4</td>
<td>-2.53</td>
</tr>
<tr>
<td>LMNIDS03 Nickel</td>
<td>26500.00y</td>
<td>-800.00</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>

Source: The Bloomberg.
V. Risky Asset Deleveraging

March 2008: *The Great Unwind / Great Bail-Out*
VI. The Case of Amaranth

There are reasonably short-horizon price-pressure effects on futures calendar spreads …

• … that are due to the seasonal hedging of commodity inventories, including in natural gas.

• But:
  – Size matters; and
  – Value matters.

Sources: Till (2006b) and Till (2007a).
VI. The Case of Amaranth

Size Matters

- The U.S. Senate Permanent Subcommittee on Investigations found that in late July 2006, Amaranth’s natural gas positions for delivery in January 2007 represented …

- “a volume of natural gas that equaled the entire amount of natural gas eventually used in that month by U.S. residential consumers nationwide.” [Italics added.]
VI. The Case of Amaranth

*Size Matters*

- This is obviously too large for a financial entity that has no physical energy assets.
- If a financial firm cannot make or take physical delivery of a commodity, …
- … then that firm’s exit strategy is very constrained.
VI. The Case of Amaranth

*Value Matters*

- Amaranth had engaged in natural gas calendar-spread trading on a vast scale …

- … in which the fund was long winter-delivery contracts and short non-winter-month contracts in the 2006 through at least 2010 maturities. (See Chincarini (2007).)

- The fund had entered into these positions at exceedingly wide levels for these spreads.
VI. The Case of Amaranth

Scenario Analysis if Winter vs. Non-Winter Spreads Reverted to Past Spread Relationships *

As of the end of August 2006, it was apparent that up to -36% could have been lost under normal conditions.

<table>
<thead>
<tr>
<th>Date</th>
<th>NGV-X</th>
<th>NGH-J</th>
<th>Losses due to V-X</th>
<th>Losses due to H-J</th>
<th>Total Losses</th>
<th>Portfolio Loss</th>
</tr>
</thead>
<tbody>
<tr>
<td>8/31/2000</td>
<td>-0.056</td>
<td>0.26</td>
<td>$(2,241,256,400)$</td>
<td>$(1,119,408,400)$</td>
<td>$(3,360,664,800)$</td>
<td>-36.5%</td>
</tr>
<tr>
<td>8/31/2001</td>
<td>-0.33</td>
<td>0.09</td>
<td>$(1,953,970,000)$</td>
<td>$(1,220,631,500)$</td>
<td>$(3,174,601,500)$</td>
<td>-34.5%</td>
</tr>
<tr>
<td>8/31/2002</td>
<td>-0.33</td>
<td>0.113</td>
<td>$(1,953,970,000)$</td>
<td>$(1,206,936,610)$</td>
<td>$(3,160,906,610)$</td>
<td>-34.4%</td>
</tr>
<tr>
<td>8/31/2003</td>
<td>-0.25</td>
<td>0.44</td>
<td>$(2,038,466,000)$</td>
<td>$(1,012,231,000)$</td>
<td>$(3,050,697,000)$</td>
<td>-33.2%</td>
</tr>
<tr>
<td>8/30/2004</td>
<td>-0.643</td>
<td>0.57</td>
<td>$(1,623,379,400)$</td>
<td>$(934,825,100)$</td>
<td>$(2,558,204,500)$</td>
<td>-27.8%</td>
</tr>
<tr>
<td>8/31/2005</td>
<td>-0.185</td>
<td>2.24</td>
<td>$(2,107,119,000)$</td>
<td>$59,543,000$</td>
<td>$(2,047,576,000)$</td>
<td>-22.3%</td>
</tr>
</tbody>
</table>

This was two weeks before the fund’s implosion.

* Note: This analysis uses positions constructed from the Senate report’s graphical representation of Amaranth’s positions as of 8/31/06. We simplify our scenario analysis by choosing two spreads that, in combination, were 93% correlated to Amaranth’s documented natural-gas book.

VI. The Case of Amaranth

Critical Liquidation Cycle

- Severe liquidation scenarios have been formally modeled for highly-leveraged funds. For example, this scenario was modeled as being short a barrier option by de Souza and Smirnov (2004).

- This framework appears to be quite appropriate for the Amaranth case.

VI. The Case of Amaranth

Nodal Liquidity

• Another key lesson from the Amaranth debacle is that the commodity markets do not have natural two-sided flow.

• The commodity markets have “nodal liquidity.”

• If a commercial market participant needs to initiate or lift hedges, there will be flow, but such transactions do not occur on demand.
VI. The Case of Amaranth

**Beneficiaries of Price-Pressure Effect**

- Commercial hedgers may have been the beneficiaries of 2/3 of the price-pressure effect caused by Amaranth’s unwind, with financial intermediaries earning the remaining 1/3.

**Inferred Tally of Winners from the Amaranth Unwind**

VI. The Case of Amaranth

Major Lessons

• One would expect there to be increased care by financial institutions in participating in the commodity derivatives markets.

• There has been an obvious regulatory gap in covering over-the-counter energy derivatives trading.

Source: Till (2007c).
VI. The Case of Amaranth

Major Lessons

• Even though the Amaranth collapse did not lead to wider problems in the financial markets, one should still be cautious about concluding that the alternative investment industry has the wherewithal to absorb major hedge fund failures.

The Amaranth debacle may eventually be seen as one of the consequences of the massive liquidity that had severely mispriced all manner of risky dollar-based assets.

VII. Outlook

(Light Sweet) Crude Oil Prices

In the short term, oil prices are searching for the level that:

(1) Induces an appropriate production response; or

(2) Induces a weakening of strict environmental regulations; or

(3) Reduces global consumption through an economic contraction.

Sources: Murti et al. (2005) and Verleger (2007).
VII. Outlook

(Light Sweet) Crude Oil Prices

- Given that none of these responses have occurred yet during a near quadrupling of oil prices (in dollars) over the past six years, ...

  ... it is an open question of how high oil prices must go before “mean-reverting.”

VII. Outlook

*(Light Sweet) Crude Oil Prices*

- This has implications for the proper choice of scalable oil-oriented commodity investing …

Source: *The Oxville Oil, Gas & Development Company’s Share Certificate, Incorporated in the Province of Alberta, Dominion of Canada, 1929.*
VII. Outlook

Beta

1. Choice of index:

   – given that the driver of returns may at times be spot returns (and not roll returns).

VII. Outlook

Alpha

2. Choice of hedge fund:

- Are energy-futures-spread strategies sufficiently scaleable?

- Do energy hedge funds have a structural edge?

VII. Outlook

*Long-Term-Strategy Choices*

- What are the structural economic changes that would result from much higher oil (and natural gas) prices?
- What are oil-exporting countries investing in?
- What will be the impact on the U.S. dollar? [See next slide.]
VII. Outlook

Long-Term-Strategy Choices

Euro / $ vs. Crude Oil (in $)
(8/17/06 through 5/2/08)

USD’s Vicious Circle

ECB becomes even more reluctant to follow the Fed easing
Deteriorating of US petroleum trade deficit offsets improving non-petroleum deficit

Oil price rise as oil producers seek compensation for lower USD and investors seek inflation insurance

Source of Graph: Based on Hill (2008).

VII. Outlook

Strategy Choice: Least Trade-Offs

• One’s choice of strategy is simplest when an investment has the following characteristics:
  - positive carry;
  - transparency; and
  - scalability.

Source of Graphic: The Bloomberg.
References


References (Continued)


References (Continued)


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Intelligent Commodity Investing

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David Kahn, Head of Risk Management and Quantitative Research, Glenwood Capital Investments, LLC, A member of the MA Group

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David Walsh, Managing Director, Alliance Investments

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Robert J. Green, Senior VP, Real Return Product Manager, PMCG

With the boomng interest in commodity investment there is a growing demand for up-to-date information. This acclaimed book provides timely and intelligent insights from a broad range of institutional investors, consultants, hedge funds, commodity index providers, risk managers as well as research from academia. This is the only multi-contributor book on commodity investment offering a breadth of opinions for sophisticated investors.

It looks at commodity investment from the following perspectives:

- The Investor
- The Active Manager
- The Commodity Index Provider
- The Risk Manager
- The Researcher

The size of the global commodities derivatives market is now estimated to be around US$750 billion. This growth is evident by the increased investment in commodity indexes and the growth of commodity hedge funds. Further evidence of growth is also seen in the increasing size of natural-resources mutual funds. China and other fast-growing countries are snapping up raw materials at a pace that, at times, is faster than mines and oil wells can produce them.

In response to the rapid growth in the market, this timely publication will bring you up to speed on the trends and challenges of commodity investment, providing you with a practical investment framework.