

**Commodities Presentation to
Chicago QWAFEFW
and Chicago PRMIA**
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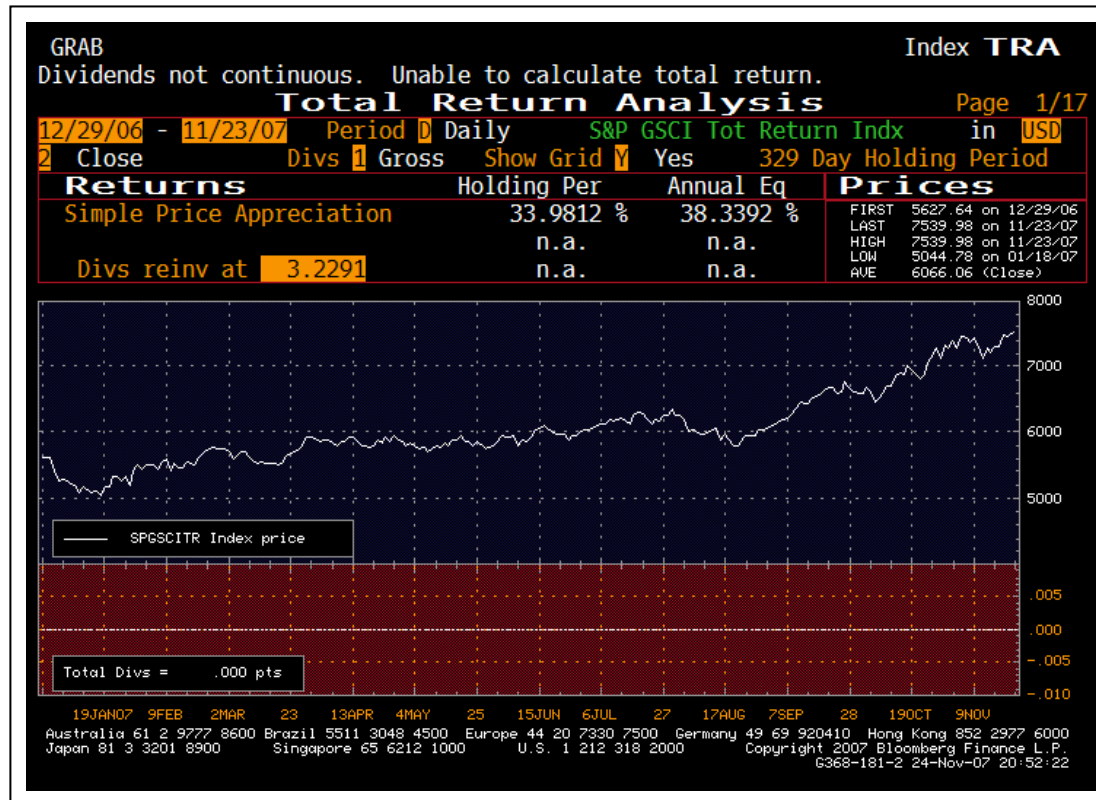
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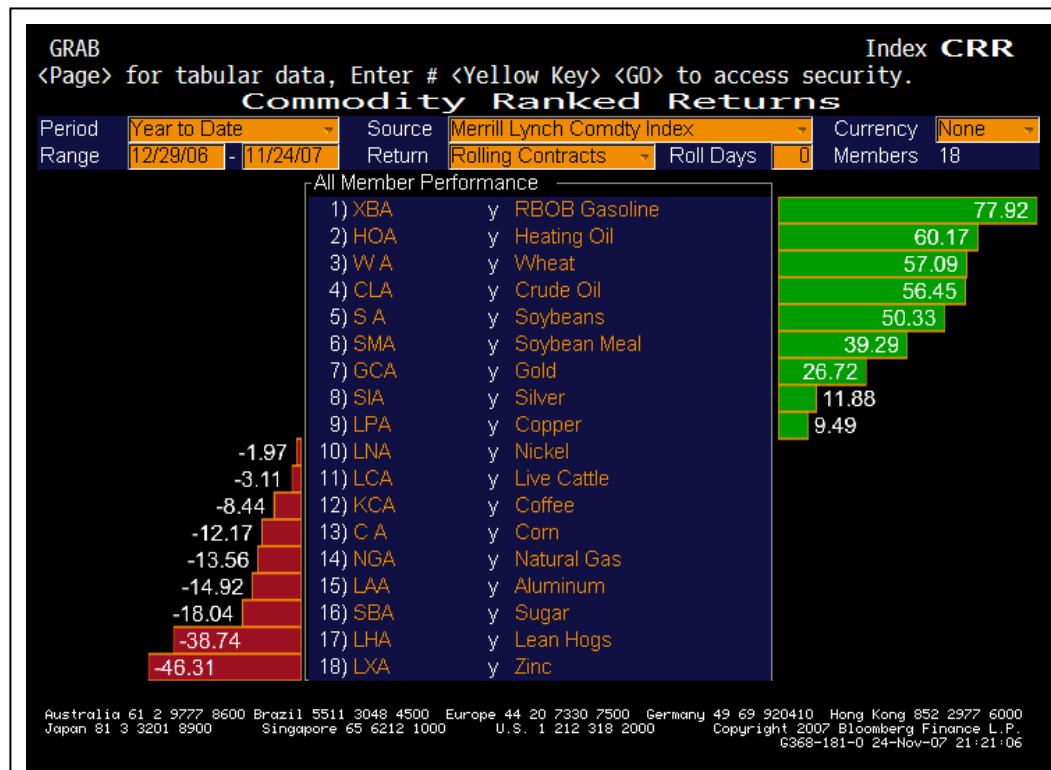
I. The Year in Review

Surprisingly Bullish Results ...



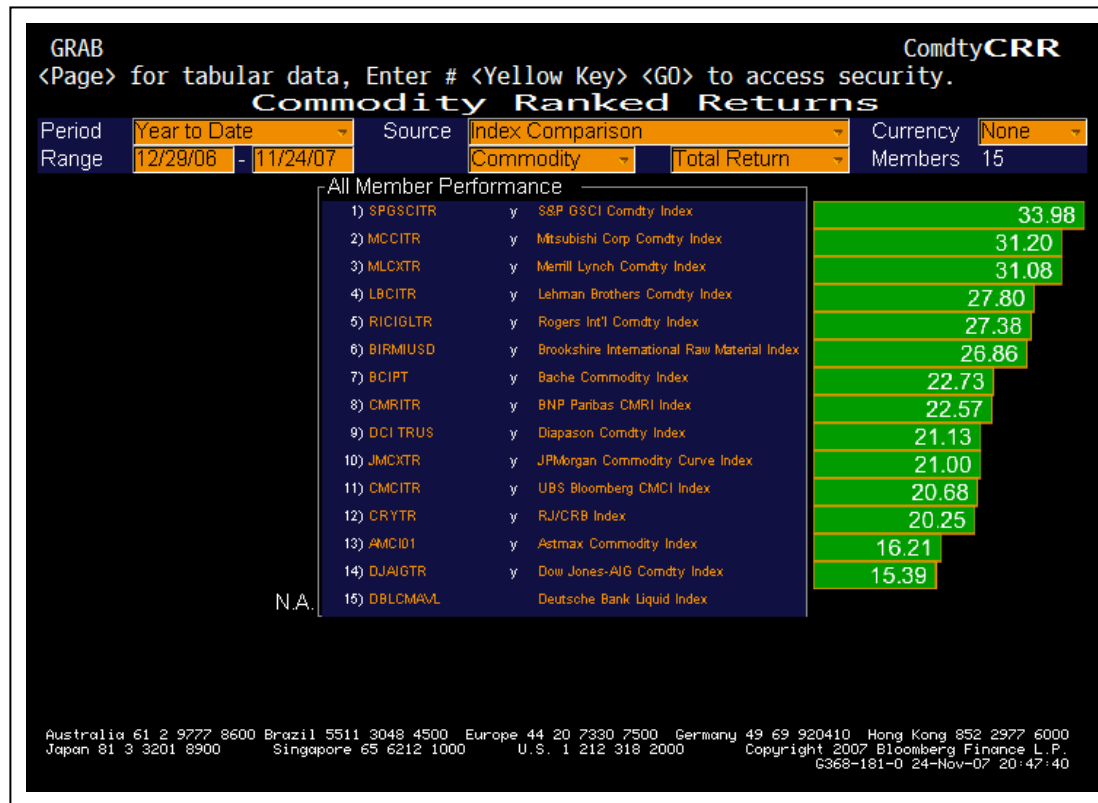
I. The Year in Review

... With the Petroleum Complex, Precious Metals, and the Agricultural Complex (Excluding Corn) Turning in the Best Results



I. The Year in Review

Proliferation of Commodity Indices:



I. The Year in Review

But Commodities Have Not Been Immune to the Financial Risk Climate:

Global Unwind		16-Aug-07
VIX (Equity Implied Vol)*		31%
<u>Risk Assets</u>		<u>Daily Percent Change</u>
Bovespa (IBX50)		-2.11%
Nasdaq		-1.01%
Nikkei		-1.99%
Silver		-8.44%
Copper		-7.26%
Gasoline		-1.52%
NZD vs. Yen		-5.32%
<u>"Safe Haven"</u>		<u>Percent Change</u>
Long Bond		0.94%
<u>Crack Spreads (Refinery Margins)</u>		<u>Daily Change</u>
Gasoline Crack		\$1.05
Heat Crack		\$0.48

GRAB		Index		DAIG
At 10:07	Vol 0 Op 164.360	Hi 164.967	Lo 162.997	Prev 167.330
DJAIG MOVERS		CHANGE	CURRENT	OPEN HIGH LOW TIME
Descend Sort	Cycle Roll	-4.173	163.157	164.360 164.967 162.997 10:07
GROUPS	Return	GROUPS	Return	
Agriculture	-2.79%	Industrials	-2.62%	
Energy	-1.86%	Livestock	-1.44%	
Precious Metals	-2.81%			

COMMODITY	PRICE	CHG	%CHG	COMMODITY	PRICE	CHG	%CHG
1)LMHDS03 Aluminum	2543.00y	-9.00	-.3531	10)HDX7 Heating Oil	201.55	-4.99	-2.42
2)NGX7 Natural Gas	7.791	-.046	-.5871	11)C Z7 Corn	336 ¹ / ₂	-8 ³ / ₄	-2.53
3)W Z7 Wheat	688 ³ / ₄	-8 ¹ / ₄	-1.1813	12)LMNDS03 Nickel	26500.0y	-800.0	-2.93
4)LCV7 Live Cattle	94.600	-1.325	-1.3814	13)SBV7 Sugar	9.16	-.29	-3.07
5)LHV7 Lean Hogs	67.550	-1.025	-1.4915	14)KCZ7 Coffee	119.30	-3.90	-3.17
6)LMZSDS03 Zinc	3230.00y	-65.00	-1.9716	15)B0Z7 Soybean Oil	35.27	-1.25	-3.42
7)XBX7 RBOB Gasolin	187.43	-3.95	-2.0617	16)SIZ7 Silver	12.290	-.445	-3.49
8)GCZ7 Gold	665.20	-14.50	-2.1318	17)S X7 Soybeans	821	-33 ¹ / ₂	-3.92
9)CTZ7 Cotton	58.85	-1.33	-2.2119	18)HGZ7 Copper	314.80	-17.40	-5.24
10)CLX7 Crude Oil	71.10	-1.73	-2.38				

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* Absolute level of the VIX.



II. Amaranth Lessons: One Year Later

- A. Background on Amaranth**
- B. Trading Strategies**
- C. Fundamental Rationale**
- D. Risk Analysis**
- E. Wider Lessons**



Icon above is based on the statue in the Chicago Board of Trade plaza.



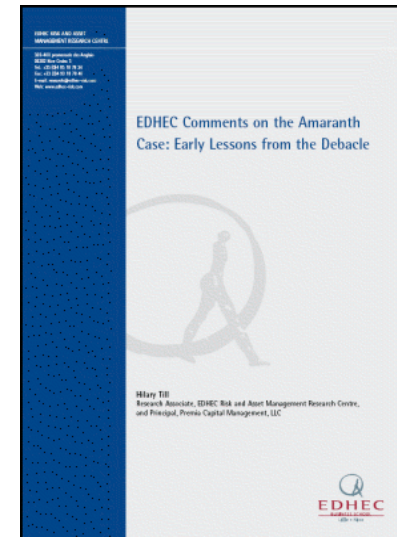
A. Background on Amaranth

- **As of 8/31/06, Amaranth Advisors had about \$9.2 billion in assets under management.**
- **On Monday, September 18th, 2006, the founder had issued a letter to investors, informing them that the fund had lost an estimated 50% of their assets since its end-August value.**
- **The fund had lost -\$560 million on Thursday, 9/14/06 alone.**



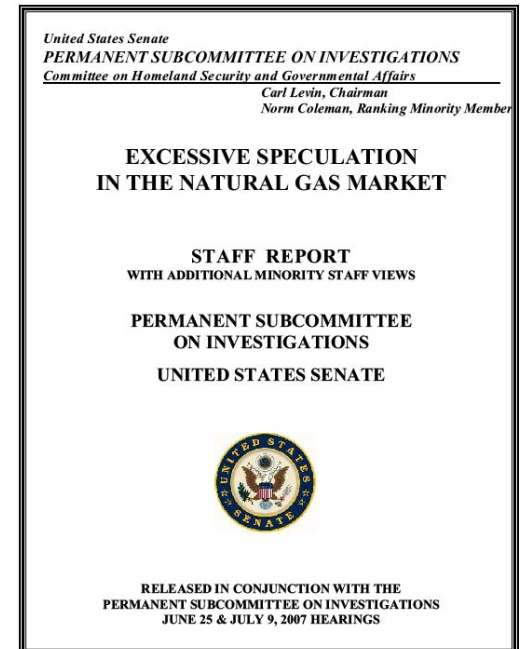
B. Trading Strategies

- **Amaranth Advisors, LLC had employed a natural gas spread strategy that would have benefited under a number of different weather-shock scenarios, ...**
- **... but did so on a scale that still surprises market participants.**




B. Trading Strategies

- **On June 25th, 2007, the U.S. Senate Permanent Subcommittee on Investigations (PSI) released a report on the Amaranth debacle.**
- **The PSI found that, for example, 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.]**



B. Trading Strategies

- **Amaranth's core energy trading strategies were constructed through calendar spreads, which were executed on both the New York Mercantile Exchange (NYMEX) and the Intercontinental Exchange (ICE).**
- **Amaranth's spread trading strategy involved taking long positions in winter contract deliveries and short positions in non-winter contract deliveries. (See Chincarini (2007).)**
-  **These positions would have benefited from potential weather events such as hurricanes and cold-shocks from 2006 through 2011.**



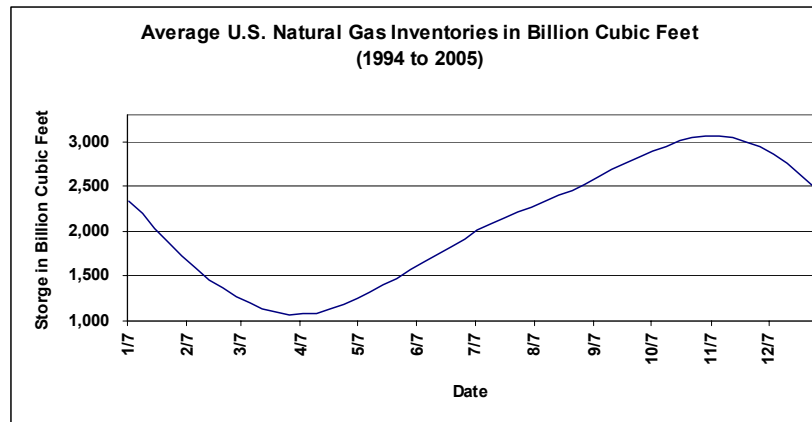
C. Fundamental Rationale for Strategies

- **Natural gas derivatives trading has offered hedge funds a potentially alluring combination of scalability and volatility, and also at times, pockets of predictability.**
- **Traders have been able to access these markets through the NYMEX for exchange-traded exposure or through the ICE for over-the-counter exposure.**



C. Fundamental Rationale for Strategies

- **There is a long “injection season” from the spring-through-the-fall in which natural gas is injected and stored in caverns for later use during the long winter season.**
- **This graph illustrates the normal seasonal pattern of builds and draws in natural gas throughout the year.**

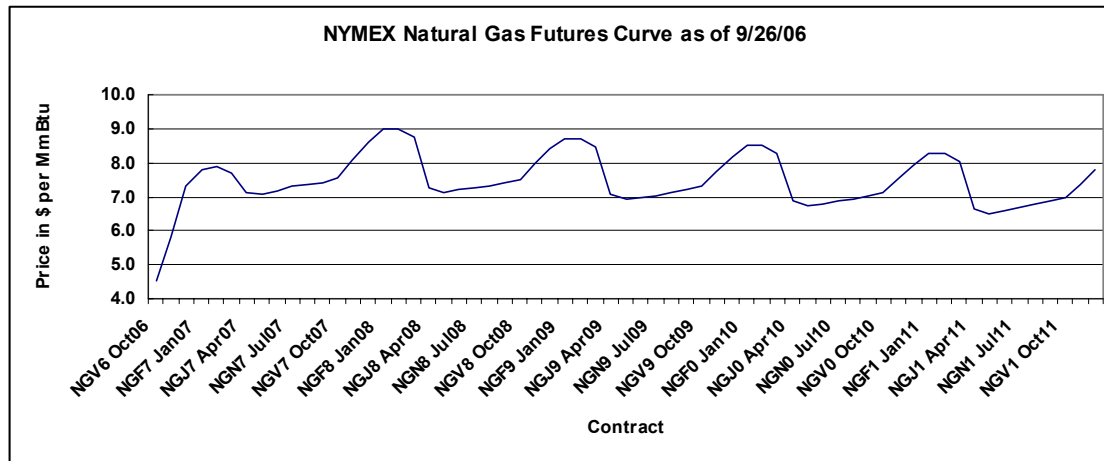


Note: This graph specifically shows the U.S. Department of Energy's total estimated storage data for working natural gas inventories averaged over the period, 1994 to 2005.



C. Fundamental Rationale for Strategies

- The graph below shows the futures curve for natural gas of 9/26/06.
- One can note that the yearly futures curves for natural gas shown below mirror the average inventory build-and-draw pattern on Slide 12.



C. Fundamental Rationale for Strategies

- **With U.S. natural gas, storage capacity has actually declined since 1989 and domestic production has not kept pace with demand.**
- **These factors have caused massive volatility in the outright price of natural gas and in the price relationships between different sectors of the natural gas curve.**
- **To give one an idea of natural gas' volatility, on 9/26/06, the implied volatility of one-month, at-the-money natural gas options was 92.5%.**



C. Fundamental Rationale for Strategies

- **This was the case even though there were no hurricanes, heat-waves, or cold-shocks presently confronting this market at the time.**



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, as discussed in Till (2007a).**
- **As documented in the U.S. Senate report, Amaranth was precisely involved in these sorts of opportunities on a massive scale.**



D. Risk Analysis

Recent Volatility

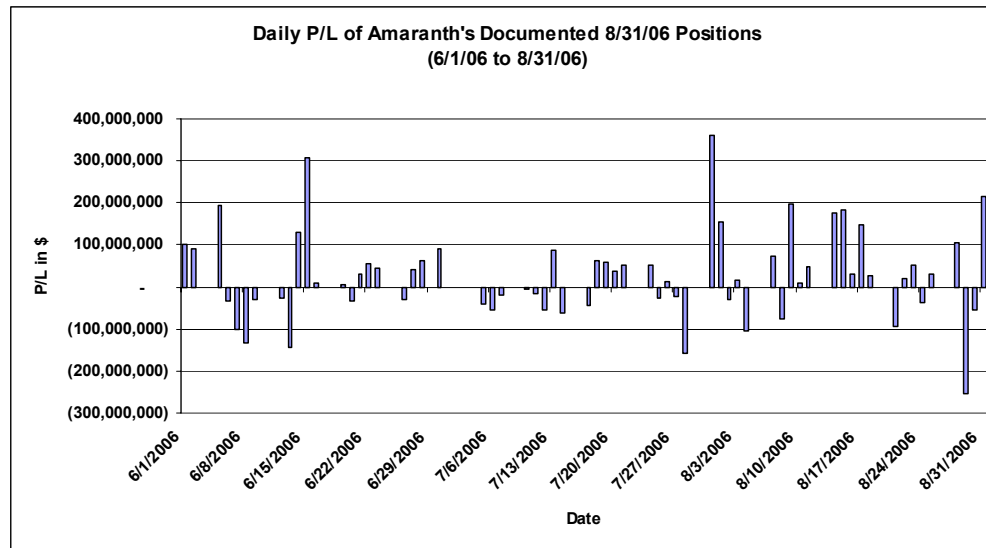
- **How could Amaranth's risk managers have gotten caught so wrong-footed?**
- **One explanation might be that risk metrics using recent historical data would have vastly underestimated the magnitude of moves that can occur during an extreme liquidation pressure event.**



D. Risk Analysis

Recent Volatility

- **This graph shows the daily p/l of Amaranth's 8/31/06 positions. These positions were documented graphically in the U. S. Senate report.**



D. Risk Analysis

Recent Volatility

- **Now, Amaranth's positions did change over the summer of 2006, so the intention of the graph on Slide 17 is not to show the fund's actual p/l over this period.**
- **Instead, the gist of the graph is to show what the typical volatility that Amaranth's risk managers might have expected from the portfolio, going into September 2006.**
- **The daily standard deviation of the 8/31/06 positions, based on three months of data, was about \$105-million.**



D. Risk Analysis

Scenario Analysis

- **As of 8/31/06, winter natural gas futures prices were trading at an extreme relative to non-winter-month contracts.**
- **A simple scenario analysis of the time would have been to examine over say, the previous six years, what the level of the fund's spreads had been.**
- **One could have then quickly evaluated what the potential losses could be if a normal state-of-the-world reappeared.**



D. Risk Analysis

Scenario Analysis

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

<u>Number of Contracts</u>	<u>Spread Symbol</u>	Natural Gas <u>Spread</u>	<u>8/31/06 Level</u>				
(105,620)	NGV-X	October-November	-2.18				
59,543	NGH-J	March-April	2.14				

<u>Date</u>	<u>NGV-X</u>	<u>NGH-J</u>	<u>Losses due to V-X</u>	<u>Losses due to H-J</u>	<u>Total Losses</u>	<u>Portfolio Loss</u>
8/31/2000	-0.058	0.26	\$ (2,241,256,400)	\$ (1,119,408,400)	\$ (3,360,664,800)	-36.5%
8/31/2001	-0.33	0.09	\$ (1,953,970,000)	\$ (1,220,631,500)	\$ (3,174,601,500)	-34.5%
8/31/2002	-0.33	0.113	\$ (1,953,970,000)	\$ (1,206,936,610)	\$ (3,160,906,610)	-34.4%
8/31/2003	-0.25	0.44	\$ (2,038,466,000)	\$ (1,012,231,000)	\$ (3,050,697,000)	-33.2%
8/30/2004	-0.643	0.57	\$ (1,623,379,400)	\$ (934,825,100)	\$ (2,558,204,500)	-27.8%
8/31/2005	-0.185	2.24	\$ (2,107,119,000)	\$ 59,543,000	\$ (2,047,576,000)	-22.3%

- **One caveat with this analysis is that it is based solely on the positions that were documented in the June 25th U.S. Senate report.**
- **This analysis may therefore be incomplete, to the extent that Amaranth held other sizeable positions *not* documented in the Senate report.**

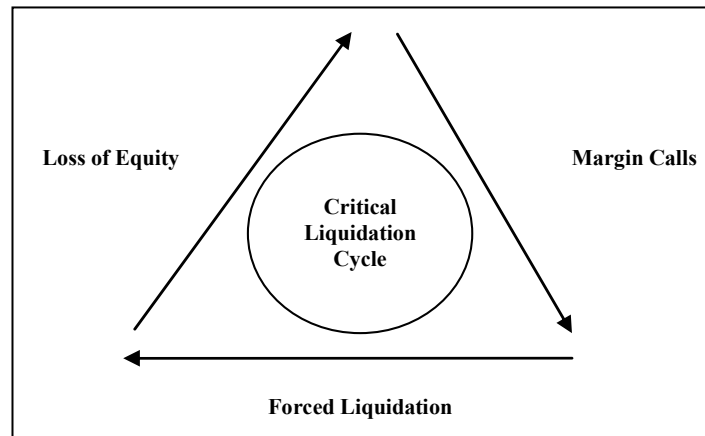
See Till (2007c) for further caveats and explanations regarding this analysis.



D. Risk Analysis

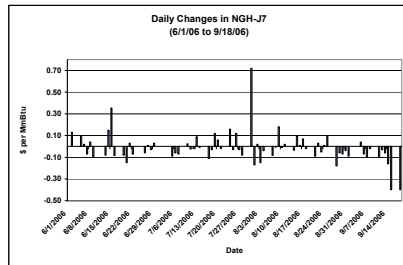
Critical Liquidation Cycle

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



D. Risk Analysis

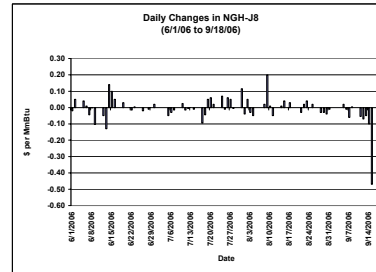
Daily Changes in March-April Natural Gas Spreads 2007 through 2011 Deliveries 6/1/06 to 9/18/06



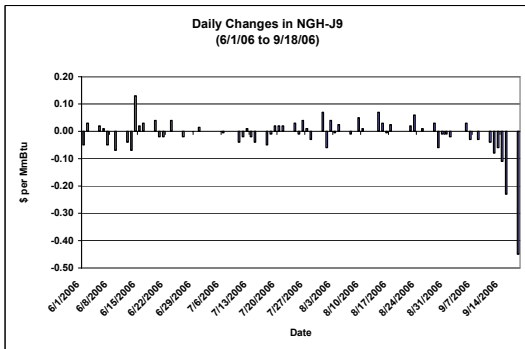
Using data from 5/31/06 to 8/31/06, the change in the NGH-J7 (Natural Gas March-April 2007) spread on 9/15/06 was -3.1 standard deviations.

H is the futures symbol for the March contract; J is the symbol for the April contract.

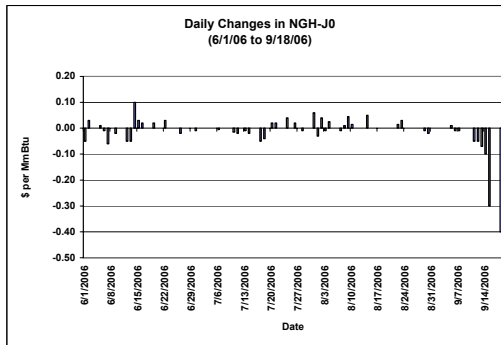
Data source: The Bloomberg



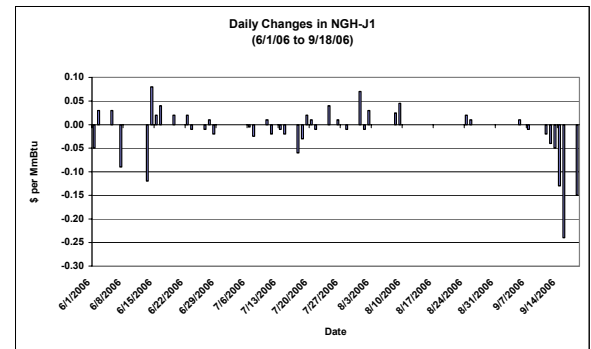
Using data from 5/31/06 to 8/31/06, the change in the NGH-J8 (Natural Gas March-April 2008) spread on 9/15/06 was -9.0 standard deviations.



Using data from 5/31/06 to 8/31/06, the change in the NGH-J9 (Natural Gas March-April 2009) spread on 9/15/06 was -6.5 standard deviations.



Using data from 5/31/06 to 8/31/06, the change in the NGH-J0 (Natural Gas March-April 2010) spread on 9/15/06 was -11.1 standard deviations.

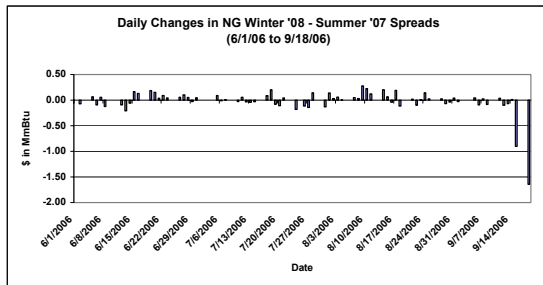


Using data from 5/31/06 to 8/31/06, the change in the NGH-J1 (Natural Gas March-April 2011) spread on 9/15/06 was -8.2 standard deviations.

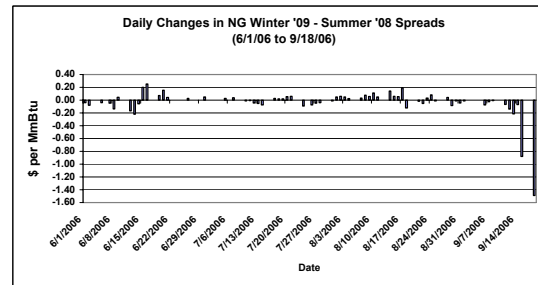


D. Risk Analysis

Daily Changes in Winter-Summer Natural Gas Spreads 2007 through 2011 Deliveries 6/1/06 to 9/18/06

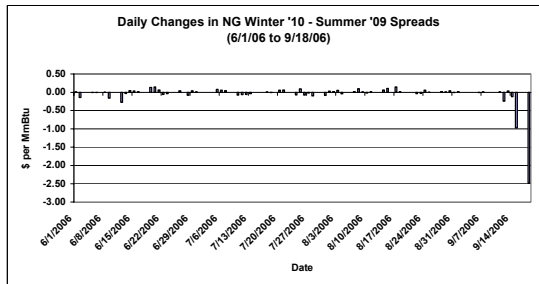


Using data from 5/31/06 to 8/31/06, the change in the Natural Gas Winter '08 - Summer '07 spread on 9/15/06 was -8.7 standard deviations.

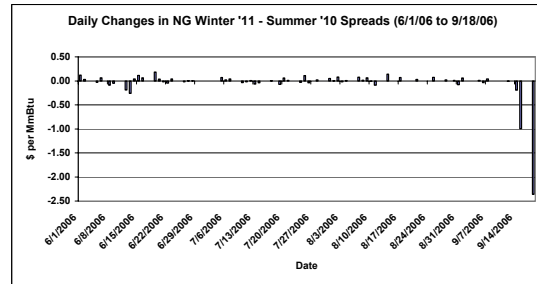


Using data from 5/31/06 to 8/31/06, the change in the Natural Gas Winter '09 - Summer '08 spread on 9/15/06 was -10.9 standard deviations.

Data source: The Bloomberg



Using data from 5/31/06 to 8/31/06, the change in the Natural Gas Winter '10 - Summer '09 spread on 9/15/06 was -13.9 standard deviations.



Using data from 5/31/06 to 8/31/06, the change in the Natural Gas Winter '10 - Summer '09 spread on 9/15/06 was -14.7 standard deviations.

Note: The definition of Winter vs. Summer natural gas spreads is long the December, January, February, and March forward maturities, and short the June, July, August, and September maturities.



D. Risk Analysis

Nodal Liquidity

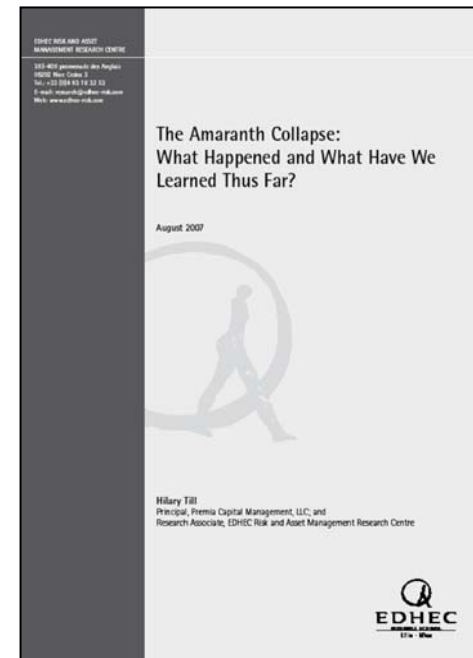
- **Another key lesson from the Amaranth debacle is that the commodity markets do not have natural two-sided flow.**
- **The commodity markets have “nodal liquidity.”**
- **If a commercial market participant needs to initiate or lift hedges, there will be flow, but such transactions do not occur on demand.**



E. Wider Lessons

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.**



E. Wider Lessons

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 will eventually be seen as one of the consequences of the *massive* liquidity that had *severely* mispriced all manner of risky assets.



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Source of graphic: Degas, Edgar, "The Cotton Exchange at New Orleans," 1873, Musée Municipal, Pau, France.

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