

A Case Study in Risk Management.
Lessons from the Collapse of Amaranth
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Outline

- I. Summary
- II. Introduction/Background
- III. The Strategy
- IV. Risk Management
- V. Lessons

Note: Paper available on my website with much more information.

Summary

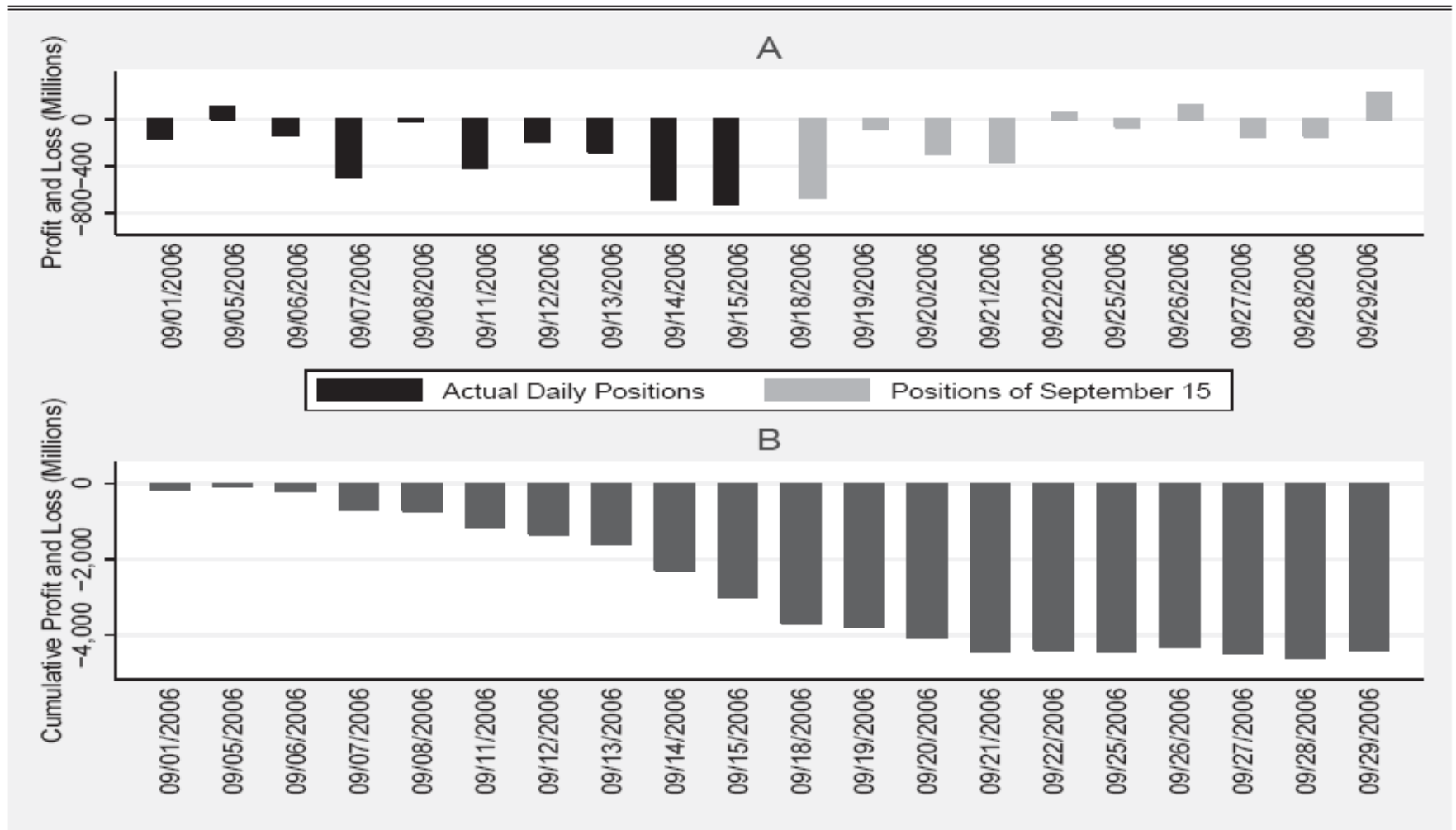
- (1) Amaranth's trading strategy was long winter, short non-winter natural gas futures contracts.
- (2) Significant leverage was used.
- (3) Market risk was high, but may have been reasonable.
- (4) Liquidity risk was excessively and imprudently high.
- (5) Regulators and/or practitioners need better measures of liquidity risk.

I. Introduction/Background

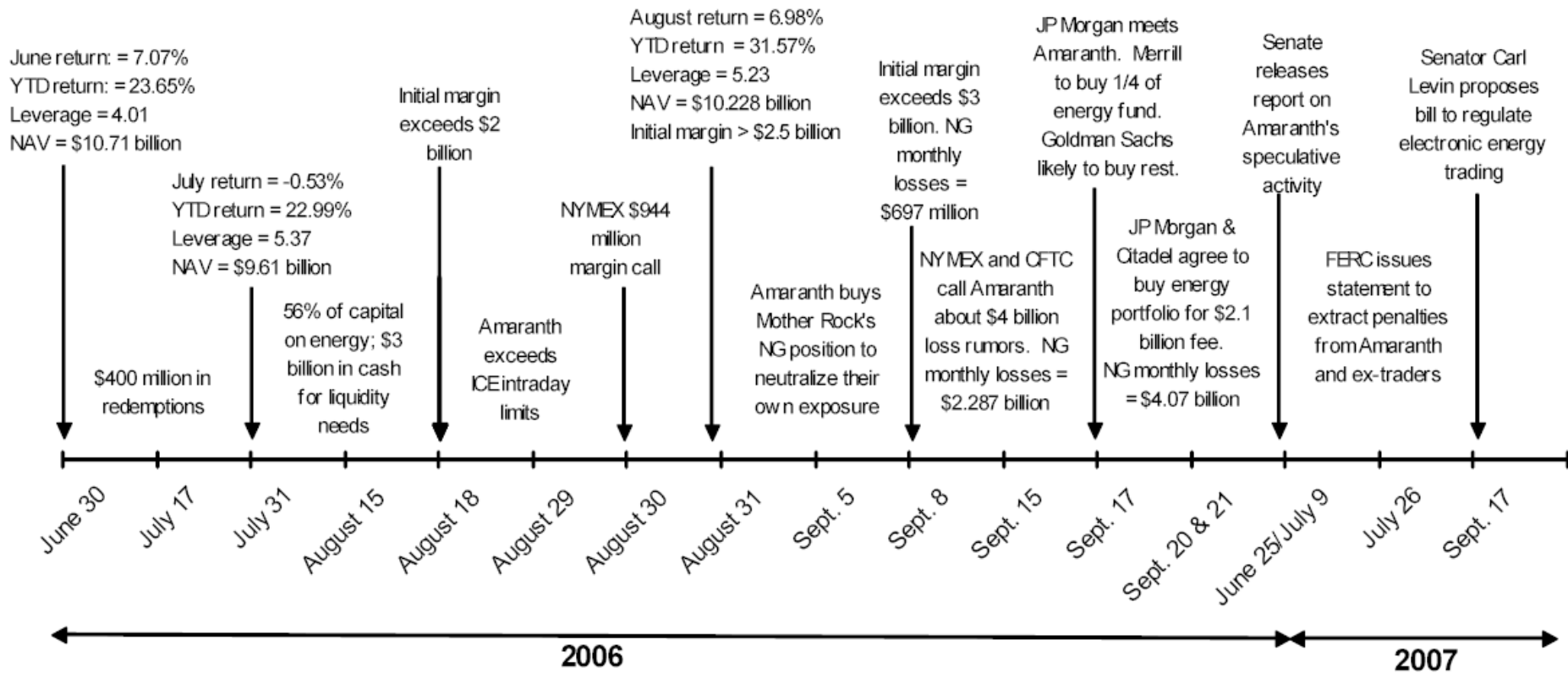
- In September of 2006, Amaranth loses \$4.942B (about 48% of the fund value)
- The losses came from the energy trading desk headed by Brian Hunter.
- The losses occurred quite quickly.

Figure 4. The Profit and Loss of Amaranth's Natural Gas Positions in September.

Note: Losses each day are computed based upon the actual positions Amaranth had at the close of the prior day. From September 18, 2006 onwards, the positions of Amaranth were not available, thus the returns are computed assuming Amaranth maintained the positions they had at the close of business on September 15, 2006.



I. Introduction/Background



II. The Strategy

- Calendar Spread Trade betting WINTER beats NON-WINTER
- Long winter natural gas futures, options, swaps
- Short non-winter natural gas futures, options, swaps

Note: Winter = Nov, Dec, Jan, Feb, and Mar

II. The Strategy

Table III: Amaranth Positions in Winter and Non-Winter Months

Note: For this table, winter months are defined to be November, December, January, February, and March. Non-Winter months are all other months. For each day listed, Winter-Longs represented the total dollar value of the long positions in winter months, Winter-Shorts represent the total dollar value of the short positions in winter months, W. Total represents the sum of the two, Non-Winter-Longs represents total dollar value of the long positions in non-winter months, Non-Winter-Shorts represents the total dollar value of the short positions in non-winter months, and N.W. Total represents the sum of the two. Correct Sign (%) represents the number of Winter (Non-Winter) months in which the position is long (short) regardless of size.

Trade Date	Total Dollar Value						Correct Sign (%)	
	Winter-Longs	Winter-Shorts	W. Total (Net)	Non-Winter-Longs	Non-Winter-Shorts	N.W. Total (Net)	Winter	Non-Winter
31-Jan-06	4,258,305,934	(4,207,665,123)	50,640,811	1,435,236,076	(2,186,529,127)	(751,293,051)	64.29	50.00
28-Feb-06	6,747,057,844	(2,581,042,631)	4,166,015,213	1,107,062,004	(4,459,247,449)	(3,352,185,445)	77.78	50.00
31-Mar-06	8,139,116,076	(1,823,491,062)	6,315,625,014	1,414,829,338	(5,252,719,674)	(3,837,890,336)	70.37	51.22
28-Apr-06	11,676,812,614	(3,236,275,580)	8,440,537,034	1,927,180,168	(6,202,124,031)	(4,274,943,863)	70.37	57.50
31-May-06	17,101,267,975	(4,524,524,915)	12,576,743,060	2,782,321,098	(11,225,510,296)	(8,443,189,198)	70.37	48.72
30-Jun-06	20,229,114,833	(5,357,498,215)	14,871,616,618	3,222,527,838	(11,998,686,079)	(8,776,158,242)	66.67	47.37
31-Jul-06	28,568,081,397	(2,432,009,020)	26,136,072,377	1,198,034,025	(19,426,414,857)	(18,228,380,831)	62.96	56.76
31-Aug-06	28,812,493,335	(5,322,867,101)	23,489,626,234	1,762,963,323	(17,626,398,609)	(15,863,435,286)	62.96	69.44

II. The Strategy

Contract	NYMEX Contracts				ICE Contracts		Total	
	Futures	Options	Swaps (NN)	Swaps (NP)	ICE Swaps	ICE Off-Exchange		
Oct-06								
	FEQ	-64711	43523	-21703	-5307	-87625	41381	-94441
	Percent	24.49	16.47	8.21	2.01	33.16	15.66	100
Nov-06								
	FEQ	-336	6431	17451	-442	85597	-49453	59247
	Percent	0.21	4.03	10.93	0.28	53.60	30.96	100
Dec-06								
	FEQ	-7308	-2430	-8154	-449	28711	-38127	-27757
	Percent	8.58	2.85	9.57	0.53	33.71	44.76	100
Average	Percent	28.40	14.82	32.61	2.00	10.21	11.96	100

II. The Strategy

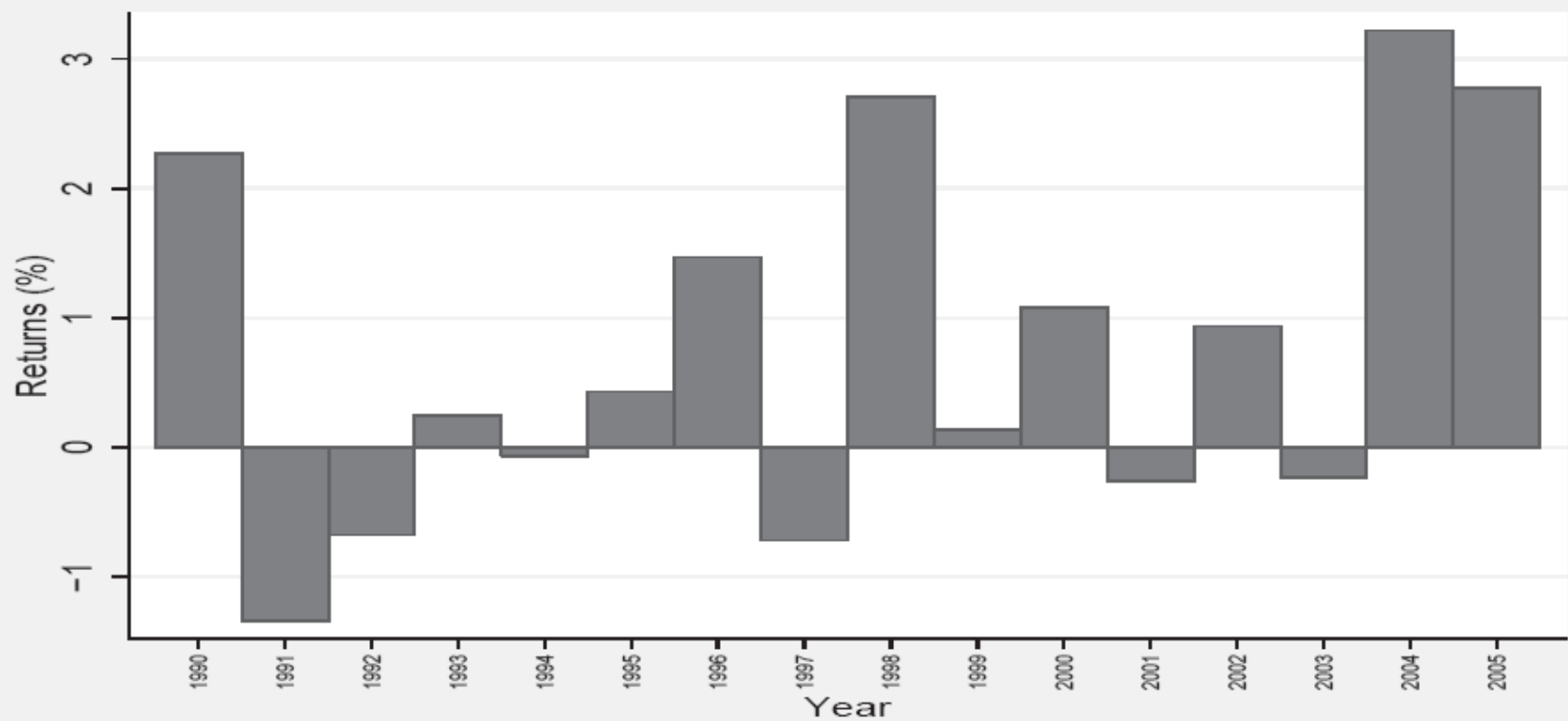
WHY DO IT?

- Compensation to speculators to natural hedgers, storage operators
- Backtest – works, but not quants
- Experience and Feeling

I think you should sell 15,000 red March April and buy 15,000 (or more) front Mar/Apr. My rationale is not that you should short the reds, just that you're moving risk...not increasing it. Leveraging it to the part of the curve that is undervalued and lightening up on the one that is perhaps fair value.²⁷—Amaranth Employee, Email to Brian Hunter, July 28, 2007 (Source: Senate Subcommittee, Exhibit #9)

II. The Strategy

Figure 6. Historical September Returns (1990-2006) from Positions Similar to Amaranth's Position on August 31, 2006



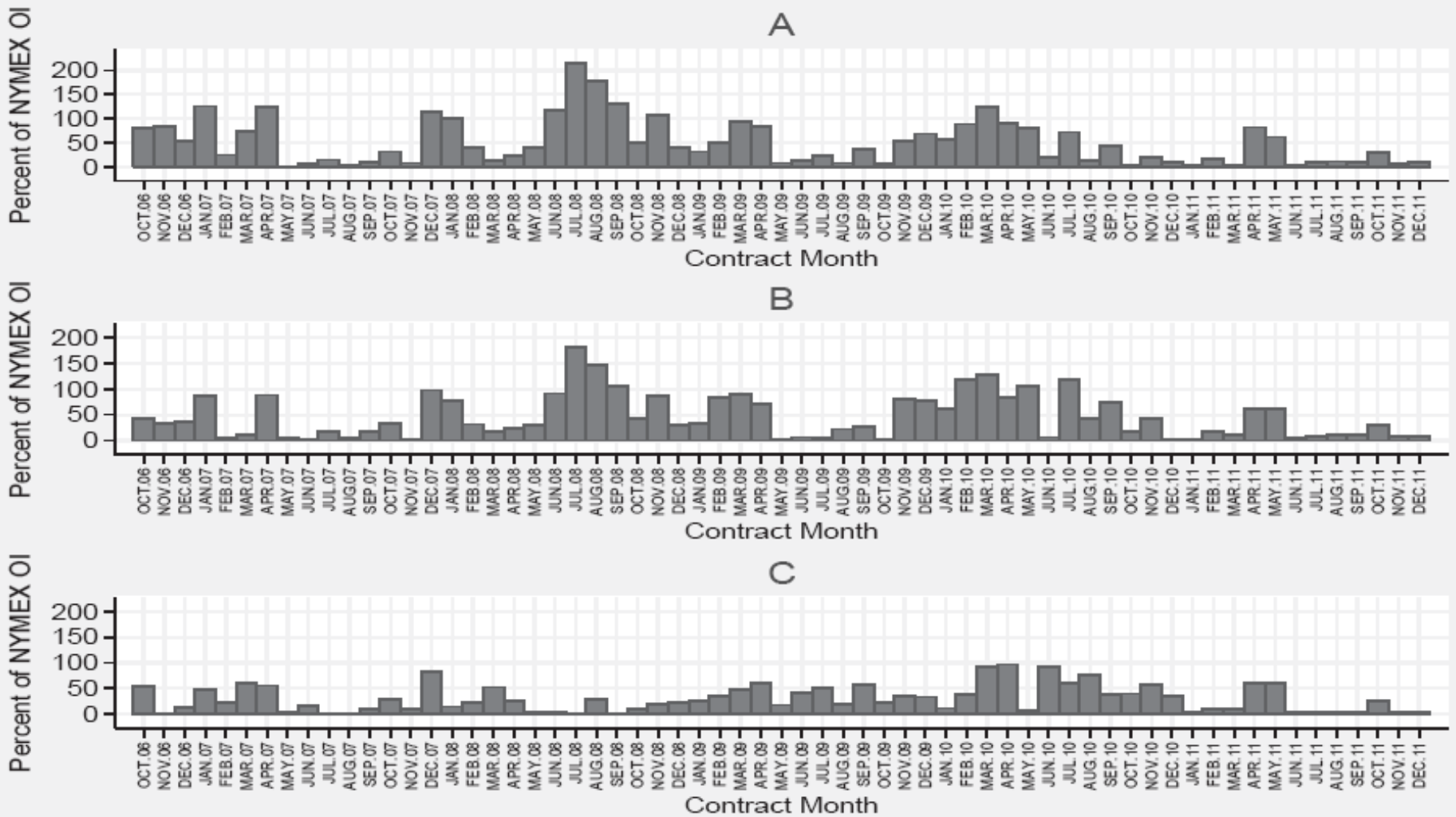
III. Risk Management

- Market Risk = VaR
- Liquidity Risk = Concentration in Market
- Management Risk = Hunter in Calgary

III. Risk Management

	Position Size	Confidence Interval			Worst	Actual ^a
		68%	99%	99.95%		
Method 1 (VaR)						
No Leverage ^b	\$10.228B	-65.83	-254.95	-391.53	-137.53	-629.97
Leverage	\$53.523B	-344.50	-1334.18	-2048.92	-719.71	-3295.50
Method 2 (Cornish-Fisher VaR)						
No Leverage	\$10.228B	-126.44	-246.31	-225.14	-137.53	-629.97
Leverage	\$53.523B	-661.67	-1288.97	-1178.16	-719.71	-3295.50
Method 3 (Recent Historical VaR)						
No Leverage	\$10.228B	-76.27	-224.43	-331.42	-137.53	-629.97
Leverage	\$53.523B	-399.12	-1174.44	-1734.37	-719.71	-3295.50

Figure 8. The Amaranth Positions as a Percentage of NYMEX Open Interest (August 31, 2006)



IV. Lessons

- (1) Liquidity Risk is a real risk.
- (2) Transparency across similar markets may be useful.
- (3) More standard measures of liquidity risk developed.
- (4) Internal Risk Management
- (5) Spread Positions are not “arbitrage positions”.

IV. Lessons

Overall, limited crisis.

- MBS, CDS market on exchange rather than OTC?
- Liquidity risk on roll over financing for “risky” positions – riskier than history suggests.
- Internal Risk – Lehman had \$72B of MBS and another \$10B of real-estate exposure and \$26B FRE/FNM with a \$6B capital base of \$26B and leverage of 24!

V. Thanks