

Equities Derivatives Strategy

**Speculators and Hedgers in  
Futures Markets**

## Introduction

- Following the money v.s. the market participants
- Price momentum, moving average, ...
- Focus on another part of the equation: market positions.
- CFTC COT report: Open interest, trading positions, number of traders in each of the trading categories - Commercials (hedgers), Non-commercials (larger speculators), and Others (small players)
- Three commodity futures: HO, HU, CL, and SP futures.
- Turnover rates, market share, empirical returns
- Compared with benchmarks, S&P 500 index and 90-day T-bills.

# Futures and Commodity Futures

- Derivative securities.
- Short maturity claim on real assets.
- Not for raise external resources for firms to invest
- Insurance for the future values of input (output)
- Hedgers pay the “premium” and speculators stays in the game if they can expect profit.
- Futures prices, bet on the expected future spot prices.
- Hedgers may be in best position to foresee supply/demand (insiders), who may predict futures price movement more accurately.
- Will observe how “premium” theory at work and at which condition the “insider” theory may effect.

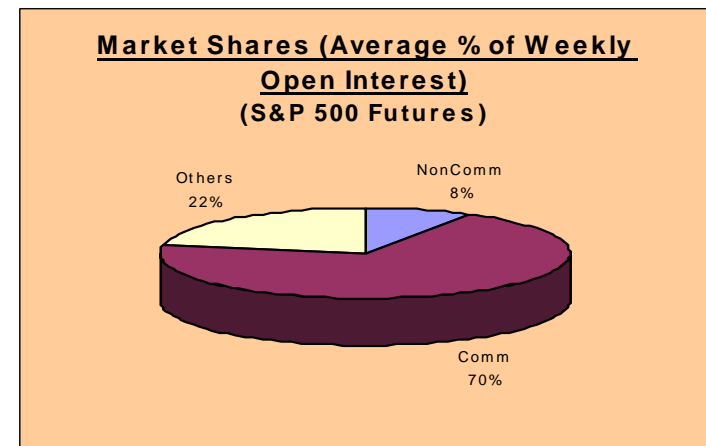
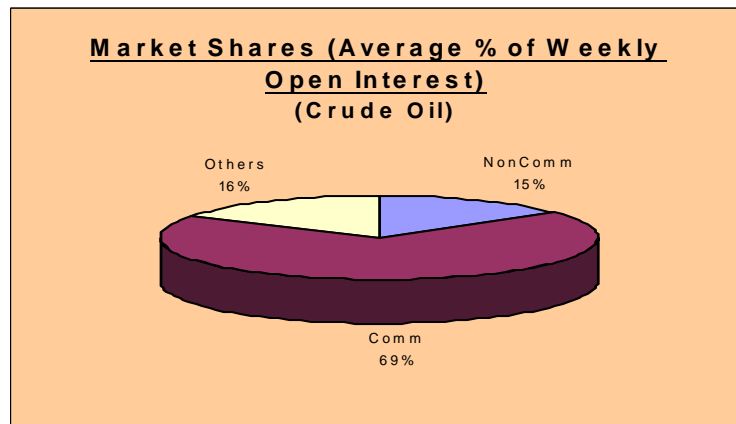
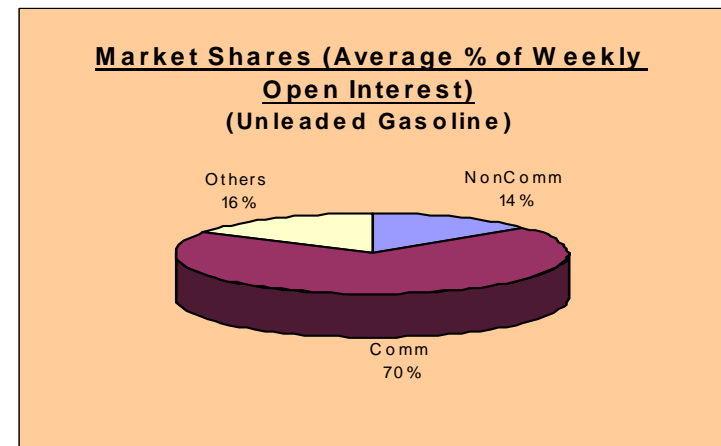
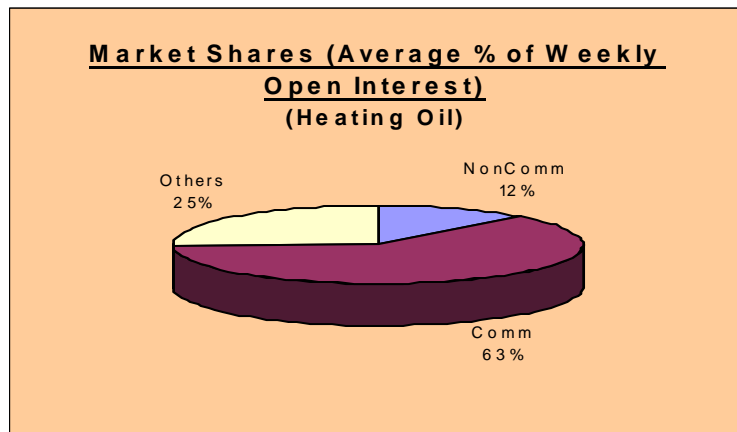
# Market Data

- CFTC started weekly COT report 9/1992
- Large traders and Commercials considered “reportable”, holding positions above reporting level set by CFTC
- COT report released each Friday afternoon at 3:30
- Position data compiled for the Tuesday in the same week
- Daily pricing data from Futures Industry Institute, 1986 ~ 2000
- Multiple contracts w/ different expirations exist concurrently.
- Only three nearest contracts are considered; Contracts further away from expiration are rather inactive. Not enough activities to trigger any action in strategic trading.

date	expiration1	expiration2	expiration3	ps-1	ps-2	ps-3
9/11/2000	2000-09	2000-12	2001-03	1491.8	1514	1537
9/5/2000	2000-09	2000-12	2001-03	1512.3	1535	1558.4
8/28/2000	2000-09	2000-12	2001-03	1518.8	1541.4	1565

# Market Shares

- Average weekly open interest



# Turnover Rates

- How often each trading category aggregately revises its positions.
- Conventional wisdom: shorter durations for speculative trades
- Weekly turnover rate per trader
- Non-commercials change positions twice as often as Commercials.

Turnover (NonComm) Test (H0: Short/Long position's TOs are the same)		
Mean(L)	Mean(S)	
10.59%	11.82%	
F-test	t-test	
0.0054%	2.9044%	
Turnover (Comm) Test (H0: Short/Long position's TOs are the same)		
Mean(L)	Mean(S)	
5.87%	5.43%	
F-test	t-test	
0.0097%	8.0237%	
<b>Heating Oil</b>		
<b>Sep 1992 ~ Dec 2004</b>		

Turnover (NonComm) Test (H0: Short/Long position's TOs are the same)		
Mean(L)	Mean(S)	
12.10%	14.36%	
F-test	t-test	
0.0000%	0.0669%	
Turnover (Comm) Test (H0: Short/Long position's TOs are the same)		
Mean(L)	Mean(S)	
7.15%	5.62%	
F-test	t-test	
0.0000%	0.0000%	
<b>Unleaded Gas</b>		
<b>Sep 1992 ~ Dec 2004</b>		

Turnover (NonComm) Test (H0: Short/Long position's TOs are the same)		
Mean(L)	Mean(S)	
7.93%	8.57%	
F-test	t-test	
0.0000%	12.4157%	
Turnover (Comm) Test (H0: Short/Long position's TOs are the same)		
Mean(L)	Mean(S)	
4.50%	4.69%	
F-test	t-test	
77.9336%	34.9162%	
<b>Crude Oil</b>		
<b>Sep 1992 ~ Dec 2004</b>		

Turnover (NonComm) Test (H0: Short/Long position's TOs are the same)		
Mean(L)	Mean(S)	
10.44%	9.57%	
F-test	t-test	
0.2229%	9.6771%	
Turnover (Comm) Test (H0: Short/Long position's TOs are the same)		
Mean(L)	Mean(S)	
3.21%	3.86%	
F-test	t-test	
0.5419%	0.0531%	
<b>S&amp;P 500 Futures</b>		
<b>Sep 1992 ~ Dec 2004</b>		

# Strategy Formulation

- Regardless futures and spot prices, trading decision made solely on position movement
- Net position of a specific trading category is tracked
- Large position changes tracked, may be indicative of trend reversal or turning point
- Small fluctuation of position shift ignored
- Commodity Commercials average in net short; S&P 500 futures in net long
- Normalization factor: rather arbitrary factor to scale the long/short positions so that a trading action takes place in proportion to the amount of net position movement.
- Percentage P/L be the same for a trading strategy regardless how the trading amount is scaled.

Average Net Position: (HO - Sep 1992 ~ Oct 2000)			
	NonCom	Comm	Other
Mean	3,246	-17,991	14,745
Stdev	9,512	13,673	6,770
Norm Fac	31,780	59,010	35,055

Average Net Position: (HU - Sep 1992 ~ Oct 2000)			
	NonCom	Comm	Other
Mean	5,613	-7,897	2,284
Stdev	7,726	10,741	4,192
Norm Fac	28,790	40,119	14,859

Average Net Position: (CI - Sep 1992 ~ Oct 2000)			
	NonCom	Comm	Other
Mean	9,802	-10,946	1,144
Stdev	26,836	37,223	12,789
Norm Fac	90,309	122,614	39,510

Average Net Position: (SP Sep 1992 ~ Sep 2000)			
	NonCom	Comm	Other
Mean	-12,892	12,279	613
Stdev	8,909	16,492	9,282
Norm Fac	39,620	61,753	28,458

## Strategy Formulation, Cont'

- COT report released on Friday
- A strategic trade takes place the next trading day (usually the next Monday)) based on the aggregated position of the concerned category on the previous Tuesday
- There is about a week lag (Tuesday to Monday).
- More confidence with strategies tracking and following positions of a category with less turnover rate – the Commercials
- Not hold commodity futures to expiration: less liquid market close to expiration; intense speculative activities near expiration obscure the strategic significance of observed market positions.
- For each “follow” strategy, there is an “against” strategy that does exactly the opposite - profit/loss inversed.
- Not necessary to formulate strategies for “Others” segment
- A “unit”: sum of up to three currently active and nearest contracts, each with different expiration date.

# Commodity Portfolios

- Buy/sell one “unit” each week and hold it until 1-month to expiration, when the category is in net long or short position beyond statistical significance
- Buy/sell one “unit” each week and hold it until two months to expiration
- Buy or sell zero to 10 “units” each week and hold them until one month to expiration. The number of “units” is proportional to the net long or short position of that category
- Buy or sell zero to 10 “units” each week and hold them until two months to expiration. The number of “units” is proportional to the net long or short position of that

## Portfolios for S&P 500 Futures Market

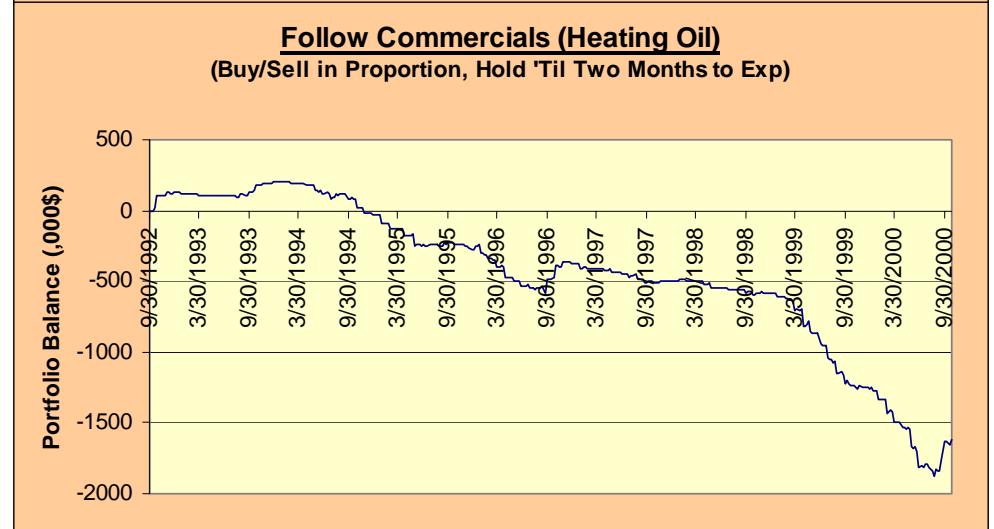
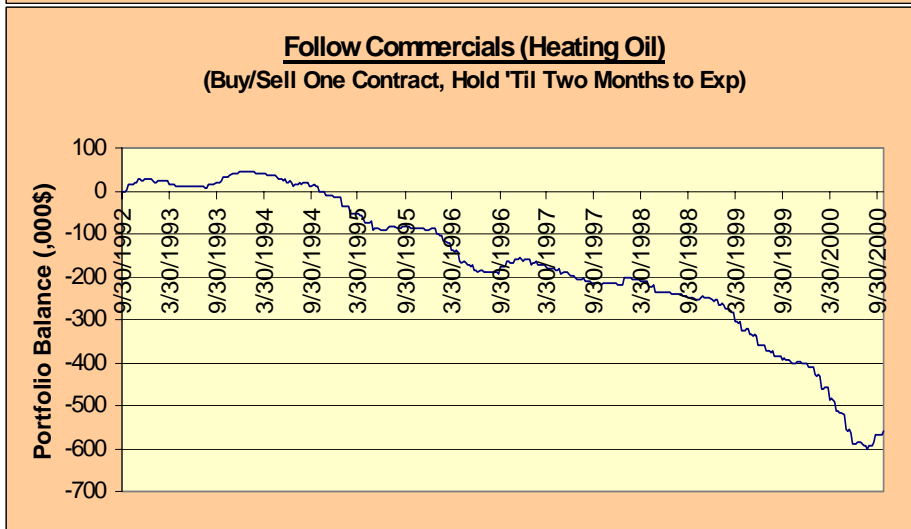
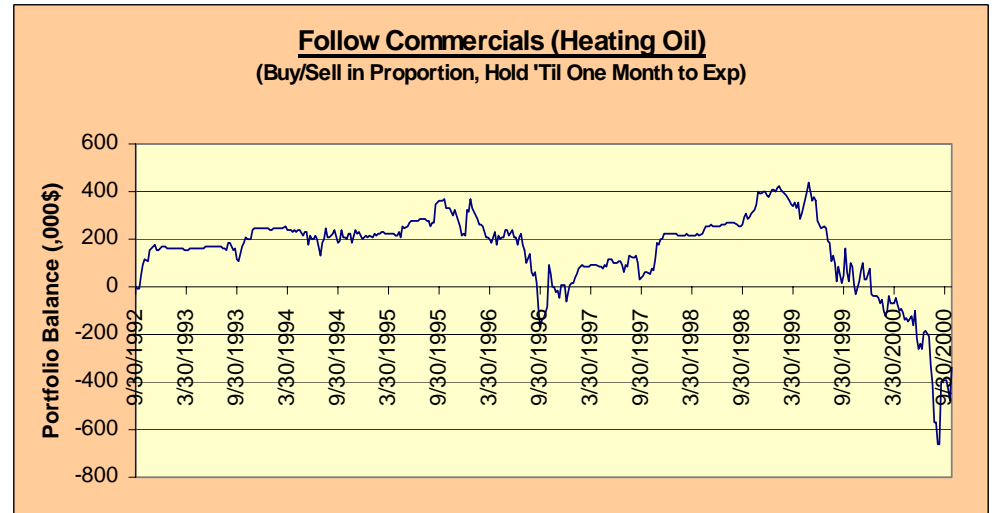
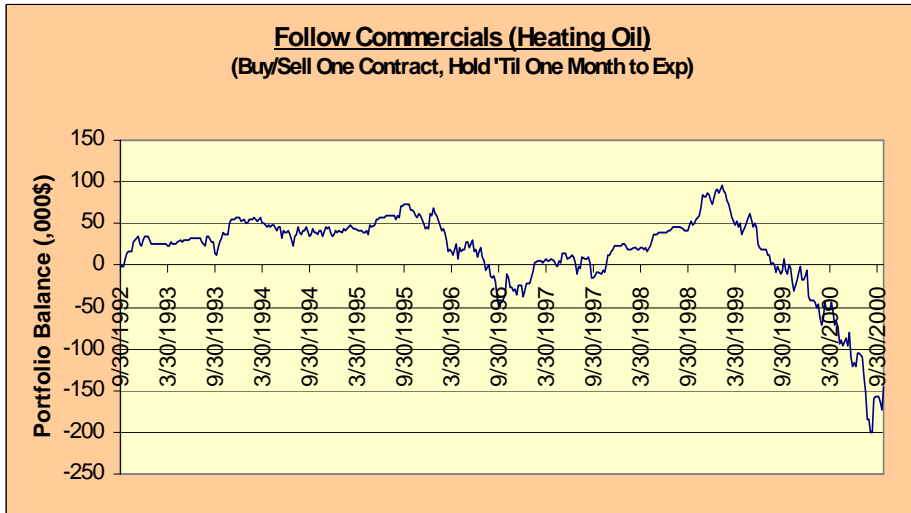
- Buy or sell one “unit” each week, held to expiration.
- Buy or sell one “unit” each week, held until three months to expiration.
- Buy or sell one “unit” each week, held until six months to expiration.
- Buy or sell zero to 10 “units” each week, held to expiration.
- Buy or sell zero to 10 “units” each week, held until three months to expiration.
- Buy or sell zero to 10 “units” each week, held until six months to expiration.

# Empirical Assessment on Portfolio Performance (1992 ~ 2000)

- Portfolio balance is initially zero
- Week 1: long/short 0~10 “units”, following or going against a specific trading category based on the rule of the strategy
- Week 2: long/short 0~10 “units”; settle contracts based on the rule, add/subtract P/L; update portfolio balance based on the current prices of the contracts still in the portfolio
- Repeat in week 3, ... ..
- Assume no margin requirement and proceeds earn no interest.
- Will consider interest effect when discuss return rate and risk.

# Portfolio Performance Assessment (Heating Oil Futures)

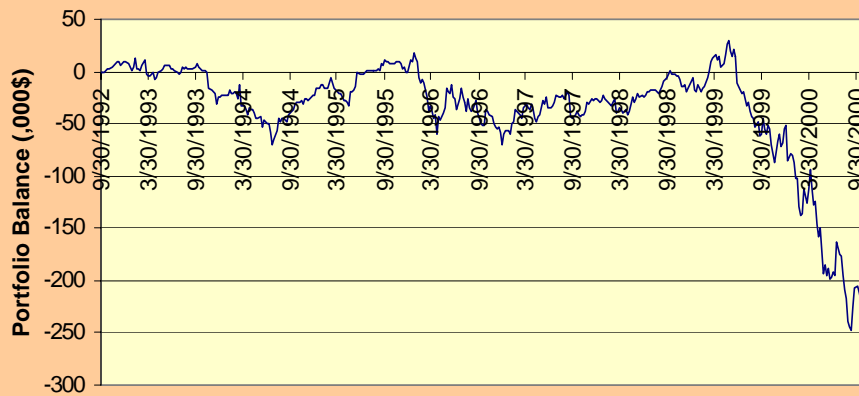
## Following the Commercials



# Portfolio Performance Assessment (Unleaded Gas Futures) Following the Commercials

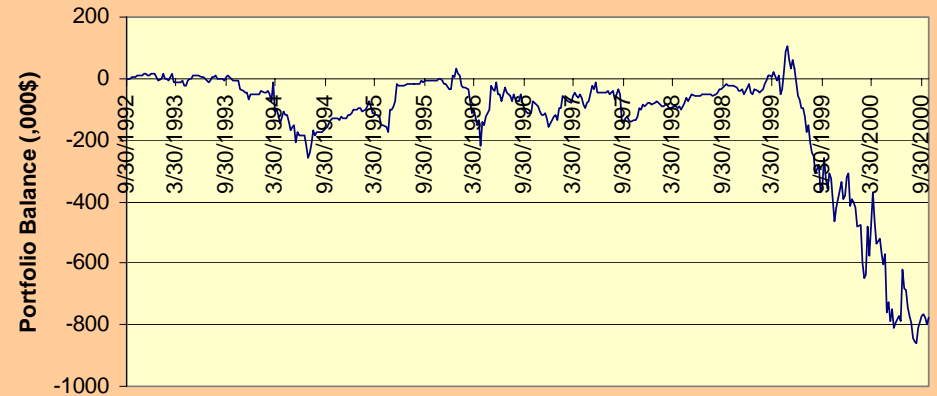
## Follow Commercials (Unleaded Gas)

(Buy/Sell One Contract, Hold 'Til One Month to Exp)



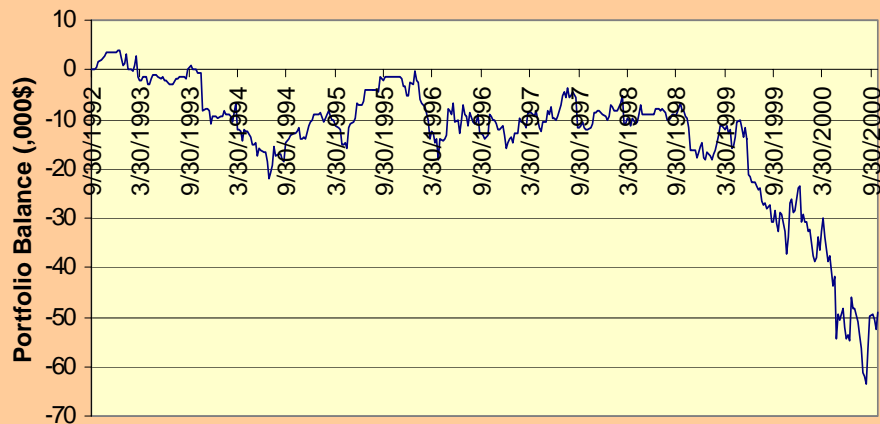
## Follow Commercials (Unleaded Gas)

(Buy/Sell in Proportion, Hold 'Til One Month to Exp)



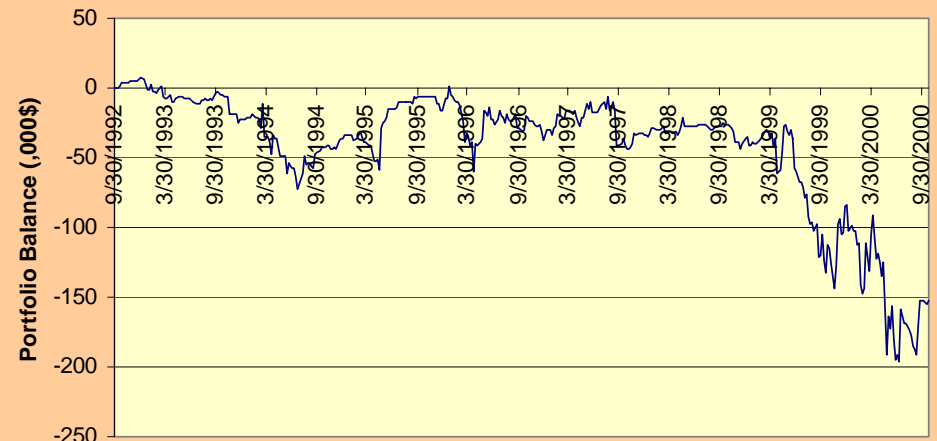
## Follow Commercials (Unleaded Gas)

(Buy/Sell One Contract, Hold 'Til Two Months to Exp)



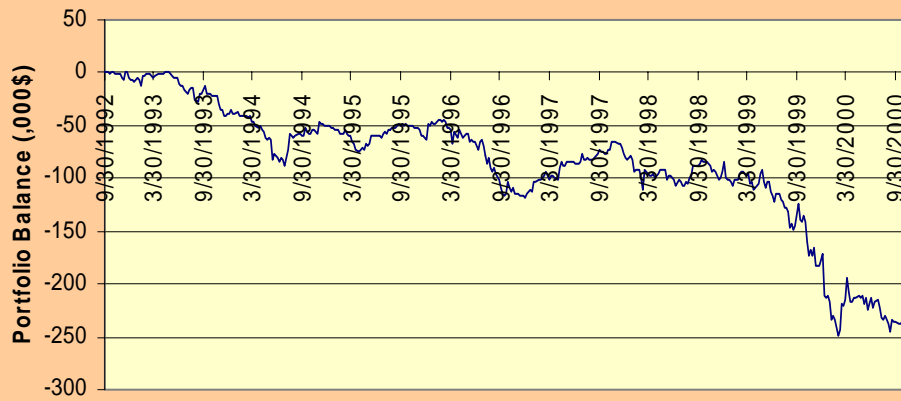
## Follow Commercials (Unleaded Gas)

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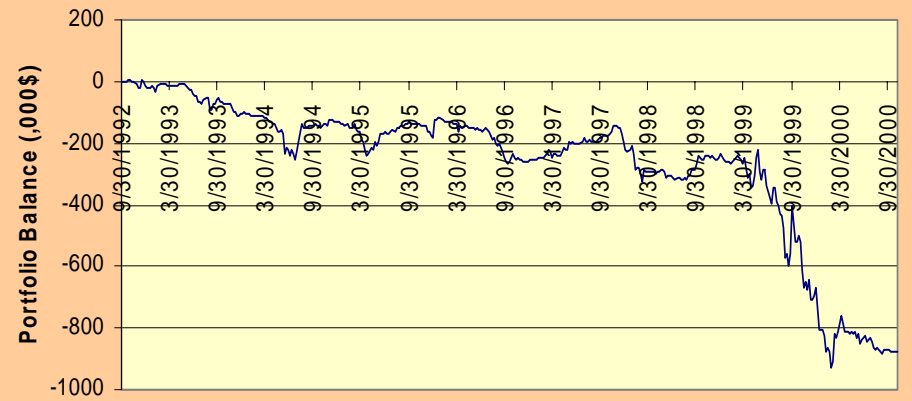


# Portfolio Performance Assessment (Crude Oil Futures) Following the Commercials

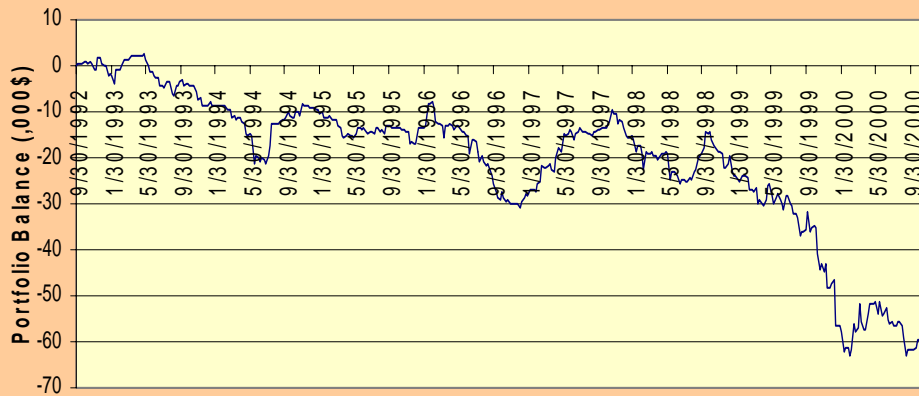
**Follow Commercials (Crude Oil)**  
(Buy/Sell One Contract, Hold 'Til One Month to Exp)



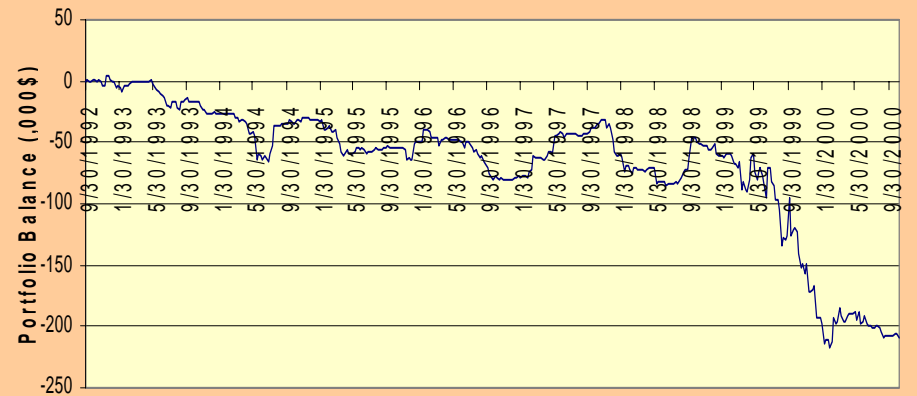
**Follow Commercials (Crude Oil)**  
(Buy/Sell in Proportion, Hold 'Til One Month to Exp)



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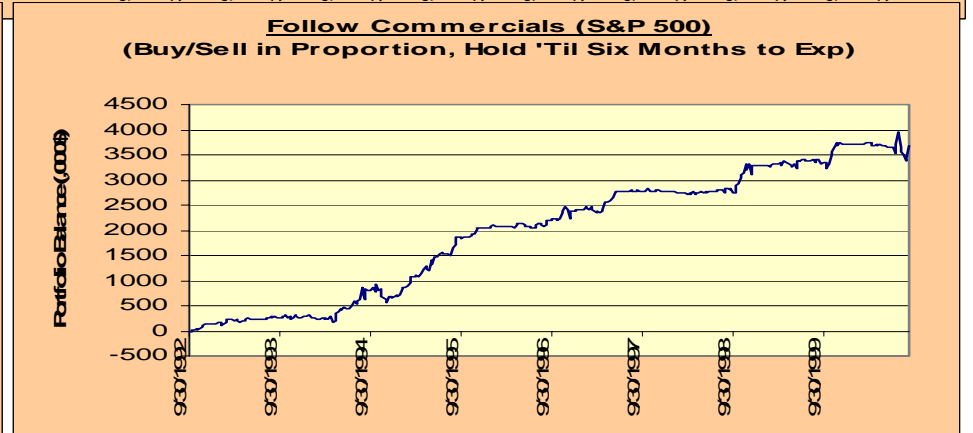
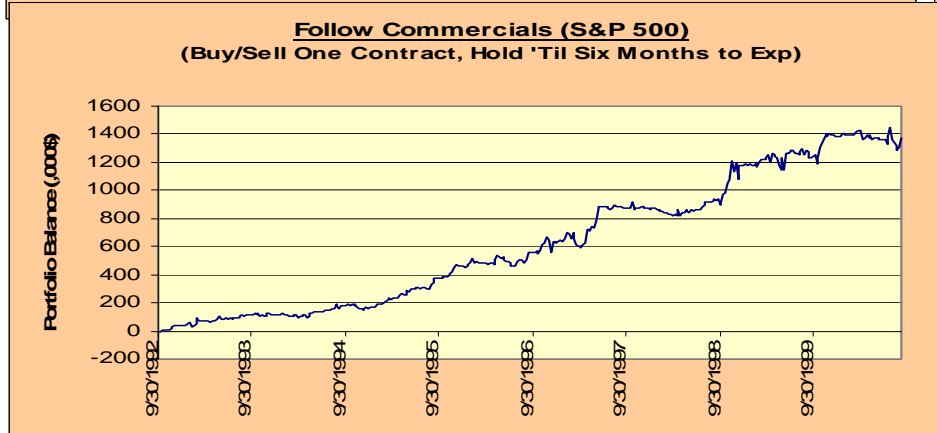
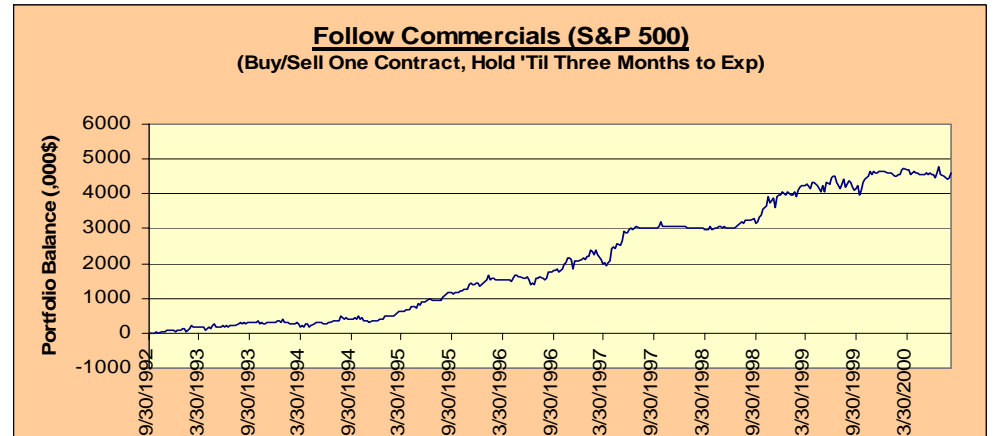
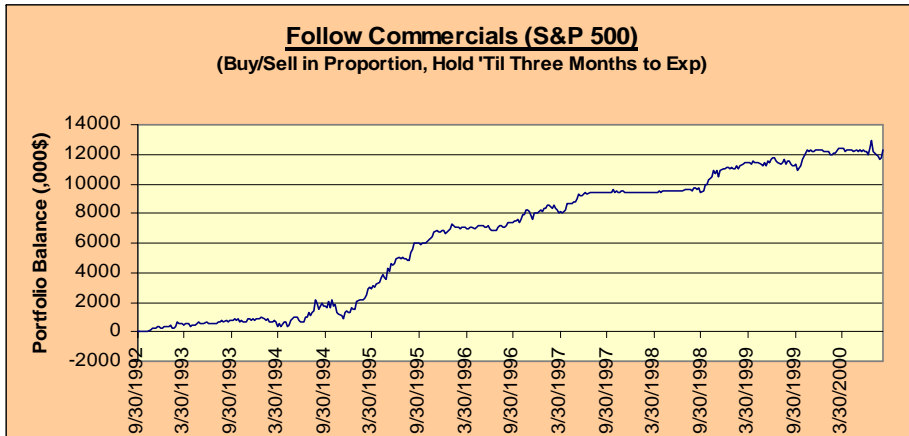
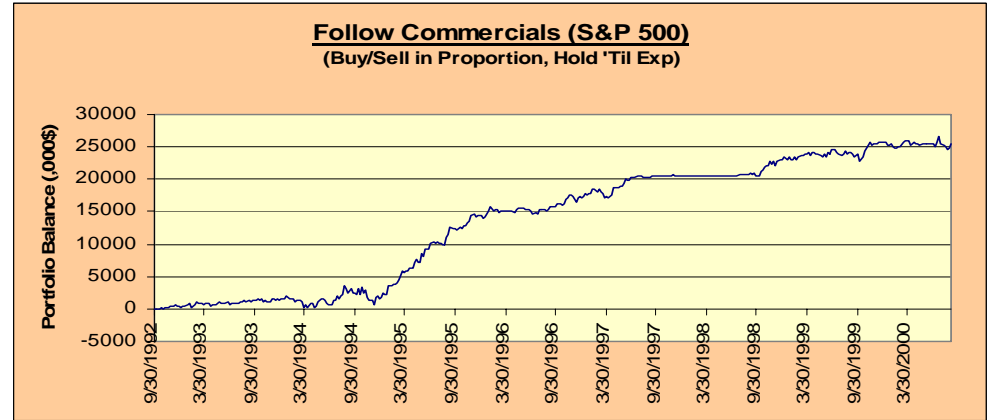
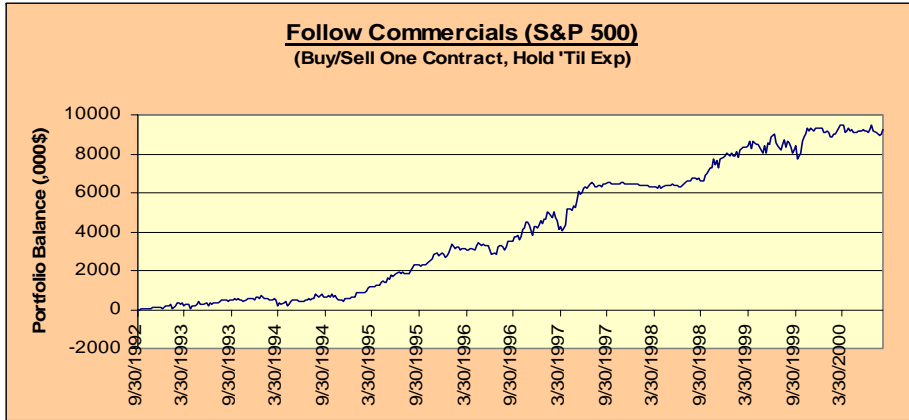


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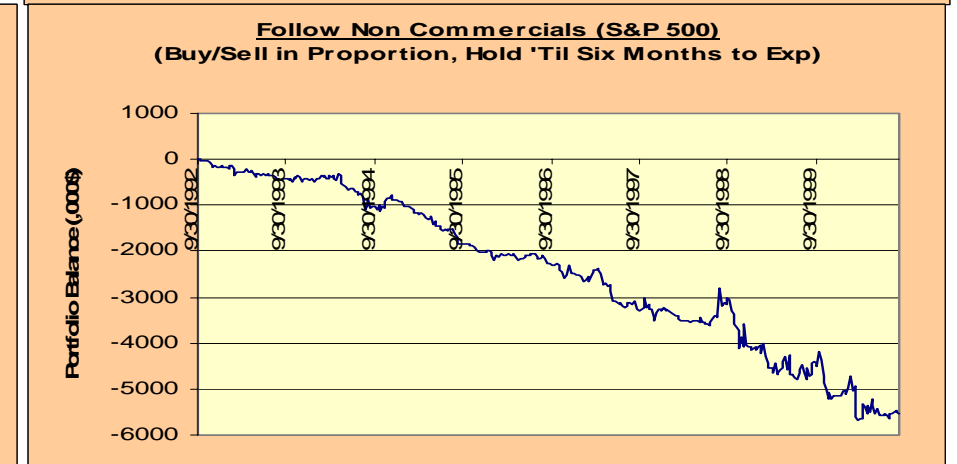
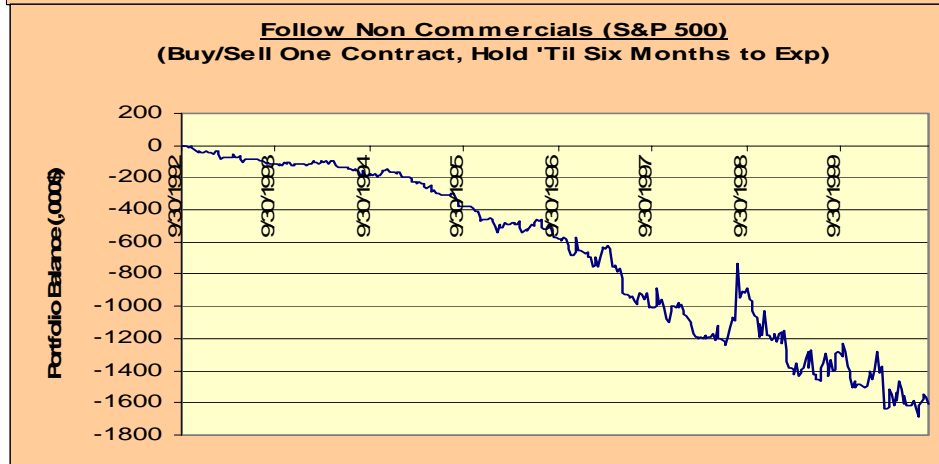
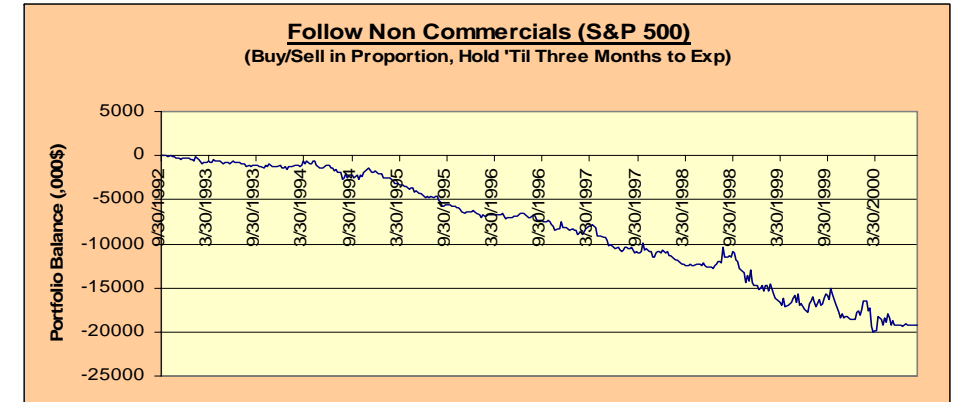
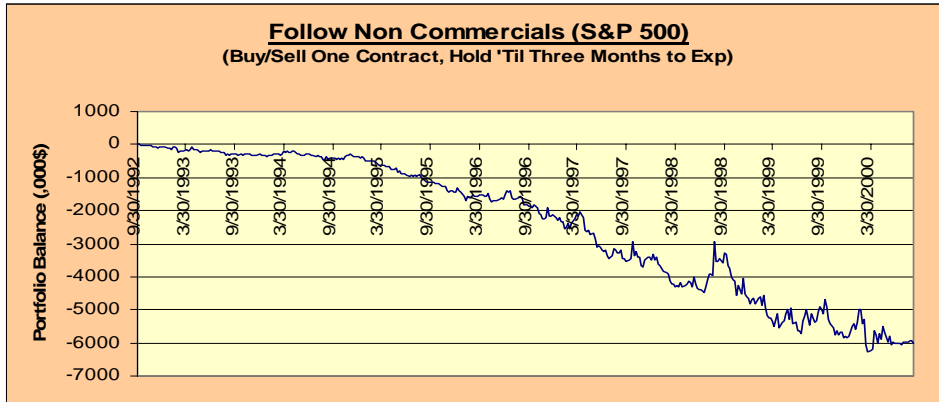
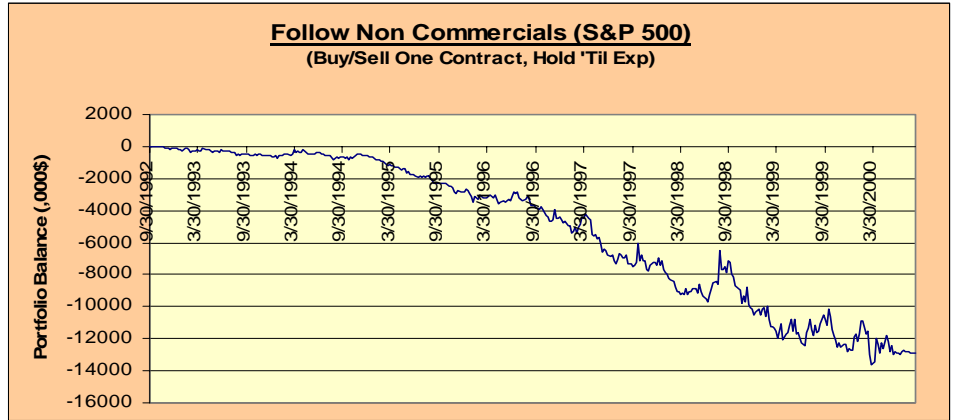
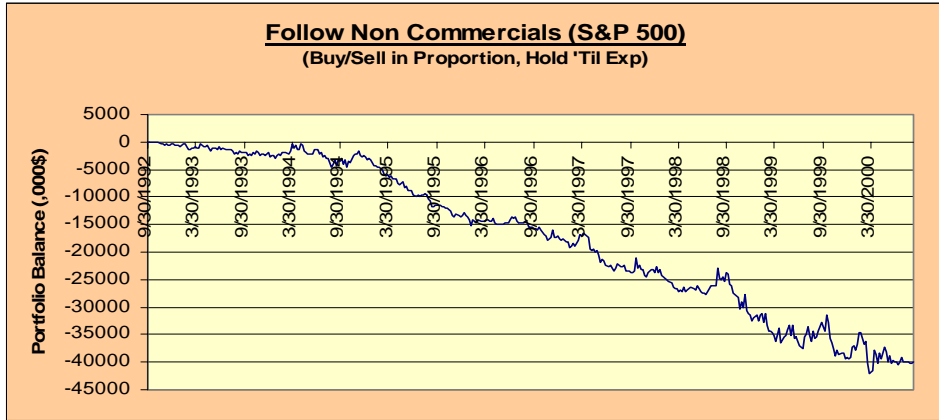


# Portfolio Performance Assessment (S&P 500 Futures)

## Following the Commercials



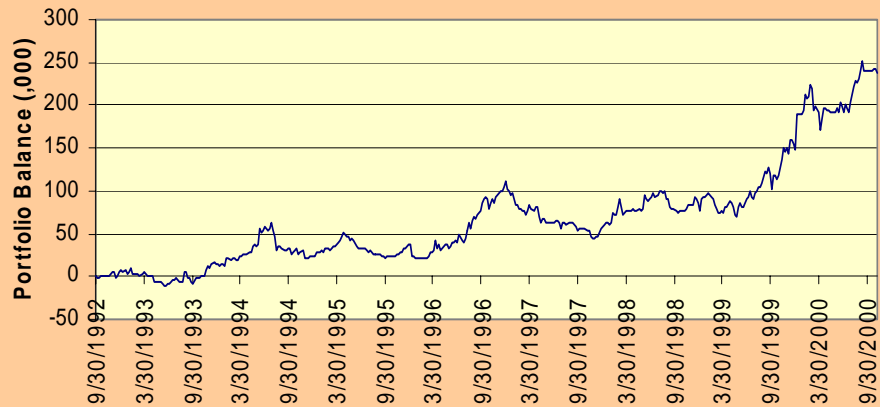
# Portfolio Performance Assessment (S&P 500 Futures) Following the Non-Commercials



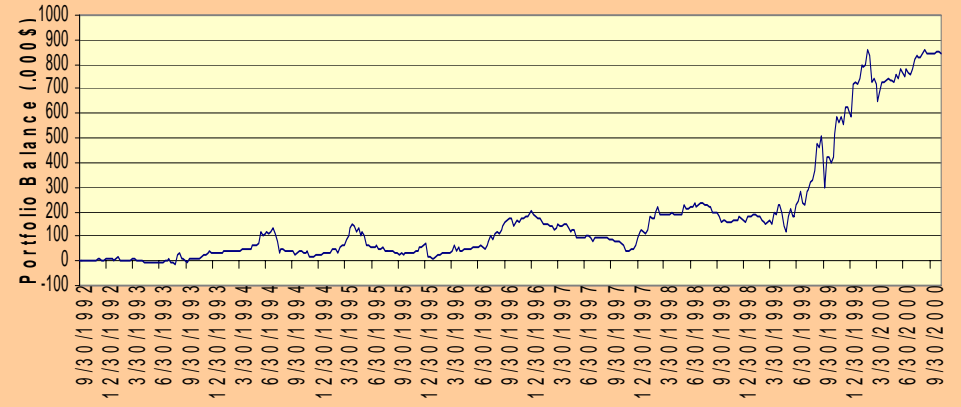
# Portfolio Performance Assessment (Crude Oil Futures)

## Following the Non-Commercials

**Follow Non Commercials (Crude Oil)**  
(Buy/Sell One Contract, Hold 'Til One Month to Exp)



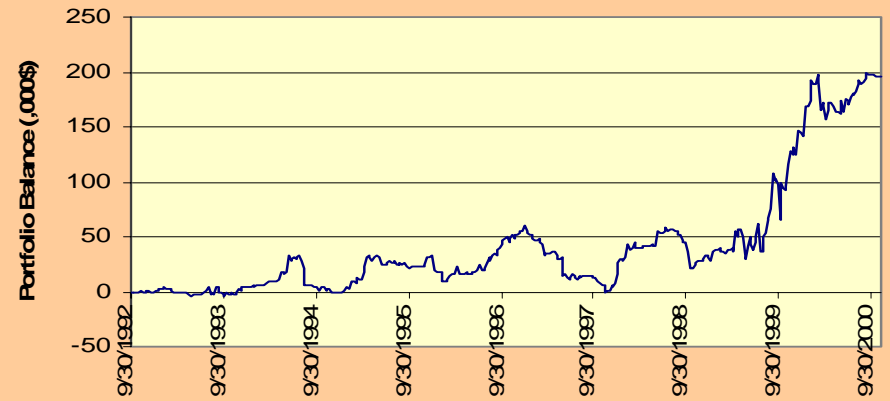
**Follow Non Commercials (Crude Oil)**  
(Buy/Sell in Proportion, Hold 'Til One Month to Exp)



**Follow Non Commercials (Crude Oil)**  
(Buy/Sell One Contract, Hold 'Til Two Months to Exp)



**Follow Non Commercials (Crude Oil)**  
(Buy/Sell in Proportion, Hold 'Til Two Months to Exp)

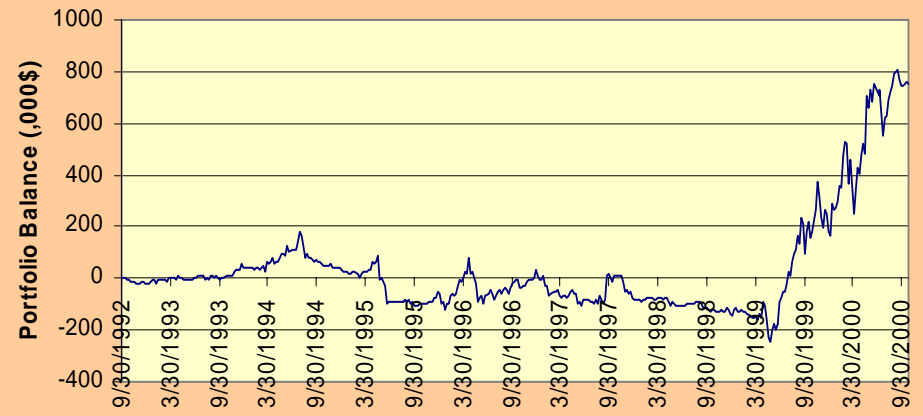


# Portfolio Performance Assessment (Unleaded Gas Futures) Following the Non-Commercials

**Follow Non Commercials (Unleaded Gas)**  
(Buy/Sell One Contract, Hold 'Til One Month to Exp)



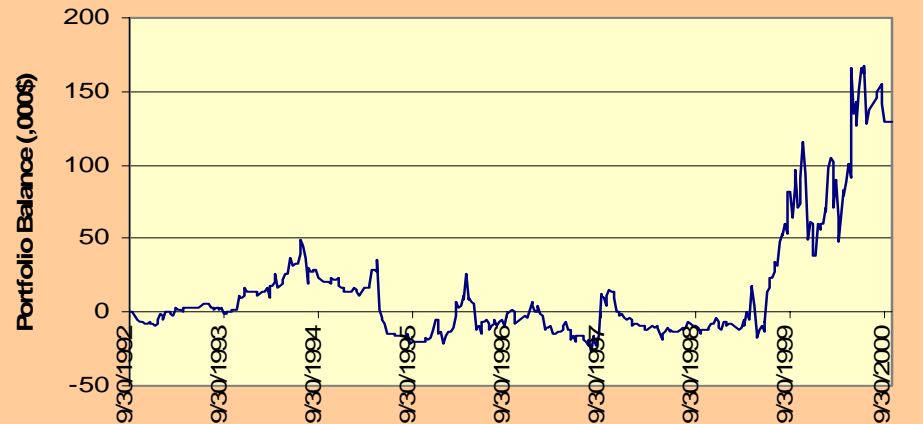
**Follow Non Commercials (Unleaded Gas)**  
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**Follow Non Commercials (Unleaded Gas)**  
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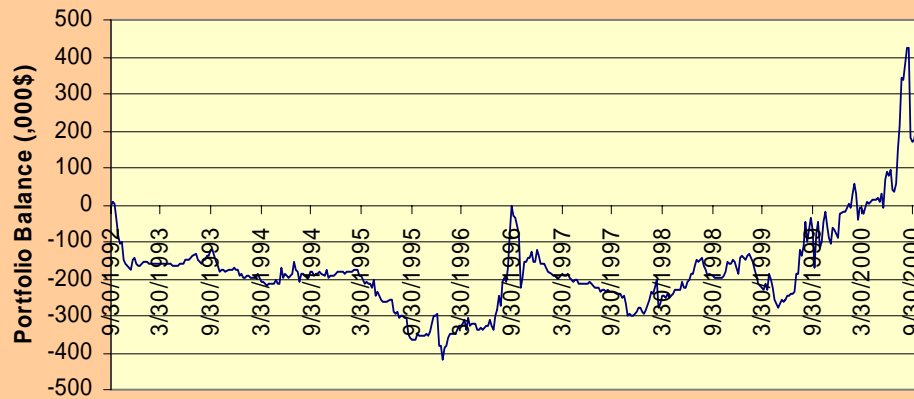
**Follow Non Commercials (Unleaded Gas)**  
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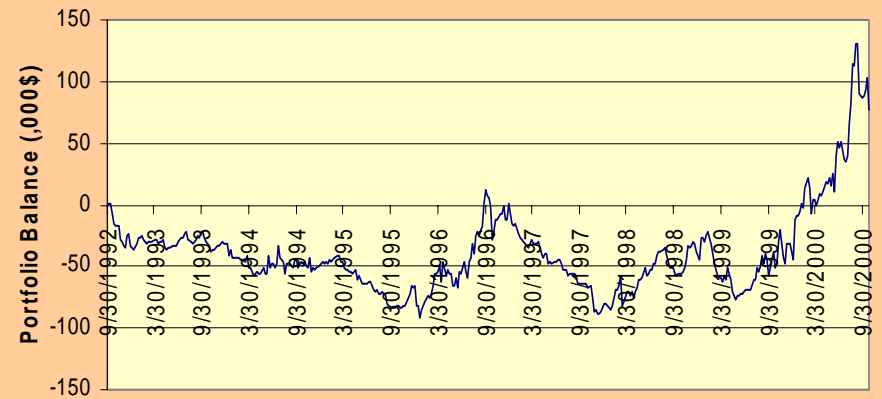
# Portfolio Performance Assessment (Heating Oil Futures)

## Following the Non-Commercials

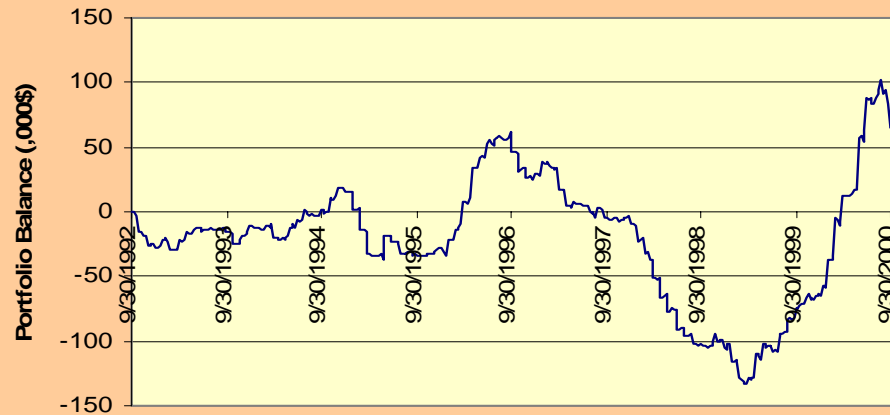
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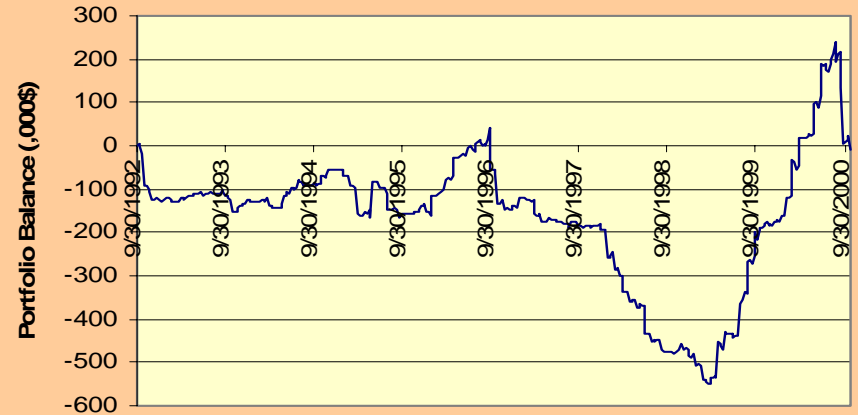
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**Follow Non Commercials (Heating Oil)**  
(Buy/Sell in Proportion, Hold 'Til Two Months to Exp)



## Portfolio Performance Assessment: Observations

- Commodity portfolios following Commercials tend to lose consistently and significantly over time
- Consistent with the theory that the risk taker gets insurance premium
- S&P 500 futures portfolios following Commercials tend to profit consistently and significantly over time
- S&P 500 futures portfolios following Non-commercials have larger fluctuations but lose consistently
- The “insurance” theory does not work as expected.
- “Insider” hypothesis seems to offer explanation: large institutional hedgers often major stockholders in S&P 500, presumably more knowledgeable than (small) speculators (or “uninformed” public)
- Could be luck: Commercials average net long from 1992~2000, a bull market
- Portfolios following Commercials and settle early (two months prior to exp) generate the most consistent and significant losses (equivalently, trading against Comm and settling early earns the most consistent profit)
- Indicate avoiding intensive speculative activities near expiration pays off, especially when the position information used for trading is about a week old.

## Returns and Risks

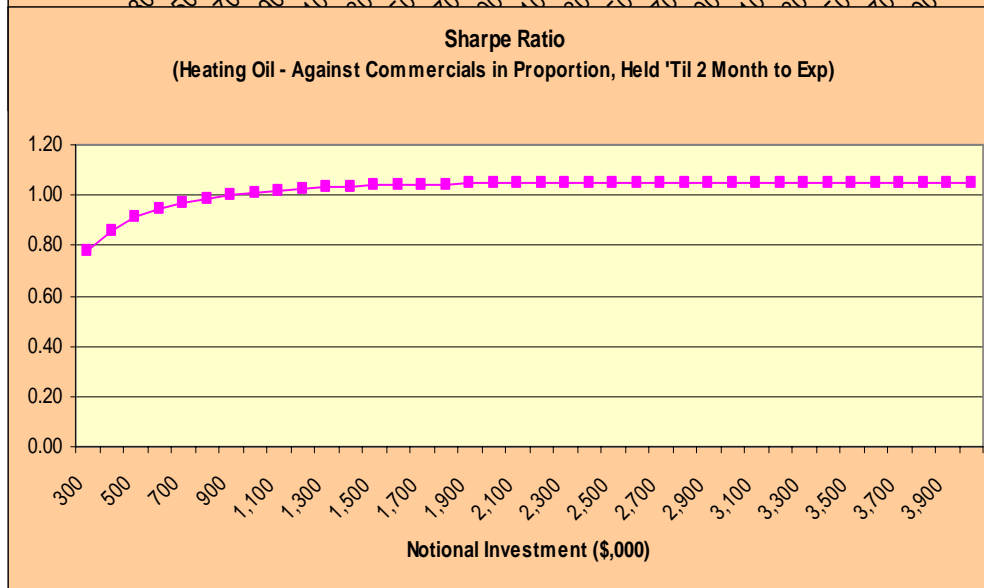
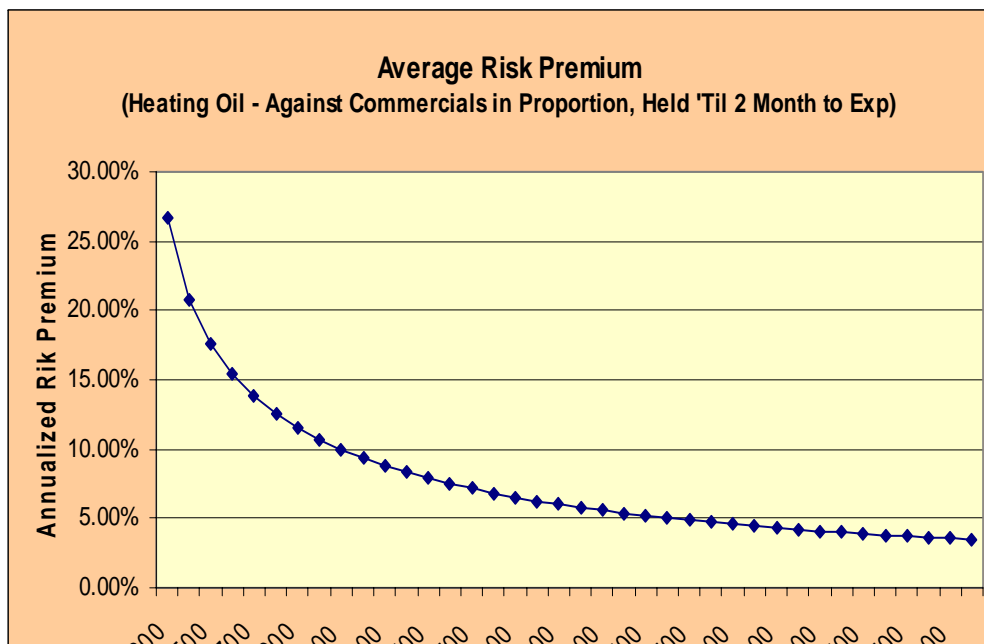
- Zero cash outlay at futures origination (zero-investment strategies)
- In practice, both short/long post collaterals to settle P/L
- Leverage is typically 10 to 1
- Margin not investment in underlying asset
- To compute return payoff divided by a notional value
- Often using initial cost of underlying assets as a base
- The return can be made large or small, but the ratio of return and stdev is about constant

Sharpe Ratio:

- $S.R. = D/\sigma_D$ , where  $D = \sum D_t / T$  and  $\sigma_D = [\sum (D_t - D)^2 / (T-1)]^{1/2}$   
 $D_t$  is defined as the differential return against a benchmark portfolio in period t:  
 $D_t = R_t - R_b$ , where  $R_t$  is the return on the portfolio in period t and  $R_b$  is typically the risk-free rate.

## Sharpe Ratios on Selected Portfolios (Trade against Heating Oil Commercials, Settle Early)

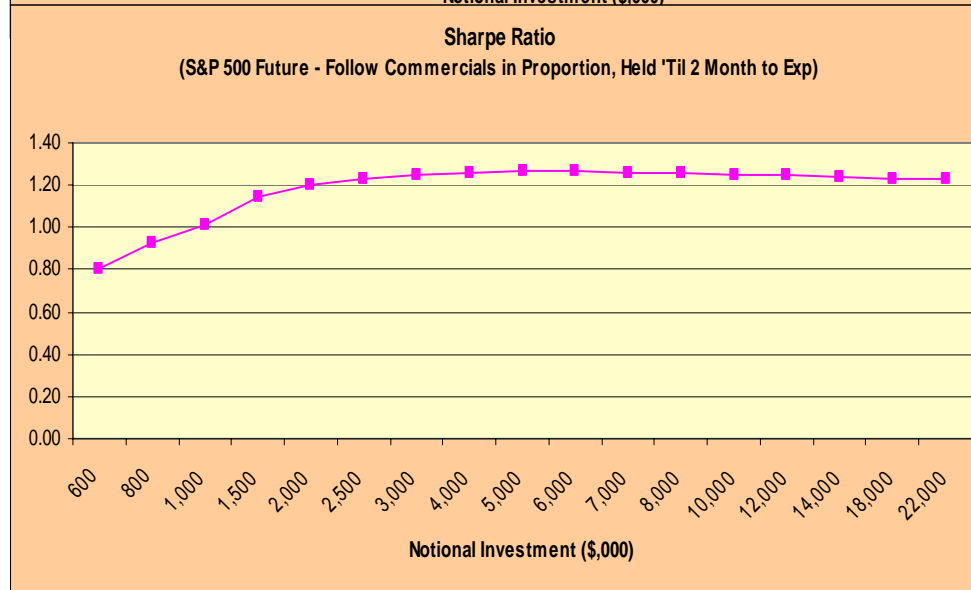
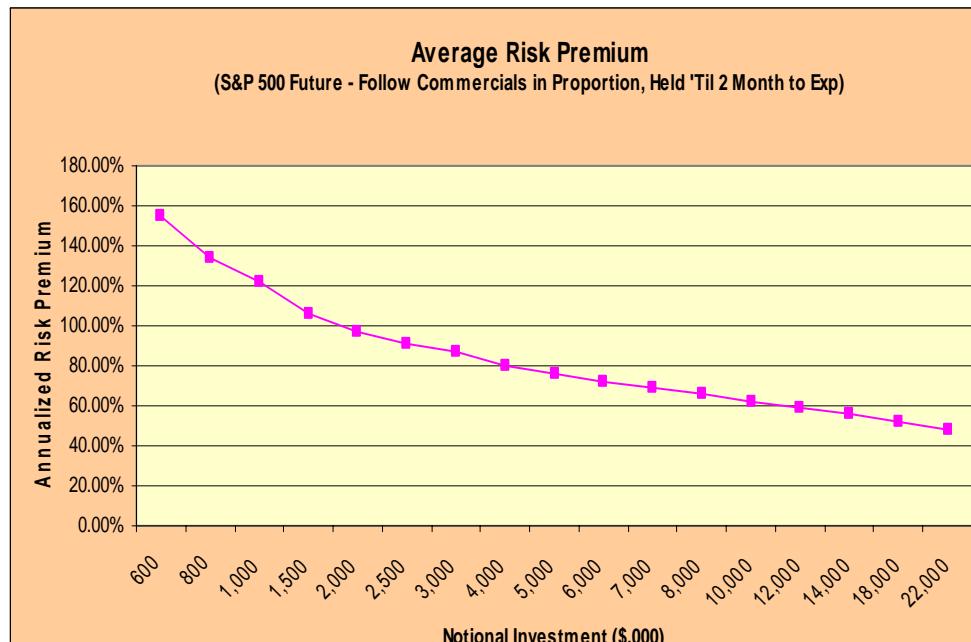
Notional Investment (\$,000)	R - Rf	Stdev	S.R.
300	26.75%	34.32%	0.78
400	20.76%	24.14%	0.86
500	17.60%	19.31%	0.91
600	15.46%	16.34%	0.95
700	13.87%	14.29%	0.97
800	12.61%	12.76%	0.99
900	11.58%	11.56%	1.00
1,000	10.73%	10.60%	1.01
1,100	10.00%	9.80%	1.02
1,200	9.37%	9.13%	1.03
1,300	8.81%	8.55%	1.03
1,400	8.33%	8.04%	1.04
1,500	7.89%	7.60%	1.04
1,600	7.50%	7.21%	1.04
1,700	7.15%	6.86%	1.04
1,800	6.83%	6.54%	1.04
1,900	6.54%	6.25%	1.05
2,000	6.27%	5.99%	1.05
2,100	6.03%	5.75%	1.05
2,200	5.80%	5.53%	1.05
2,300	5.59%	5.33%	1.05
2,400	5.39%	5.14%	1.05
2,500	5.21%	4.97%	1.05
2,600	5.04%	4.81%	1.05
2,700	4.88%	4.65%	1.05
2,800	4.73%	4.51%	1.05
2,900	4.59%	4.38%	1.05
3,000	4.46%	4.25%	1.05
3,100	4.34%	4.13%	1.05
3,200	4.22%	4.02%	1.05
3,300	4.11%	3.92%	1.05
3,400	4.00%	3.82%	1.05
3,500	3.90%	3.72%	1.05
3,600	3.81%	3.63%	1.05
3,700	3.72%	3.55%	1.05
3,800	3.63%	3.46%	1.05
3,900	3.55%	3.39%	1.05
4,000	3.47%	3.31%	1.05



## Sharpe Ratios on Selected Portfolios

### (Following S&P 500 Futures Commercials, Settle Early)

Notional Investment (\$,000)	R - Rf	Stdev	S.R.
600	154.58%	193.21%	0.80
800	133.88%	145.07%	0.92
1,000	122.03%	120.51%	1.01
1,500	105.97%	92.67%	1.14
2,000	97.15%	80.68%	1.20
2,500	91.21%	73.89%	1.23
3,000	86.75%	69.40%	1.25
4,000	80.26%	63.57%	1.26
5,000	75.55%	59.73%	1.27
6,000	71.87%	56.87%	1.26
7,000	68.84%	54.59%	1.26
8,000	66.27%	52.68%	1.26
10,000	62.09%	49.62%	1.25
12,000	58.75%	47.17%	1.25
14,000	55.98%	45.14%	1.24
18,000	51.56%	41.85%	1.23
22,000	48.12%	39.25%	1.23



# Portfolio Evaluation w/ CAMP Model

- Fama and French three-factor model requires size factor and book-to-market factor
- Single factor model CAMP wide used for portfolio evaluations
- Issue: return rates scaled up/down inversely with notional values used
- Assuming each week positions exactly collateralized with matching investment in T-bills, may generate a single weekly return rate
- Issue: at times a portfolio contains no outstanding positions; large amount of accumulated P/L as the result of frequent settlements obscure the base used to fully leverage the positions.
- Experimented with return rates at different levels of notional investment and the regressions results are similar

# Portfolio Evaluation w/ CAPM Model, Cont'

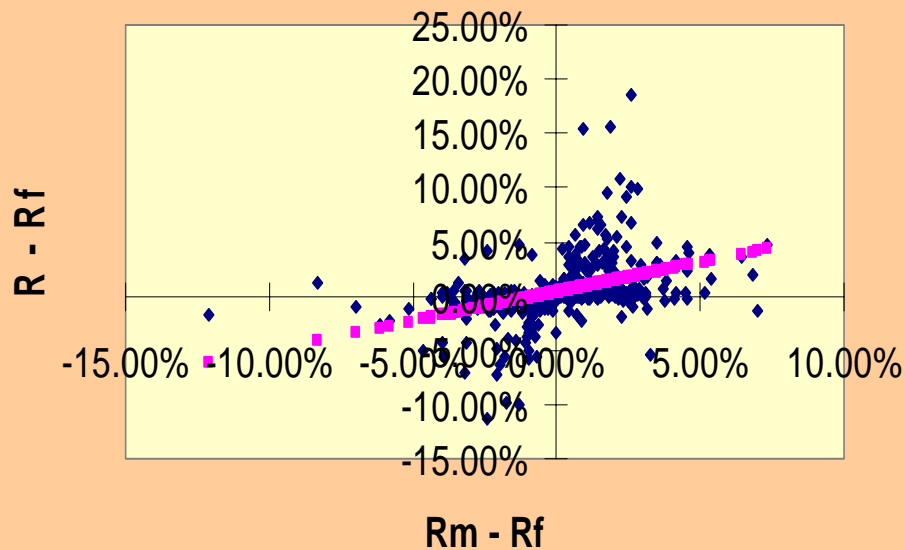
Category	Notional Investment	R - Rf = alpha + beta*(Rm - Rf) + e			Correlation to S&P 500 Index
		R-Squared	Alpha (p-value)	Beta (p-value)	
Heating Oil Futures *	\$3M	0.002	4.3% (0.004)	0.0128 (0.338)	0.047
	\$100M	0.003	0.1% (0.008)	0.0006 (0.238)	0.0576
S&P 500 Futures **	\$3M	0.083	69.4% (0.0036)	1.28 (0.000)	0.288
	\$100M	0.167	18.3% (0.007)	0.54 (0.000)	0.408

\* Trade heating oil futures against "Commercials" in proportion, held 'til 2 months to expiration

\*\* Trade S&P 500 futures following "Commercials" in proportion, held 'til 6 month to expiration

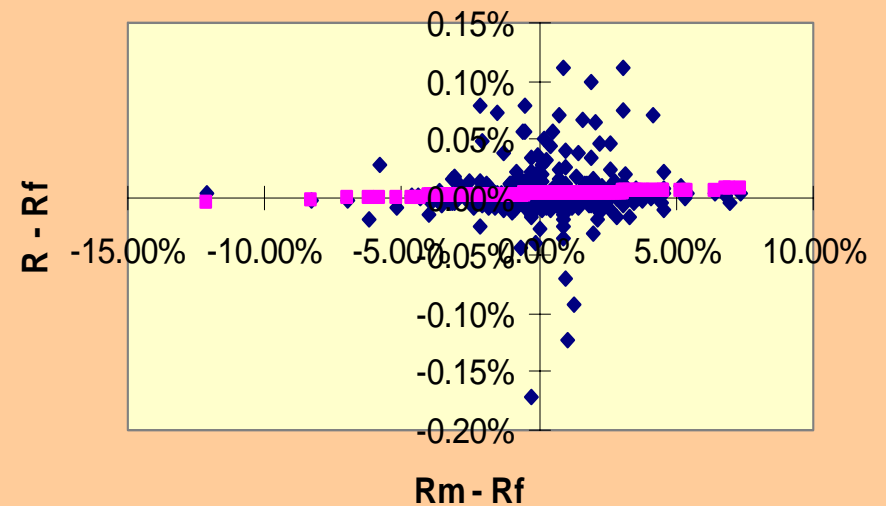
## S&P 500 Futures - Notional Investment \$100M

(Follow "Commercials" in proportion, held 'til 6 mo to exp)



## Heating Oil - Notional Investment \$100M

(Against "Commercials" in proportion, held 'til 2 months to exp)



# Trading Strategies and Portfolios Performance Summary

Future Markets	Participants				Strategies		Sharpe Ratios*
	Category	Turnover Rates		Market Share	Amount to Follow	Settlement	
		Long	Short				
Heating Oil	Commercials	5.9%	5.4%	62.6%	Long/Short 1 Contract	1 Month to Exp	-0.33
						2 Month to Exp	-1.71
					Long/Short in Proportion (Up to 10)	1 Month to Exp	-0.17
						2 Month to Exp	-1.24
	Non Commercials	10.6%	11.8%	12.2%	Long/Short 1 Contract	1 Month to Exp	0.19
						2 Month to Exp	0.19
					Long/Short in Proportion (Up to 10)	1 Month to Exp	0.08
						2 Month to Exp	-0.01
Unleaded Gas	Commercials	7.1%	5.6%	70.0%	Long/Short 1 Contract	1 Month to Exp	-0.47
						2 Month to Exp	-0.42
					Long/Short in Proportion (Up to 10)	1 Month to Exp	-0.43
						2 Month to Exp	-0.32
	Non Commercials	12.1%	14.4%	13.8%	Long/Short 1 Contract	1 Month to Exp	0.46
						2 Month to Exp	0.32
					Long/Short in Proportion (Up to 10)	1 Month to Exp	0.40
						2 Month to Exp	0.26
Crude Oil	Commercials	4.5%	4.7%	68.5%	Long/Short 1 Contract	1 Month to Exp	-0.74
						2 Month to Exp	-0.70
					Long/Short in Proportion (Up to 10)	1 Month to Exp	-0.71
						2 Month to Exp	-0.66
	Non Commercials	7.9%	8.6%	15.0%	Long/Short 1 Contract	1 Month to Exp	0.70
						2 Month to Exp	0.69
					Long/Short in Proportion (Up to 10)	1 Month to Exp	0.65
						2 Month to Exp	0.60
S&P 500 Futures	Commercials	3.2%	3.9%	69.4%	Long/Short 1 Contract	At Expiration	1.03
						1 Month to Exp	1.06
					2 Month to Exp	0.98	
						At Expiration	1.21
					Long/Short in Proportion (Up to 10)	1 Month to Exp	1.22
						2 Month to Exp	1.15
	Non Commercials	10.4%	9.6%	8.4%	Long/Short 1 Contract	At Expiration	-0.67
						1 Month to Exp	-0.68
					2 Month to Exp	-0.64	
						Long/Short in Proportion (Up to 10)	At Expiration
1 Month to Exp	-0.86						
2 Month to Exp	-0.87						

\* Sharpe ratios are calculated based on the scale-independent formula for zero-investment strategies.

# Conclusions and Limitations

- Winning portfolios in commodity markets examined: trade against Comm and settle early
- Payoffs seem to be in excess of risks involved: Sharpe Ratio is as high as 1.7 for heating oil futures portfolios; Sharpe Ratio for S&P 500 index historically about 0.5, it is 0.75 during 1992~2000
- Winning portfolios in S&P futures market: trade as Comm do.
- Sharpe Ratio is as high as 1.2

## Limitations:

- Pricing info only from 1992 to 2000, a crazy period in US equity market
- Empirical excess return could have been partly the result of that. More data would provide more balanced assessment
- Expansion of assessment to other commodity markets, exploring the relationships and potential routes for optimizing/modifying portfolios
- Discussion on return/risk brief
- Limit on what COT can provide: time-lag, no info on position overlaps from market to market, ...