UNIVERSITY OF ILLINOIS
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Energy Futures Prices and Commodity Index Investment: New Evidence from Firm-Level Position Data

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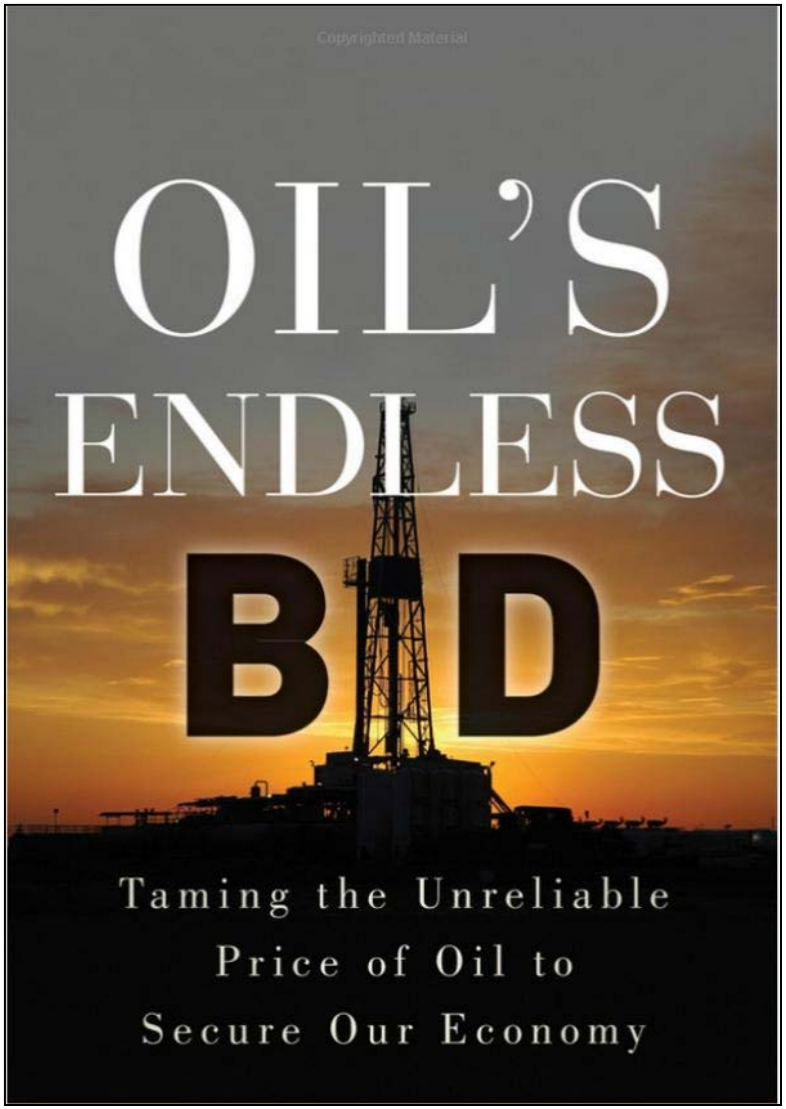
illinois.edu



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"The Masters Hypothesis"

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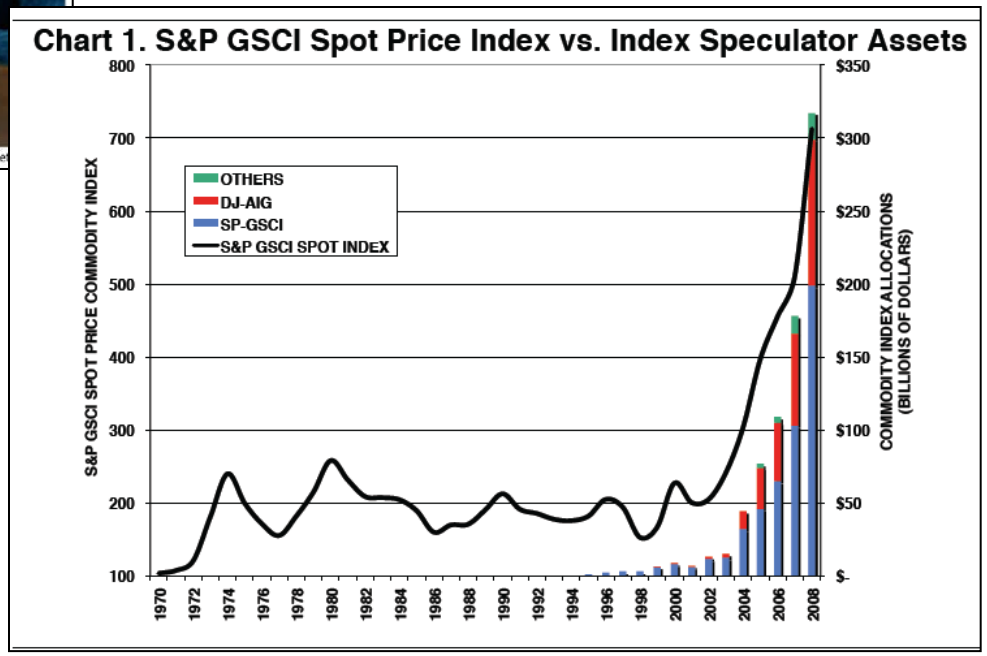

http://www.loe.org/images/content/080919/Act1.pdf

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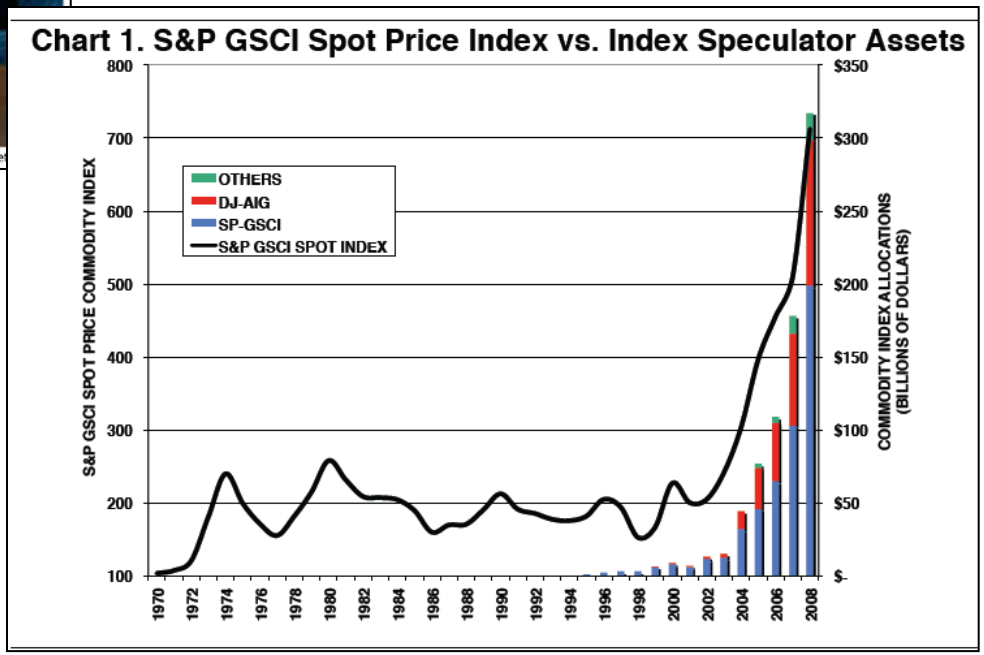
Passive index investment “too big” for commodity markets:

- Long-lived and massive bubbles
- Prices far exceed fundamental values during spikes



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October 19, 2011

INVESTING | 10/19/2011 @ 1:55PM | 747 views

CFTC Position Limits Rule Divides Agency, Angers Market Participants

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Sterling Smith, commodity trading adviser at Country Hedging, said it's unlikely to keep people who want to speculate away from commodities. "The bottom line is, people want to be long these markets and if they can find a way to leverage themselves they're going to. If a foreign entity offers said vehicle they may go there. This doesn't address the problem of the (2008 financial) crisis, which was bad mortgages," Smith said.

http://www.forbes.com/sites/kitconews/2011/10/19/cftc-position-limits-rule-divides-agency-angers-market-participants/

Do Index Traders Drive Commodity Futures Prices?

Yes!

- Michael Masters (2008)
- Gilbert (2010)
- Singleton (2013)

No!

- Stoll and Whaley (2010)
- Buyuksahin and Harris (2011)
- Hamilton and Wu (2013)

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- The majority of studies fail to find any direct linkage between index fund positions and commodity futures prices
- Still, there is disagreement within the literature

Agreement: Need Better Data

CFTC Data

1. Legacy Commitments of Traders
2. Disaggregated Commitments of Traders
3. Supplemental Commitments of Traders
4. Index Investment Data

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- Need higher frequency data, particularly for energy markets
  - CFTC's Large Trader Database
  - Publically traded ETF's
  - Private index funds

Private Fund Data

- Private firm that manages long-only commodity investments for large clients (minimum investment up to $100 million).
  - Tracks proprietary long-only index
  - Primarily direct futures positions
  - Some “look alike” swaps (none in energy markets)
  - Daily position data across 22 U.S. markets by contract
  - October 2007 – May 2012 (1,176 daily observations)
- Daily futures positions analyzed in:
  - WTI crude oil
  - Heating oil
  - RBOB gasoline
  - Natural gas

Empirical Methods

Test for linkages between the Fund's change in positions and market returns

- Daily frequency
- Exact measurement of energy market positions
- Net position changes can be disentangled from contract rolling/switching

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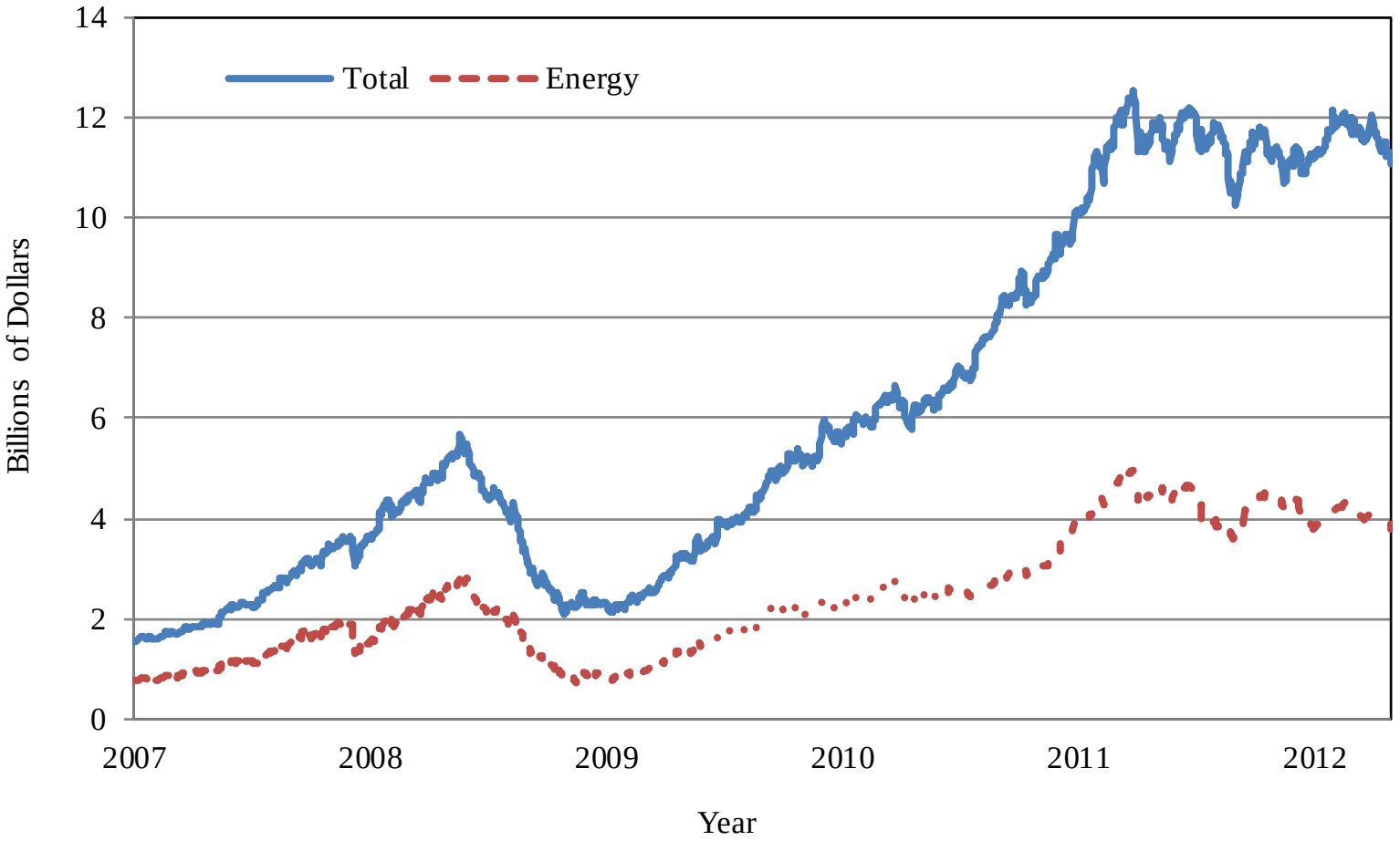
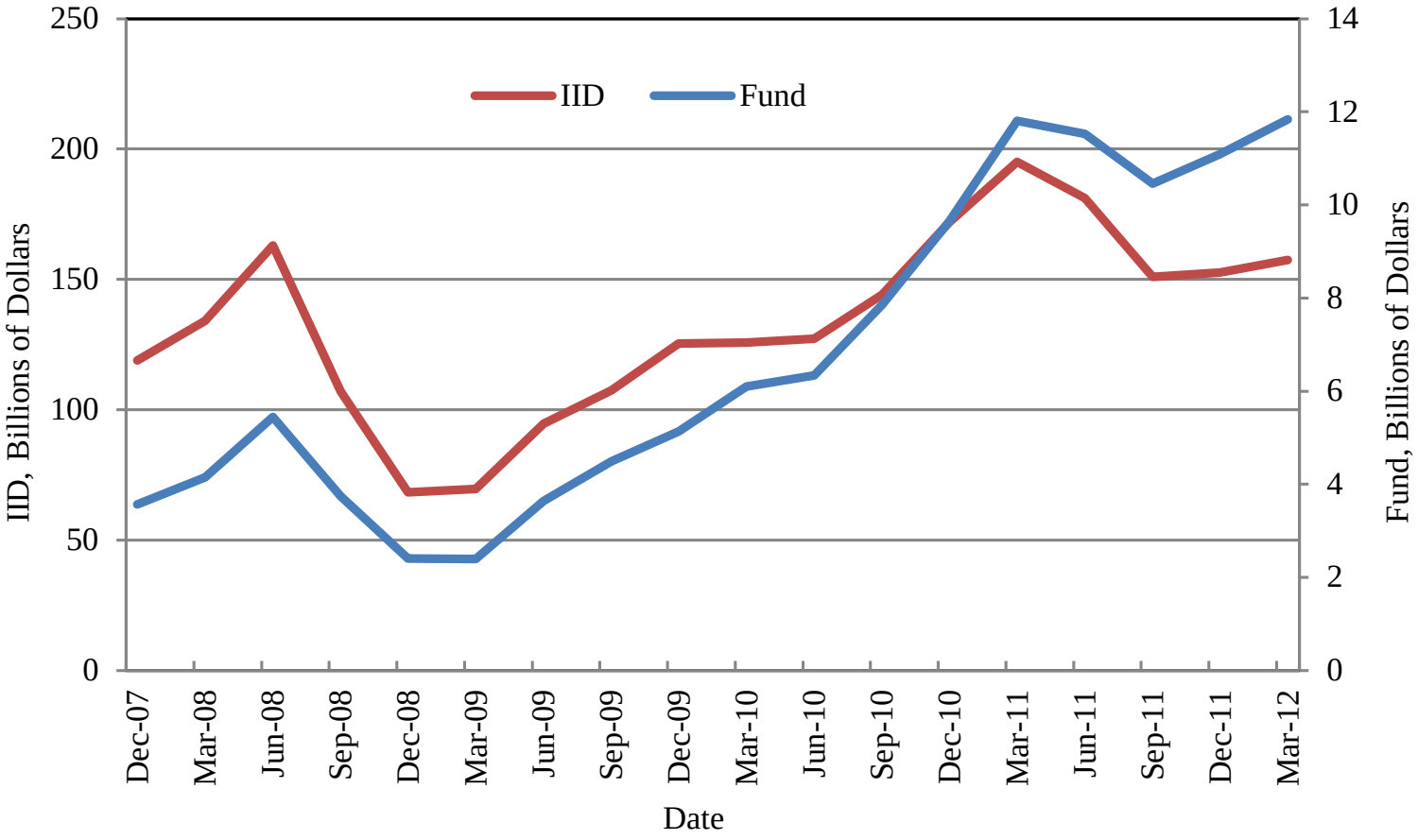
1. Pearson correlations
2. Cumby-Modest difference in mean regressions
3. Granger causality regressions
4. Singleton regressions
5. Long-horizon regressions

Total Notional Value of Fund Positions



Total Fund Notional Value Compared to CFTC's Index Investment Data (IID)



Fund and IID Market Allocation: April 29, 2011

Market	($ Billions) Fund	% Allocation	($ Billions) IID	% Allocation	Fund % of IID
NYMEX WTI Crude Oil	2.973	24%	53.800	27%	5.5%
NYMEX Gold	1.421	12%	19.200	9%	7.4%
NYMEX Natural Gas	0.823	7%	17.800	9%	4.6%
CBOT Corn	0.814	7%	15.700	8%	5.2%
CBOT Soybeans	0.753	6%	13.500	7%	5.6%
NYMEX Copper	0.691	6%	7.600	4%	9.1%
NYMEX Heating Oil	0.637	5%	10.700	5%	6.0%
NYMEX RBOB Gasoline	0.616	5%	11.800	6%	5.2%

Average Fund Position Size

Market	2008	2009	2010	2011
Panel A: Average Total Postion Size (contracts)				
Crude Oil	10,620	13,245	19,365	24,992
Heating Oil	1,738	1,964	3,281	4,588
RBOB Gasoline	2,522	3,248	3,415	4,546
Natural Gas	3,549	4,185	8,628	16,490

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- The average position size (contracts) was relatively large and ranged from 1%-2% of the total open interest

Average Change in Total Fund Position Size

Market	2008	2009	2010	2011
Panel B: Average Change in Total Position (contracts)				
Crude Oil	95	103	69	111
Heating Oil	26	18	19	14
RBOB Gasoline	26	27	26	16
Natural Gas	28	62	91	91

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Crude Oil	95	103	69	111
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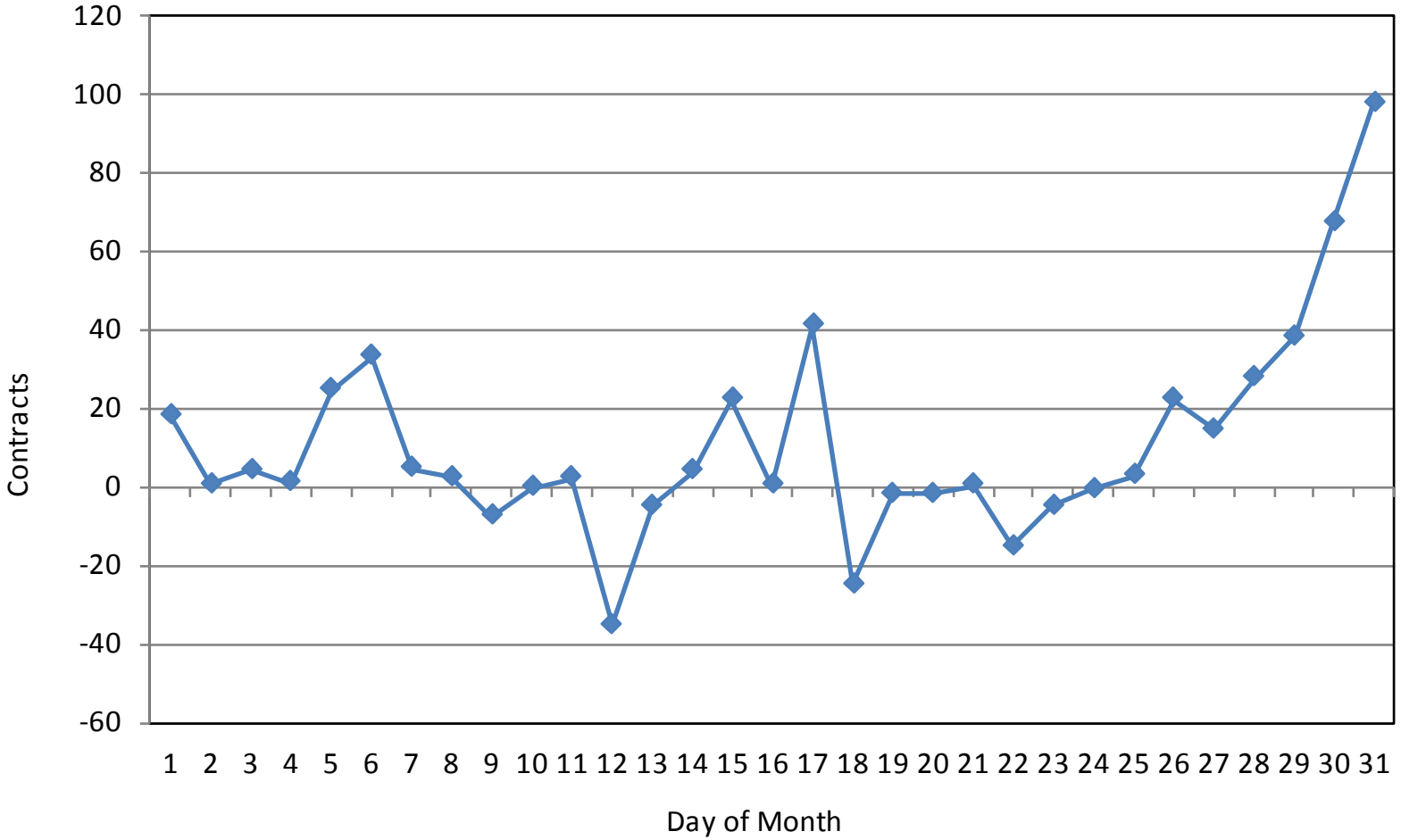
- The average daily change in position size is small relative to the total position size ("massive passives")

Daily Trading Pattern of Fund Through Month



Average Change in Total Fund Position Size and Average Size of Roll

Market	2008	2009	2010	2011
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Crude Oil	95	103	69	111
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Panel D: Average Size of Roll (contracts)				
Crude Oil	868	566	544	710
Heating Oil	167	99	104	85
RBOB Gasoline	283	157	169	190
Natural Gas	290	277	315	502

Correlation between Positions and Returns

- Aggregate position change across all contract maturities each day
- Log-relative nearby futures return
- Sample period is October 2007 – May 2012 (1,176 daily observations)

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	Unconditional		Conditional	
Market	**Contemporaneous**	**1-Day Lag**	**Contemporaneous**	**1-Day Lag**
Panel A: Position Changes				
WTI Crude Oil	0.0241	-0.0144	0.0279	-0.0173
Heating Oil	0.0228	0.0316	0.0279	0.0472
RBOB Gasoline	0.0052	0.0057	-0.0014	0.0117
Natural Gas	-0.0255	0.0065	-0.0376	0.0077
Average	**0.0067**	**0.0074**	**0.0042**	**0.0123**

Cumby-Modest Difference-in-Mean Regressions

$$R_t = \alpha + \beta_1 Buying_{t-1} + \beta_2 Selling_{t-1} + \epsilon_t$$

Test whether mean market return on days following fund buying ($\alpha + \beta_1$) or fund selling ($\alpha + \beta_2$) are different from the unconditional mean (α)

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Market	No Change	p-value	Buying	p-value	Selling	p-value
Crude Oil	0.0063	0.9562	-0.0637	0.7064	-0.0656	0.6971
Heating Oil	0.0231	0.7778	0.1404	0.3178	-0.2207	0.1466
RBOB Gasoline	0.1175	0.2146	-0.1107	0.4728	-0.2303	0.2061
Natural Gas	-0.2698	0.0196	0.0956	0.6596	0.0060	0.9750

Granger Causality Regressions

$$R_t^1 = \alpha_k + \sum_{i=1}^{m} \gamma_{i,k}\ R_{t-i}^1 + \sum_{j=1}^{n} \beta_{j,k}\ \Delta Position_{t-j} + \epsilon_t$$

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Panel A: Independent Variable: Contracts

Market	*m*,*n*	β_j	p-value
Crude Oil	1,1	-0.0140	0.6314
Heating Oil	1,1	0.1778	0.0320
RBOB Gasoline	1,1	0.0439	0.8240
Natural Gas	2,1	0.0061	0.7827

Panel B: Independent Variable: Notional Value

Market	*m*,*n*	β_j	p-value
Crude Oil	1,1	-0.0674	0.9906
Heating Oil	1,1	4.2472	0.0074
RBOB Gasoline	1,1	-0.1531	0.9806
Natural Gas	2,1	-4.0257	0.4201

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Panel A: Independent Variable: Contracts

	k=30		k=65		k=130	
Market	**Slope Estimate**	**p-value**	**Slope Estimate**	**p-value**	**Slope Estimate**	**p-value**
Crude Oil	0.0024	0.4801	0.0017	0.5330	0.0025	0.2978
Heating Oil	-0.0018	0.9153	-0.0005	0.9699	0.0038	0.7167
RBOB Gasoline	0.0161	0.4360	0.0089	0.5082	0.0113	0.2683
Natural Gas	-0.0015	0.7417	-0.0039	0.1574	-0.0003	0.9014

Further Results for Singleton Regressions

$$R_t = \alpha + \gamma R_{t-1} + \beta_1 \Delta Position_{t-1,t-k+1} + \beta_2 \Delta SCOT\ Position_{t-1,t-k+1} + \epsilon_t$$

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Panel A: Independent Variables: Own Contracts and SCOT Market Contracts (k=65)				
	Own Position Slope		SCOT Position Slope	
Market	Estimate	p-value	Estimate	p-value
Crude Oil	0.0013	0.6205	0.0038	0.0442
Heating Oil	-0.0029	0.8158	0.0027	0.0636
RBOB Gasoline	0.0030	0.8003	0.0028	0.1278
Natural Gas	-0.0051	0.0777	0.0038	0.0247

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Natural Gas	-0.0051	0.0777	0.0038	0.0247

Panel B: Independent Variables: Own Contracts and SCOT Market Contracts (k=65)

	Own Position Slope		SCOT Position Slope	
Market	**Estimate**	**p-value**	**Estimate**	**p-value**
Sample: 2007-09				
Crude Oil	-0.014	0.0442	0.0100	0.0005
Heating Oil	-0.020	0.2309	0.0066	0.0022
RBOB Gasoline	-0.011	0.7563	0.0060	0.0347
Natural Gas	0.052	0.1593	0.0010	0.7741
Sample: 2010-12				
Crude Oil	-0.001	0.6174	-0.0025	0.1519
Heating Oil	-0.002	0.9042	-0.0026	0.0432
RBOB Gasoline	-0.010	0.4209	-0.0018	0.2349
Natural Gas	-0.006	0.0772	0.0021	0.2884

Long-Horizon Regressions

$$\sum_{i=0}^{m-1} R_{t+i} = \alpha + \beta \sum_{i=0}^{k-1} \Delta Position_{t+i-1} + \epsilon_{t+1}$$

- Essentially a regression of the m-day moving average of returns on the k-day lagged moving average of position changes
- The moving averages create an overlapping horizons issue
- Valkanov's corrected t-statistics are used for inference

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Panel A: Dependent Variable: Contracts Critical values for the rescaled t-statistic (-0.563,0.595).

	k=30		k=65		k=130	
Market	**Slope Estimate**	**Re-scaled t-stat.**	**Slope Estimate**	**Re-scaled t-stat.**	**Slope Estimate**	**Re-scaled t-stat.**
Crude Oil	0.1682	0.06	0.3086	0.05	0.5362	0.04
Heating Oil	0.5733	0.04	0.9168	0.03	1.0122	0.02
RBOB Gasoline	0.7697	0.03	1.2372	0.03	2.1416	0.05
Natural Gas	-0.0951	-0.07	-0.1375	-0.05	-0.1376	-0.02

Correlation of Roll Activity and Spreads

	Unconditional		Conditional	
Market	**Contemporaneous**	**1-Day Lag**	**Contemporaneous**	**1-Day Lag**
WTI Crude Oil	0.0143	-0.0275	0.0461	-0.0360
Heating Oil	-0.1140*	-0.0318	-0.1460*	0.0008
RBOB Gasoline	-0.1701*	-0.0337	-0.1957*	-0.0433
Natural Gas	-0.0278	0.0315	0.0177	0.0688
Average	**-0.0744**	**-0.0154**	**-0.0695**	**-0.0024**

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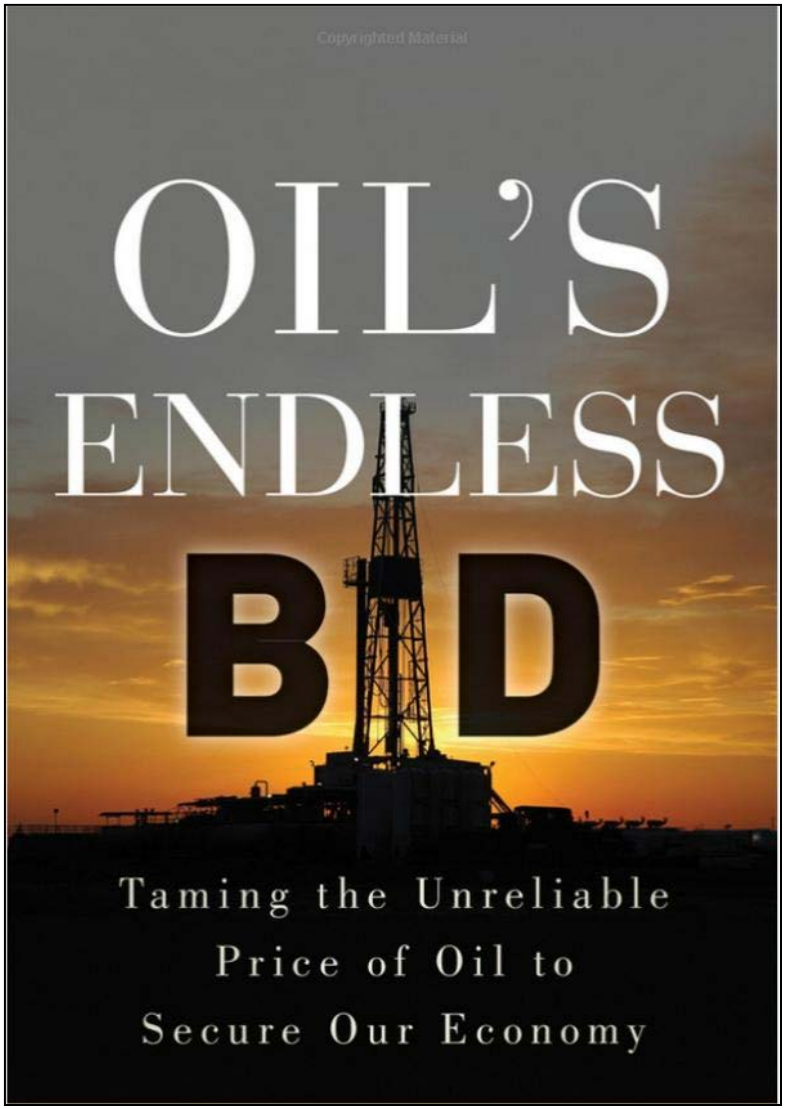
Average	**-0.0744**	**-0.0154**	**-0.0695**	**-0.0024**

- Direction of the impact tends to be negative which is opposite of a price pressure effect
- Roll transactions that involve selling (buying) the nearby contract actually occur in conjunction with the nearby contract increasing (decreasing) in price relative to the deferred contract

Summary & Conclusions

1. Fund data are representative of overall index investments as measured by the IID
   - Daily data (1,176 observations from 2007-2012)
   - Focus on WTI crude oil, heating oil, RBOB gasoline, natural gas
2. Variety of tests for linkages between daily futures returns and daily buying and selling by the Fund
3. Consistently—across all empirical approaches and all four energy futures markets—there is little evidence that changes in the positions are associated with price changes



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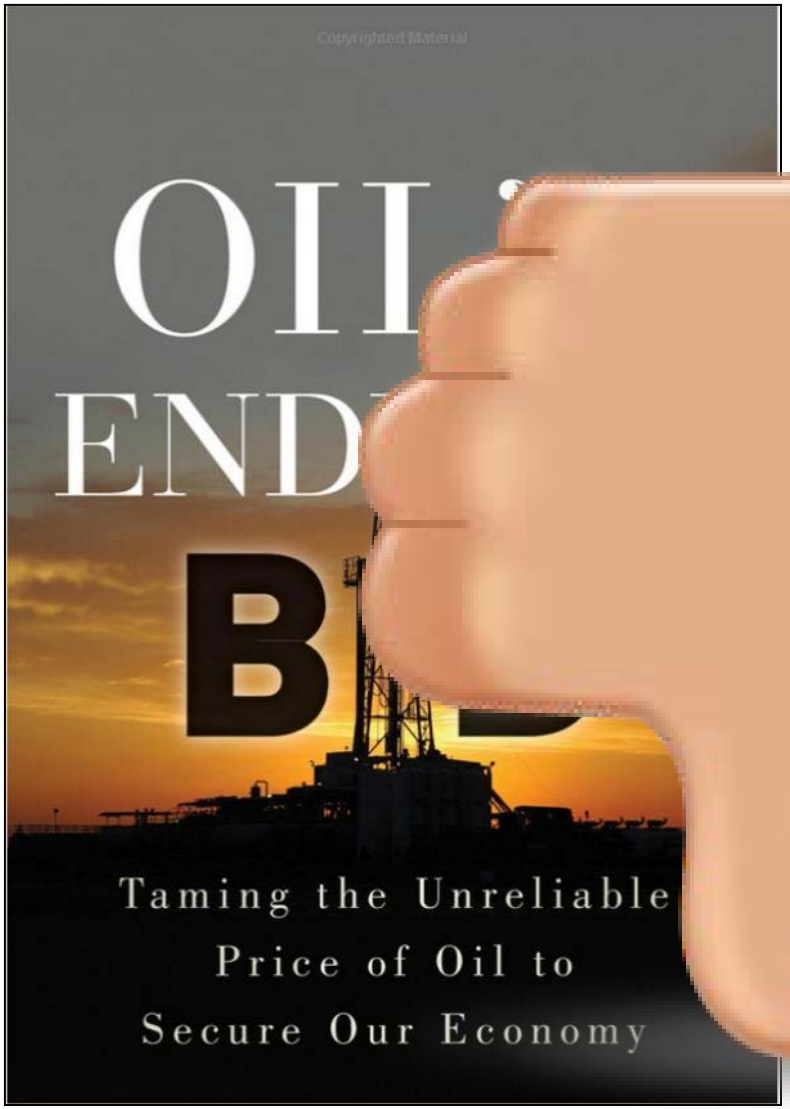

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