

# Energy “Paper” Markets Matter

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# ***Energy Market Financialization and Energy-Equity Co-Movements***

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\*THIS PRESENTATION REFLECTS THE OPINIONS OF ITS AUTHORS ONLY AND NOT THOSE OF THE INTERNATIONAL ENERGY AGENCY (OECD-IEA) OR MEMBER COUNTRIES, THE U.S. COMMODITIES FUTURES TRADING COMMISSION (CFTC), THE COMMISSIONERS, OR THE AUTHORS' COLLEAGUES UPON THE STAFFS OF EITHER INSTITUTION.

# Background

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- **More investment money in commodity futures markets**
  - ✦ Thousands of hedge funds, commodity index funds, etc.
  - ✦ Commodity assets under management (AUM):  
exceed \$400bn, inflows = \$350+bn in 10 years (Barclays, Apr. 2011)
- **What could this development mean for...**
  - ✦ Energy Price Levels?
  - ✦ Oil Market Volatility?
  - ✦ Cross-Market Linkages? → **My focus today**

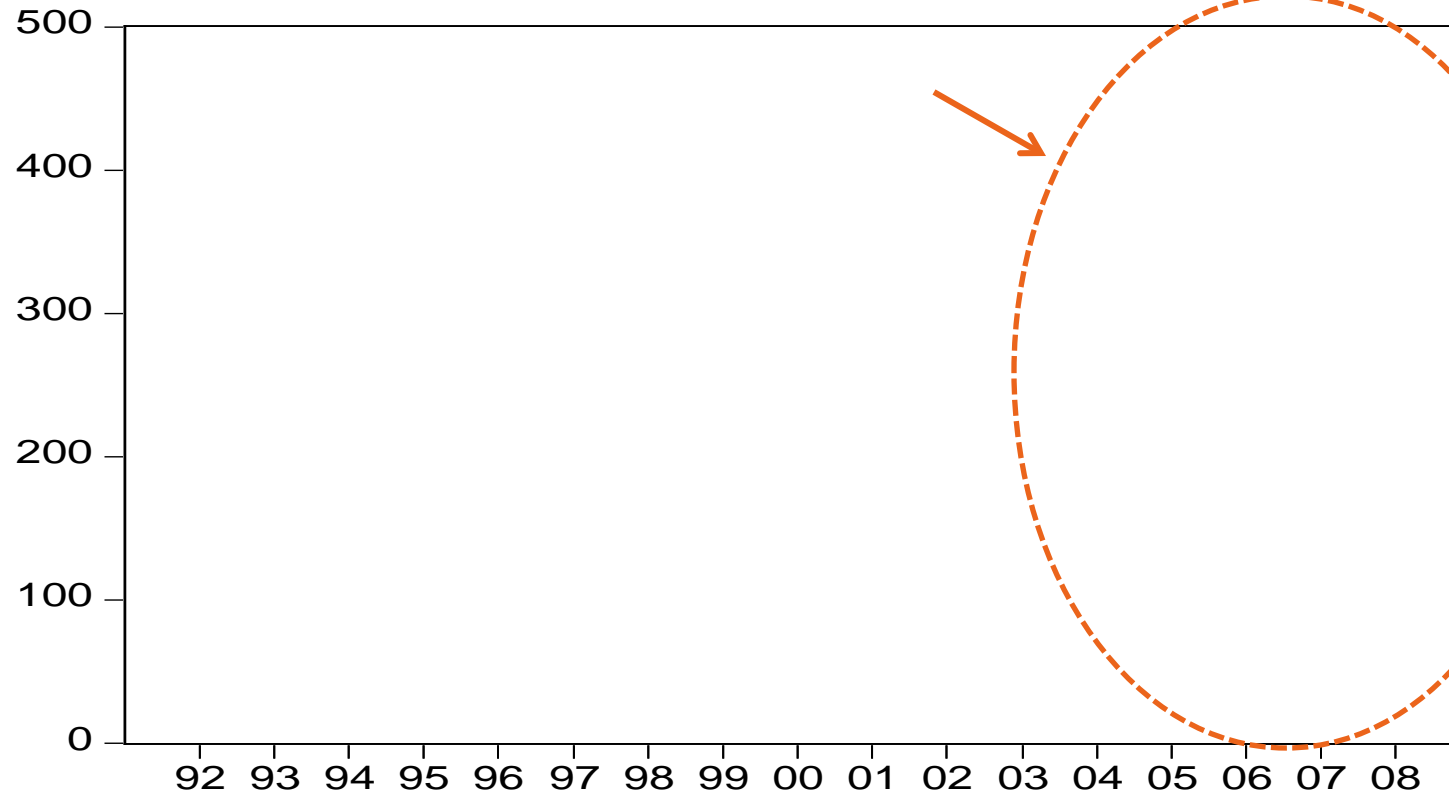
# Background

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***“As more money has chased (...) risky assets, correlations have risen. By the same logic, at moments when investors become risk-averse and want to cut their positions, these asset classes tend to fall together. The effect can be particularly dramatic if the asset classes are small—as in commodities. (...) This marching-in-step has been described (...) as a ‘market of one’.”***

**The Economist, March 8, 2007.**

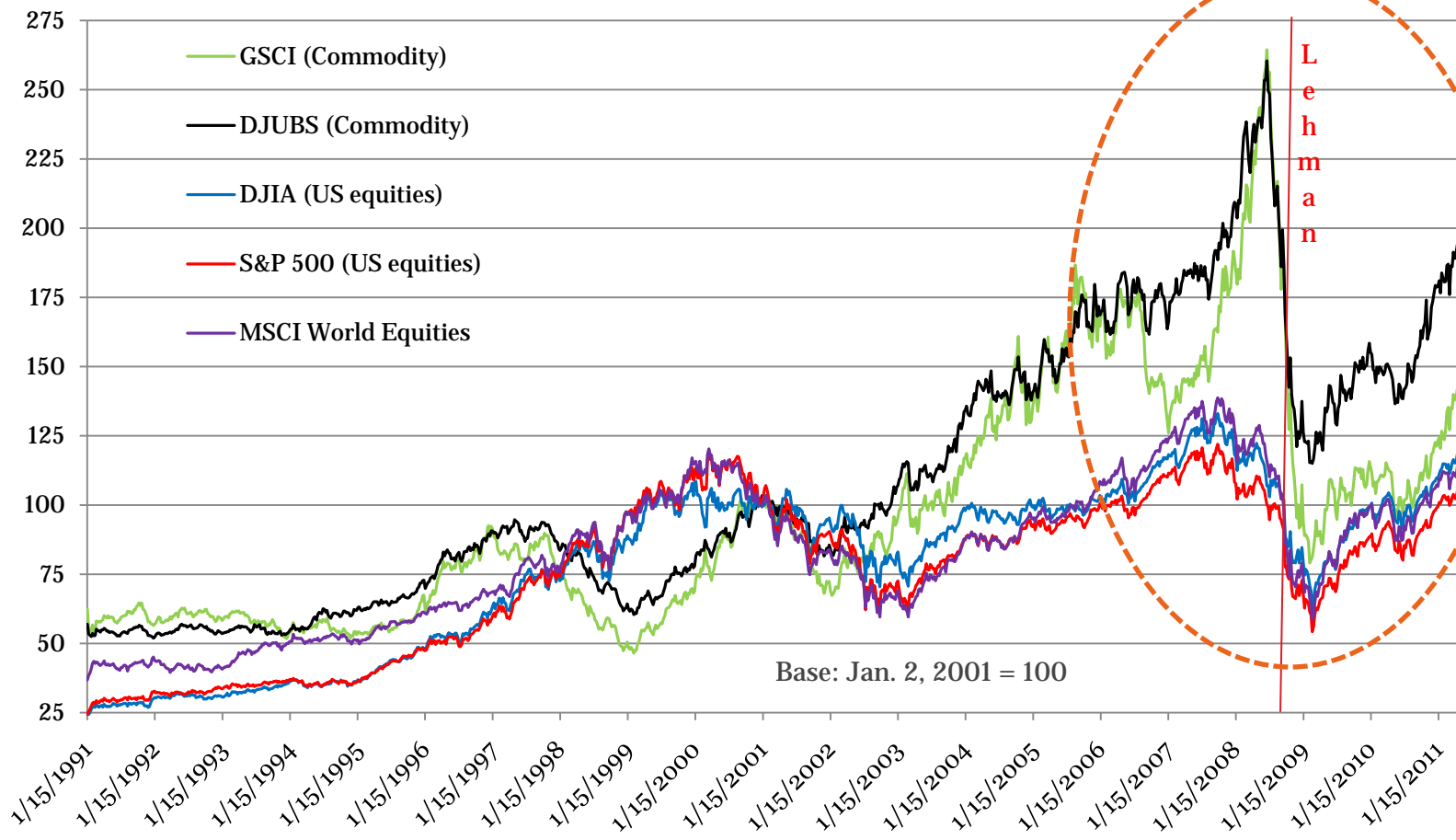
# The “Marching in Step” Observers Had in Mind



- S&P 500 Index (1991=100)
- Dow Jones Industrial Index (1991=100)
- S&P GS Commodity Total Return Index (1991=100)
- DJ\_AIG Commodity Total Return Index(1991=100)

# The “Marching in Step” – after Lehman

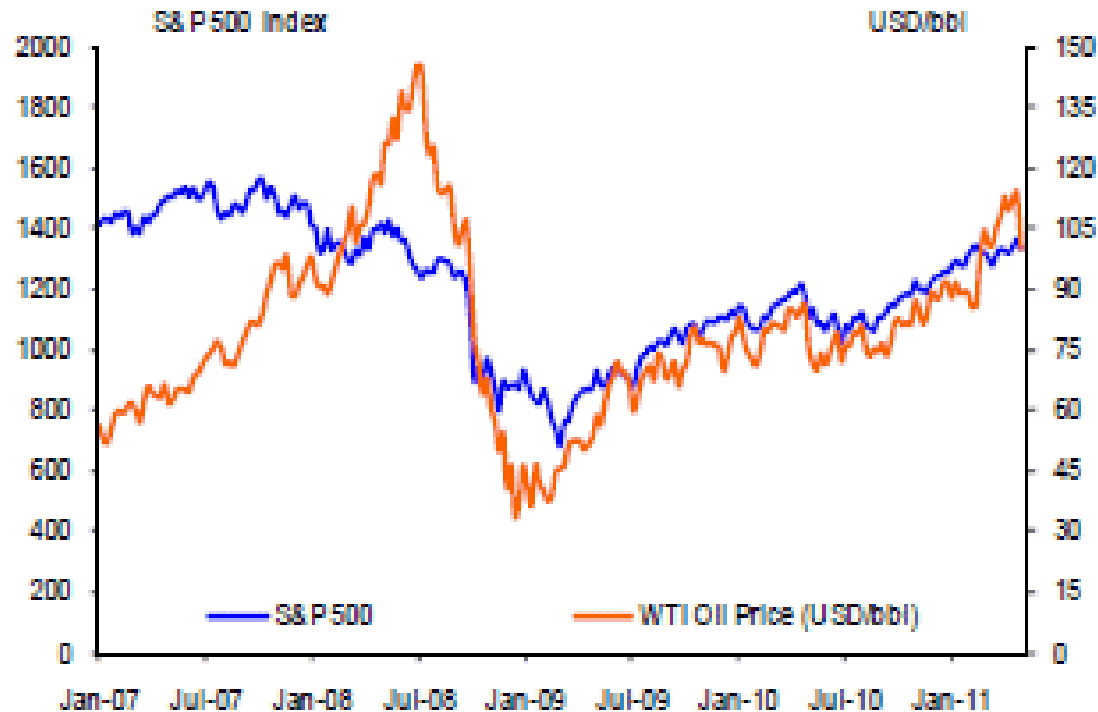
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# The “Marching in Step” – after Lehman

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Figure 2: S&P 500 Index and oil prices



Source: Bloomberg Finance LP, Deutsche Bank

Source:  
Deutsche Bank's  
*Global  
Commodities  
Daily*

# Outline of Today's Talk

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## ○ Provide evidence on Prices

- ✦ **Cross-market Linkages** → Have *returns* on energy products & equities started to move in sync?

## ○ Provide evidence on Trading Activity

- ✦ Who trades?
- ✦ Cross-markets → Do more equity futures traders also trade commodity futures?

## ○ Explain Linkages

- ✦ Commodity fundamentals or Trading Activity?
  - Can we explain what (or *who*) drives variations in market linkages?
- ✦ Something special has been happening for the last two years
  - Evidence from the recent boom-bust cycle



# A “Market of One” – Really?

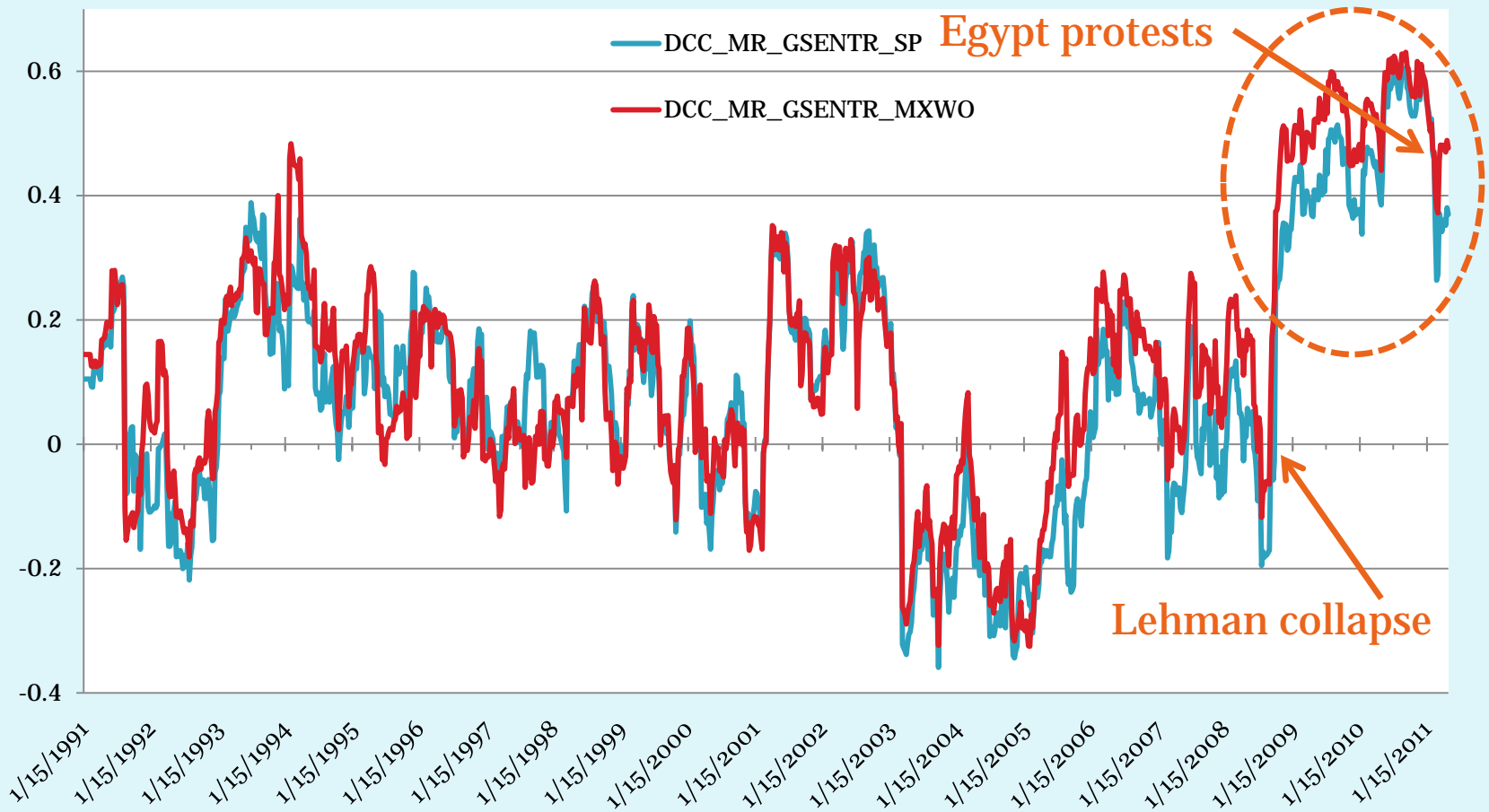
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- Büyükşahin, Haigh & Robe (*JAI* 2010):
  - **Not so fast:**
    - ✦ Let’s look at return correlations, not price levels
      - On average, return correlations between passive equity and energy investments were about zero (1991 to August 2008)
      - No secular increase in dynamic conditional correlations (DCC)
  - **General result?**
    - ✦ **Yes**
      - True at daily, weekly & monthly frequencies
      - True regardless of index choice (GSCI or DJ-UBS; S&P or DJIA)
    - ✦ **And yet...**

# SP500 & GSCI Correlation (DCC), 1991-2011

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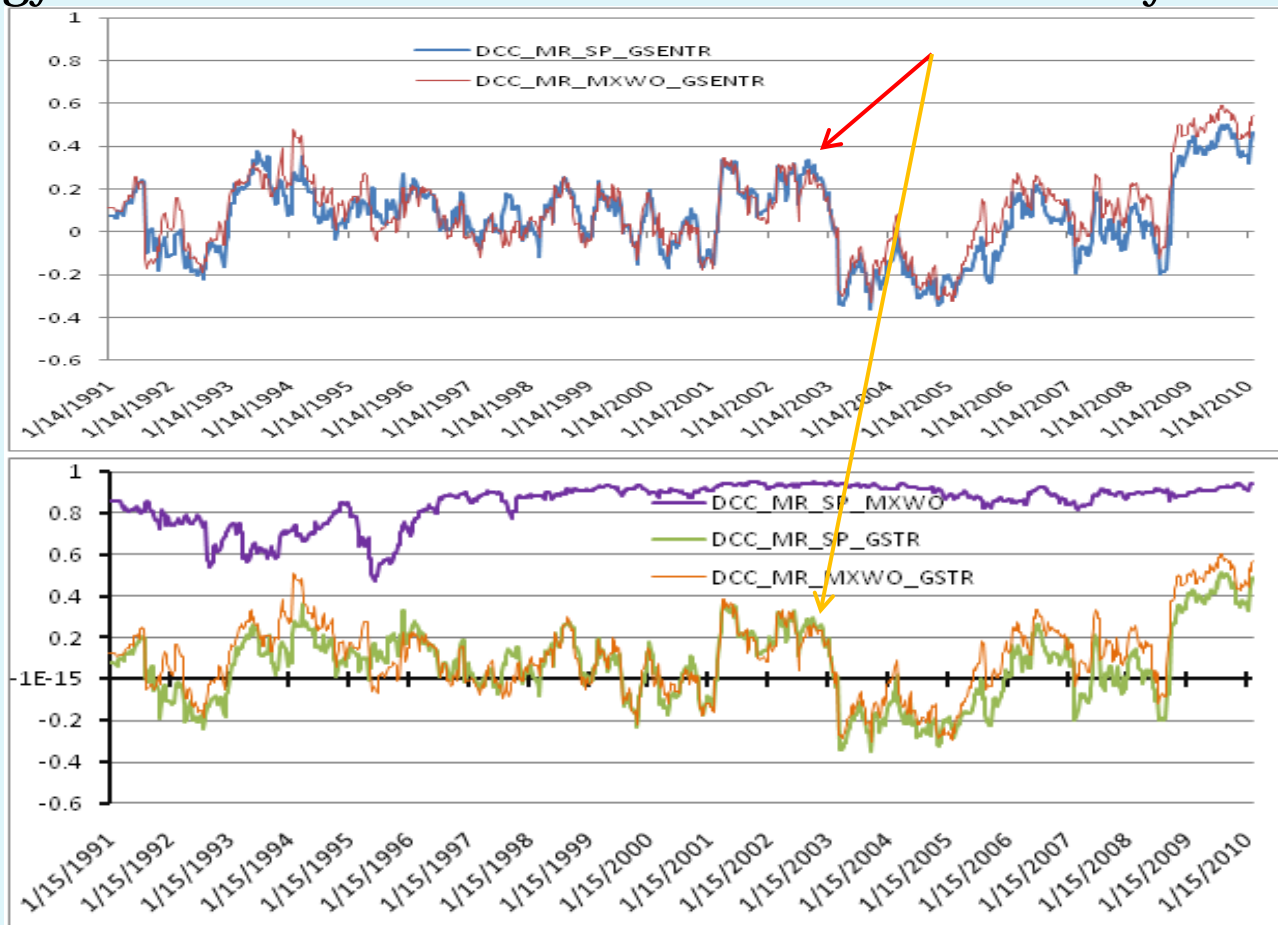
- DCC estimates average close to 0, fluctuates substantially over time



# Equities vs. Energy or Other Commodities

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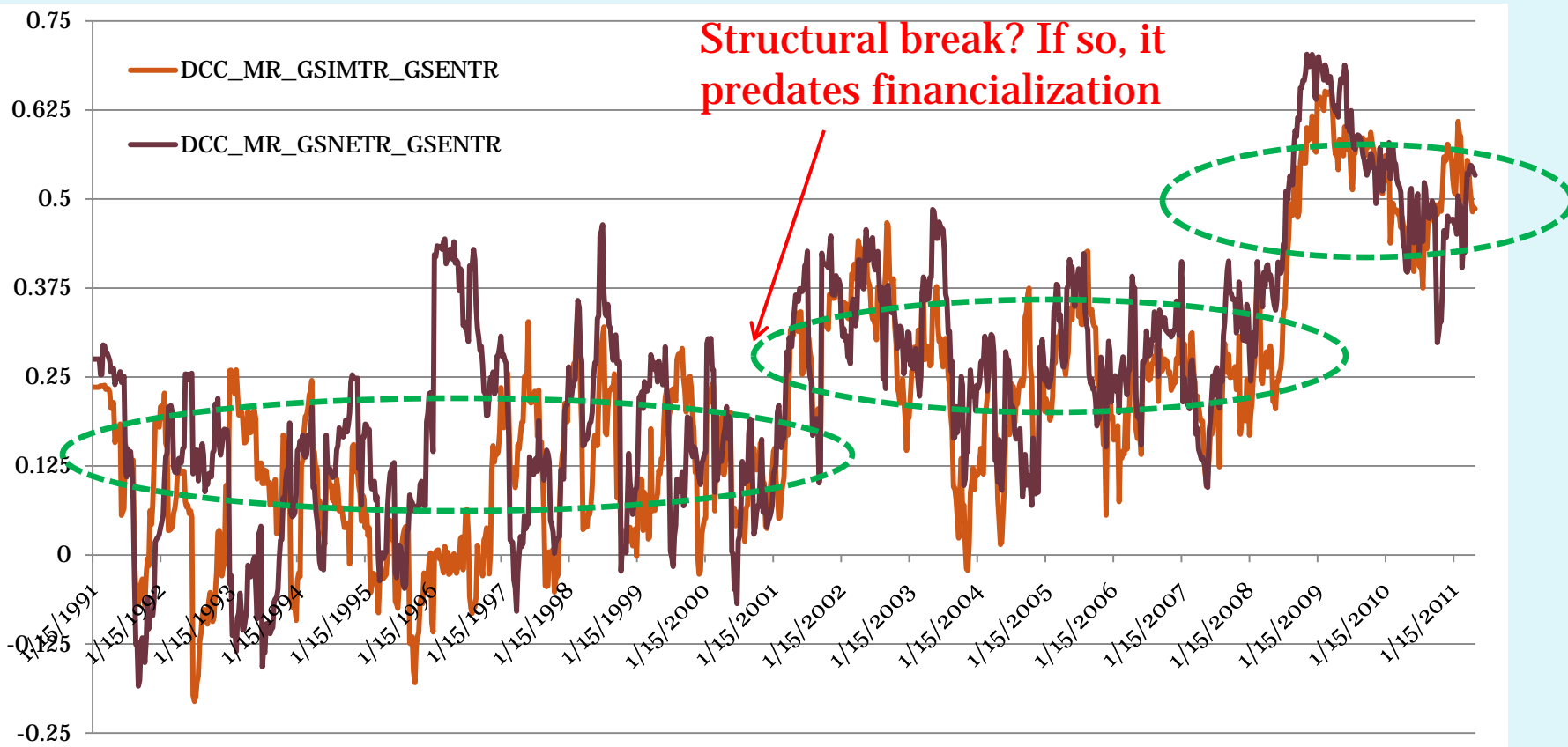
- Energy Futures vs. Diversified Portfolio of Commodity Futures



# Cross-Commodity Correlations

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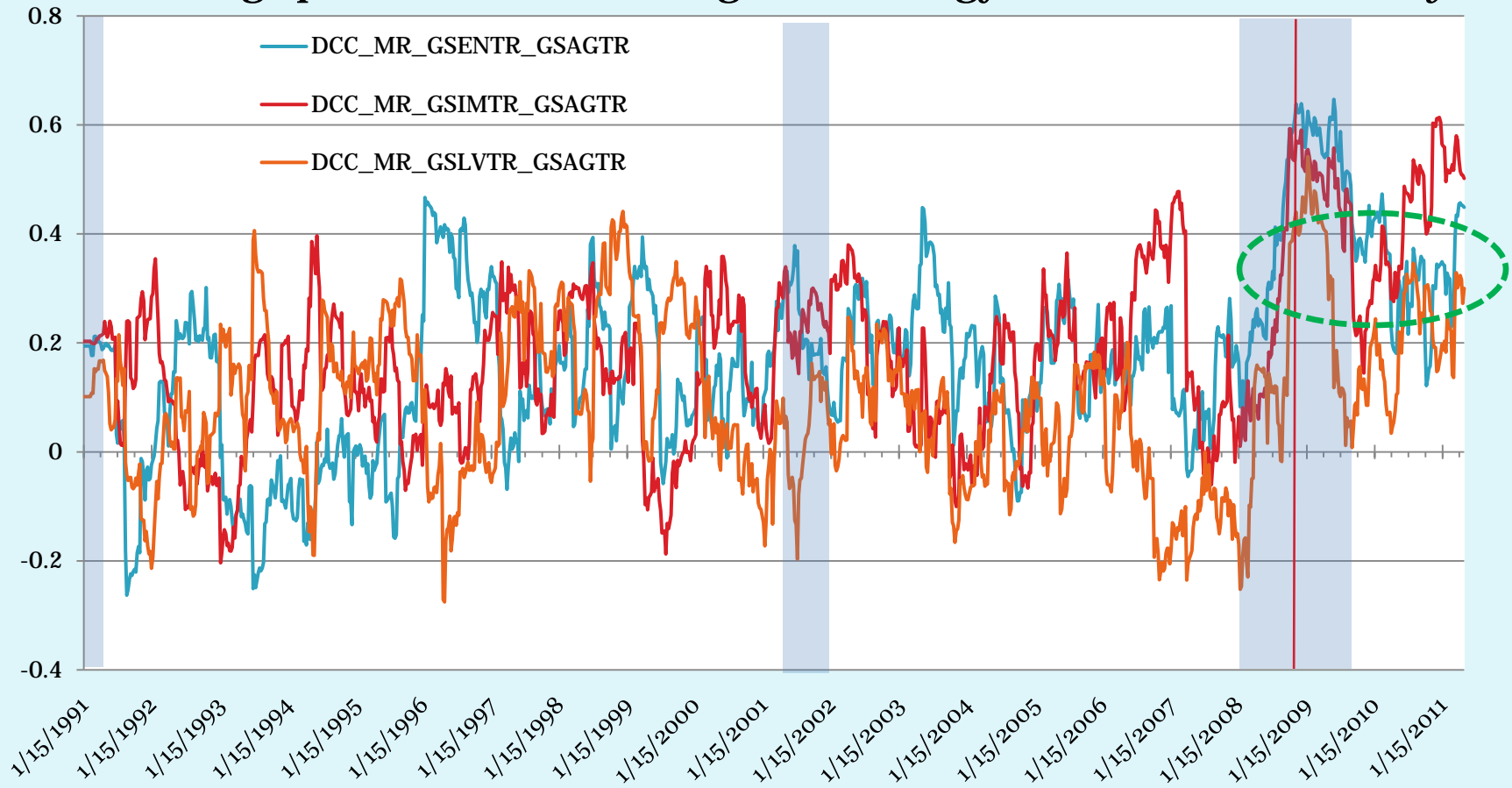
- Same for Cross-Commodity correlations? *Not for Industrial Metals...*



# Cross-Commodity Correlations

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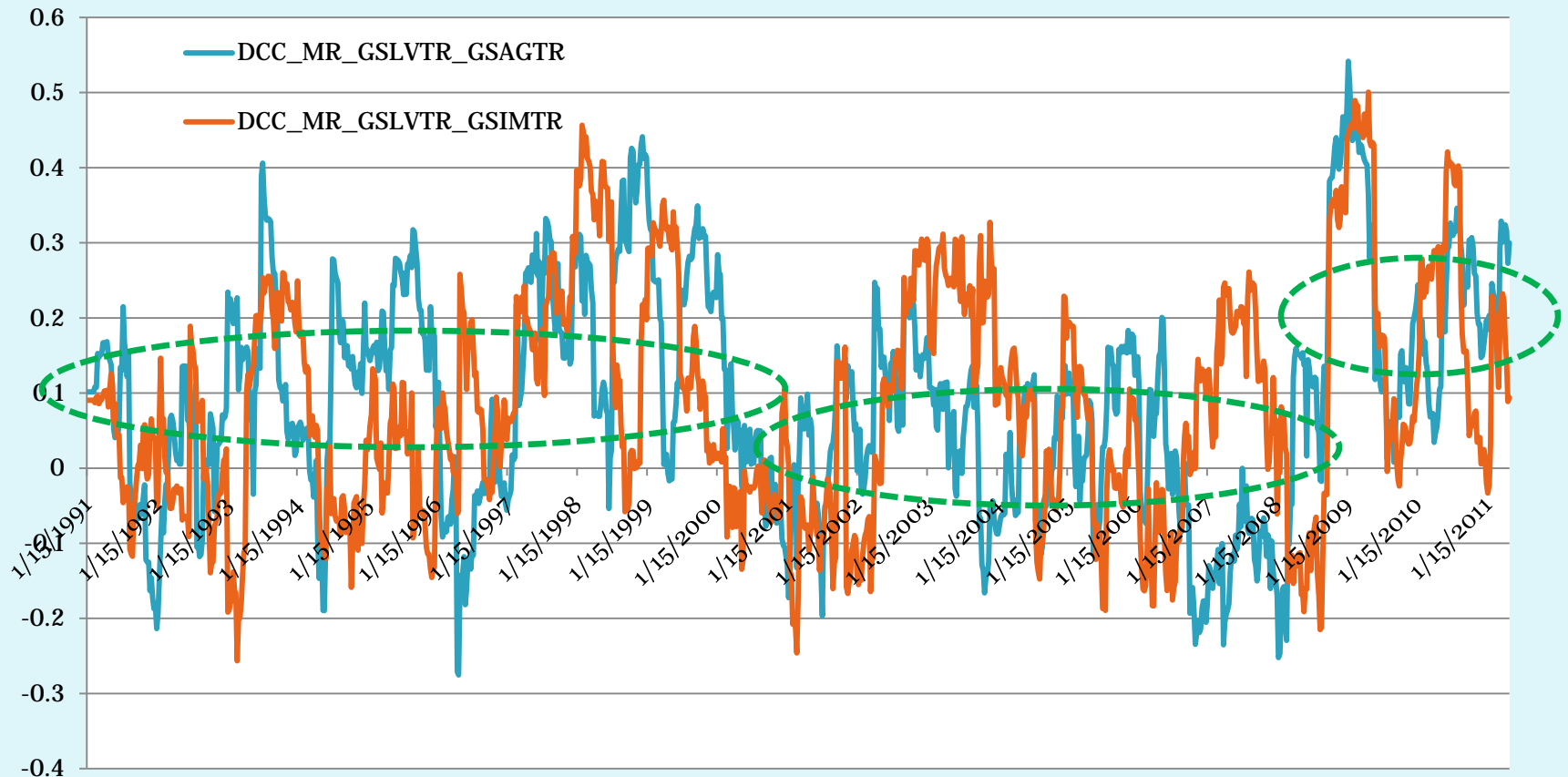
- Have “Ag” prices started moving with Energy or Metals? *Not really...*



# Cross-Commodity Correlations

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- How about Livestock? *Quite the opposite...*

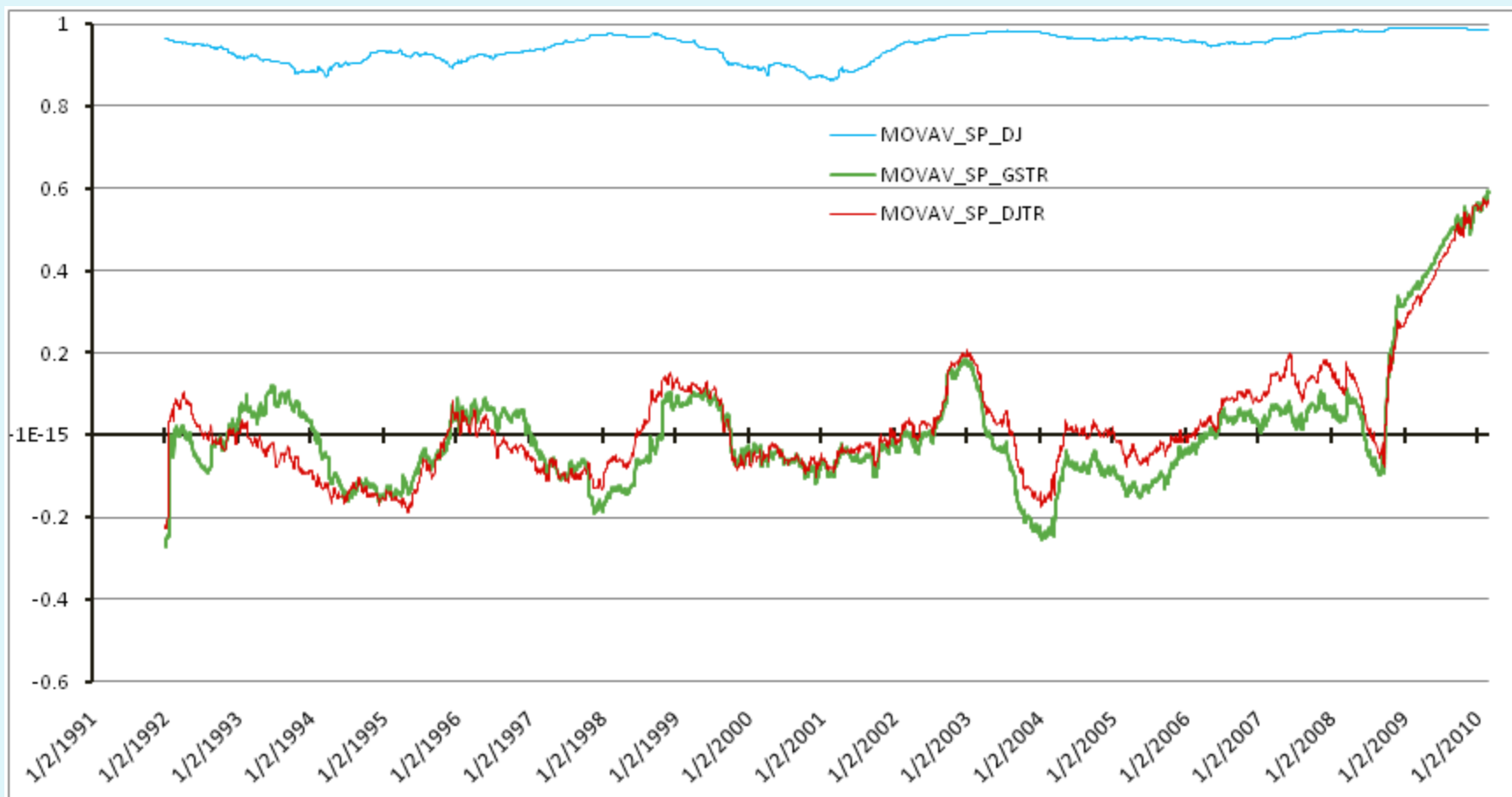


- **Dynamic Conditional Correlation (Engle, *JBES* 2002)**
  - 2-stage estimation:
    - ✦ **First stage,**
      - $n$  univariate GARCH(1,1) estimates are obtained (simultaneously), producing consistent estimates of time-varying variances ( $Dt$ ).
    - ✦ **Second stage,**
      - correlation part of the log-likelihood function is maximized, conditional on the estimated  $Dt$  from the first stage.
  - **Advantages:**
    - ✦ **Takes into account the time varying nature of the relationship between variables**
    - ✦ **Accounts for changes in volatility**
      - Important – see Forbes & Rigobon (*JF* 2002) for emerging mkts

# Without accounting for time-varying volatility...

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- ... we'd mis-estimate how much & when correlations change

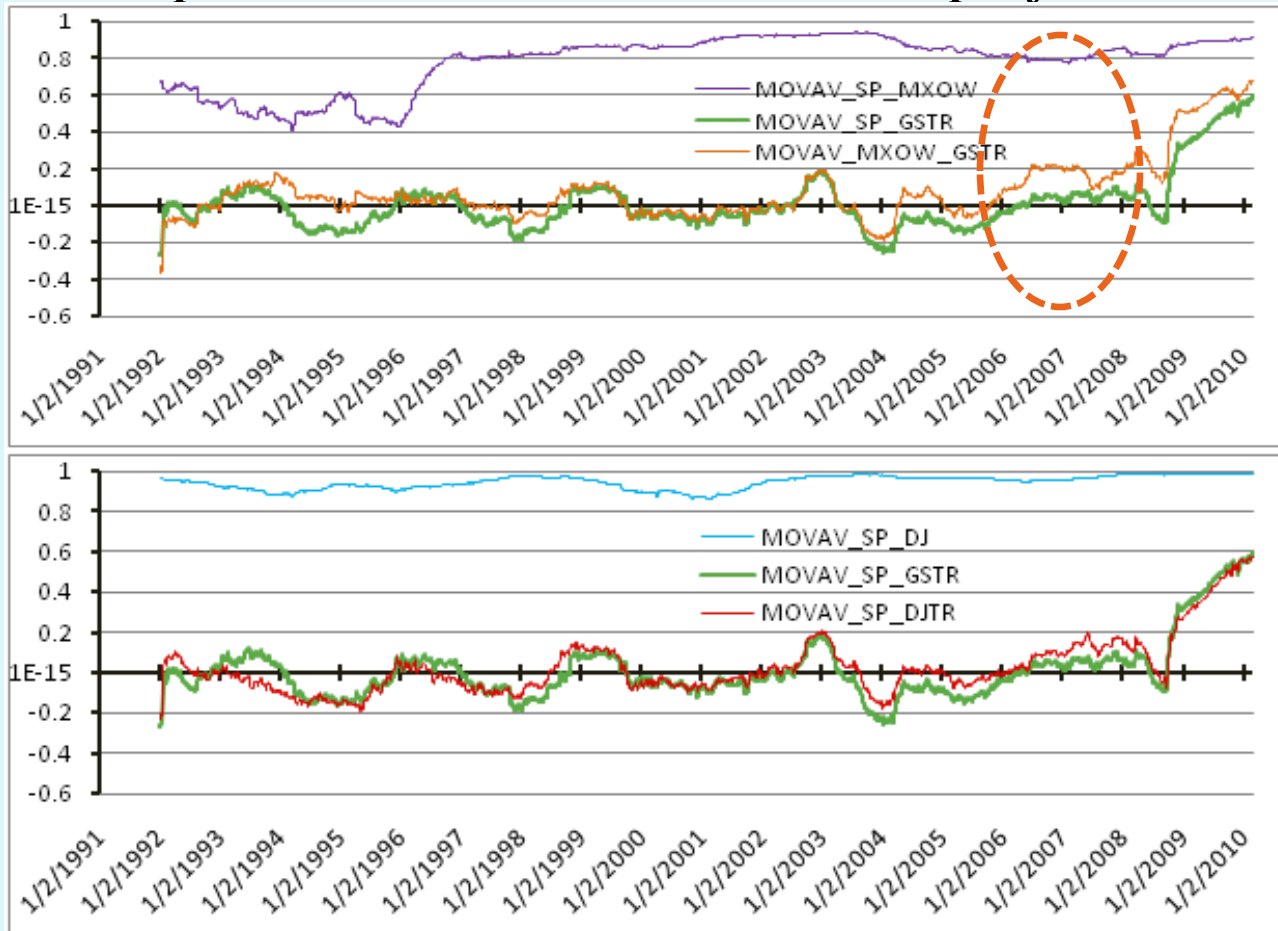




# Without accounting for time-varying volatility...

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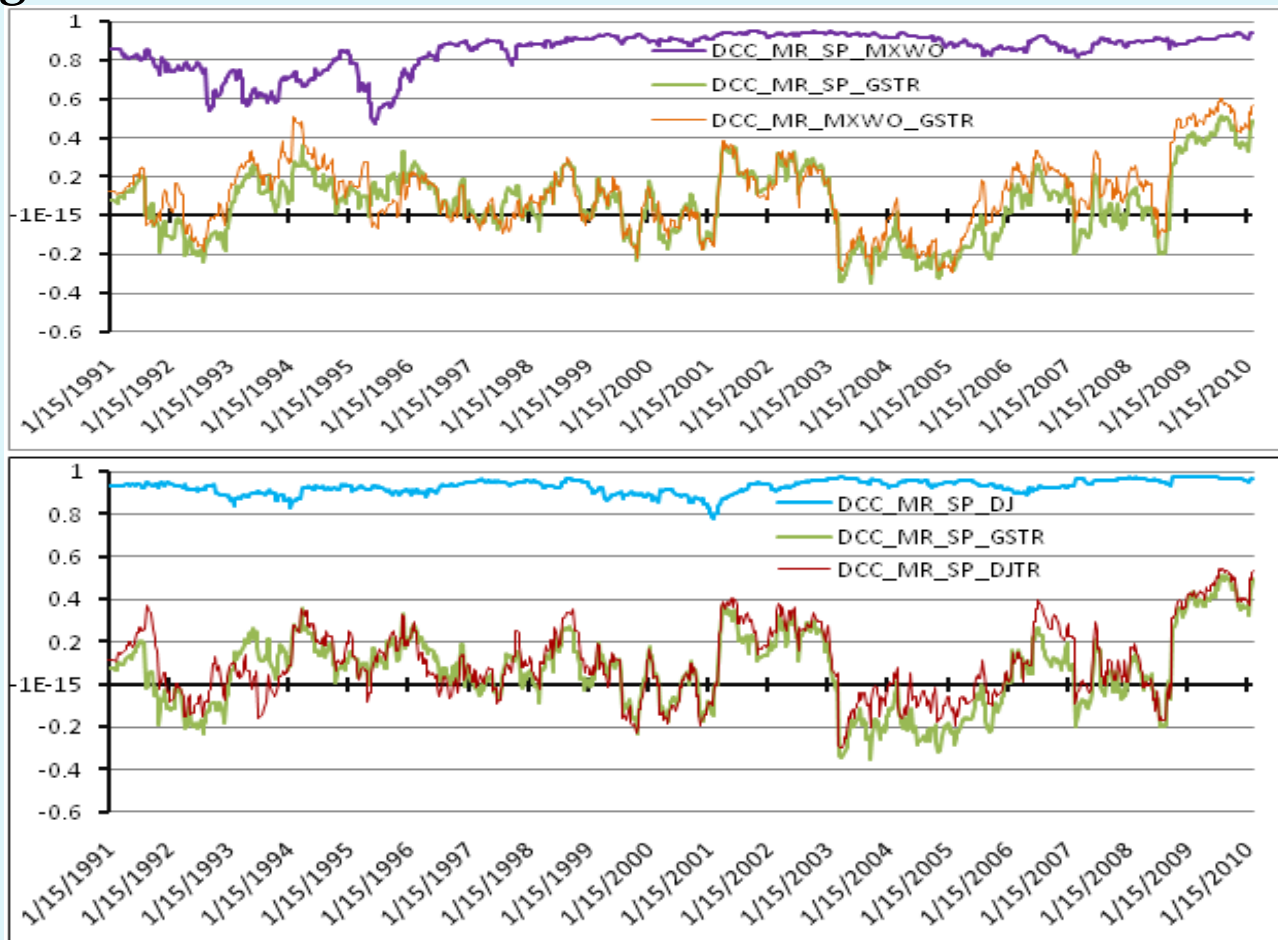
- Even worse problem with the MSCI World Equity Index



# Vs. accounting for time-varying volatility...

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- Using DCC, we find no *visible* trend before Lehman



# I. This Paper

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# Thinking about Commodity-Equity Linkages

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## ○ As the DCC graphs show...

- ✦ Equity-energy DCC estimates *do* fluctuate substantially over time
  - This paper: can we explain what (or *who*) drives them?
    - Macroeconomic / physical fundamentals? Trading? Both?
- ✦ Extreme-event correlations *do* exist (Shanghai Feb.'07, Lehman Sept.'08,...)
  - This paper: does financial stress increase correlations?
  - This paper: how (through what **channel**) does stress affect distributions?

## ○ Our focus

- ✦ **Equity**-energy co-movements
  - Why?

# Related Literature #1

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## ○ Does It Matter Who Trades?

### ✦ Theoretical results

- Arrival of less constrained traders (value arbitrageurs) should reduce mispricing
    - e.g., Rahi & Zigrand (*RFS* 2009); Başak & Croitoru (*JFE* 2006)
  - Limits to arbitrage
    - Questions about such traders' behavior in periods of market stress
    - Leverage constraints, wealth effects, portfolio rebalancing needs, etc.
    - Kyle & Xiong (*JF* 2001), Gromb & Vayanos (*JF* 2001), Kodres & Pristker (*JF* 2002), Broner, Gelos & Reinhart (*JIE* 2006), Pavlova & Rigobon (*REStud* 2008), ...
- Our paper: empirical analysis, using commodity and equity markets

## ✦ What do we contribute to this literature?

- Direct evidence that *who* trades matters for asset pricing

→ In general, difficult to test the theory

→ Unlike other authors, we have access to comprehensive daily data on

(i) trader-level (i.e., individual) positions

(ii) each trader's main of business & underlying motive for trading  
(i.e., hedging or not)

(iii) over an entire decade (July 2000 to March 2010)

→ The composition of the open interest helps explain an important aspect of the joint distribution of commodity and equity returns

# Related Literature #2

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## ○ Financialization of commodity markets

✦ Vibrant debate on the impact of having more financial traders

### ✦ Extant findings?

○ Energy futures risk premia given limits to arbitrage

• Acharya, Lochstoer & Ramadorai (2009), Etula (2010)

↔ Hong & Yogo (2010)

○ Intra-market linkages (crude oil)

• Büyükşahin, Haigh, Harris, Overdahl & Robe (2009)

○ Cross-commodity linkages

• Stoll & Whaley (2010) ↔ Tang & Xiong (NBER 2010)

# Related Literature #2

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## ✦ What do we contribute?

- We provide the **first detailed evidence on financialization** in a cross-section of energy markets
- We provide the **first evidence of increased cross-market trading**
- We show that **some, not all, types of financial traders affect correlations**
  - Hedge funds? **Yep!** Index traders? **Nope!**
- We show that **hedge fund heterogeneity matters**
  - Not all hedge funds drive cross-market correlations equally
  - Funds active in both equity and energy futures markets *vs.* others



# II. Trading Facts

## *Financialization of Energy Futures Markets*

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# A. Position Data

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- **Publicly available data**
  - CFTC Commitments of Traders (COT) Reports (Weekly since 1990's)
  - **Highly aggregated**
    - All maturities are lumped together
    - Traders grouped in just 2 bins (*“Commercials” vs. “Non-Commercials”*)
- **vs. Our data: Large Trader Reporting System (LTRS)**
  - **End-of-day positions of every individual large trader (Daily)**
    - ✦ Non-public, CFTC only
      - For every contract maturity
      - Every day from July 1, 2000 to February 26, 2010
  - **Information on each trader's line of business**

# Our Detailed Data: Main Sub-Categories (*Oil*)

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- **Non-commercials**
  - **Hedge Funds** (includes Commodity Pool Operators (CPOs), Commodity Trading Advisors (CTAs), Associated Persons who control customer accounts, and other Managed Money traders)
  - **Floor Brokers & Traders**
  - **Non-Registered Participants** (Traders not registered under the Commodity Exchange Act (CEA); category includes non-MMT financial traders)
- **Commercials**
  - **“Traditional”**
    - ✦ **Producers**
    - ✦ **Manufacturers** (refiners, etc.)
    - ✦ **Dealers** (energy wholesalers, exporter/importers, marketers, etc.)
  - **Commodity Swap Dealers** (includes arbitrageurs and CITs)

# What Does our Additional Information Show?

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## 1. *Importance of Financial Traders*

- Hedge Funds & Swap Dealers (*incl.* CITs) are up

## 2. *Heterogeneity within the Broad Categories*

- Good idea to break out Swap Dealers & Hedge Funds (2009)
- *Heterogeneity Extends to Use of Options*

## 3. *Differential Growth at Near/Far Ends*

- E.g., *1-3 years OI now > 1-3 months OI back in 2000*

## 4. *Differential Behaviors at Near/Far Ends*

- E.g., Swap Dealers: net long in nearby / net short in backdated

# Generalizing to all GSCI Commodities

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- **We would like**
  - Detailed position data for futures contracts in GSCI Energy index
- **Unfortunately**
  - two contracts are non-US → no data (Gas oil and Brent)
  - Position data for RBOB gasoline are available only after 2006
- **Bottom line**
  - We have data WTI crude, Henry-Hub natural gas, No.2. heating oil
  - Weights:
    - ✦ Time-varying GSCI weights, scaled to account for “missing” contracts

Heating Oil	WTI Crude Oil	Natural Gas
10%	77%	13%

## B. Measurement Issues

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- **Traders' shares in short-term & long-term contracts**
  - For each category of traders, we get
    - ✦ Share of the total open interest (all contract months)
      - Average of long & short positions divided by open interest
    - ✦ Share of the open interest in first 3 contract months
      - Commodity indices focus on near-dated contract
- **Speculators**
  - Hedge funds?
    - ✦ Register with CFTC → detailed data
  - CITs (Commodity Index Traders)?
    - ✦ Detailed data at quarterly frequency & only since 2008.
      - we proxy their market share by share of commodity swap dealers
        - Best we can do (*Why?*), but imperfect
          - Approximation is better for short-term contracts (why?)
  - Overall importance?

TECHNICAL

# Measurement Issue: Speculative Activity

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- Working's T (1960):

- Goal: measure the extent to which speculative positions exceed the net hedging demand in a given futures market  $i$
- Intuition: long and short hedgers do not trade simultaneously or in the same quantity; speculators satisfy this unmet hedging demand in the marketplace – but there may be more spec activity than that bare minimum.

- Formally:

$$WSIS_i = 1 + \frac{SS_i}{HL_i + HS_i} \text{ if } HS_i \geq HL_i$$

$$WSIS_i = 1 + \frac{SL_i}{HL_i + HS_i} \text{ if } HL_i \geq HS_i$$

TECHNICAL

where  $SS_i$  is the magnitude of the short positions held in the aggregate by all non-commercial traders;  $SL_i$  stands for all non-commercial long positions; and,  $HS_i$  stands for all non-commercial long positions and  $HL_i$  stands for all long hedge positions.

# C. Financialization in Pictures

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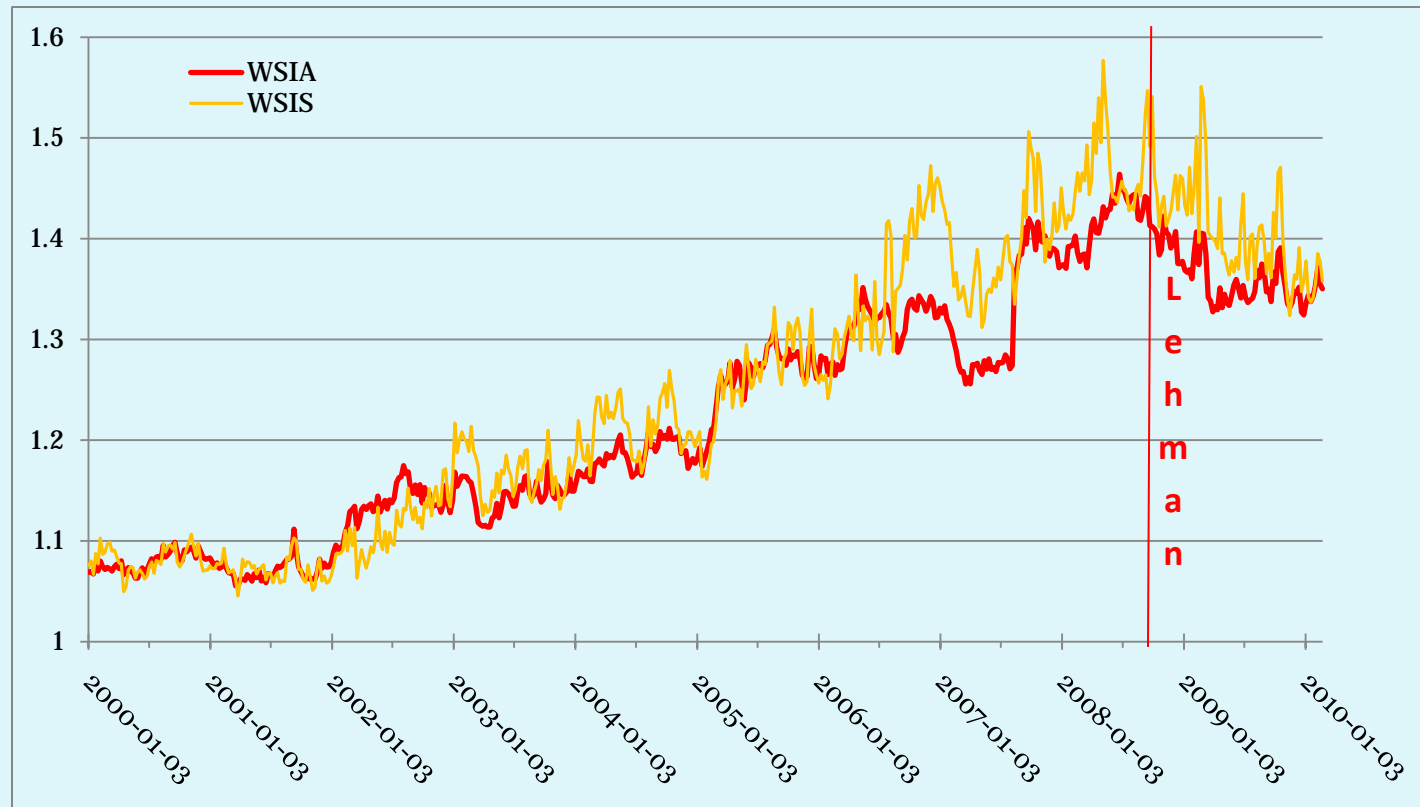
- **Overall speculation is up**
  - From about 10% excess spec till 2002  
to 35-50% after 2005
- **Commodity Index Trading is Up**
  - Swap Dealer positions account for about 35% of futures OI
- **Hedge Funds are Up**
  - From 5-10% of the futures OI till 2002  
to 25-30% after 2005
- **Cross-Market Trading is Up**
  - Tripled since 2002
  - Pattern does not follow other hedge funds



# Energy Speculation

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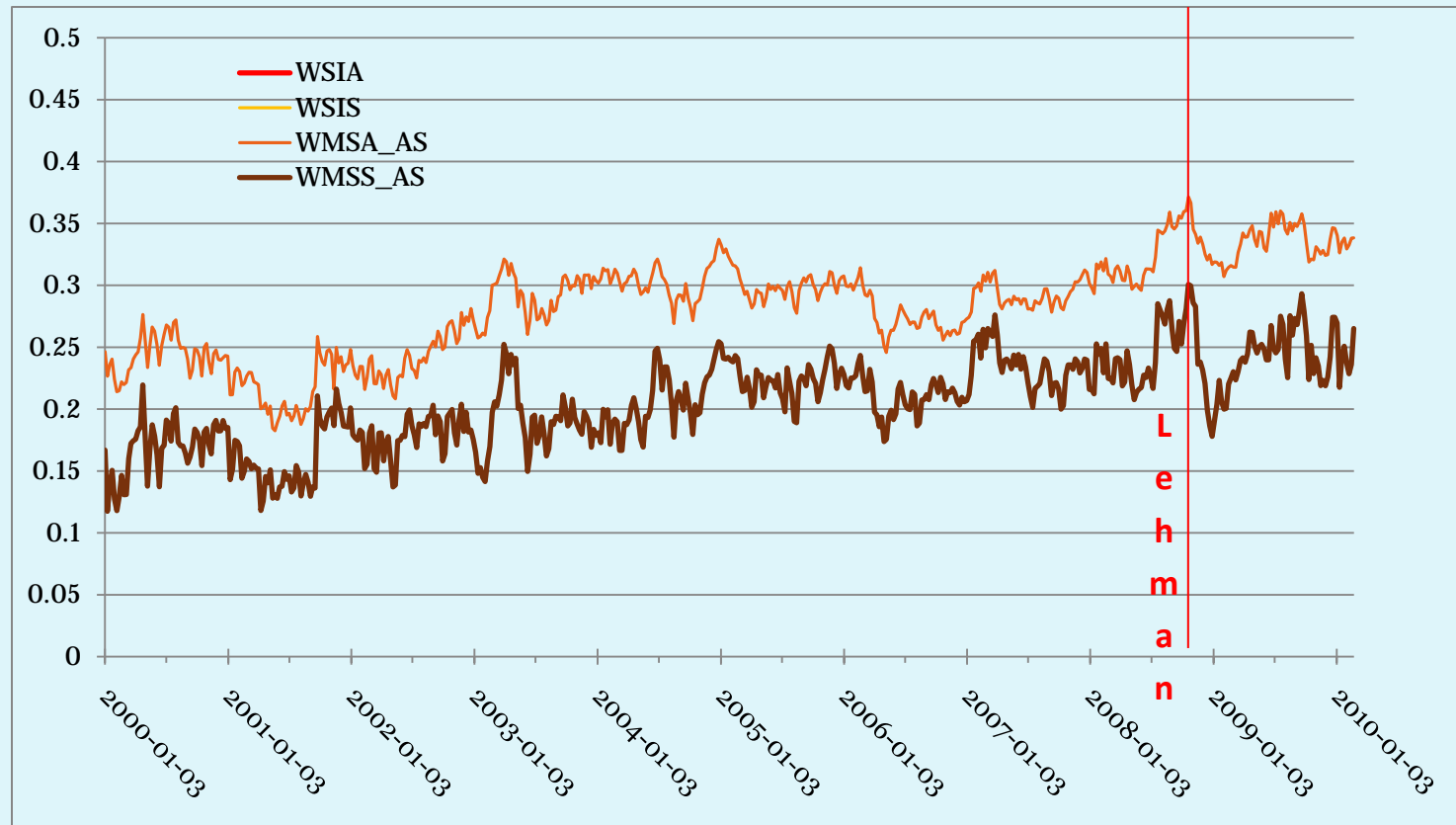
- Working's T, January 2000 to March 2010



# Swap Dealing & Commodity Index Trading

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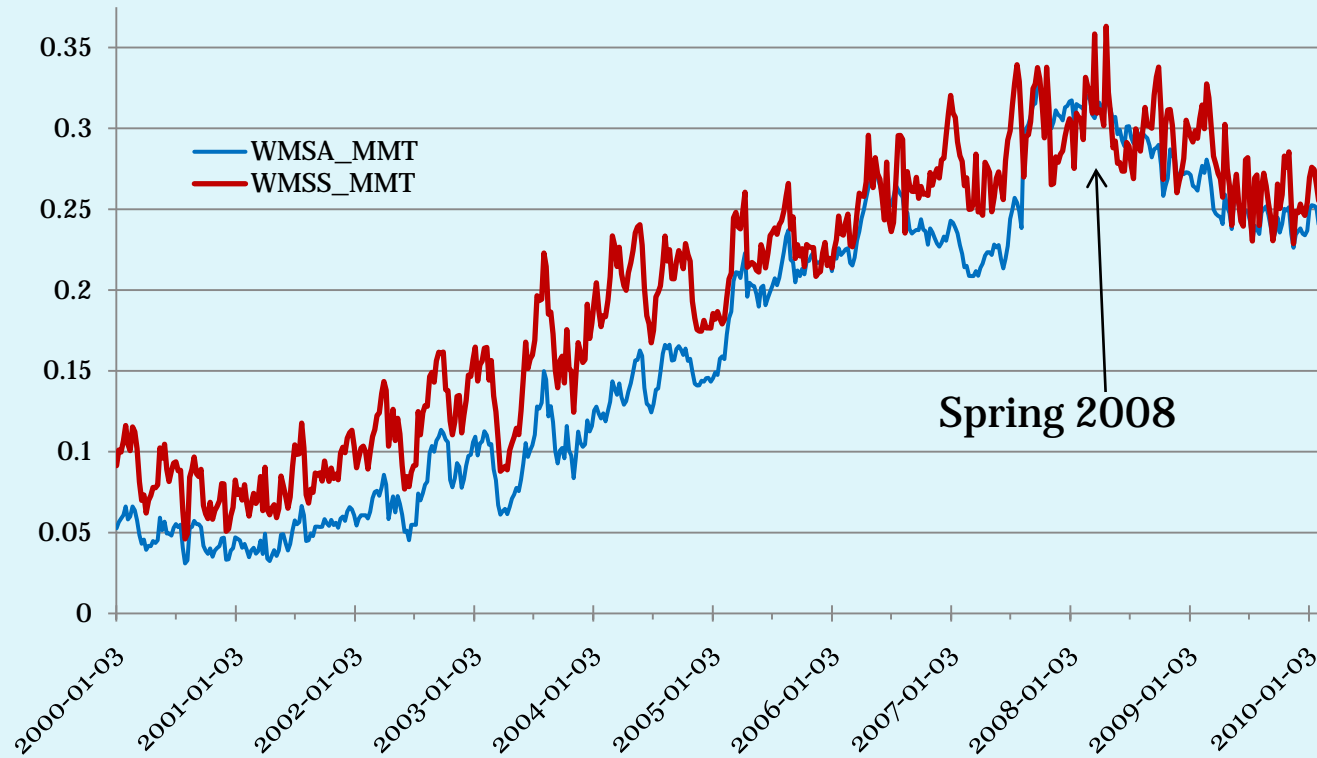
- Overall vs. Near-dated Swap Dealer Positions (% of OI), 2000-2010



# Hedge Funds *and* Cross Traders

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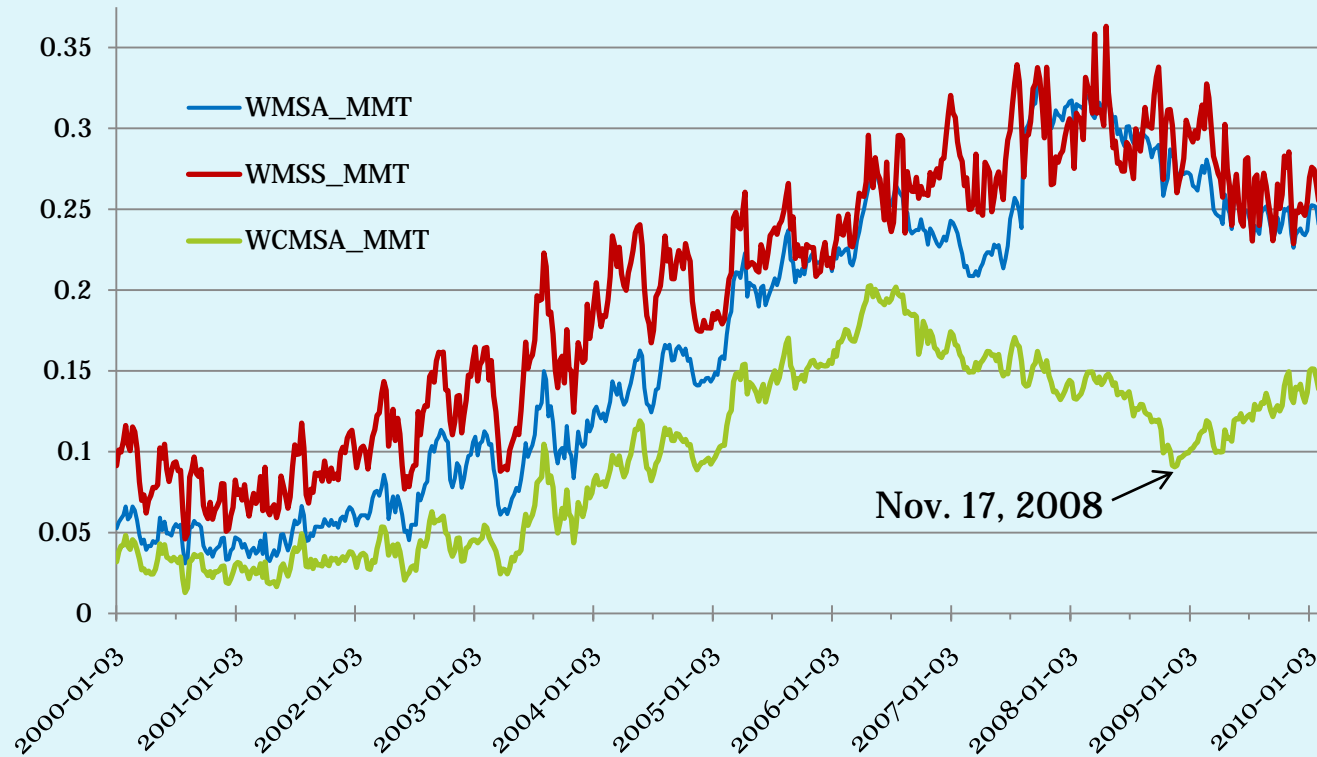
- Hedge funds' share of Energy Futures Open Interest, 2000 to 2010



# Hedge Funds *and* Cross Traders

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- Hedge funds that Trade both Energy and Equity Futures, 2000-2010



# III. Main Question

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# Does Trader Identity Matter?

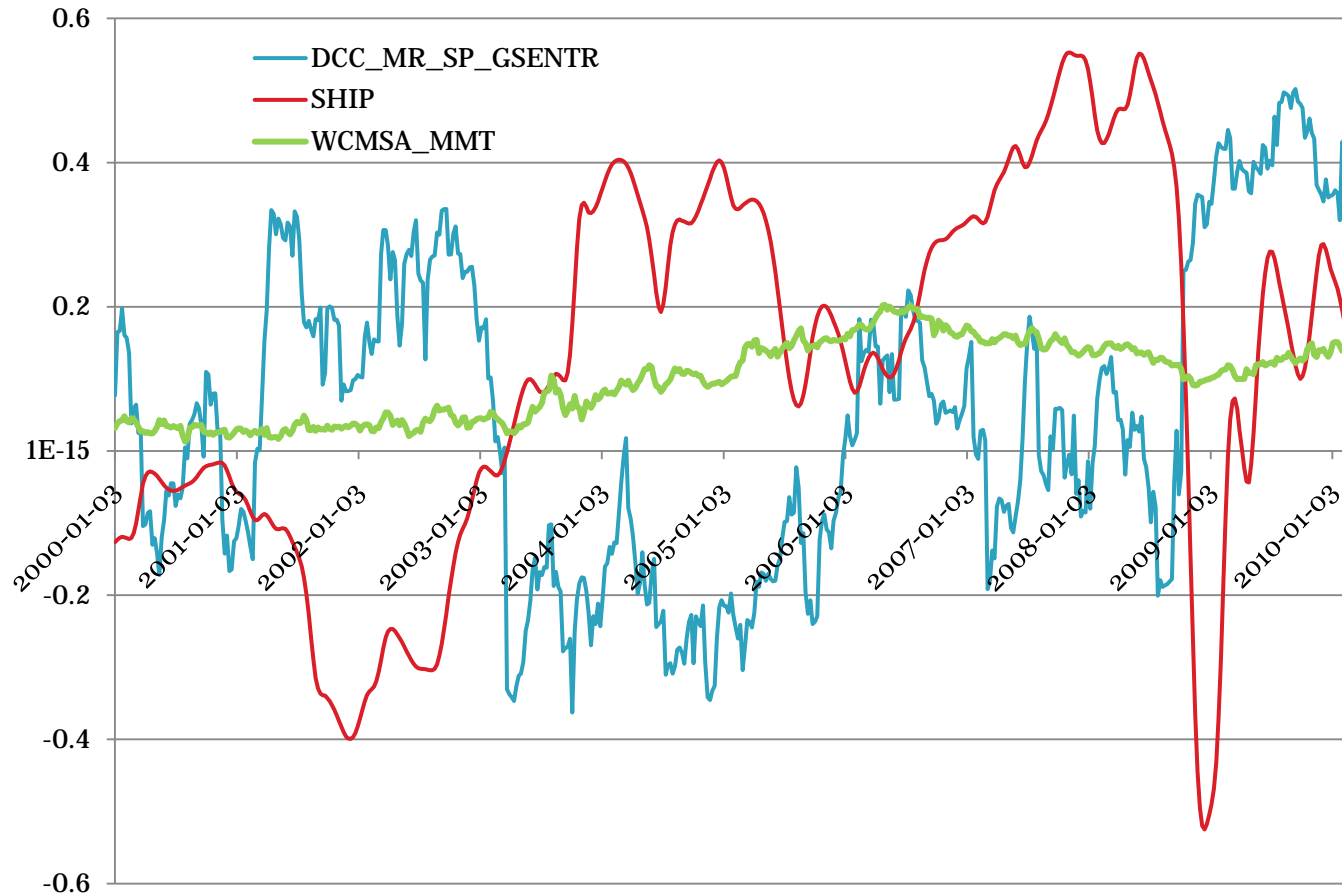
38

- Does the composition of trading activity (*i.e.*, who trades) matter for asset pricing?
  - Theoretical reasons to believe trader identity matters
    - ✦ Models show that less-constrained traders link asset markets
      - e.g., Basak & Croitoru (*JFE* 2006)
    - ✦ During financial stress periods, contagion or retrenchment?
      - E.g., Kyle & Xiong (*JF* 2001), Pavlova & Rigobon (*REStud* 2008)
  - Who is a “candidate” for enhancing linkages?
    - ✦ Traditional commercial traders, Long-term investors, etc.? → Unlikely
    - ✦ Hedge funds? → More likely
      - Enter/exit markets frequently
      - trade across markets to exploit perceived mis-pricings/opportunities
        - Levered + subject to borrowing limits/wealth effects + value-arb across markets

# More Speculators → Ever Higher DCC?

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- Cross trading should be the best candidate: does a graph suggest it?



# **A. Dependent Variable:** *Equity-Energy Correlations (DCC)*

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# **B. What Drives Correlations: Trading Activity *or* Fundamentals?**

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# 1. Trading

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- Does *trader identity* trades matter for asset pricing?
  - Theoretical reasons to believe trader identity matters
    - ✦ Models show that less-constrained traders link asset markets
      - e.g., Basak & Croitoru (*JFE* 2006)
    - ✦ During financial stress periods, contagion or retrenchment?
      - E.g., Kyle & Xiong (*JF* 2001), Pavlova & Rigobon (*REStud* 2008)
  - Who is a “candidate” for enhancing linkages?
    - ✦ Traditional commodity users, passive indexers? → Less likely
    - ✦ Hedge funds? → More likely
      - Enter/exit markets frequently
      - trade across markets to exploit perceived mis-pricings/opportunities
      - Levered & subject to borrowing limits/wealth effects under stress

## 2. Fundamentals?

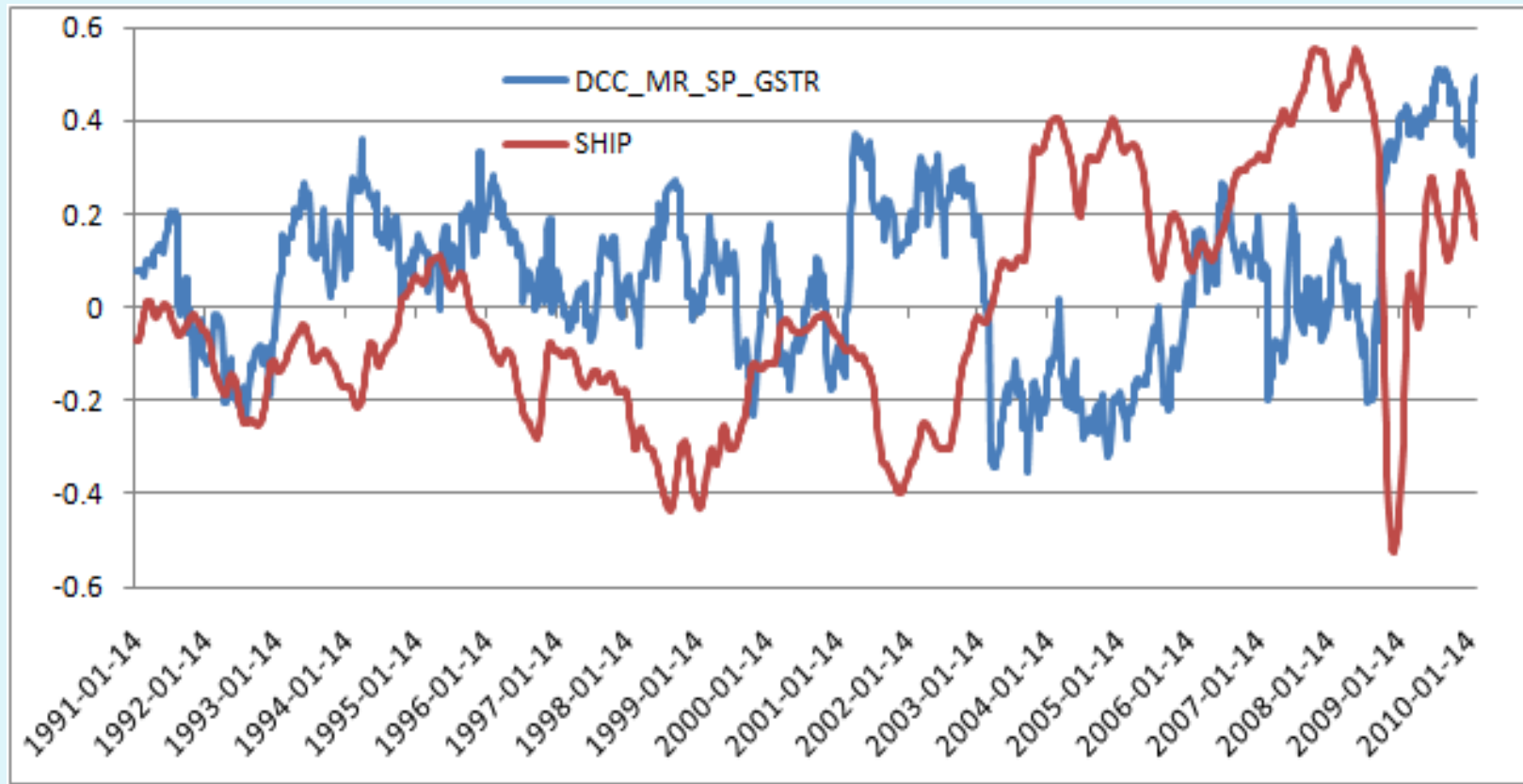
43

- **Macroeconomic fundamentals**
  - Inflation?
  - Business cycles / economic climate?
    - ✦ They ought to matter
      - Gorton & Rouwenhorst (*FAJ* 2006); also, Kilian & Park (*IER* 2009)
    - ✦ Measurement
      - US economic activity?
        - ADS (*Aruoba-Diebold-Scotti, JBES* 2009)
      - World economy?
        - SHIP - Shipping freight rates (*Kilian, AER* 2009)?
        - LPI (non-exchange-traded commodity price index)?
- **Energy-market fundamentals**
  - Spare crude oil production capacity?

# Worldwide Economic Activity & DCC

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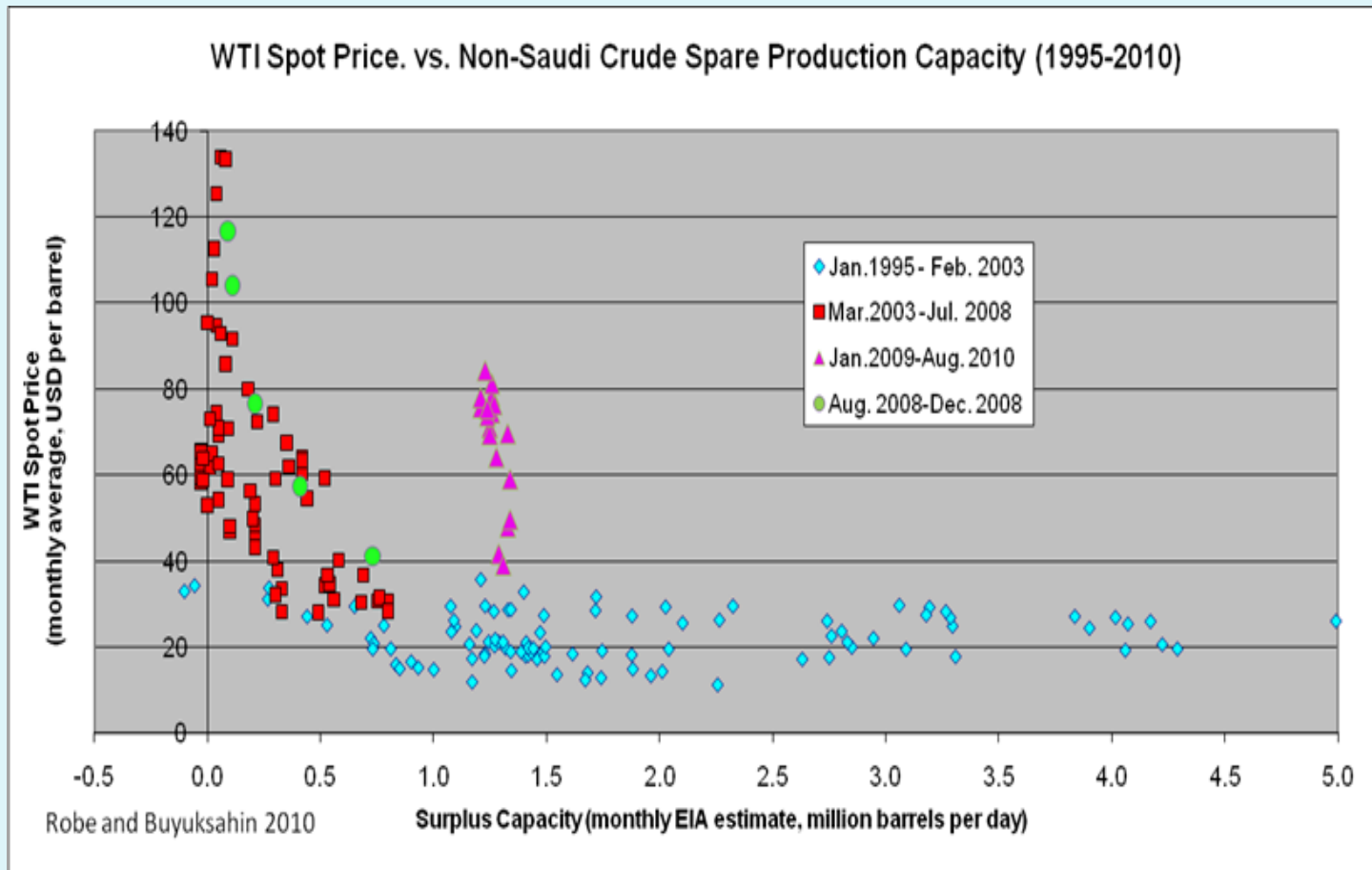
- Figure 3: SHIP negatively related with DCC after 1997?



# Worldwide Economic Activity & DCC

45

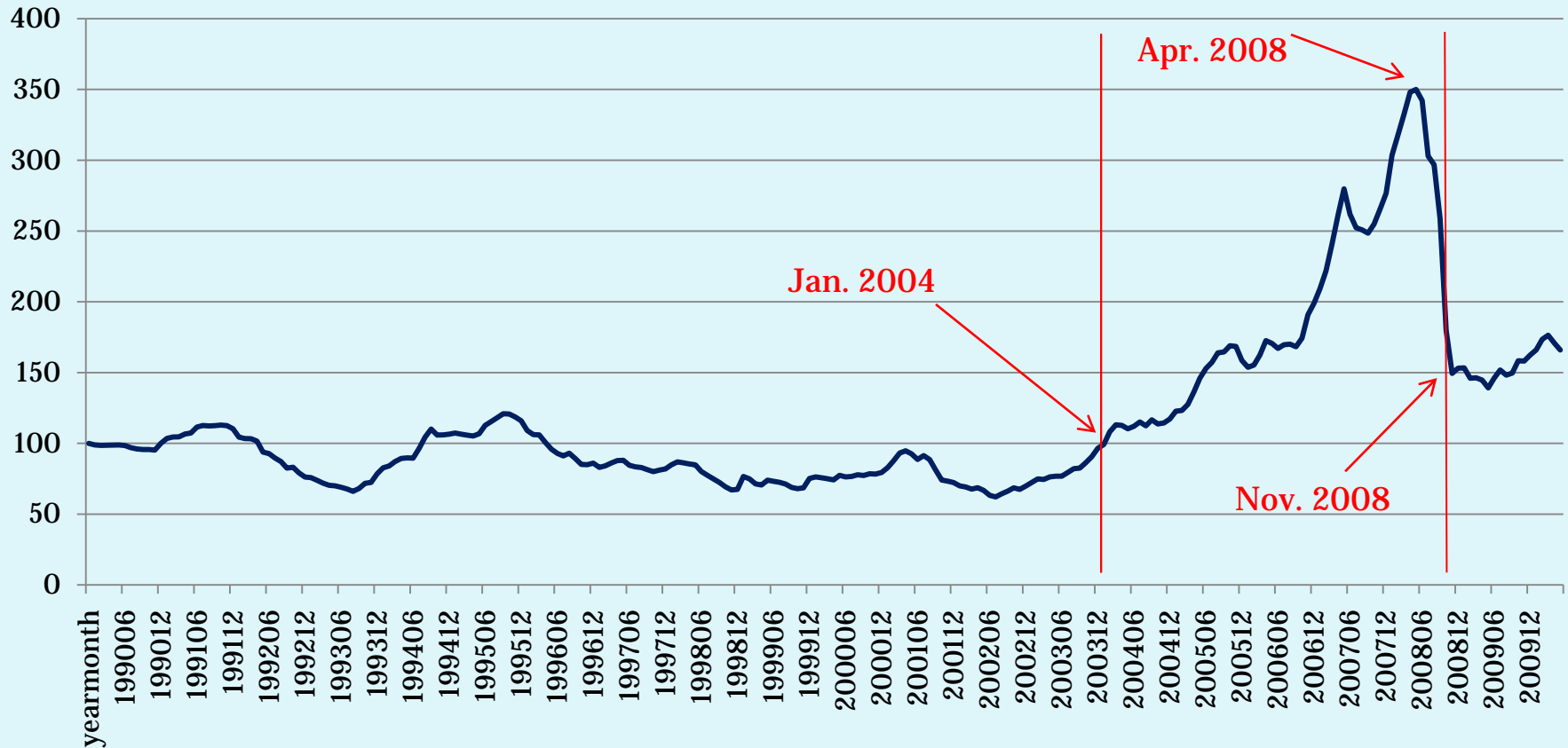
- **Figure 4: SPARE**



# Commodity-Demand Shock in 2004

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Non-exchange traded commodity price index -- Nominal, 1990 to 2010 (Jan. 1990=100)



# 3. Market Stress?

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- 1. Financial Stress?
  - Financial stress should matter – evidence on extreme linkages:
    - ✦ *Bond-equity* returns extreme linkages in G-5 countries
    - ✦ *International equity* market correlations increase in bear markets
    - ✦ *Commodity-equity* linkages went up in Fall 2008
  - Our measure: TED Spread
    - ✦ *Robustness: VIX*
- 2. Hedge fund / Spec activity / Cross-market trading?
- **1+ 2**: Do these effects interact?

# C. What Really Matters?

## ARDL Regressions

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# B. Explaining Commodity-Equity DCC

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- Regress the DCC estimate on...
  - ...trader **position data**
    - ✦ Each trader category entered separately
      - Short-dated ( $\leq 3$  months) vs. Far-dated ( $> 3$  months) positions
    - ✦ All traders in a category vs. only energy-equity cross-market traders
  - ...**real-sector variables**
  - ...**market stress proxies**
- Technical issue
  - Some series are  $I(0)$ , others  $I(1)$ ; also, endogeneity?
    - ARDL model, Pesaran-Shin (1999) approach
    - Lagged values of variables to deal with AC and endogeneity

# Economic Activity & Market Stress Matter (5A)

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	<u>1995-2000</u>		<u>2000-2010</u>		<u>1995-2010</u>		<u>1991-2000</u>		<u>2000-2010</u>		<u>1991-2010</u>
<b>Constant</b>	0.181332	***	-0.291257	**	-0.180740		0.201441	**	-0.0495553		-0.0290865
	(0.06578)		(0.1398)		(0.1106)		(0.08028)		(0.1111)		(0.07028)
<b>ADS</b>							-0.0891680		0.120929		-0.0940820
							(0.08694)		(0.1477)		(0.06288)
<b>SHIP</b>							-0.113461		-0.754496	**	-0.277686
							(0.2694)		(0.3682)		(0.1680)
<b>SPARE</b>	-0.0111549		0.134130	**	0.0581962						
	(0.02713)		(0.06252)		(0.04732)						
<b>UMD</b>	0.00106191		0.141386		0.0876287		0.0468735		0.141192		0.102172
	(0.03897)		(0.1044)		(0.07926)		(0.06957)		(0.1082)		(0.06996)
<b>TED</b>	-0.164767		0.516236	**	0.362652	**	-0.269397		0.592622	**	0.193733
	(0.1122)		(0.2046)		(0.1530)		(0.1754)		(0.2955)		(0.1274)

# The Post-Lehman Period is Special (5B)

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	<u>2000-2010</u>		<u>1995-2010</u>		<u>2000-2010</u>		<u>1991-2010</u>	
<b>Constant</b>	-0.189684 (0.06799)	***	-0.118617 (0.05827)	**	-0.0178242 (0.05516)		-0.00982412 (0.04566)	
<b>ADS</b>					0.144228 (0.07731)	*	-0.00556276 (0.04499)	
<b>SHIP</b>					-0.581261 (0.1795)	***	-0.279126 (0.1107)	**
<b>SPARE</b>	0.0973745 (0.03288)	***	0.0613461 (0.02581)	**				
<b>UMD</b>	0.0858745 (0.05115)	*	0.0623155 (0.04212)		0.0814175 (0.05151)		0.0752574 (0.04498)	*
<b>TED</b>	0.208681 (0.09205)	**	0.130900 (0.07568)	*	0.313905 (0.1287)	**	0.0871756 (0.08180)	
<b>DUM</b>	0.422350 (0.1075)	***	0.452321 (0.1003)	***	0.481028 (0.1182)	***	0.459802 (0.1173)	***

# Fundamentals Matter (Control for Trading – 6A)

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<b>Constant</b>	-0.826467 (0.2323)	***	-1.96763 (0.7290)	***	-2.56901 (1.057)	**	-3.17242 (1.273)	**
<b>SPARE</b>	0.154870 (0.03576)	***	0.135986 (0.03237)	***	0.121034 (0.03185)	***	0.107117 (0.03093)	***
<b>UMD</b>	0.0710231 (0.04025)	*	0.0727269 (0.03981)	*	0.0579558 (0.03378)	*	0.0586289 (0.03274)	*
<b>TED</b>	1.77734 (0.5081)	***	4.60514 (1.485)	***	1.38053 (0.4230)	***	3.39324 (1.346)	**
<b>WMSS_MMT</b>	2.37960 (0.8664)	***			5.22120 (1.523)	***		
<b>WMSS_AS</b>					0.896538 (1.624)		-0.949729 (1.275)	
<b>WMSS_TCOM</b>					2.82919 (1.358)	**	1.07074 (0.9123)	
<b>WSIA</b>			1.32955 (0.5596)	**			2.21413 (0.7198)	***
<b>INT_TED_MMT</b>	-5.51366 (1.676)	***			-4.30584 (1.402)	***		
<b>INT_TED_WSIA</b>			-3.20403 (1.064)	***			-2.37744 (0.9594)	**
<b>DUM</b>	0.347098 (0.09457)	***	0.350655 (0.09879)	***	0.445824 (0.09043)	***	0.380342 (0.08412)	***

Log likelihood

881.086

871.939

884.97

875.182

# But Speculative Activity Matters, as well! (6B)

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<b>Constant</b>	-0.826467 (0.2323)	***	-1.96763 (0.7290)	***	-2.56901 (1.057)	**	-3.17242 (1.273)	**
<b>SPARE</b>	0.154870 (0.03576)	***	0.135986 (0.03237)	***	0.121034 (0.03185)	***	0.107117 (0.03093)	***
<b>UMD</b>	0.0710231 (0.04025)	*	0.0727269 (0.03981)	*	0.0579558 (0.03378)	*	0.0586289 (0.03274)	*
<b>TED</b>	1.77734 (0.5081)	***	4.60514 (1.485)	***	1.38053 (0.4230)	***	3.39324 (1.346)	**
<b>WMSS_MMT</b>	<b>2.37960</b> (0.8664)	<b>***</b>			<b>5.22120</b> (1.523)	<b>***</b>		
<b>WMSS_AS</b>					0.896538 (1.624)		-0.949729 (1.275)	
<b>WMSS_TCOM</b>					2.82919 (1.358)	**	1.07074 (0.9123)	
<b>WSIA</b>			1.32955 (0.5596)	**			2.21413 (0.7198)	***
<b>INT_TED_MMT</b>	-5.51366 (1.676)	***			-4.30584 (1.402)	***		
<b>INT_TED_WSIA</b>			-3.20403 (1.064)	***			-2.37744 (0.9594)	**
<b>DUM</b>	0.347098 (0.09457)	***	0.350655 (0.09879)	***	0.445824 (0.09043)	***	0.380342 (0.08412)	***

Log likelihood

881.086

871.939

884.97

875.182

# Hedge Funds and Stress Interact

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<b>Constant</b>	-0.826467 (0.2323)	***	-1.96763 (0.7290)	***	-2.56901 (1.057)	**	-3.17242 (1.273)	**
<b>SPARE</b>	0.154870 (0.03576)	***	0.135986 (0.03237)	***	0.121034 (0.03185)	***	0.107117 (0.03093)	***
<b>UMD</b>	0.0710231 (0.04025)	*	0.0727269 (0.03981)	*	0.0579558 (0.03378)	*	0.0586289 (0.03274)	*
<b>TED</b>	1.77734 (0.5081)	***	4.60514 (1.485)	***	1.38053 (0.4230)	***	3.39324 (1.346)	**
<b>WMSS_MMT</b>	<b>2.37960</b> (0.8664)	<b>***</b>			<b>5.22120</b> (1.523)	<b>***</b>		
<b>WMSS_AS</b>					0.896538 (1.624)		-0.949729 (1.275)	
<b>WMSS_TCOM</b>					2.82919 (1.358)	**	1.07074 (0.9123)	
<b>WSIA</b>			1.32955 (0.5596)	**			2.21413 (0.7198)	***
<b>INT_TED_MMT</b>	<b>-5.51366</b> (1.676)	<b>***</b>			<b>-4.30584</b> (1.402)	<b>***</b>		
<b>INT_TED_WSIA</b>			-3.20403 (1.064)	***			-2.37744 (0.9594)	**
<b>DUM</b>	0.347098 (0.09457)	***	0.350655 (0.09879)	***	0.445824 (0.09043)	***	0.380342 (0.08412)	***

Log likelihood

881.086

871.939

884.97

875.182

# Cross-Trading Hedge Funds Matter

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	<u>2000-2010</u>		<u>2000-2010</u>		<u>2000-2010</u>		<u>2000-2010</u>		<u>2000-2010</u>		<u>2000-2010</u>	
<b>Constant</b>	-0.778333 (0.2196)	***	0.210448 (0.4022)		-0.971063 (0.8296)		-0.783793 (0.2277)	***	0.315275 (0.4216)		-0.675490 (0.8831)	
<b>ADS</b>							0.0381775 (0.06174)		0.0536956 (0.05042)		0.0631063 (0.04728)	
<b>SPARE</b>	0.178190 (0.04215)	***	0.129834 (0.03684)	***	0.104834 (0.03318)	***	0.179592 (0.04372)	***	0.126999 (0.03755)	***	0.102546 (0.03384)	***
<b>UMD</b>	0.0722604 (0.04570)		0.0565843 (0.03696)		0.0645123 (0.03534)	*	0.0715149 (0.04713)		0.0540846 (0.03760)		0.0602626 (0.03580)	*
<b>TED</b>	1.37460 (0.4684)	***	1.01301 (0.3643)	***	3.29099 (1.400)	**	1.46240 (0.5075)	***	1.07753 (0.3831)	***	3.14341 (1.427)	**
<b>WCMSA_MMT</b>	<b>5.10806</b> (1.717)	<b>***</b>	<b>3.92980</b> (1.358)	<b>***</b>			<b>5.13408</b> (1.783)	<b>***</b>	<b>3.76414</b> (1.392)	<b>***</b>		
<b>WCMSA_AS</b>			-3.73983 (1.543)	**	-2.86410 (1.567)	*			-4.14034 (1.629)	**	-3.40879 (1.653)	**
<b>WSIA</b>					1.08753 (0.5081)	**					0.946378 (0.5354)	*
<b>INT_TED_CMMTA</b>	<b>-9.82038</b> (3.644)	<b>***</b>	<b>-6.96981</b> (2.862)	<b>**</b>			<b>-10.2754</b> (3.853)	<b>***</b>	<b>-7.13595</b> (2.950)	<b>**</b>		
<b>INT_TED_WSIA</b>					-2.26677 (1.005)	**					-2.11807 (1.028)	**
<b>DUM</b>	0.214922 (0.1120)	*	0.370933 (0.1067)	***	0.431396 (0.1017)	***	0.230696 (0.1226)	*	0.418018 (0.1196)	***	0.496860 (0.1197)	***
<b>Log likelihood</b>	881.802		885.162		875.116		882.31		885.943		876.387	

# VI. Conclusion

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# Findings

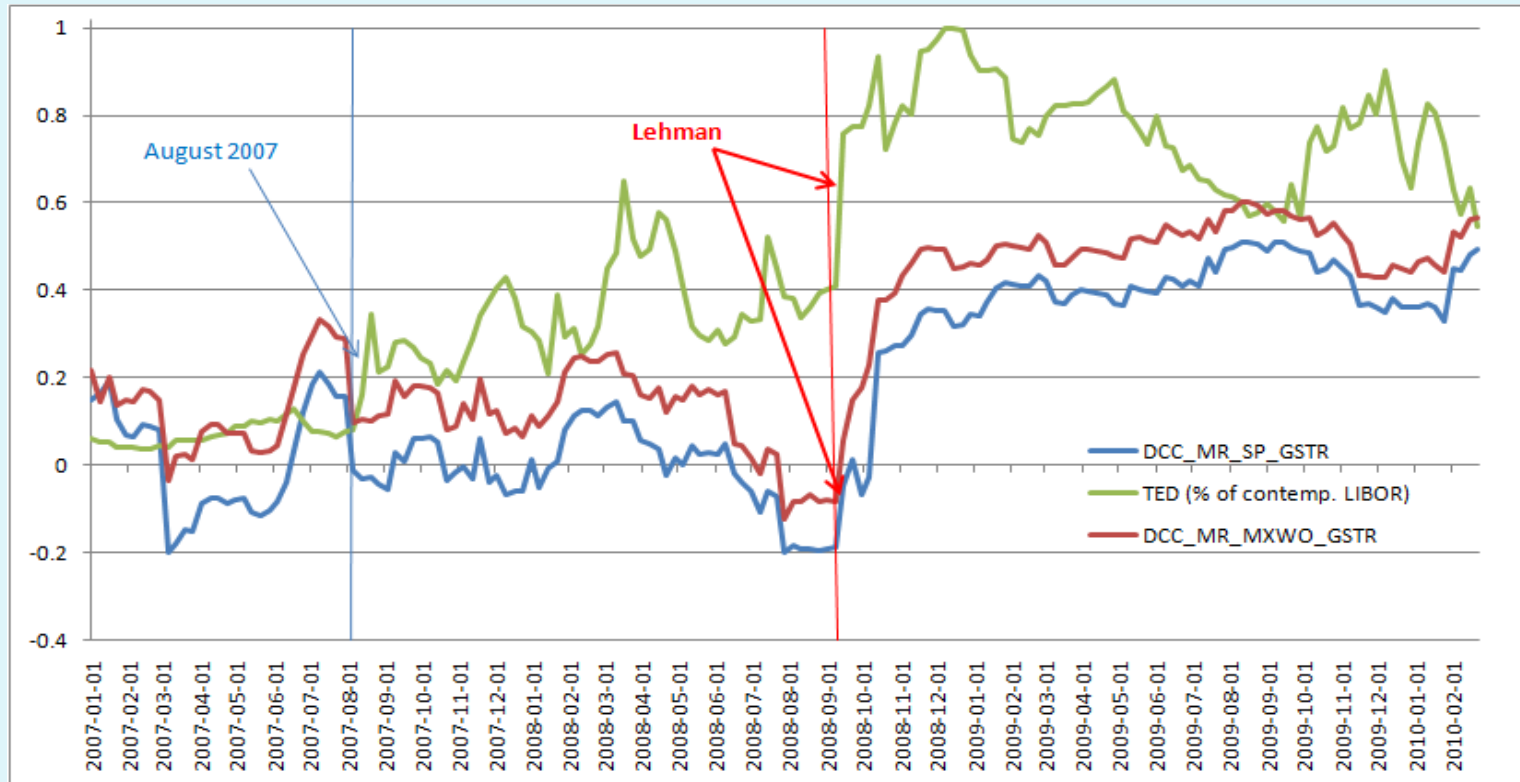
57

- **“Co-movements”**
  - ✦ Time variations in correlations, but no upward trend till crisis
  - ✦ Extreme-events analysis: commodity umbrella leaks
- **“Speculation”** in cross-section of energy paper mkts
  - ✦ Increase in speculation + hedge fund activity + cross-mkt activity
- **Impact of hedge funds** in energy markets
  - ✦ Hedge fund activity helps link markets
  - ✦ Market stress matters, too
  - ✦ Interaction – contagion through wealth effects?
- **Information on OI composition is payoff-relevant**
  - ✦ CFTC decision to disaggregate more

# Further Work (2011)

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- What has been happening post-Lehman?



- Theory?