

# Assessing the impact of speculators on agricultural prices

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# About Riskelia

- We help regulators, investors and hedgers better understand and anticipate speculative behaviors (trends, bubbles, crises)
- We have developed a Radar of Financial Markets screening all assets (commodities, currencies, interest rate futures, stocks) traded in the world
- We provide cutting-edge analyses on contagions and cross-market linkages

# Motivation of the present work

- Outstanding commodities price fluctuations in the last decade
  - By their synchronization
  - By their size
  - By their duration
- Financialization of commodities markets
  - Emergence of index speculation
  - Automated trading systems
- Fundamental transformations (Asia, oil depletion, geopolitics...)
- Is it possible to assess the impact of index investors on agricultural prices?

# The paper in a nutshell 1/3

- Triple aim:
  - better understand the motives of traditional speculators and index investors in agricultural markets
  - Understand which type of actors offset index flows into agricultural markets (hedge funds or hedgers)
  - identify the impact of index investors on agricultural commodities' futures prices
    - > we select 12 US-traded agricultural contracts supervised by the CFTC
    - > the analysis is done over the Jan 2006-Sept 2012 period

# The paper in a nutshell 2/3

- We do that by regressing weekly commercial flows/futures prices returns on *contemporaneous* index flows (provided by the CFTC)
- We alleviate endogeneity problems
  - By controlling for relevant fundamental and financial variables
  - by using 2 different instrumental variables (aggregate index flows towards 11 other agricultural commodities, flows towards the 3 main generalist commodity ETFs)

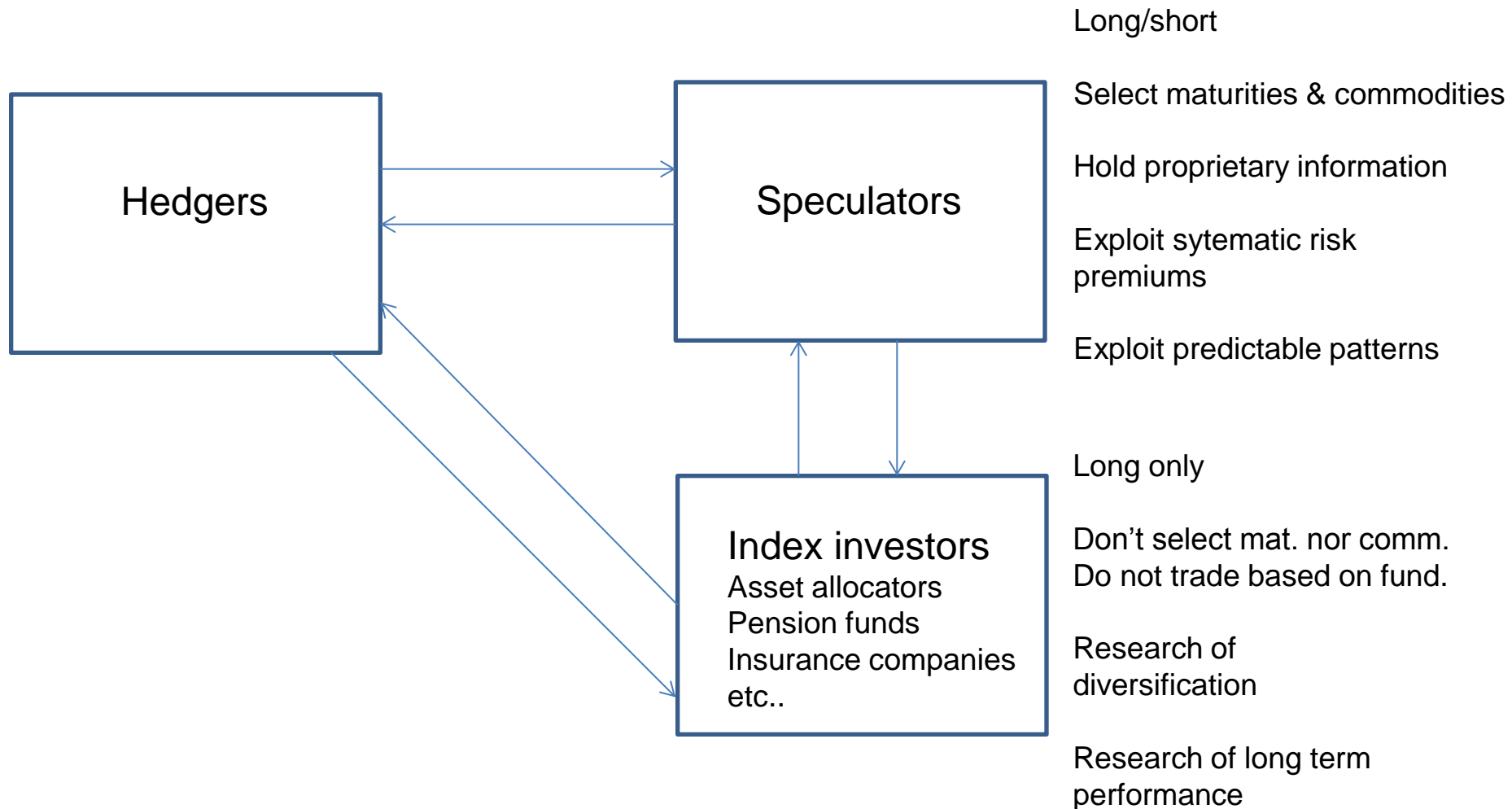
# The paper in a nutshell 3/3

- We find that:
  - Speculators follow fundamentals, index investors much less
  - Index flows are offset by commercial flows, not speculators' flows
  - There is clear evidence of CITs impact for the soybeans complex, cocoa and cotton
  - No impact on meat prices
  - The commodities markets where index flows have the largest impact are those where speculators synchronize with index investors
  - The impact is located in periods of global liquidity stress (and the correlation between spec and index flows as well)
    - > the nonstationarity is very pronounced for corn, the soybeans complex and cotton

# Agenda

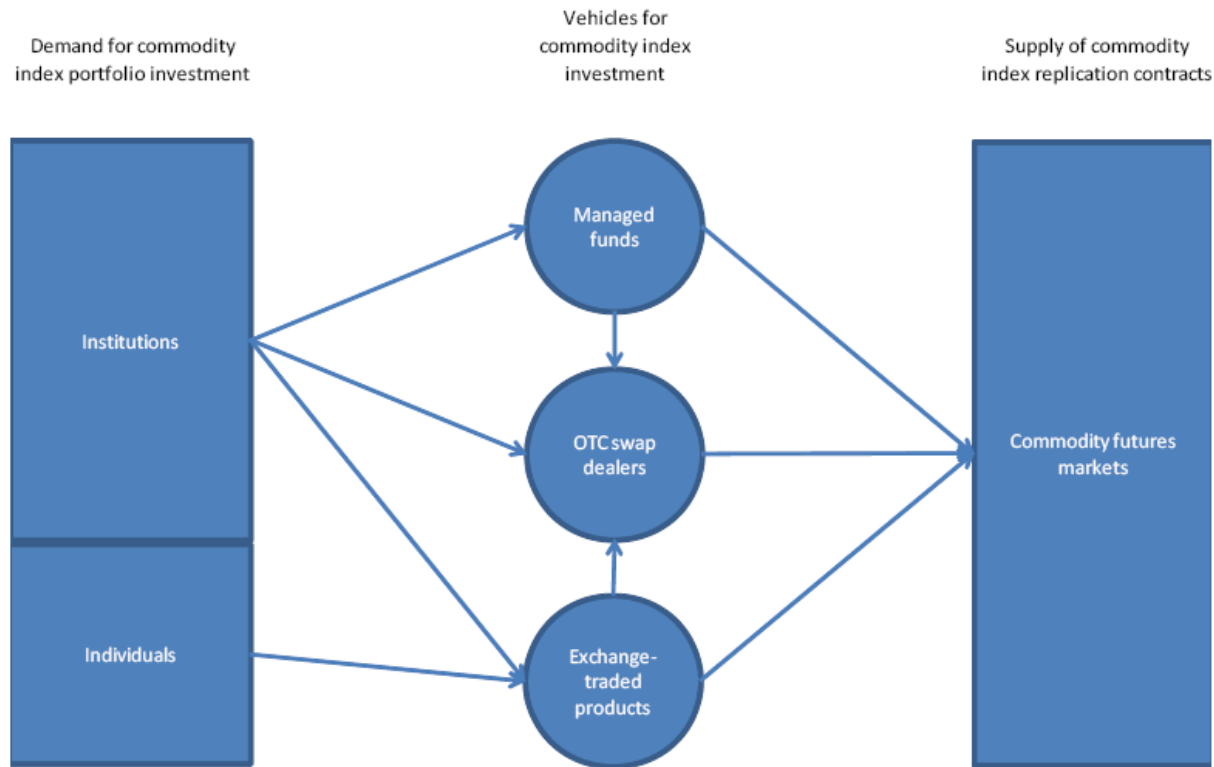
- Theoretical aspects of the problem
- Previous empirical works
- Our approach of the problem
  - Drivers of index investors and hedge funds
  - Index flows' counterparties and market impact
- Discussion

# The emergence of index speculation





# The mechanics of index speculation



*Stoll et Whaley (2009)*

# The debate on the « speculative impact »

## Theoretical approaches

Krugman's chinese wall between spot and paper markets

Spot market  
The price is determined only  
by supply and demand  
Speculative storage could play a role

No impact

Paper markets  
Traders « bet » on future spot  
price outcome  
How can the bet influence  
the outcome?

<http://krugman.blogs.nytimes.com/2008/06/23/speculative-nonsense-once-again/>

# The debate on the « speculative impact »

## Theoretical approaches

Babusiaux, Pierru and Lasserre (2011)

2

Spot market

The spot price follows the trend  
set by the paper market

The spot price becomes higher than justified by fundamentals

This anomaly takes time to be corrected because  
supply and demand are inelastic in the short term

1

Paper markets

Imagine uninformed long investors arrive  
in mass, we need to balance out the new  
long investment positions with new short  
commercial positions (producers...)  
the forward price is driven higher, away  
from fundamentals



Traders execute the C&C arbitrage

Physical contracts are indexed on spot prices

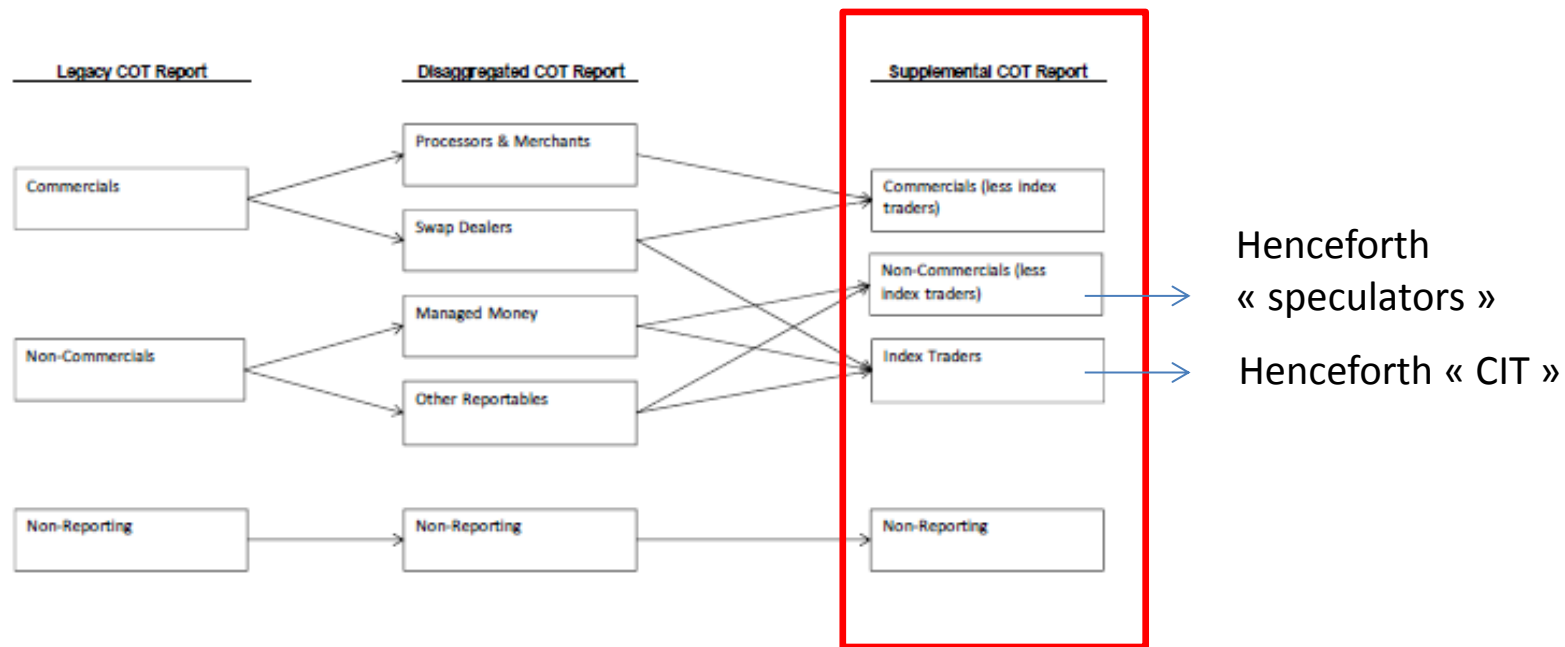
# Agenda

- Theoretical aspects of the problem
- **Previous empirical works**
- Our approach of the problem
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# Empirical approaches

## CFTC data

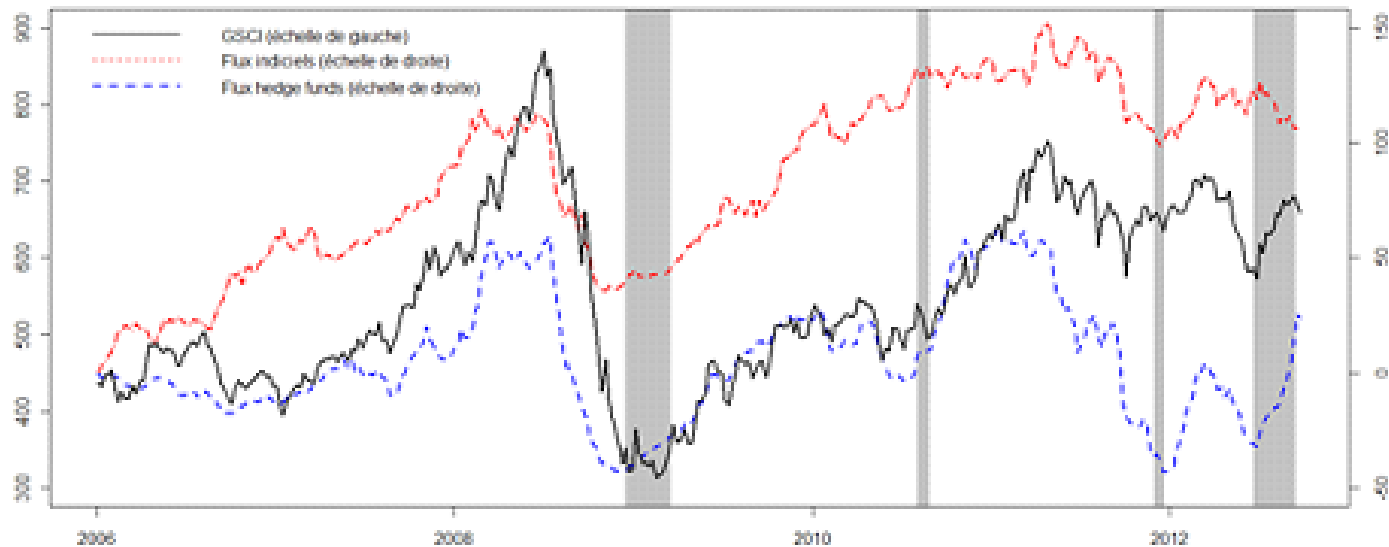
Figure 1. Relationship between Legacy, Disaggregated, and Supplemental Commitments of Traders Reports



Irwin and Sanders, 2012

# Empirical approaches to the problem

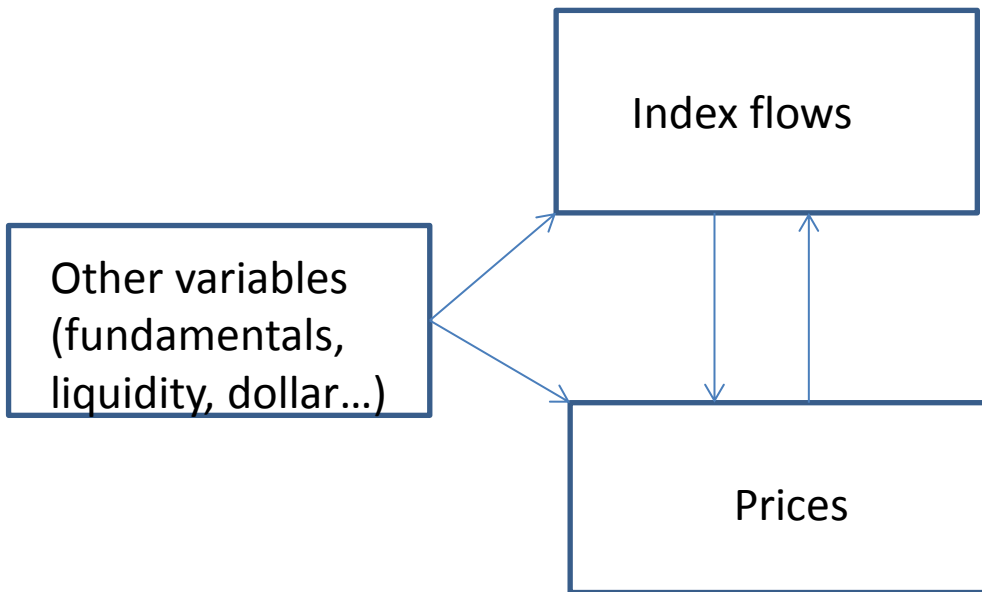
The visual correlation between index flows and prices



Important reference: Masters (2008)

# Empirical approaches to the problem

Correlation is not causation...



Approaches found in the literature to bypass the endogeneity problem:

- **Granger causality**

Irwin and Sanders, 2010

Büyüksahin and Harris, 2011

- **Control variables**

-> Singleton (2011): regress returns on lagged (cumulative) flows + control variables

-> Structural models to estimate the « bandwagon effect » or « overshooting »

Frankel and Rose, 2010;

Lombardi and Robays, 2011;

Morana, 2012; Juvenaly and Petrella, 2012

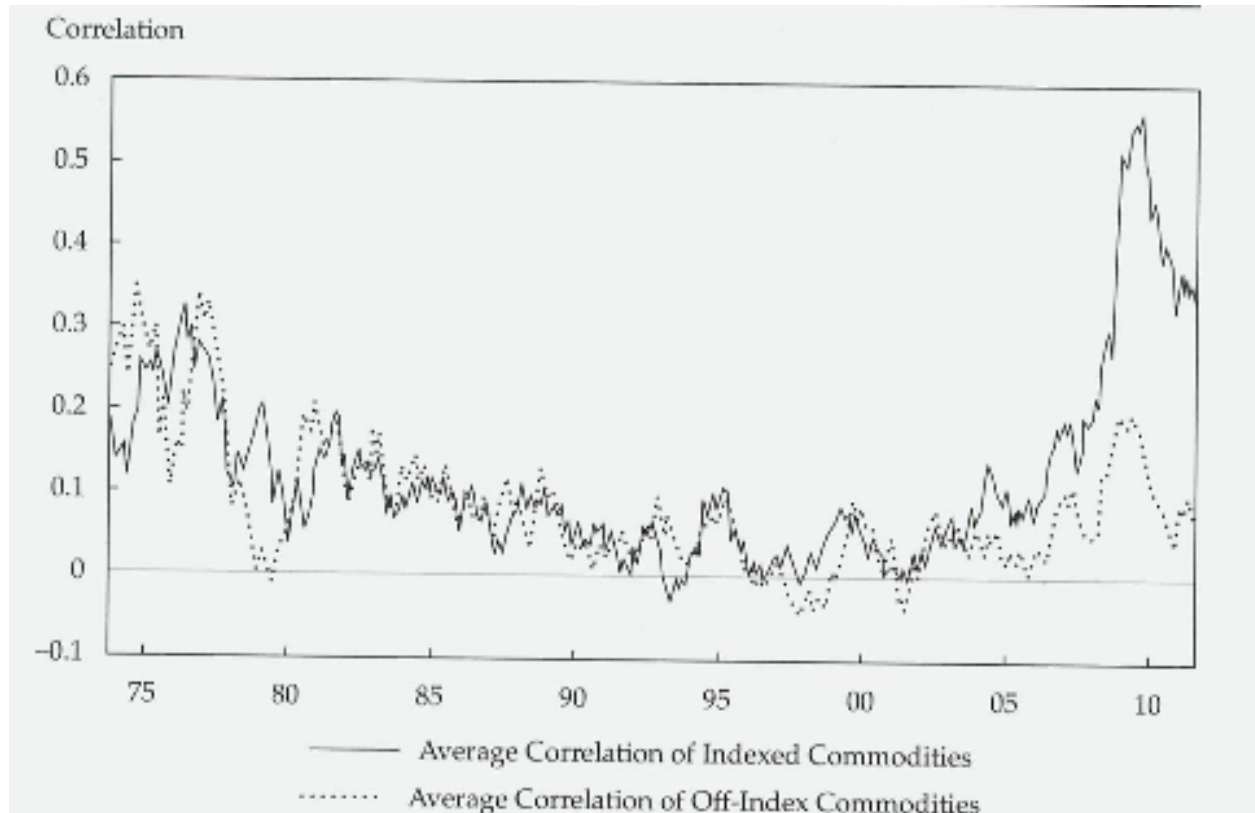
- **“Exogenous” index flows variables**

Gilbert (2010)

Hendersen, Pearson, Wang (2012)

# Empirical approaches to the problem

## Integration and index investment



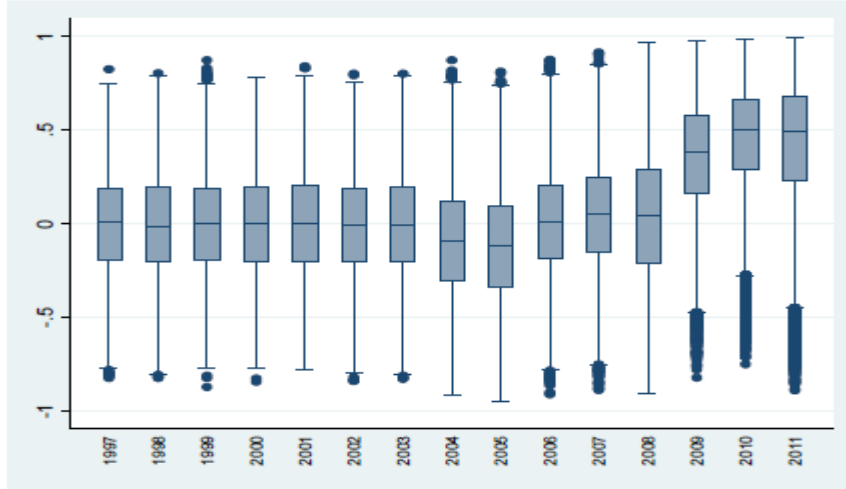
Tang, K., Xiong, W., 2012. Index investment and financialization of commodities. *Financial Analysts Journal* 68, 54-74



# Empirical approaches to the problem

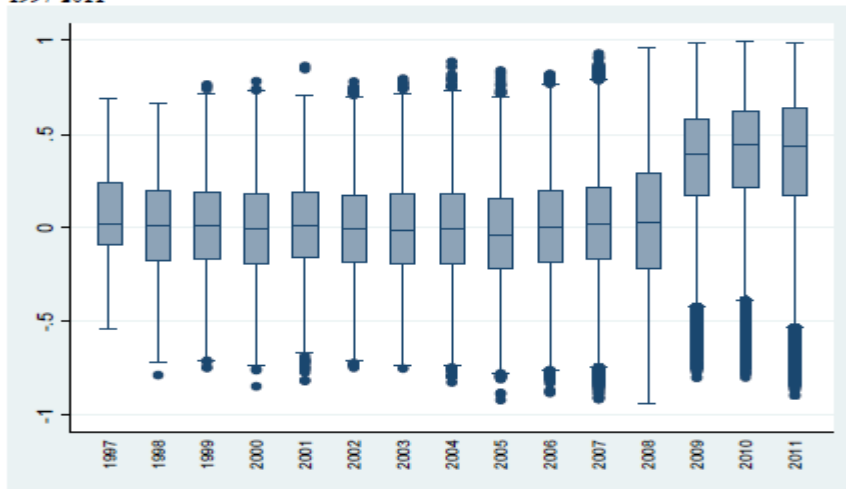
## Integration and algorithmic/high frequency trading

Figure 2c: Annual distribution of the 5-minute rolling correlations computed over 75 minutes between the returns on the WTI and the E-mini S&P 500 futures (front month), 1997-2011



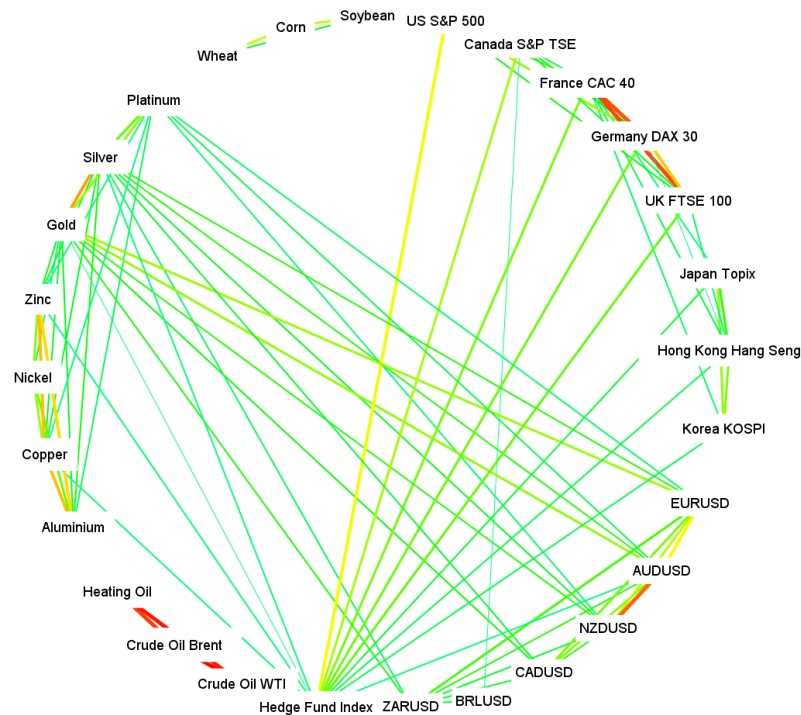
Bicchetti, D., Maystre, N., 2012. The synchronized and long-lasting structural change on commodity markets: evidence from high frequency data. United Nations Conference on Trade and Development – UNCTAD White Paper

Figure 2d: Annual distribution of the 10-second rolling correlations computed over 150 seconds between the returns on the WTI and the E-mini S&P 500 futures (front month), 1997-2011



# Correlation network 2002-2006

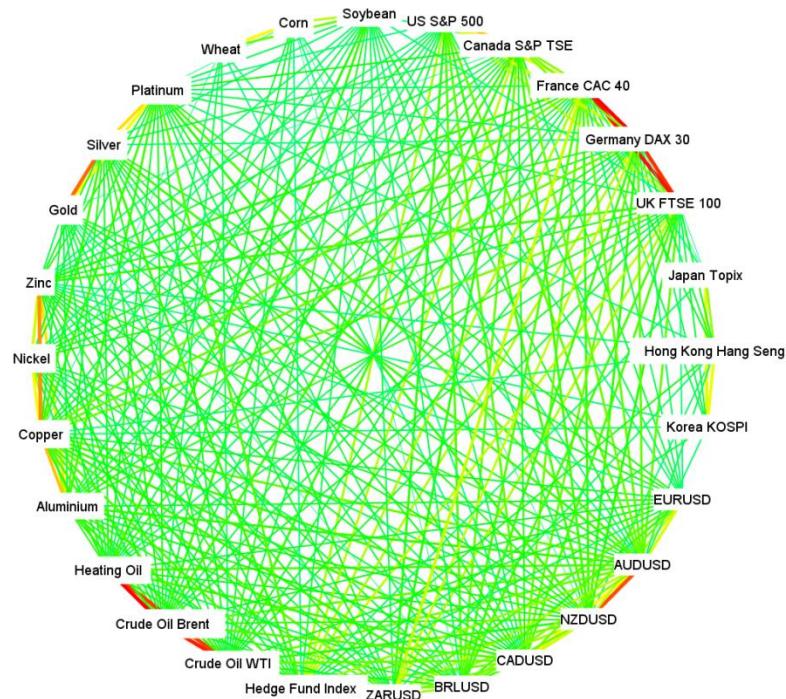
Correlations between daily returns  
Only correlations above 25% are represented



Source: Riskelia

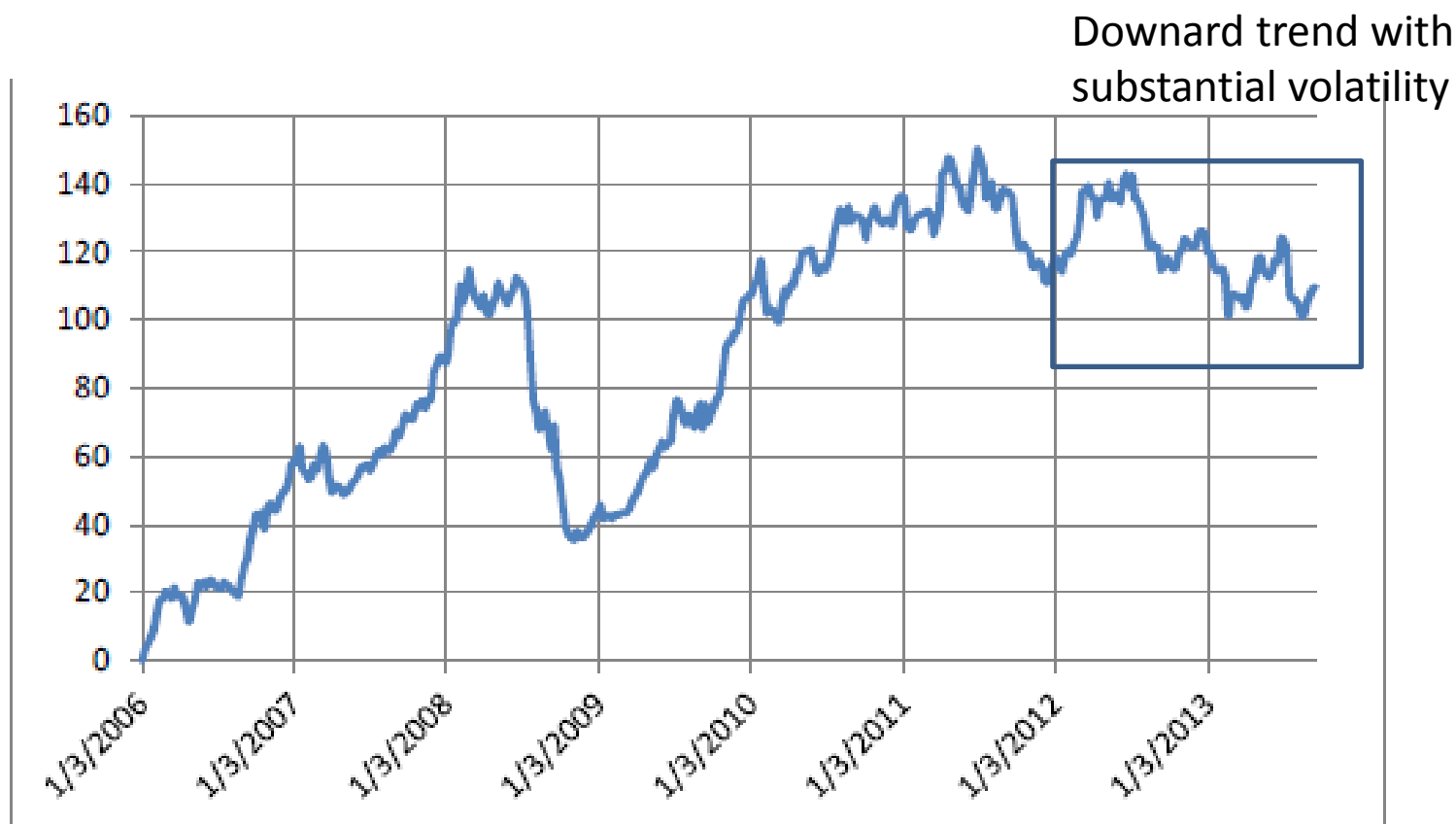
# Correlation network 2006-2012

Correlations between daily returns  
Only correlations above 25% are represented



Source: Riskelia

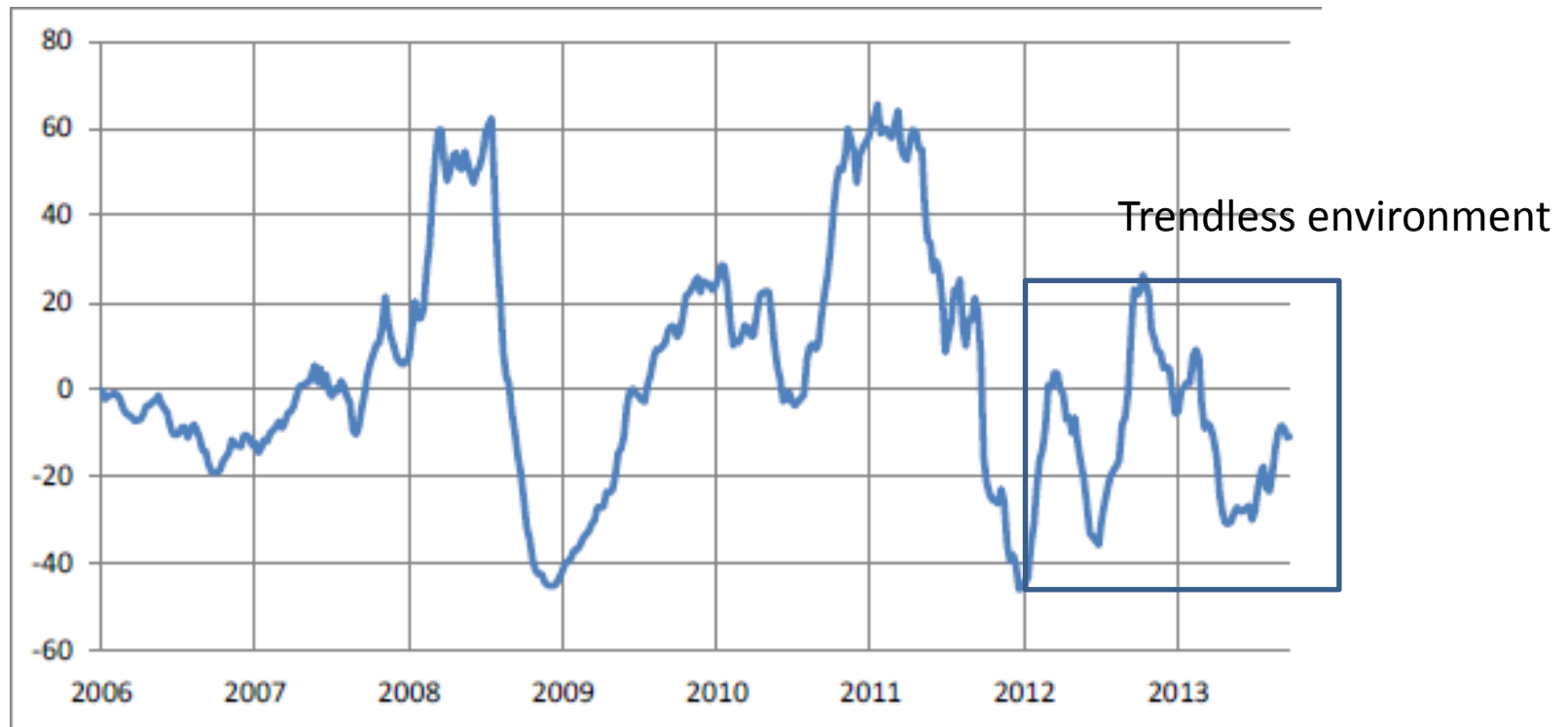
# Recent evolution of index flows



Source: Riskelia

# Recent evolution of speculative flows

Source: Riskelia

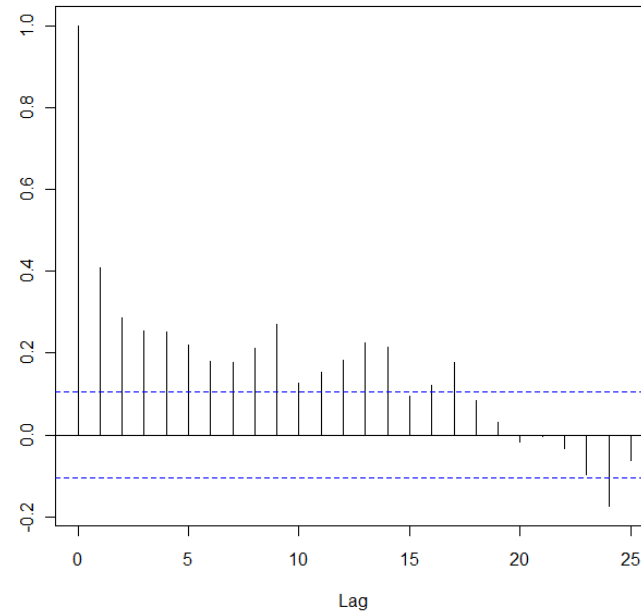


## Hedge funds suffer from the trendless environment

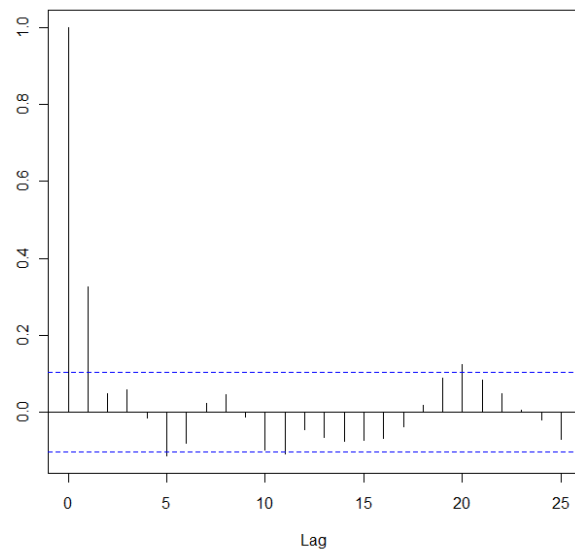
"Clive Capital Fund Plans to Close After Two Years of Losses", Bloomberg, Sept 2013

"Some of the biggest commodity hedge funds have closed since the start of last year. BlueGold Capital Management LLP, the \$1 billion energy fund co-founded by Pierre Andurand, liquidated in April 2012 after losing 34 percent in 2011, and New York-based Fortress Investment Group LLC shut a \$500 million commodities fund after it lost almost 13 percent in four months. Andurand, 36, started a new commodity fund this year. Assets managed by commodity hedge funds have fallen 5 percent since the end of 2012 to \$75 billion, according to Atlanta-based data provider Evestment."

# Serial correlation of weekly flows



CITs



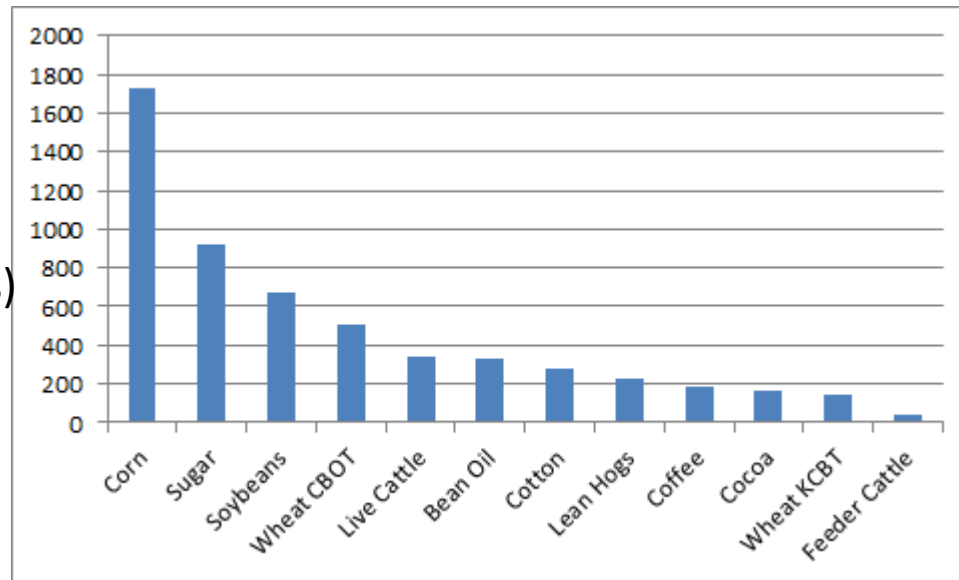
Speculators

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# 12 US-traded agricultural contracts

Open Interests  
(in number of lots)



Index investors  
and speculators  
in % of OI

	CIT		Speculators	
	Mean	Std	Mean	Std
Wheat (CBOT)	38%	4%	-6%	6%
Bean Oil (CBOT)	24%	4%	5%	10%
Corn (CBOT)	22%	4%	7%	5%
Soybean (CBOT)	24%	3%	7%	8%
Feeder Cattle (CME)	23%	5%	10%	13%
Lean Hogs (CME)	39%	5%	1%	9%
Live Cattle (CME)	36%	5%	8%	8%
Kansas Wheat (KCBT)	23%	5%	13%	11%
Cocoa (ICE US)	14%	4%	8%	12%
Coffee (ICE US)	25%	5%	5%	9%
Cotton (ICE US)	28%	7%	6%	10%
Sugar (ICE US)	22%	5%	7%	5%
Average	26%	5%	6%	9%



# Correlations between weekly flows/inventory changes/price returns

	RA	Dollar	Cycl Inv Proxy	Agri Inv Proxy	Agri Prices	Index flows	Spec flows
RA	1	0.32***	0.03	0.08	-0.34***	-0.13**	-0.27***
Dollar		1	0.22***	0.12**	-0.44***	-0.29***	-0.26***
Cycl Inv Proxy			1	0.16***	-0.3***	-0.16***	-0.12**
Agri Inv Proxy				1	-0.61***	-0.11**	-0.42***
Agri Prices					1	0.33***	0.63***
Index flows						1	0.20***
Spec flows							1

We construct an inventory proxy by computing the weekly change of the « basis » (spread between forward harvest and prompt harvest futures prices)

Cycl Inv proxy refers to a proxy for the inventory of highly cyclical commodities (metals, energy)

The « RA » refers to a risk aversion variable aggregating market price of risk in various markets

Agricultural prices are driven by fundamental as well as financial factors

Hedge funds are sensitive to fundamentals and prices (trend following behavior)

Index flows are sensitive to liquidity but not much to fundamentals (as could be expected)

Index and speculative flows are positively correlated

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- Theoretical aspects of the problem
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# Our approach

- Contemporaneous relations between index flows and hedgers' flows (are index flows balanced by hedgers or hedge funds?)
- Contemporaneous relations between weekly index flows and prices returns for the 12 agricultural commodities covered by the Supplemental Report
- We have an endogeneity problem ...
  - The correlation may be due to omitted variables (liquidity, fundamentals...)
  - The direction of causality could be from prices to flows

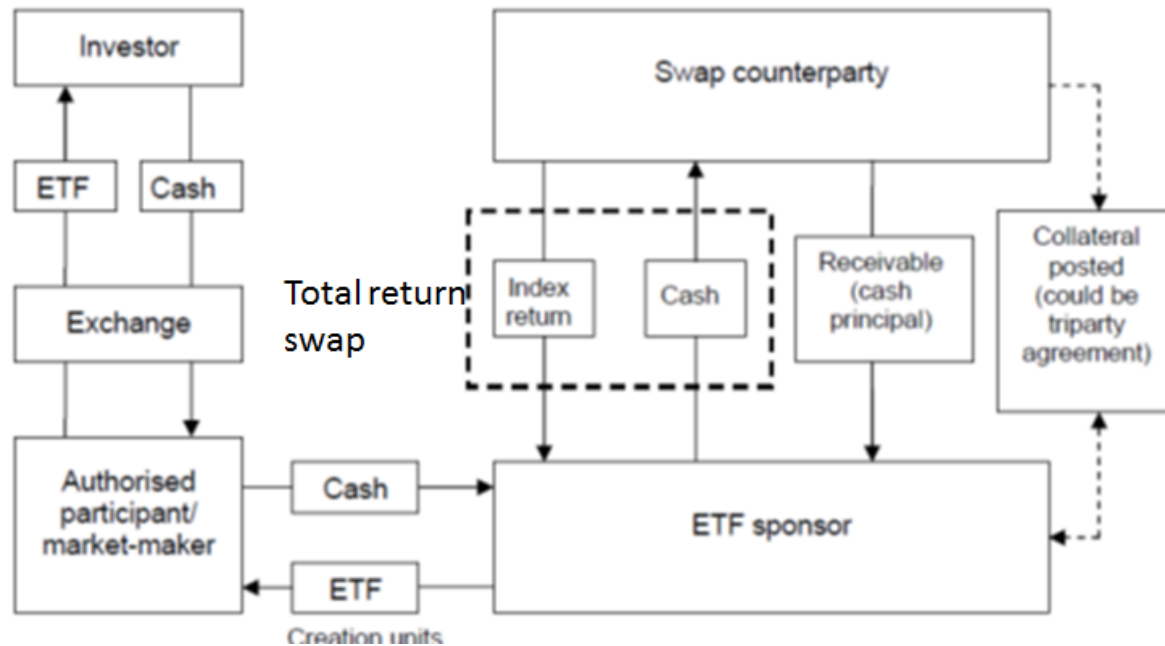
# How we alleviate the endogeneity issue

- Index investor's positions in individual agricultural markets can be broken down into three distinct components, ranked by decreasing level of exogeneity to individual agricultural markets:
  - Index investors' investment into generalist commodity indices (consisting of baskets of agriculture, energy and metal contracts)
  - Index investors' investment into general agricultural commodity indices (consisting of baskets of agricultural contracts only)
  - Idiosyncratic index investors' investment into single-commodity indices (may lead to overestimate the impact of index flows on prices if flows are trend-following or informed)
- Fourth component: periodic rebalancings to maintain the weights constant in the basket (may lead to underestimate the impact of index flows on prices)

# How we alleviate the endogeneity issue

- Index flows are plausibly exogenous to individual agricultural markets because the main commodity indices have lower correlation to agricultural prices than to energy or metal prices
  - We introduce control variables in the price model (liquidity, dollar, perceived inventory level inferred from forward curves)
  - We project index flows on two instrumental variables capturing the most exogenous components of index flows (flows to the main generalist ETFs, aggregate flows to the 12 agricultural commodities)
- > Two Stage Least Squares regression...

# How ETFs work



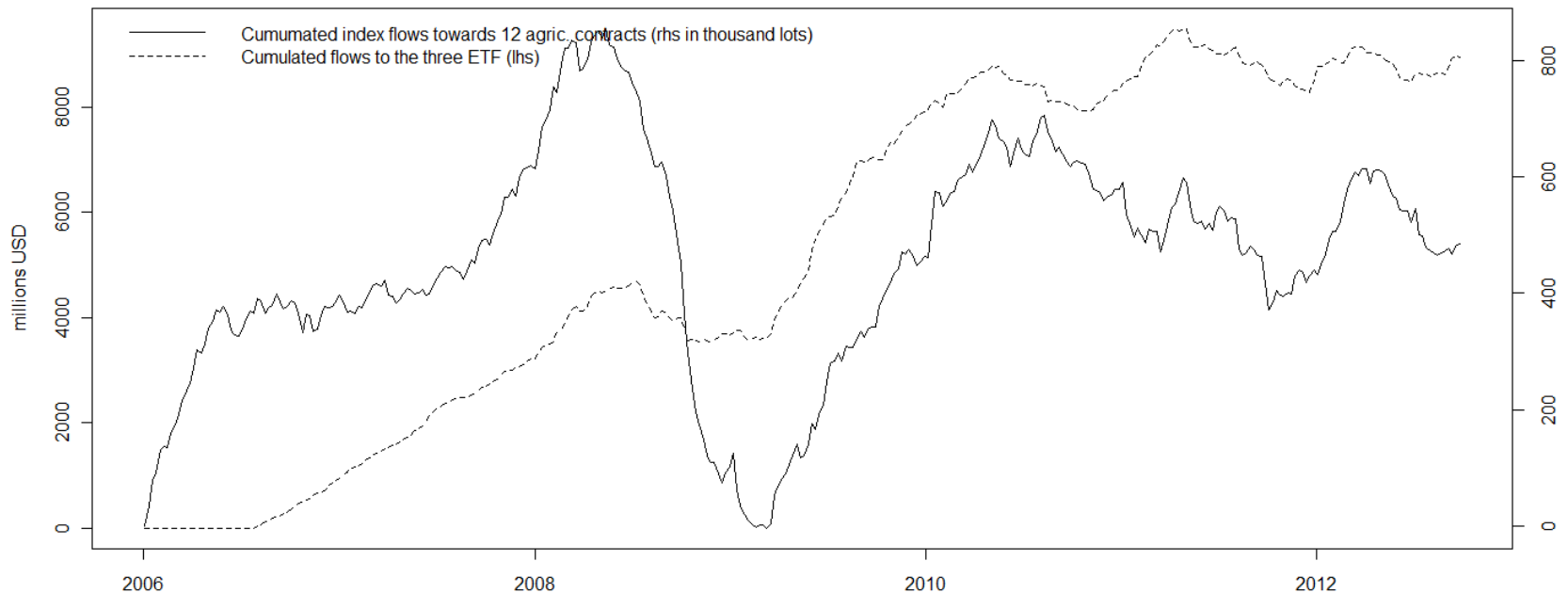
*Source: Ramaswamy (2011)*

# Three main generalist commodity ETFs

ETF Name	POWERSHARES DB	IPATH DOW JONES-UBS	ISHARES S&P GSCI
Index	DB	DJ UBS	GSCI
Parent Comp Name	PowerShares DB ETFs/USA	iPath ETNs/USA	iShares/USA
Outstanding Shares	244 000 000	47 795 190	34 700 000
Last Price (USD)	27.77	41.48	33.16
Total AUM (bln USD)	6.78	1.98	1.15
Agriculture Weight	23%	36%	20%

(Jan 2013)

# Flows to the three main ETFs and index flows towards the 12 agricultural contracts



The correlation between weekly index flows is 40%



# Methodology – 2SLS regression for commercial flows

In the first stage regression, we estimate the following model:

$$\Delta CIT_t^i = \tilde{\alpha} + \tilde{\beta}_1 IV_t + \tilde{\varepsilon}_t^i$$

where

$\Delta CIT_t^i = CIT_t^i - CIT_{t-1}^i$  is the weekly change in net index positions for commodity i

$IV_t$  represents alternatively the flows to the three main generalist ETFs or the index flows to the 11 other agricultural commodities.

In the second stage, we estimate the following regression:

$$\Delta NonCom_t^i = \alpha + \beta_1 \widehat{\Delta CIT_t^i} + \varepsilon_t^i$$

where

$\Delta NonCom_t^i = NonCom_t^i - NonCom_{t-1}^i$  is the weekly change in net speculative positions

$\widehat{\Delta CIT_t^i}$  are the fitted values of  $\Delta CIT_t^i$  obtained from the first stage linear regression.

HF trade in sync with CIT for six commodities, so that hedgers have a double burden....meat markets are an exception...

		OLS (351 obs.)	2SLS Agri (351 obs.)	2SLS ETF (322 obs.)
Corn	Coeff	0.37**	0.90***	1.07*
	Std	(0.16)	(0.34)	(0.62)
	Adj. R <sup>2</sup>	0.01	-0.02	-0.08
Wheat CBOT	Coeff	-0.23*	0.29	0.51
	Std	(0.12)	(0.31)	(0.45)
	Adj. R <sup>2</sup>	0.01	-0.05	-0.11
Wheat KCBT	Coeff	0.06	1.14*	0.90
	Std	(0.15)	(0.69)	(1.27)
	Adj. R <sup>2</sup>	0.00	-0.15	-0.12
Soybeans	Coeff	0.93***	0.90**	1.85**
	Std	(0.20)	(0.46)	(0.90)
	Adj. R <sup>2</sup>	0.05	0.05	0.02
Bean Oil	Coeff	0.39*	1.52**	3.42**
	Std	(0.20)	(0.66)	(1.61)
	Adj. R <sup>2</sup>	0.01	-0.08	-0.71
Feeder Cattle	Coeff	0.24	0.27	1.04
	Std	(0.16)	(0.80)	(1.14)
	Adj. R <sup>2</sup>	0.00	0.00	-0.06
Lean Hogs	Coeff	-0.22*	-0.11	0.07
	Std	(0.13)	(0.33)	(0.85)
	Adj. R <sup>2</sup>	0.01	0.00	-0.01
Live Cattle	Coeff	0.31*	0.52*	0.75
	Std	(0.16)	(0.30)	(0.55)
	Adj. R <sup>2</sup>	0.01	0.00	0.00
Cocoa	Coeff	-0.12	2.20**	1.64**
	Std	(0.20)	(0.87)	(0.69)
	Adj. R <sup>2</sup>	0.00	-0.40	-0.25
Coffee	Coeff	0.52**	1.23***	2.21**
	Std	(0.22)	(0.43)	(1.04)
	Adj. R <sup>2</sup>	0.01	-0.02	-0.16
Cotton	Coeff	0.63***	1.02**	1.76*
	Std	(0.15)	(0.40)	(1.03)
	Adj. R <sup>2</sup>	0.05	0.03	-0.07
Sugar	Coeff	-0.07	1.93**	0.63
	Std	(0.11)	(0.93)	(0.61)
	Adj. R <sup>2</sup>	0.00	-0.91	-0.12
Aggregate	Coeff	0.63***	-	1.15***
	Std	(0.15)	-	(0.38)
	Adj. R <sup>2</sup>	0.05	-	0.01

# Methodology – 2SLS regression for price returns

In the first stage regression, we estimate the following model:

$$\Delta CIT_t^i = \tilde{\alpha} + \tilde{\beta}_1 IV_t + \text{other variables} + \tilde{\varepsilon}_t^i$$

where we have posed:  $\Delta CIT_t^i = \frac{CIT_t^i - CIT_{t-1}^i}{OI_{t-1}^i}$

and where  $IV_t$  represents alternatively the flows to the three main generalist ETFs and the index flows to the 11 other agricultural commodities.

In the second stage, we estimate the following regression:

$$\frac{P_t^i - P_{t-1}^i}{P_{t-1}^i} = \alpha + \beta_1 \widehat{\Delta CIT_t^i} + \beta_2 \frac{\Delta Dollar_t}{Dollar_{t-1}} + \beta_3 \Delta RA_t + \beta_4 Control_t^i + \varepsilon_t^i$$

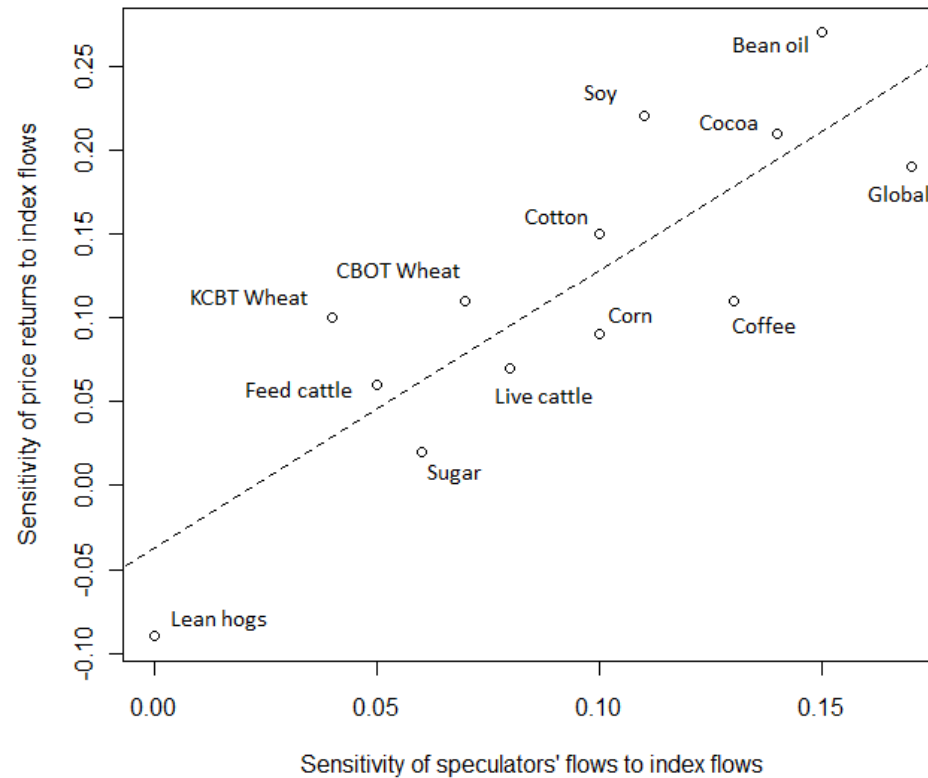
(M1 Prices)

where  $\widehat{\Delta CIT_t^i}$  are the fitted values of  $\Delta CIT_t^i$  obtained from the first stage linear regression.

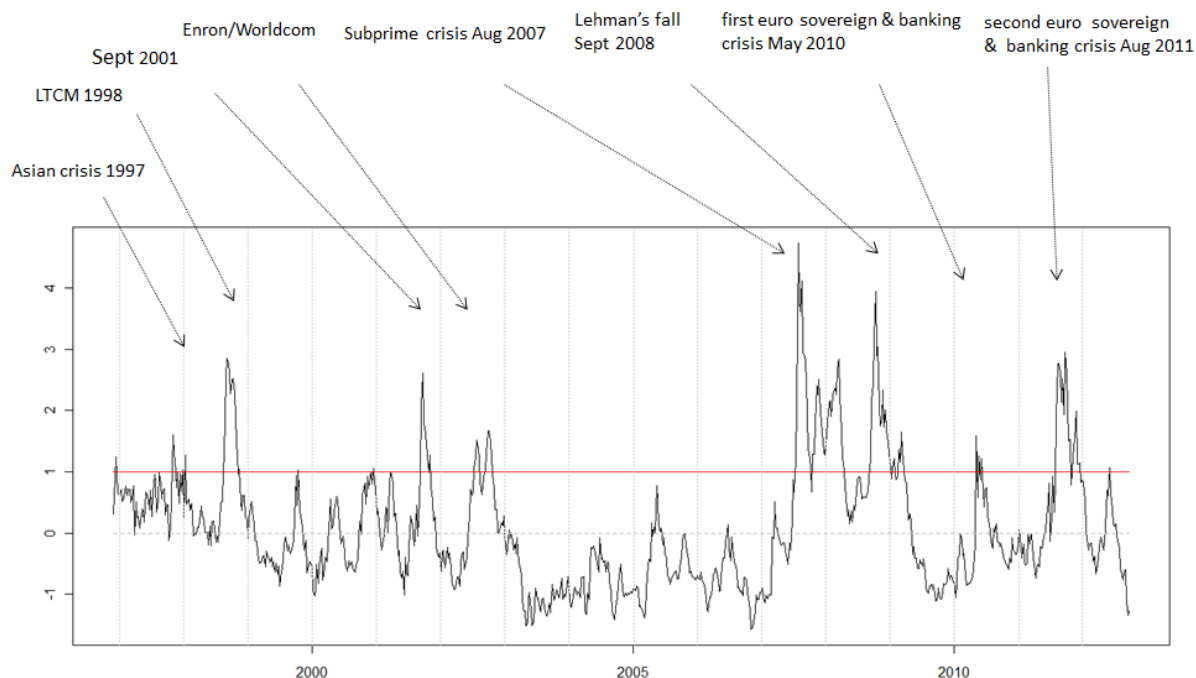
# Evidence of a CITs impact for the soybeans complex, cocoa, coffee and cotton

		OLS (351 obs.)	2SLS Agri (351 obs.)	2SLS ETF (322 obs.)
Corn	Coeff	0.21	0.87	0.37
	Std	(0.36)	(0.75)	(1.59)
	Adj. R <sup>2</sup>	0.52	0.52	0.51
Wheat CBOT	Coeff	0.26	1.72***	1.16
	Std	(0.25)	(0.61)	(0.96)
	Adj. R <sup>2</sup>	0.53	0.49	0.52
Wheat KCBT	Coeff	0.38*	2.54***	1.76
	Std	(0.23)	(0.97)	(1.57)
	Adj. R <sup>2</sup>	0.44	0.29	0.36
Soybeans	Coeff	0.95***	1.34**	3.21**
	Std	(0.28)	(0.57)	(1.40)
	Adj. R <sup>2</sup>	0.44	0.44	0.37
Bean Oil	Coeff	0.40**	2.24***	5.17**
	Std	(0.19)	(0.63)	(2.23)
	Adj. R <sup>2</sup>	0.30	0.30	0.67
Feeder Cattle	Coeff	0.11	0.32	0.27
	Std	(0.09)	(0.45)	(0.71)
	Adj. R <sup>2</sup>	0.01	0.00	0.01
Lean Hogs	Coeff	0.14	0.04	-2.01
	Std	(0.17)	(0.41)	(1.65)
	Adj. R <sup>2</sup>	0.00	0.00	-0.47
Live Cattle	Coeff	0.50***	0.39	0.46
	Std	(0.17)	(0.31)	(0.67)
	Adj. R <sup>2</sup>	0.03	0.03	0.04
Cocoa	Coeff	1.14***	1.90*	2.68***
	Std	(0.22)	(1.02)	(0.92)
	Adj. R <sup>2</sup>	0.52	0.51	0.47
Coffee	Coeff	0.70***	1.13**	1.32
	Std	(0.25)	(0.51)	(1.23)
	Adj. R <sup>2</sup>	0.55	0.54	0.55
Cotton	Coeff	0.40*	1.69***	3.66**
	Std	(0.21)	(0.52)	(1.76)
	Adj. R <sup>2</sup>	0.61	0.57	0.39
Sugar	Coeff	0.32	2.89	3.91**
	Std	(0.26)	(1.96)	(1.88)
	Adj. R <sup>2</sup>	0.62	0.51	0.44
Aggregate	Coeff	0.98***	-	1.91***
	Std	(0.22)	-	(0.65)
	Adj. R <sup>2</sup>	0.58	-	0.57

# CIT's impact is related to speculators' synchronicity

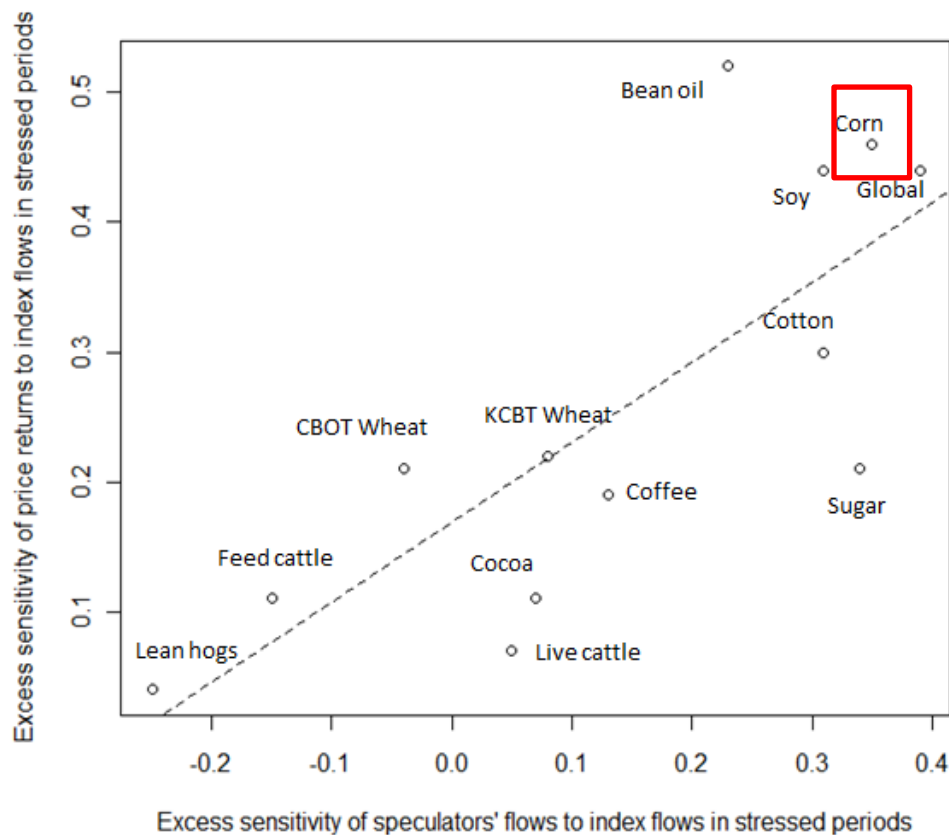


# Our liquidity variable



Guilleminot, B., Ohana, S., 2012a., A new financial stress indicator: construction, properties and applications, Working Paper

CIT's impact is increased in periods of liquidity stress...as is  
speculators' synchronicity



meat markets stand out again from the rest  
for corn, the CITs impact is only visible in periods of stress

# Agenda

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# Summary

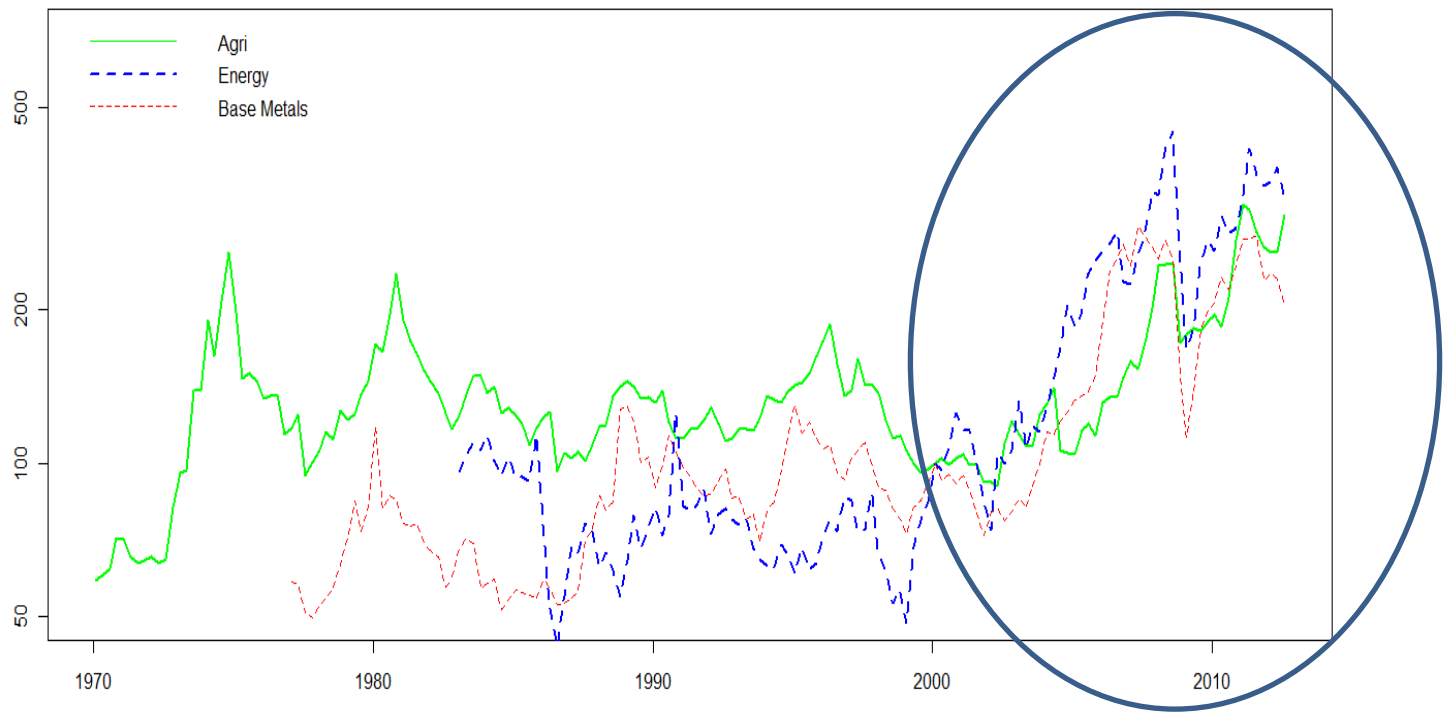
- We contribute to the debate in several respects:
  - We shed light on Speculators and CIT's motives in agricultural markets
  - We alleviate the endogeneity problems in the estimation of the CIT's impact
  - Commercials, not speculators, provide liquidity to index speculators
  - We relate the CIT's impact to the behavior of speculators : the impact is stronger in those commodities markets where speculators synchronize with CITs
  - CIT's impact and speculators' synchronicity are located in periods of global market stress
  - Meat markets stand out by their resilience to index speculation and liquidity stresses

# Discussion

- Implications and opened questions:
  - The endogeneity issue would be made easier to solve if we had a proper decomposition of index flows into generalist/specialized flows
    - > Could European regulation directly move towards such decomposition ?
  - The interaction of uninformed and trend-chasing investors may provoke artificial fluctuations
    - Why don't hedge funds trade directionnally against index investors?
      - Is it due to the positive serial correlation in CITs flows ? -> speculators attempt to ride predictable index investment waves...
      - If this is the case, limits on aggregate CIT positions could change the speculators' behavior
  - How to explain the absence of synchronization of speculators to CITs in some markets (e.g. meat) ?

# Annex

# Outstanding commodity price fluctuations by their amplitude, duration and synchronization

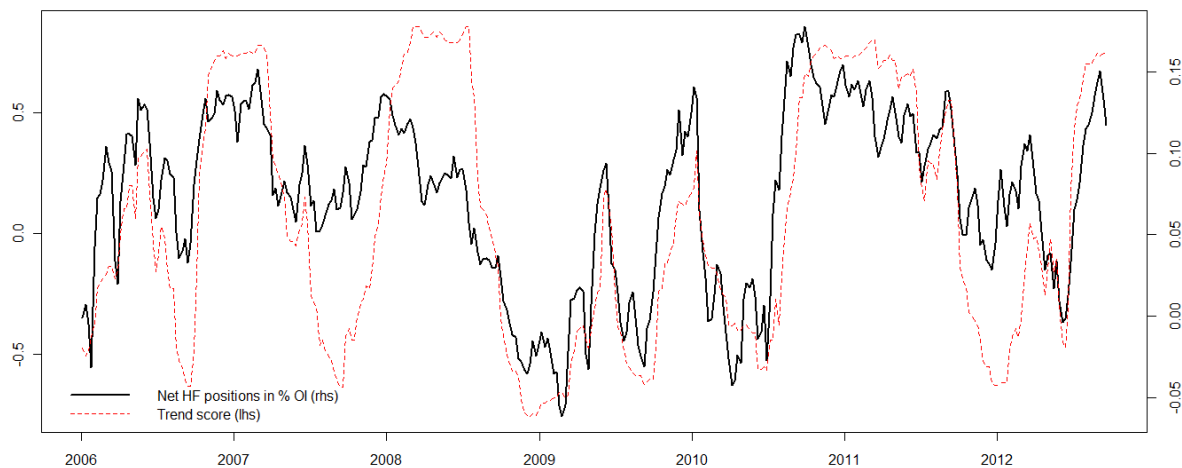
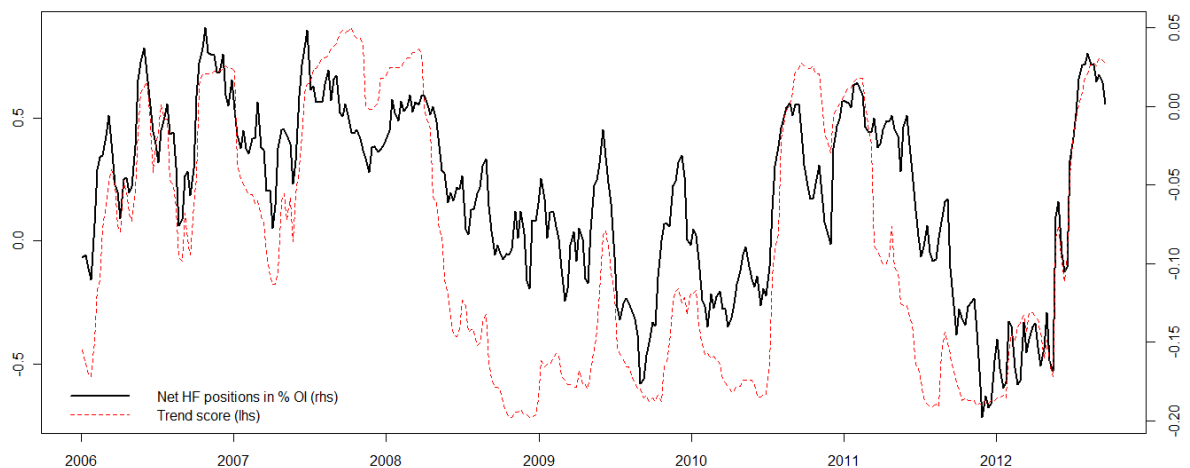


Source: Riskelia

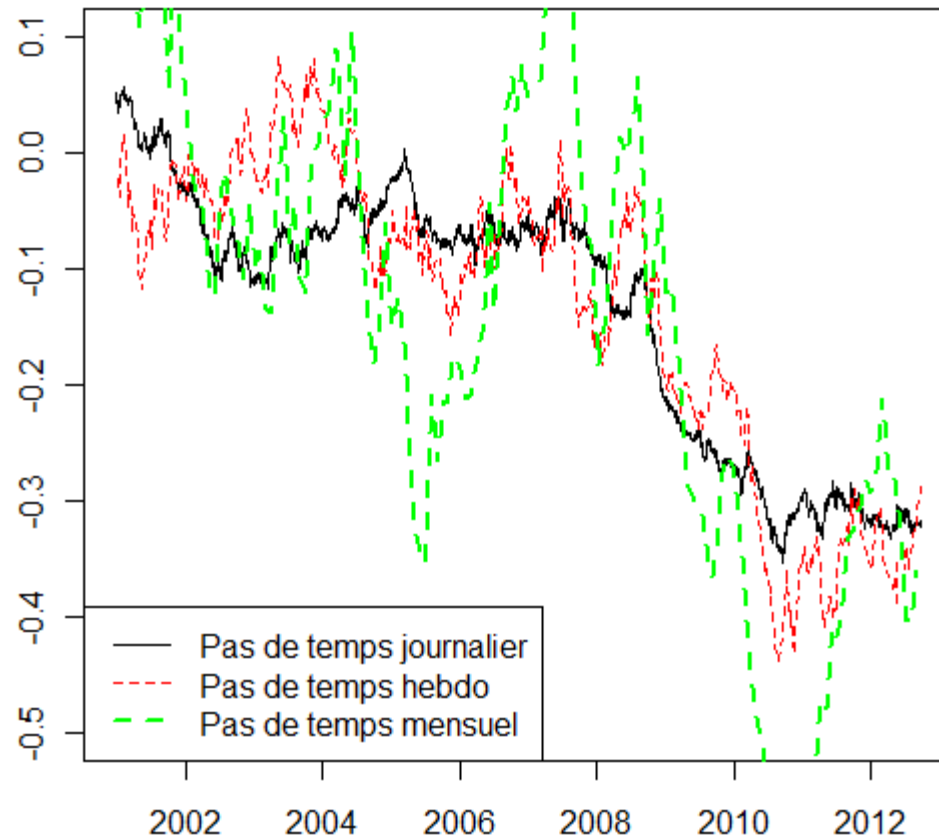
Historical perspective on commodity prices:

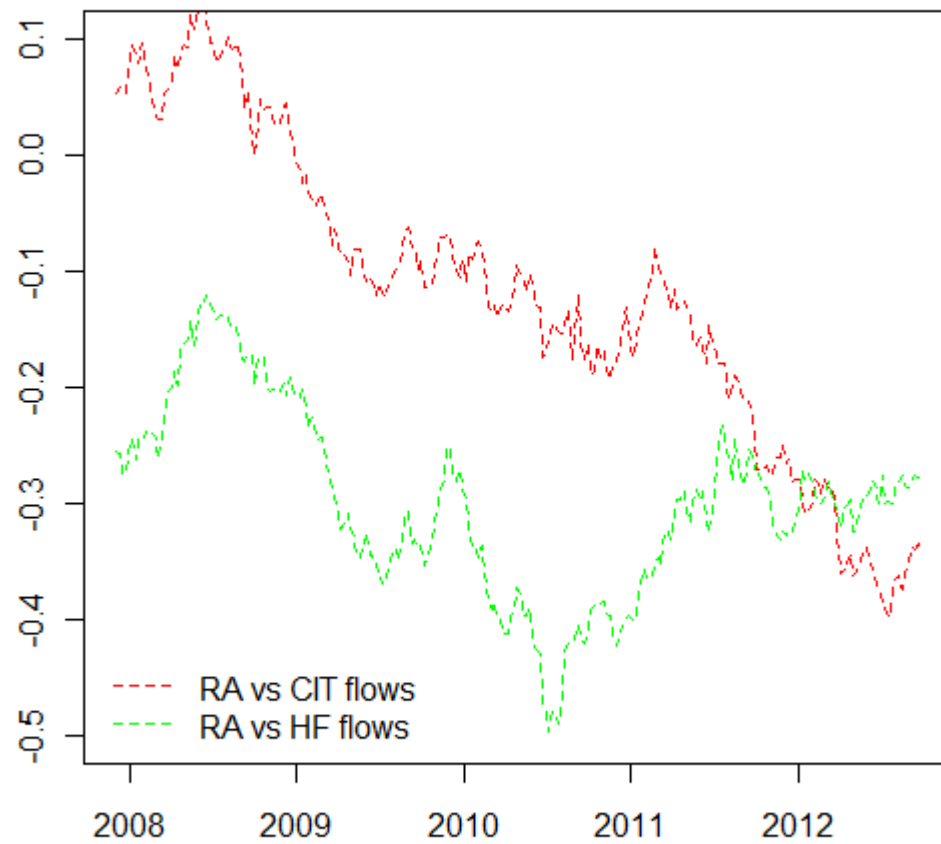
Helbling, T. 2008. "The Current Commodity Price Boom in Perspective." In International Monetary Fund, World Economic Outlook. Washington, D.C.

# Trends and HF positioning for wheat (top) and corn (bottom)



# Agricultural commodities get increasingly connected with market liquidity





# HF vs CIT flows





# A particular extreme move

Performance of several commodities during the week of  
May 2-6, 2011

Commodities	Performance
Silver	-26%
Brent	-13%
Gold	-4%
Platinum	-4.6%
Copper	-5.2%
Nickel	-8.4%
Corn	-9.3%
Wheat	-5.2%

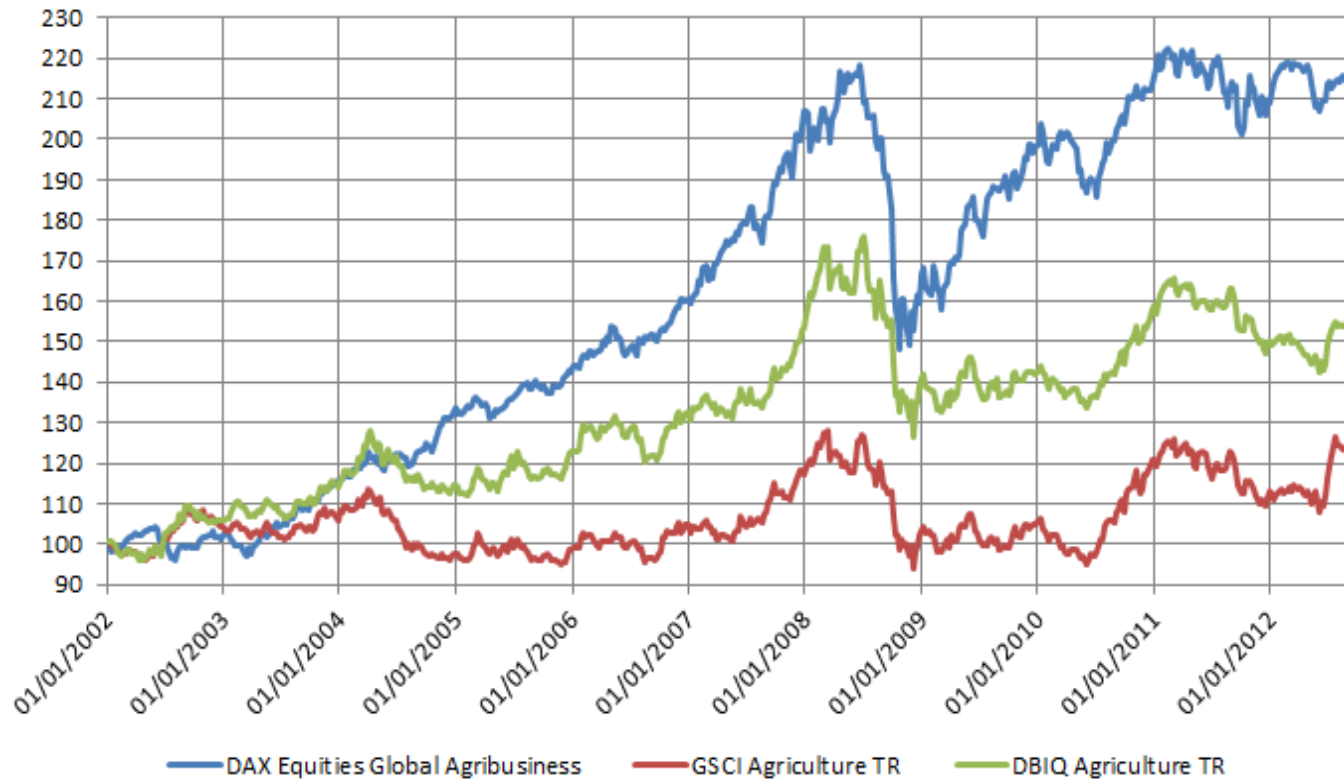
The euro slipped from 1.48\$ to 1.43\$ the same  
week

# Robots have taken over



All this will end!

Why commodities producers are an interesting alternative to commodity indices



# Methodology – what happens when liquidity dries up

Intuition: when liquidity dries up, HF trade even more in sync with CIT and the impact of CIT is therefore aggravated

$$\Delta Com_t^i = \alpha_1 + \beta_1(CIT_t^i - CIT_{t-1}^i) + \beta_2(CIT_t^i - CIT_{t-1}^i) * 1(RA_{t-1} > 0) + \varepsilon_t^i$$

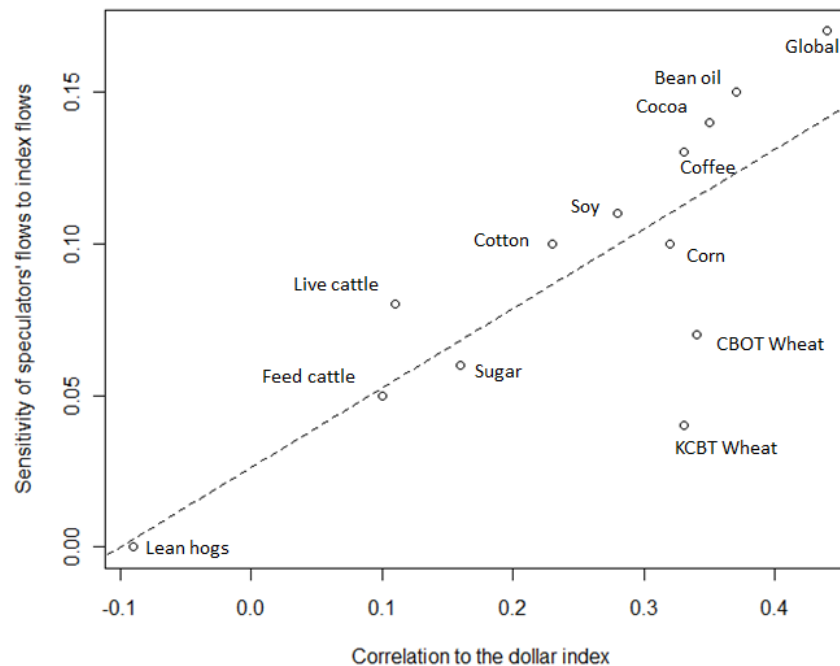
(M2 Flows)

$$\frac{P_t^i - P_{t-1}^i}{P_{t-1}^i} = \alpha + \beta_1 \frac{CIT_t^i - CIT_{t-1}^i}{OI_{t-1}^i} + \beta_2 \frac{CIT_t^i - CIT_{t-1}^i}{OI_{t-1}^i} * 1(RA_{t-1} > 0) + \beta_3 \frac{\Delta Dollar_t}{Dollar_{t-1}} + \beta_4 \Delta RA_t + \beta_4 Control_t^i + \varepsilon_t^i$$

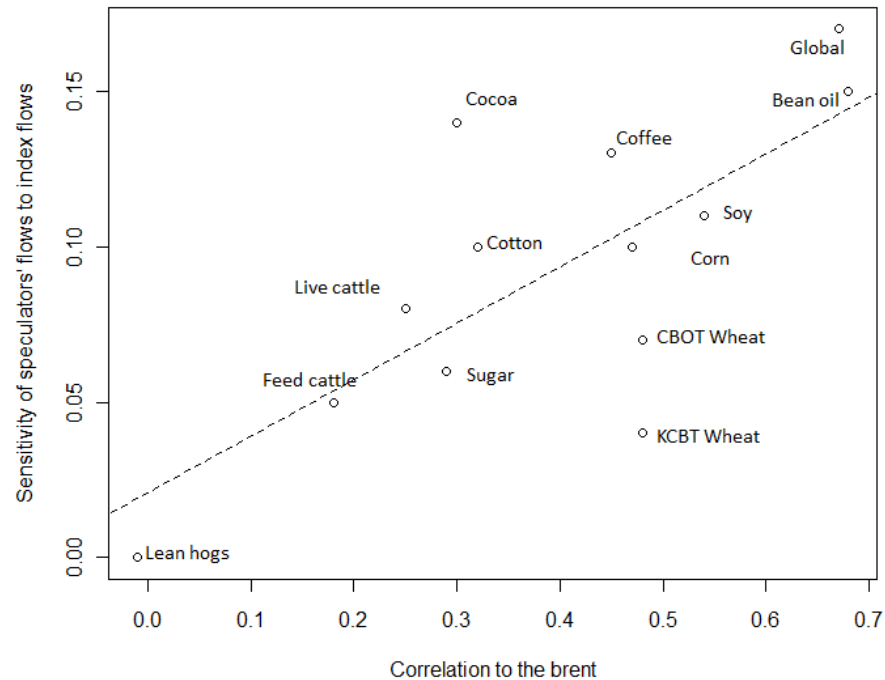
(M2 Prices)

$RA_{t-1}$  is the lagged risk aversion indicator

# Cyclical commodities have higher speculators' synchronization

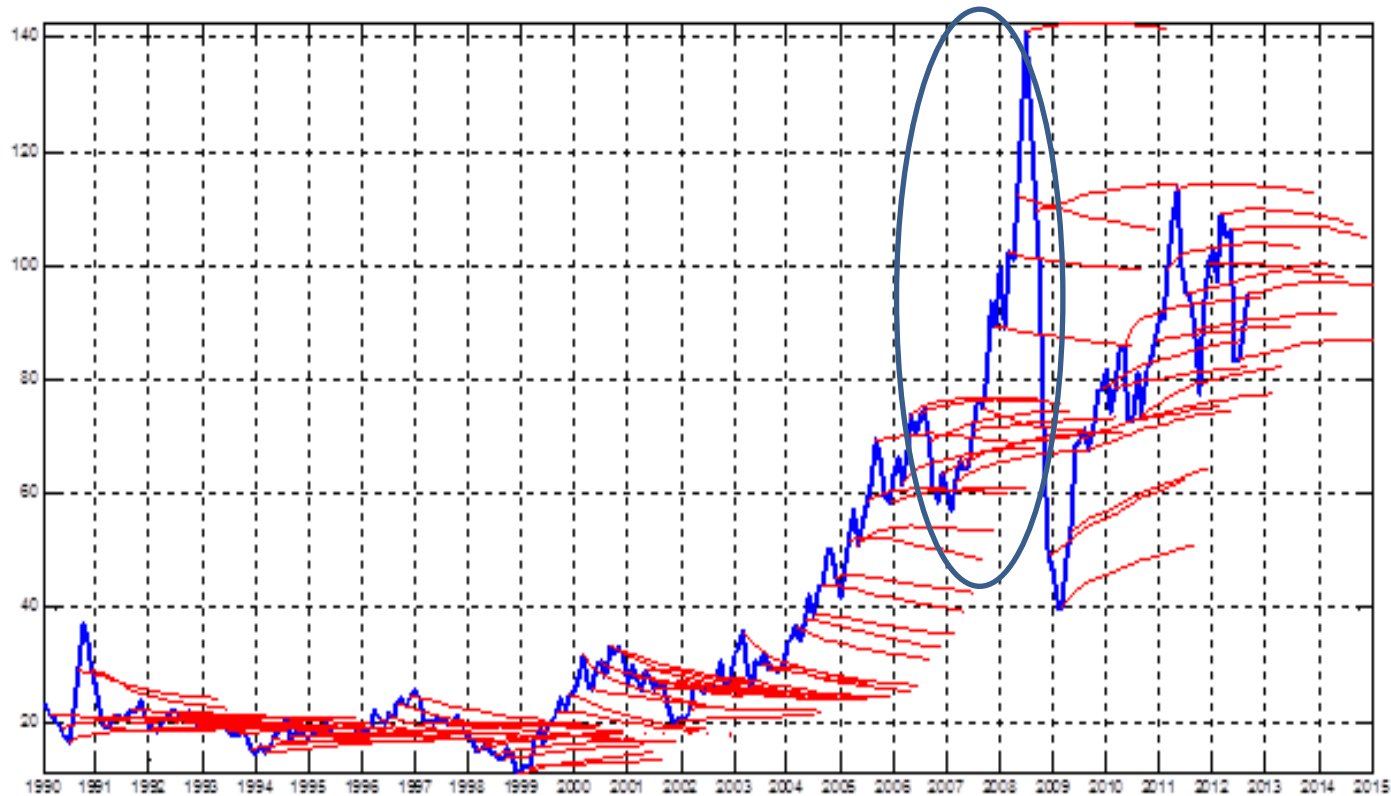


# Cyclical commodities have higher speculators' synchronization



# Empirical approaches to the problem

## Bubble « tests »



Sornette (2009) identifies a bubble on oil prices in 2008

Emketer et al. (2012) identify bubbles on grains prices

Gilbert (2012) and Liu et al. (2012) reach opposite conclusions