European Capital Markets Institute (ECMI)
Centre for European Policy Studies (CEPS)
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Price formation in commodities markets: financialisation and beyond

Brussels, Italy
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Agenda

Agenda

- Scope of the report
- Setting the scene
  - A complex marketplace (no one-size-fits-all)
- Physical and futures markets
  - Inventories and price convergence
  - Reference prices
- Key market developments (see press release)
  - International trade (e.g. China)
  - International finance (e.g. monetary policies, deregulation, etc)
  - Technological developments in trading infrastructure (e.g. futures markets)
- What does financialisation mean?
  - Pooling effects
  - Size of financial over physical markets…add spread trading
  - Futures commercial and non-commercial
- Policy conclusions

Scope of the report

Scope of the report

- ECMI-CEPS Task Force Group on commodities price formation
  - 31 commodities firms, plus regulators, academics and independent experts
  - 11 commodities markets (including crude oil)
  - Public event in September
- Price formation mechanisms (long-term view)
  - Storable commodities
  - Areas we looked at…
    - Supply and demand characteristics
    - Market organisation
    - Trading practices and financialisation
    - Market surveillance and transparency

Disclaimer

Disclaimer

- Disclaimer!
  - Views are not necessarily those of the members or their respective companies.
  - The author is responsible for the content of the report!
  - *The findings of this Final Report do not necessarily reflect the views of all the members of the Task Force, or the views of their respective companies. Members contributed to the Task Force meetings and provided input to the discussions through presentations and relevant material for the Final Report. A set of principles has guided the drafting process to allow all of the interests represented in the Task Force to be heard and to comment on each chapter of the Final Report. Wherever fundamental disagreements arose, the rapporteurs have made sure that all views have been explained in a clear and fair manner. The Final Report was independently drafted by the author who is solely responsible for its content and any errors. Neither the Task Force members nor their respective companies necessarily endorse the conclusions of the Final Report.*

A complex marketplace

Complexity

KEY DRIVERS OF COMMODITIES PRICE FORMATION

PRODUCT CHARACTERISTICS

- Quality
- Storability
- Renewability
- Recyclability
- Substitutability
- (Final) usability

SUPPLY FACTORS

- Production convertibility and capital intensity
- Horizontal and vertical integration
- Storability and transportability
- Industry concentration
- Geographical concentration (emerging markets)
- Technological developments
- Supply peaks and future trends

DEMAND FACTORS

- Income growth and urbanisation
- Technological developments and alternative uses
- Long-term habits and demographics
- Economic cycle

EXOGENOUS FACTORS

- 'Financialisation process' and monetary policies
- Subsidies programmes
- General government interventions (e.g. export bans)
- The economic cycle and other macroeconomic events
- Technological developments
- Unpredictable events (e.g. weather)

MARKET ORGANISATION

- Microstructural developments (e.g. competitive setting)
- Functioning of internationally recognised benchmark futures or physical prices
- International trade
- Expansion of commodities futures markets and 'non-commercial' investors
- Futures markets infrastructure

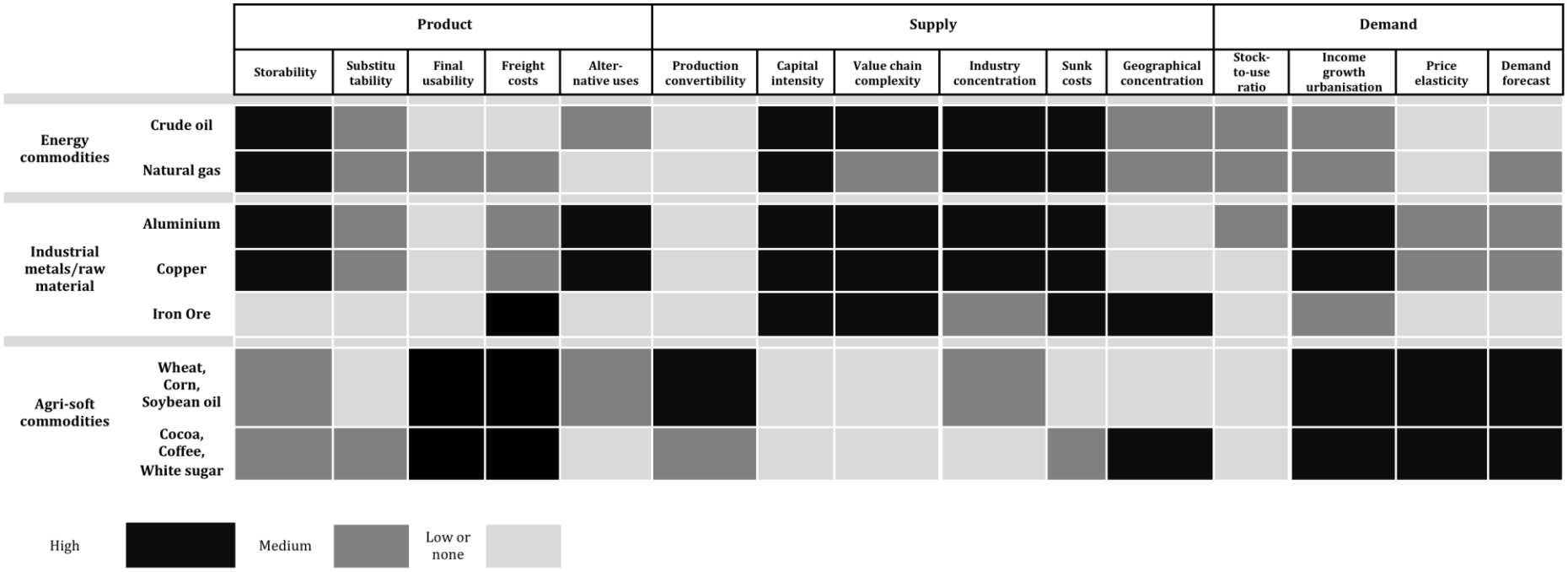
Product characteristics

. Exposure to exogenous factors

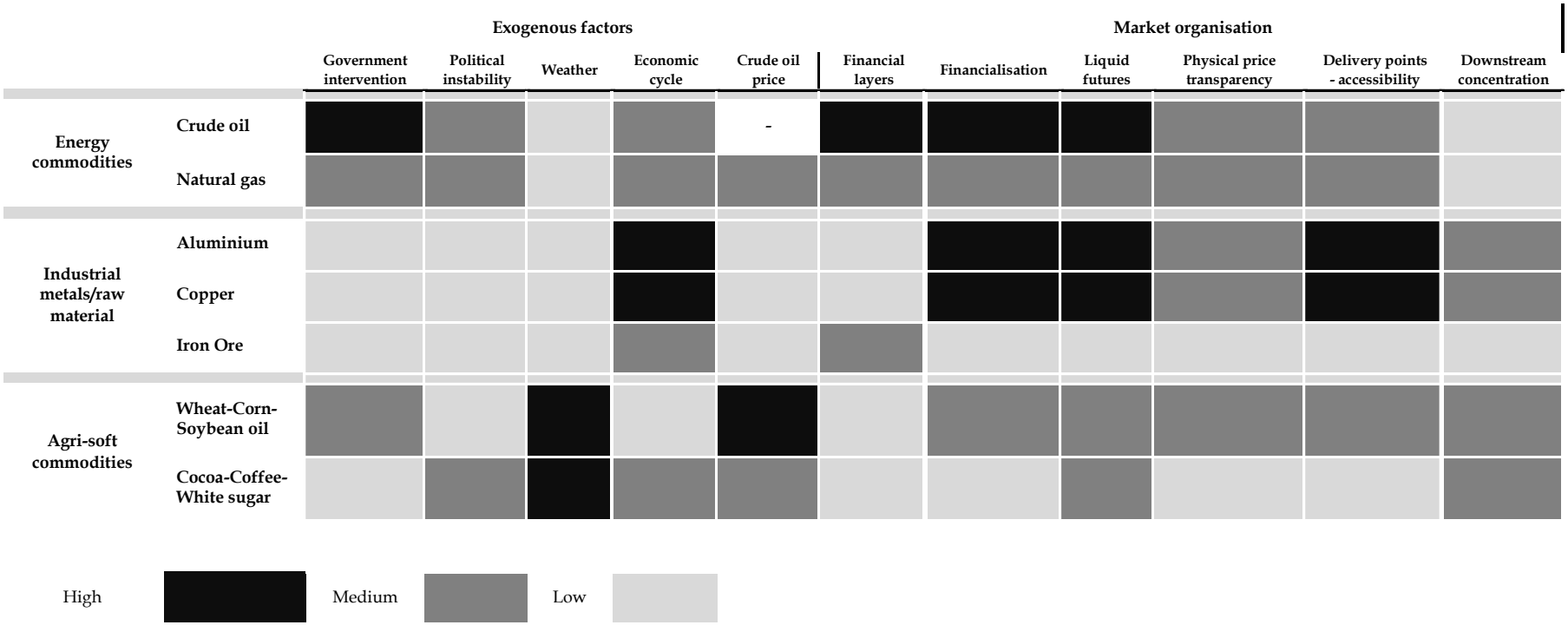
Key product characteristics		Exogenous factors	Examples
Seasonality	→	Weather and currency	Drought
Transportability	→	Freight market/mobility restrictions	Freight capacity
Alternative uses/substitutability	→	Other commodities markets	Biofuel policies
Storability	→	Market/warehouse location	Pipeline disruption
Production yields	→	External incentives for long-term investments or technological shock	Price subsidies

Source: Author.

Weighting drivers of price formation (1)



Weighting drivers of price formation (2)

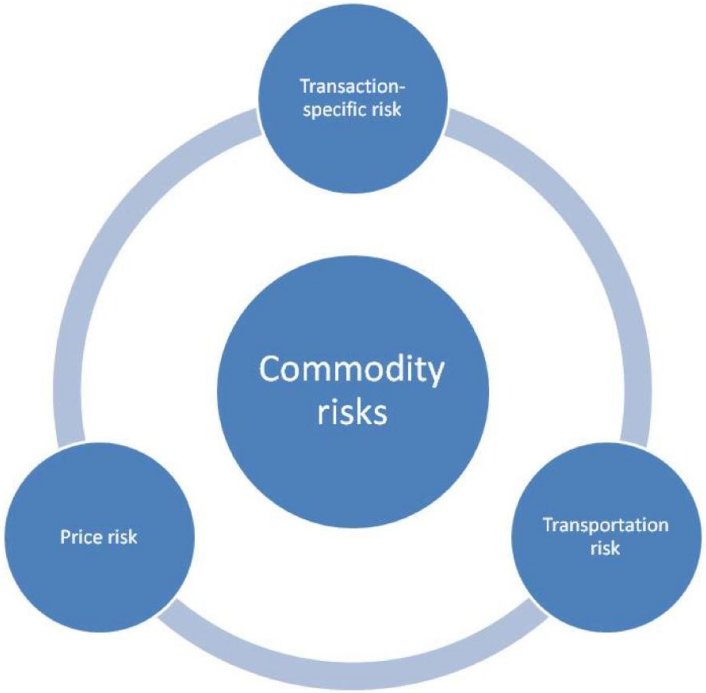


Physical and Futures Markets

Key 'physical' risks

- Physical markets bring together buying and selling interests in the physical commodity to level supply and demand imbalances, taking into account immediately available inventory levels. The spot price is the price of a commodity that is readily available to be delivered

Key commodity risks



Source: Author.

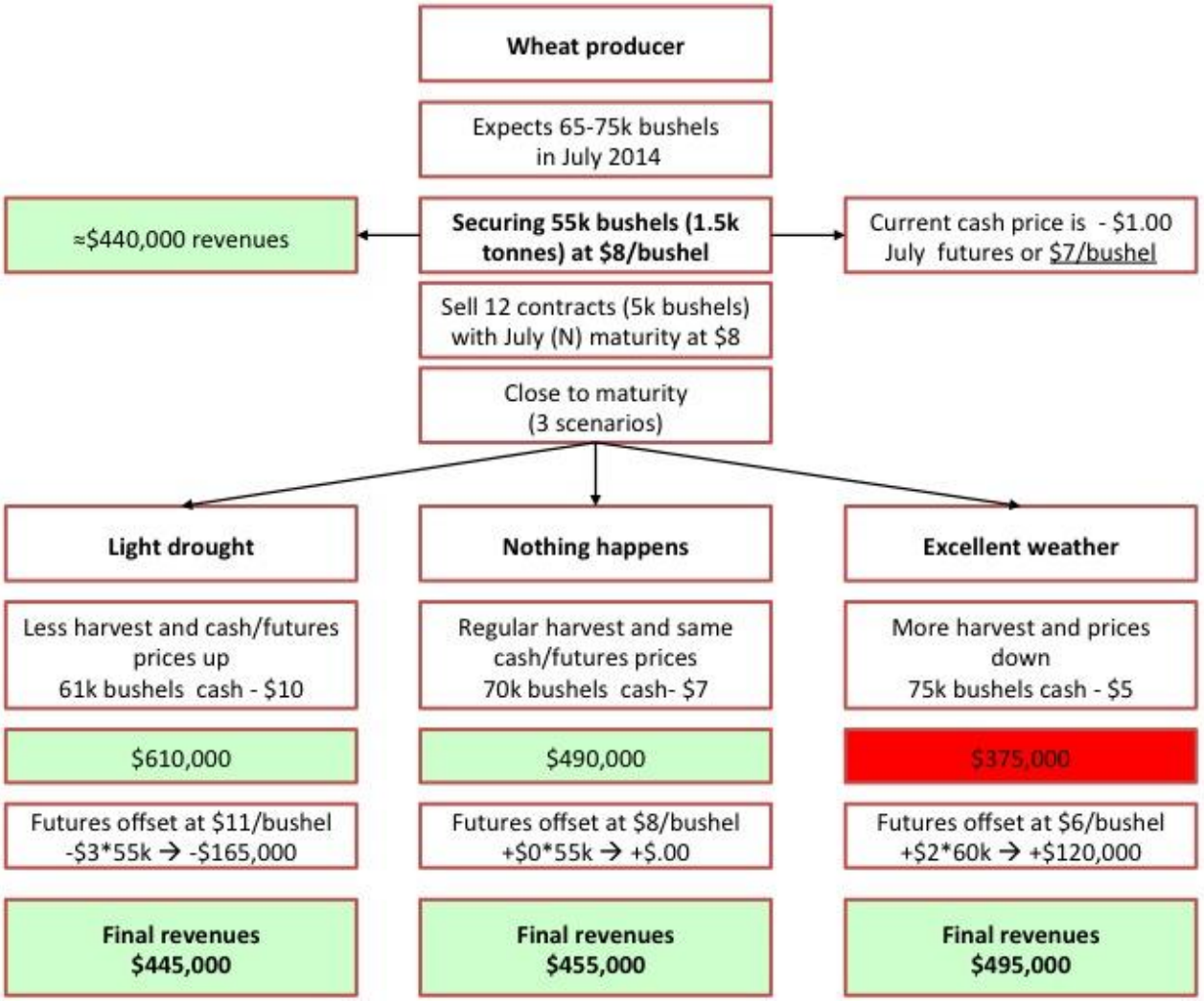
Key ‘physical’ risks (2)

- Price risk (market)
- Transportation risk (e.g. logistics)
- Transaction-specific risks:
  - Product risk (e.g. quality)
  - Mismatch risk (e.g. currency)
  - Counterparty risk (e.g. credit risk)

Futures markets

- Futures markets serve the intertemporal choice of end users by trading expectations on supply and demand patterns ('risk transfer'), which occur mainly through changes of inventory levels over a time period.
- Futures contracts (or 'futures') are agreements between two parties to buy or sell an agreed quantity of an asset (commodity) at a certain future date for an *ex ante* agreed price.
  - Open platforms matching
  - Margin calls (initial and variations)
    - Leverage from 12 [LIFFE, Wheat] to 34 [CBOT, Soybean oil])
    - Marked-to-market positions
  - Physical delivery (only 2%)

Example: Hedging Trade



Key characteristics

Key characteristics of transactions

	Spot contract	Forward contract	Futures contract
Nature of transaction	Bilateral (OTC)	Bilateral (OTC)	Multilateral (exchange)
Transaction terms (delivery dates, contract size)	Customised	Customised	Standardised
Price	FOB	FOB/CIF	FOB (or in warehouse)
Settlement	Physical	Cash/Physical (to maturity/shipment)	Cash (daily) Offset/Physical (to maturity, 'physical' if requested)
Typical holding period	To delivery	To delivery	Before delivery
Delivery	Spot	Customised	Selected months
Storage costs	No	Yes	Yes
Transaction costs	Medium	Medium/High	Low
Leverage	No	No	Yes
Counterparty risk	Limited (spot)	High	Limited (daily mark-to-market)
Currency risk	No	Limited (choice)	Yes
Price risk	No	Yes	Yes
Interest rate risk	No	No	Yes
Regulation and supervision	Limited	Limited	High

Source: Author.

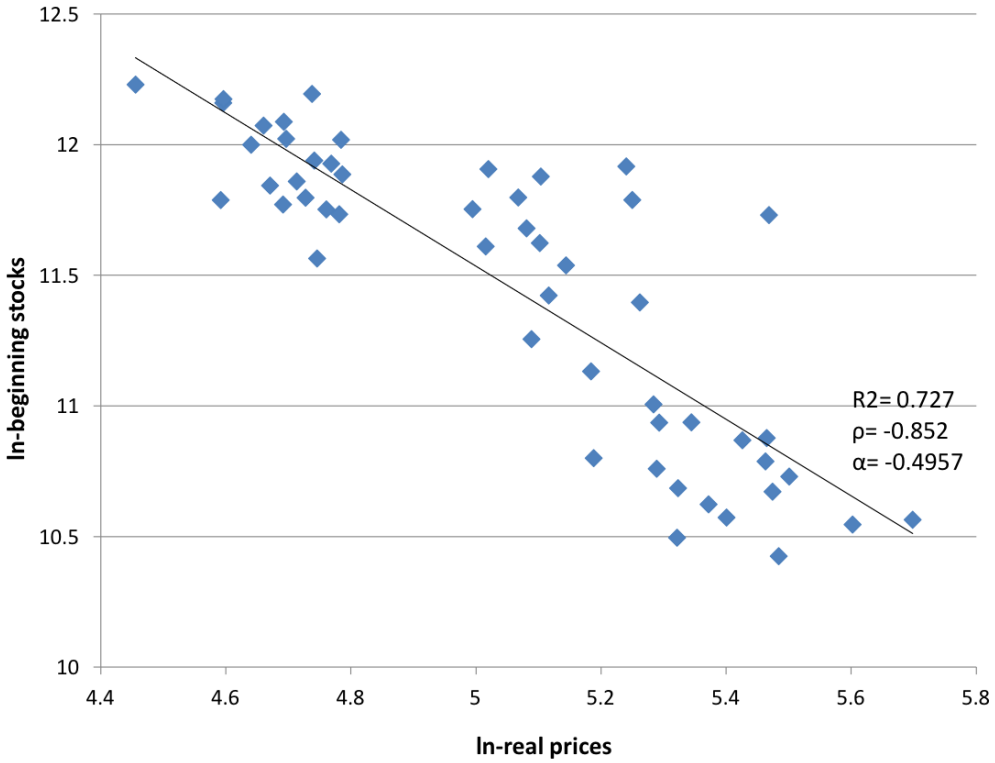
Inventories and price convergence

The role of inventories

- Response function to supply and demand factors (through net demand)
  - Absolute values and expectations!
- Key aspect of physical and futures markets
  - Create a barrier against price volatility
  - Minimise the costs of adjusting production due to foreseeable events (e.g. demand volatility or increases in the marginal cost of production)
  - Reduce marketing costs by facilitating production and delivery schedules.
  - Inventories also reduce the impact of unpredictable disruptive events (e.g. weather events).
- Carrying a commodity over time (storage) or incentive to do so has three main costs reflected by the MCY:
  - Costs of physical storage (and insurance)
    - Warehousing costs, insurance, material degradation, and delivery times
  - Opportunity costs
    - Interest forgone (e.g. risk-free)
  - Costs from price risk
    - Benefit of holding the commodity (to be hedged)
- All these aspects (with contango) contribute to 'cash-and-carry' trades

Essential in absolute terms…

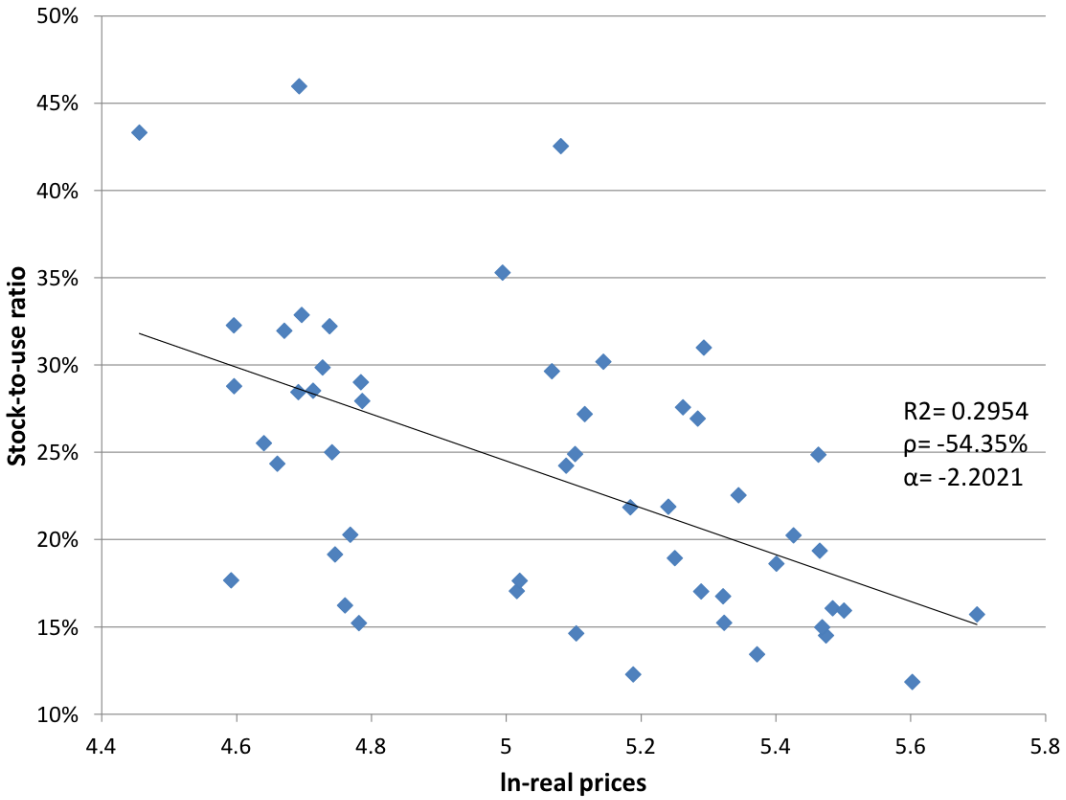
Link between real spot prices and inventories for corn, 1960-2011



Sources: Author's estimates from US Department of Agriculture (USDA) and World Bank. Note: Natural logarithms.

…and relative terms!

Stock-to-use ratio and real prices for corn, 1960-2011

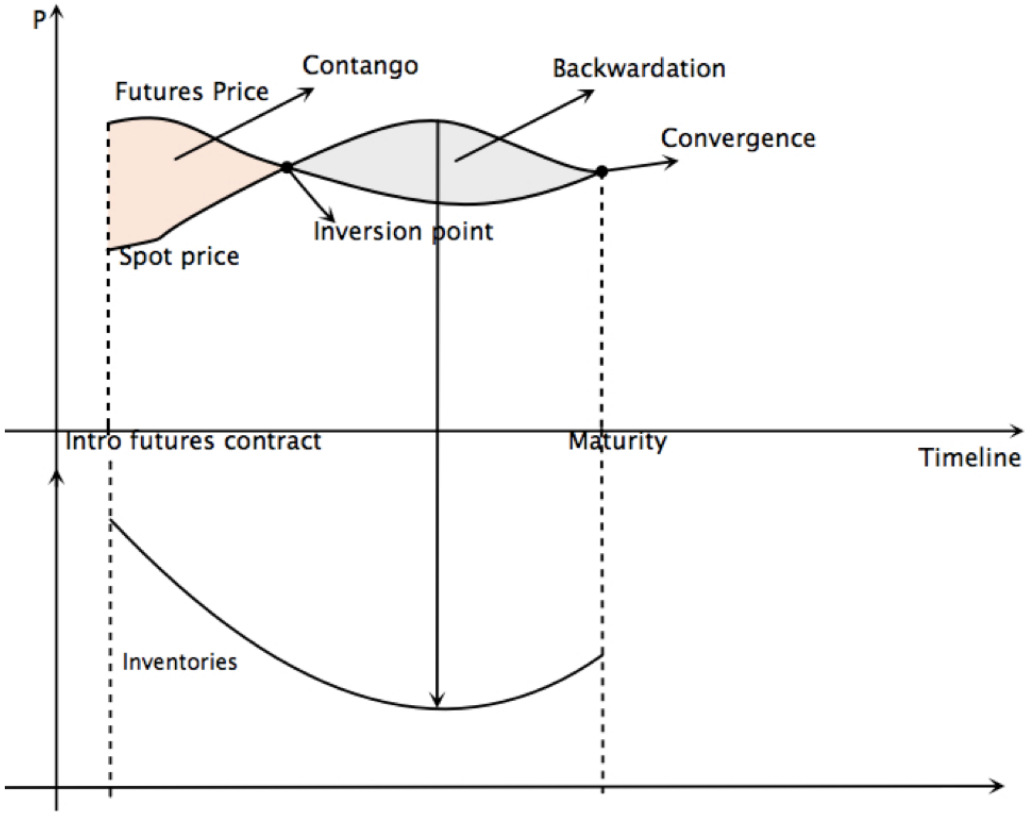


Sources: Author's calculation from USDA and World Bank. Note: Natural logarithms.

- These findings were confirmed by more detailed analyses run for each commodity market!

Futures-spot interaction

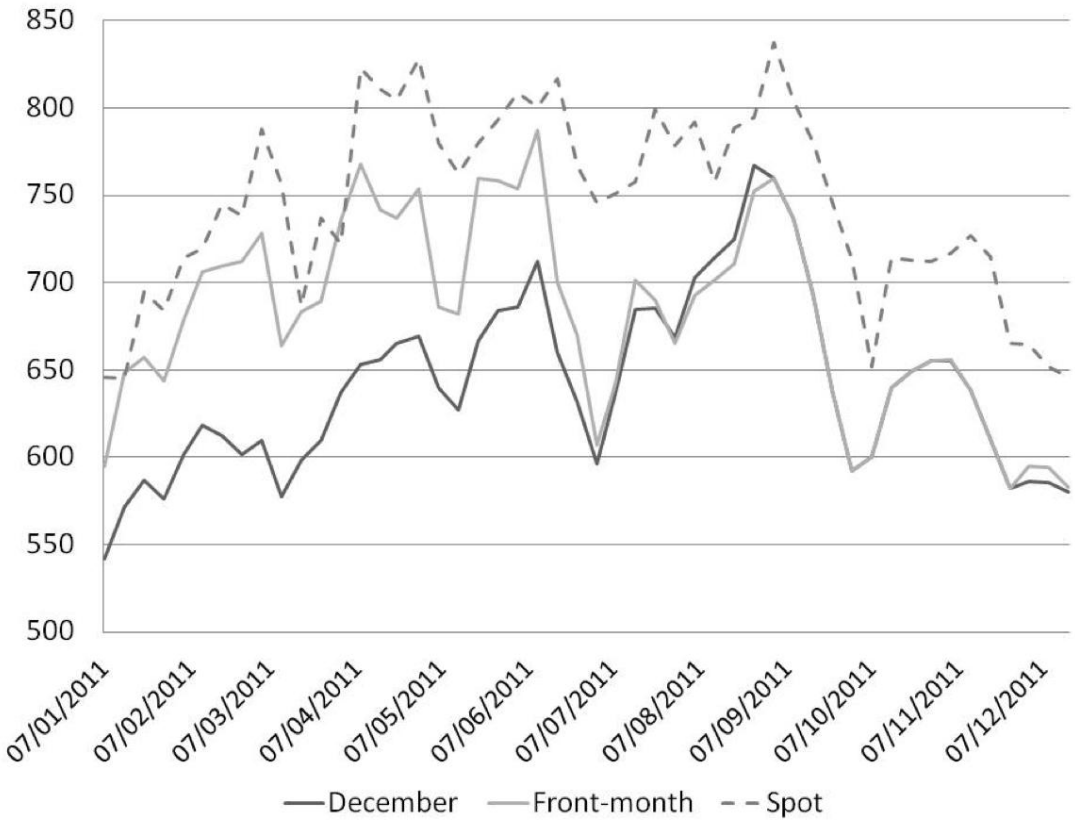
Futures-spot price interaction through inventories



Source: Author's own.

Price convergence

Futures price convergence in corn futures contracts



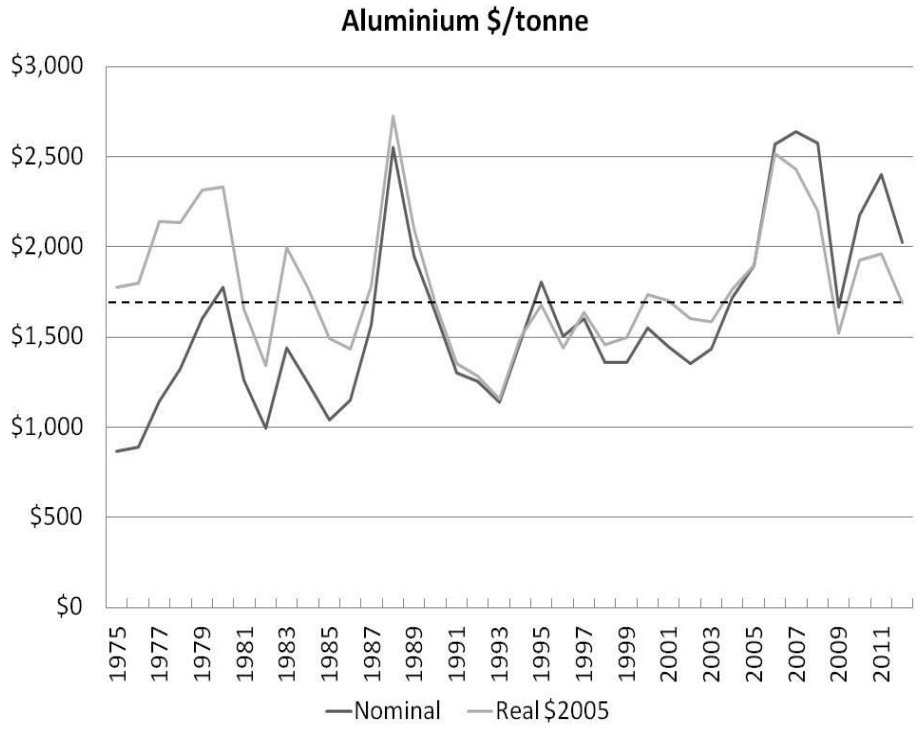
Source: Author's elaboration from CBOT, FAO, USDA. Note: $cents/bushel; spot price is US No.2, Yellow, U.S. Gulf (Friday).

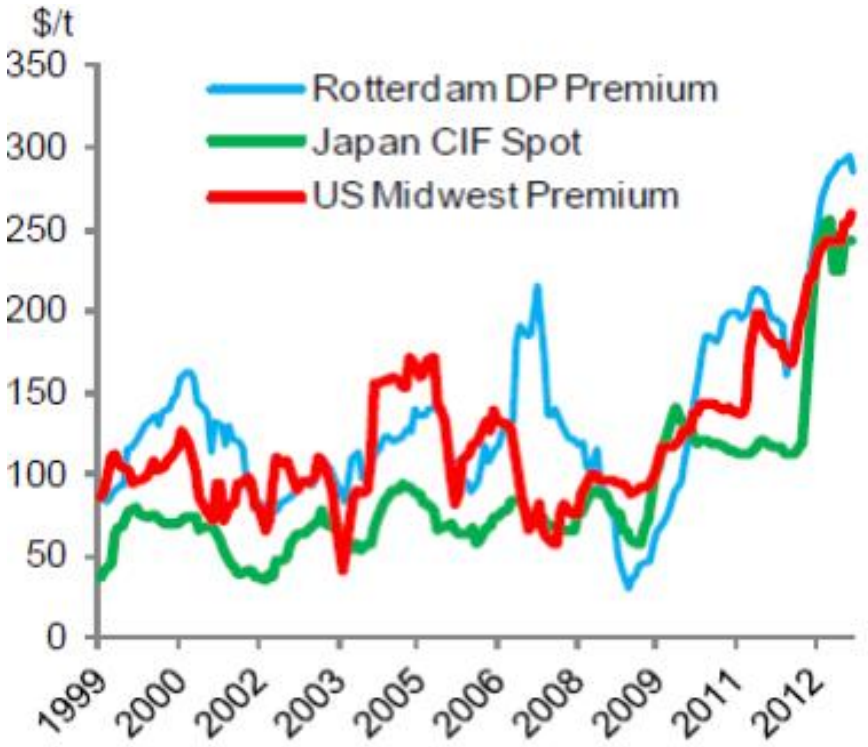
Warehousing and physical delivery

- The physical delivery obligation, when the contract is brought to maturity, essentially aligns the futures contracts to the underlying spot market prices close to maturity ('no arbitrage clause'). In around 98% of futures, there is no actual delivery since traders enter into reversal trades (offsetting).
- Actual delivery of the commodity is set a few times a year for futures contracts on exchanges,. Typically, there are no more than four or five delivery dates per year (i.e. every three or four months).
- Different models of warehousing and delivery.
  - The business model of the London Metal Exchange (740 warehouses). Key requirements (LME, 2011):
    - The delivery warrant should identify the specific parcel of metal within the warehouse (plus the exact brand, weight and shape).
    - In the event of bankruptcy, local laws must foresee that no restriction should be placed on owners of metals that want to take possession of the individually identified metal.
    - The warehouse should meet all other requirements that are requested by the international banking finance activities for the warrant to be accepted as a fully negotiable. Each warrant is equivalent to one lot of the commodity.
  - Plus…
    - The warehouse should be located in a area of net consumption and away from areas of production.
    - The area where the warehouse is located should be a key passage for international trading.
    - The location of the warehouse should be safe, politically and economically stable, and with an appropriate fiscal and legal system.
- Warehousing rules and the delivery system should reflect characteristics in underlying market..

The case of aluminium regional premia (1)

- Spot prices vs regional premia
  - Oversupply vs ?
  - Regional premium is roughly 15% of LME nominal price

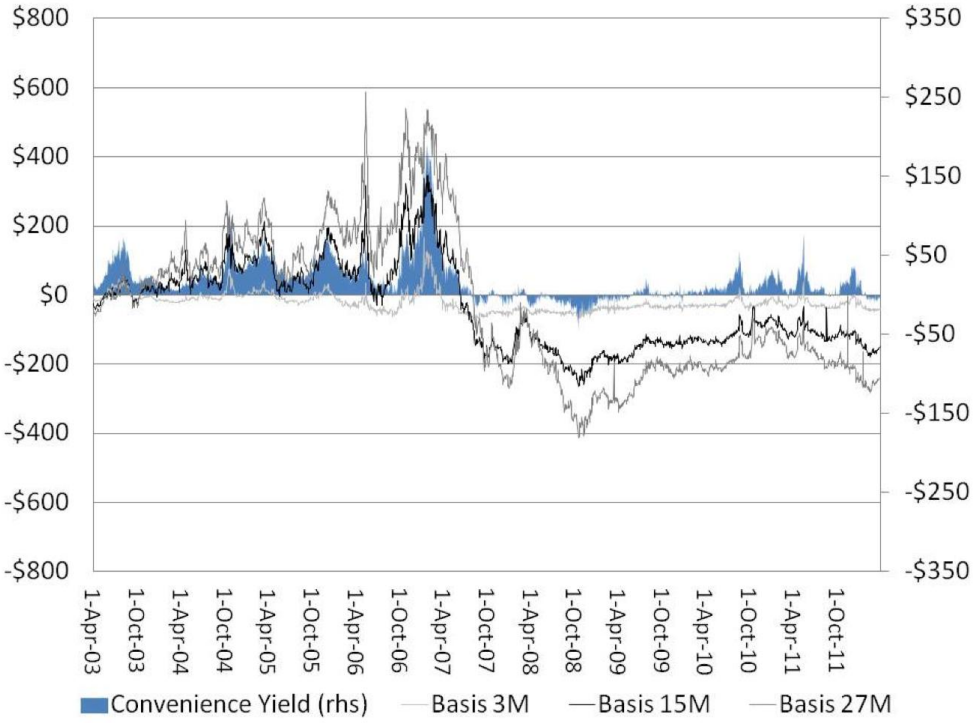




The case of aluminium regional premia (2)

- A market in strong contango…
  - …helped by low convenience yields!

Basis and convenience yield (rhs), Q2 2003-Q1 2012 ($/tonne)

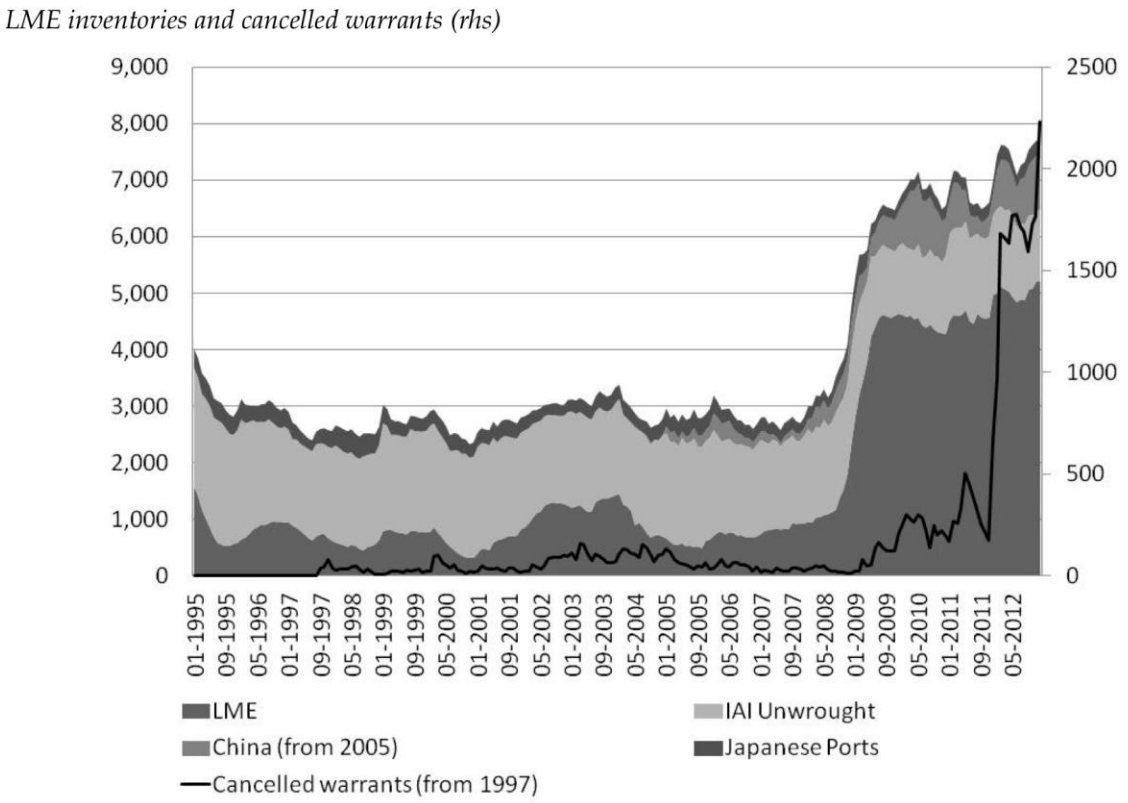


Source: Author's calculation from LME and the Fed. Note: 'Basis' calculated as differential between cash forward and the maturities mentioned above.

The case of aluminium regional premia (3)

- And LME warehousing rules…

- Record of cancelled warrants
- 355 days delays in Vlissingen and 272 in Detroit
  - Up to $160/tonne more
- Rules based:
  - Size of WH (before '12)
  - Stored tonnage
  - Loading-in next?



Source: Author's elaboration from Alcoa and LME Sword.

LME stocks (end year)

LME aluminium and copper stocks, 2003-2011

Year	Global Production	Global Consumption	LME stocks*	% Global production	Global Production	Global Consumption	LME stocks*	% Global production
	Aluminium				Copper			
2003	28,002	27,608	1,423	5.08%	15,221	15,315	431	2.83%
2004	29,940	29,957	693	2.31%	15,832	16,671	49	0.31%
2005	31,889	31,689	644	2.02%	16,651	16,680	92	0.55%
2006	33,975	33,935	698	2.06%	17,353	17,007	191	1.1%
2007	38,186	37,411	929	2.43%	18,044	18,143	199	1.1%
2008	39,669	36,900	2,338	5.89%	18,501	18,138	341	1.84%
2009	37,198	34,765	4,624	12.43%	18,613	18,178	502	2.7%
2010	41,112	39,662	4,275	10.4%	19,190	19,365	378	1.97%
2011	43,652	42,027	4,979	11.41%	19,578	19,508	372	1.9%
2012	45,207	45,000	5,100	11.28%	19,951	20,376	300	1.5%

Source: LME, WMBS, International Aluminium Institute, CRU. Thousands of metric tonnes (MT). Note: see Annex for full data from 1992. Note: *end of the year, thousands tonnes. See also sections **Error! Reference source not found.** and **Error! Reference source not found.**.

The case of aluminium regional premia (4)

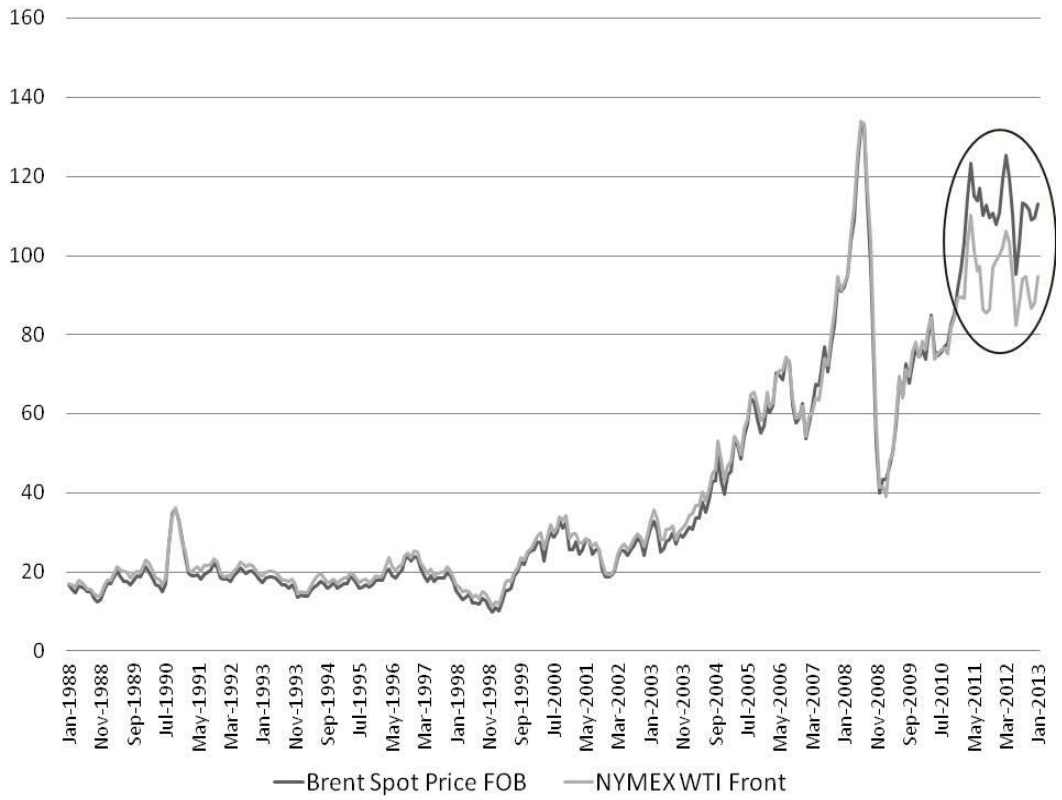
- What do we learn?
  - Warehousing and delivery rules MUST reflect conditions in the underlying physical market, taking into account the business model of the exchange
  - Conflicts of interest policies for market infrastructure are important
    - WHs were key shareholders of LME!
  - Lack of clarity on cross-border supervision of international market infrastructures
    - More coordination is needed

Reference prices

- A benchmark (or reference) price is a price recognised by parties as fair for their bilateral transactions (Clark et al., 2001).
- Different types:
  - Rolling front-month futures price (e.g. agricultural commodities)
  - Cash forward price (e.g. for industrial metals)
  - Regional spot market (assessed) prices (such as Dated Brent or IODEX for iron ore)
- Liquid reference prices are not available in every commodities market, however.
  - *To accommodate demand and supply, these markets should be competitive and liquid, which means that they will be able to provide a market clearing price at all times, and for all quantities, within a reasonable time frame.*
- A recognised international benchmark should:
  - Have enough supply in the underlying reference physical market (supply security)
  - Provide market access and an efficient price discovery system (demand security)
  - Promote competition in the upstream and downstream physical market, and where possible, develop secondary markets for underlying forward contracts.

The case of WTI and Brent

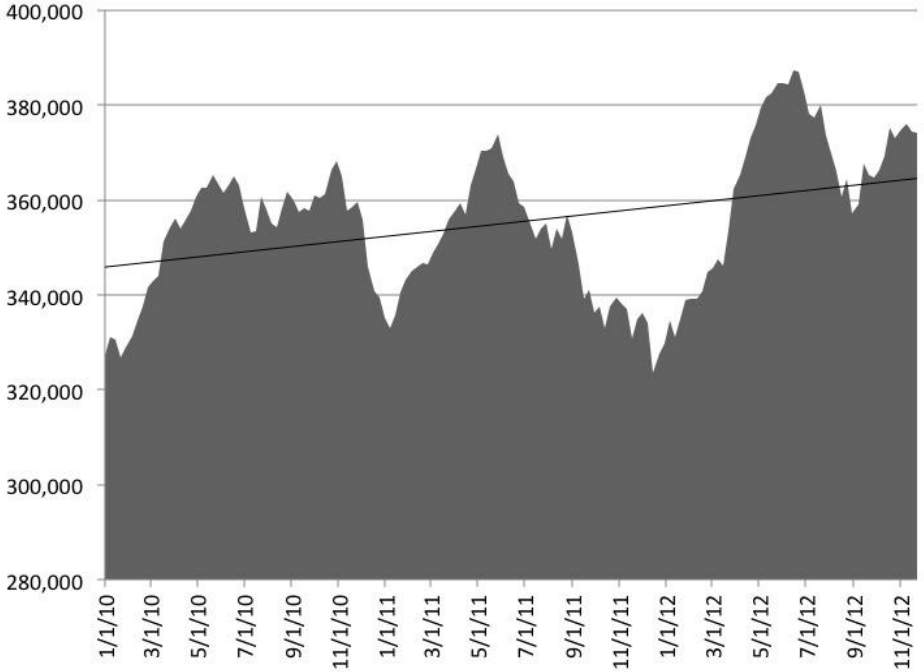
- Failure to secure supply that reflects underlying international oil markets deteriorates benchmarks…



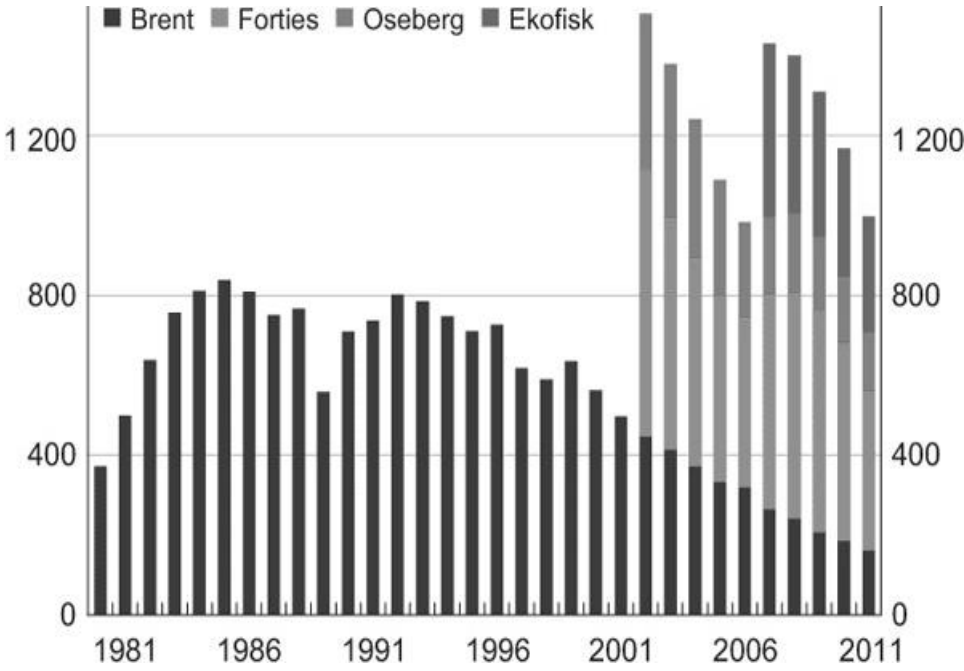
Source: EIA, Thomson Reuters and World Bank.

The case of WTI and Brent

- …for opposite reasons…



Weekly U.S. Ending Stocks excluding SPR of Crude Oil (k/barrels; Jan 2010 – Nov 2012) (from EIA)



BFOE Production Volumes (kb/d) Source: Spencer (2012) from BP, RBA, Statistics Norway, UK Department of Energy and Climate Change.

Key market developments

Key market developments

- Growth of international trade
  - Boosted by WTO agreements (e.g. China's entry)
    - Sudden change in market structure
      - Example: Seaborne freight markets
- Technological developments in trading infrastructure
  - Promoted 24/7 remote access to futures markets
  - Global infrastructures
- Growth of international commodities finance
  - Accommodating monetary policies
    - Access to cheap credit for a prolonged period
  - Deregulation

International trade

International trade

Growth of exports value ($bn) and size, 2001-11

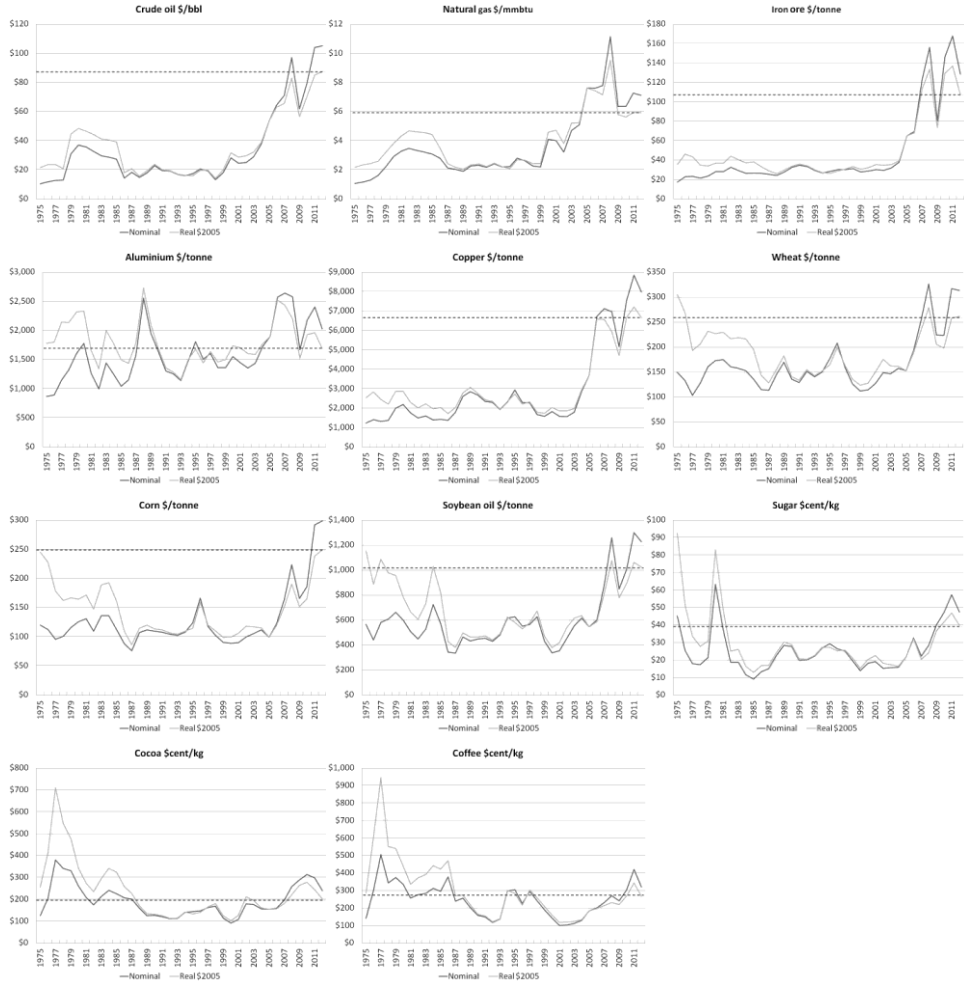
	Value ($bn)			Size		
	2001	**2011**	**CAGR**	**2001**	**2011**	**Units**
Crude oil	340.1	1,475	16%	38,262.1	38,854	kbbl/day
Natural Gas	82.4	368.5	16%	553.46	1073.32	bcum
Iron ore	14.8	180	28%	493.1	1,072.9	mn/tonnes
Wheat	19.1	47.6	10%	105.92	150.4	mn/tonnes
Aluminium*	16	38.1	9%	11.1	15.87	mn/tonnes
Corn	6.7	34.1	18%	74.67	117.03	mn/tonnes
Coffee	5.4	28.6	18%	5.45	6.81	mn/tonnes
Sugar	4	17.8	16%	21.11	31.12	mn/tonnes
Soybean oil	2.9	11.1	14%	8.25	8.52	mn/tonnes
Cocoa	2.6	8.8	13%	2.47	2.96	mn/tonnes
Copper	na	Na	na	Na	na	na

*Exports are estimates.

Source: Author's calculation from World Bank, USDA, ABREE, BP, OPEC, FAO. See footnote **Error! Bookmark not defined.** for the description of prices used for calculation.

Sustained by higher prices…

Long-term nominal and real spot prices for sample commodities, 1975-2012

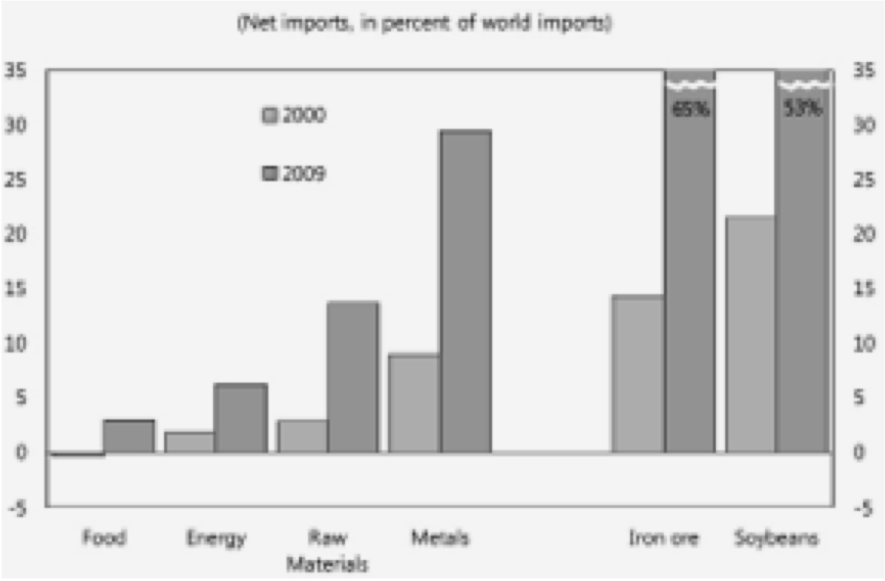


Source: Author's elaboration from World Bank. Note: World Bank Manufactures Unit Value Index deflator (representing 15 commodities countries with ad hoc weights, with base year=2005). Dashed line compares 2012 real price with historical trend.

…and strong Chinese demand! (1)

Exports (% tot)	**2001**	**2003**	**2011**
European Union	40.1%	42.0%	35.1%
United States	13.1%	10.9%	9.6%
Japan	5.8%	5.6%	4.2% (4th)
China	3.9% (5th)	5.2% (4th)	9.5% (3rd)

Chinese net imports (% of world imports)



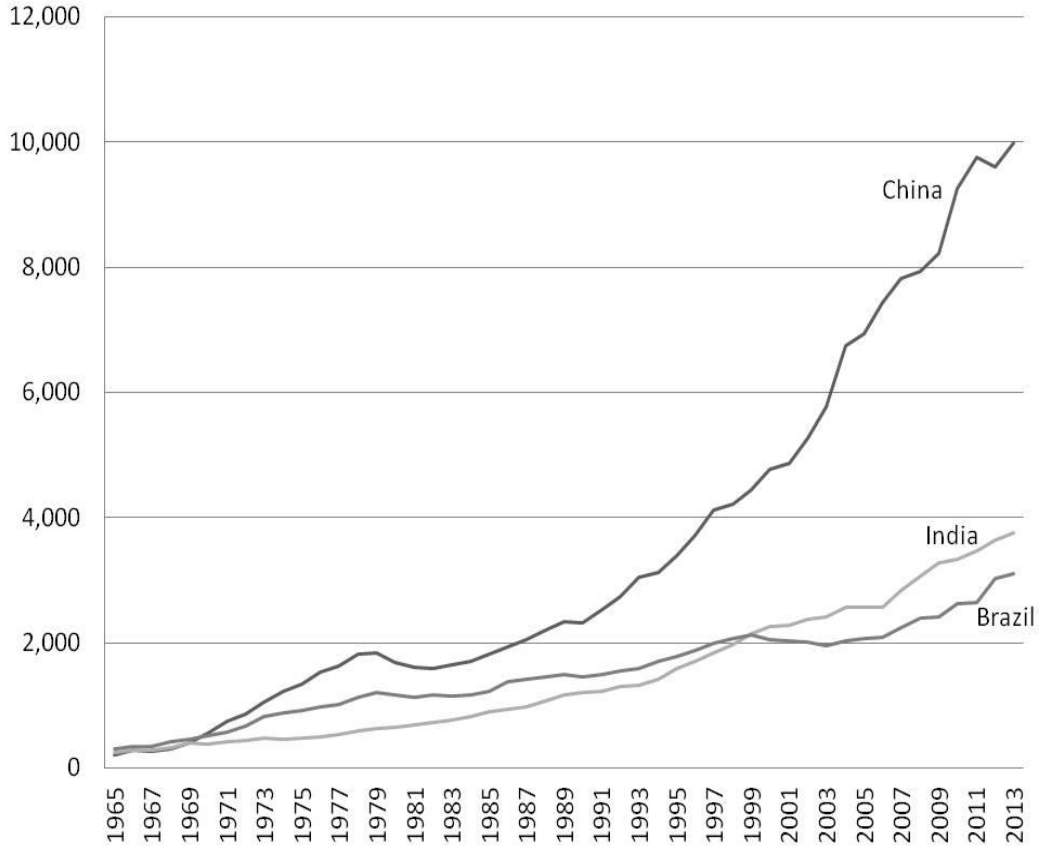
Source: IMF (2011, p. 4).

…and strong Chinese demand! (2)

	Production (top 10; % tot)		Consumption (top 10; % tot)		Exports (top 10; % tot)		Imports (top 10; % tot)	
	2001	2011/2012	2001	2011/2012	2001	2011/2012	2001	2011/2012
Crude oil	7th (4.4%)	5th (4.9%)	3rd (6.3%)	2nd (11.1%)	no	no	n/a	2nd (14.9%)
Natural Gas	n/a (1.2%)	6th (3.1%)	n/a (1.1%)	4th (4.1%)	no	no	n/a	10th (1.2%)
Iron ore	n/a	2nd (22.9%)	n/a (13%)	1st (50%)	no	no	n/a	1st (60.2%)
Aluminium	2nd (13.5%)	1st (41.8%)	n/a	1st (41.5%)	no	no	5th *	10th
Copper	n/a	1st (26.4%)	n/a	1st	no	no	n/a	1st
Wheat[a]	2nd (16%)	2nd (7.7%)	2nd (18.5%)	2nd (17.9%)	no	no	no	no
Corn[a]	2nd (19%)	2nd (15%)	2nd (1.8%)	2nd (22.4%)	no	no	no	no
Soybean oil[a]	4th (12.4%)	1st (26.2%)	2nd (14.7%)	1st (28.9%)	3rd	1st	no	no
Sugar[a]	5th (5.2%)	4th (7.2%)	5th (6.7%)	3rd (9%)	no	no	7th	4th
Cacao	no	no	no	no	no	no	9th	8th
Coffee	no	no	no	no	no	no	no	no

…and strong Chinese demand! (3)

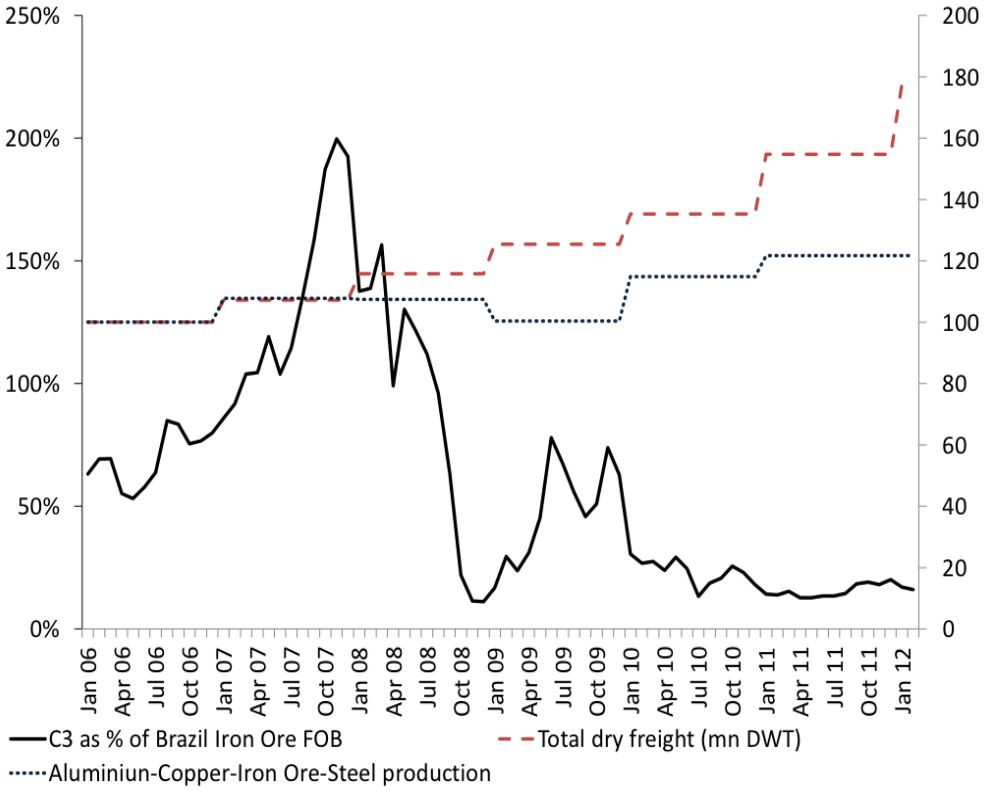
- Crude oil, for instance…



Source: Authors' elaboration from BP Stats and IEA (2013). kbbl/day

Example: Seaborne freight markets

Freight rates and total production/capacity (2006=100)



Sources: Author's elaboration from ICAP, UNCTADstat, WBMS, World Steel Association (WSA), LKAB.

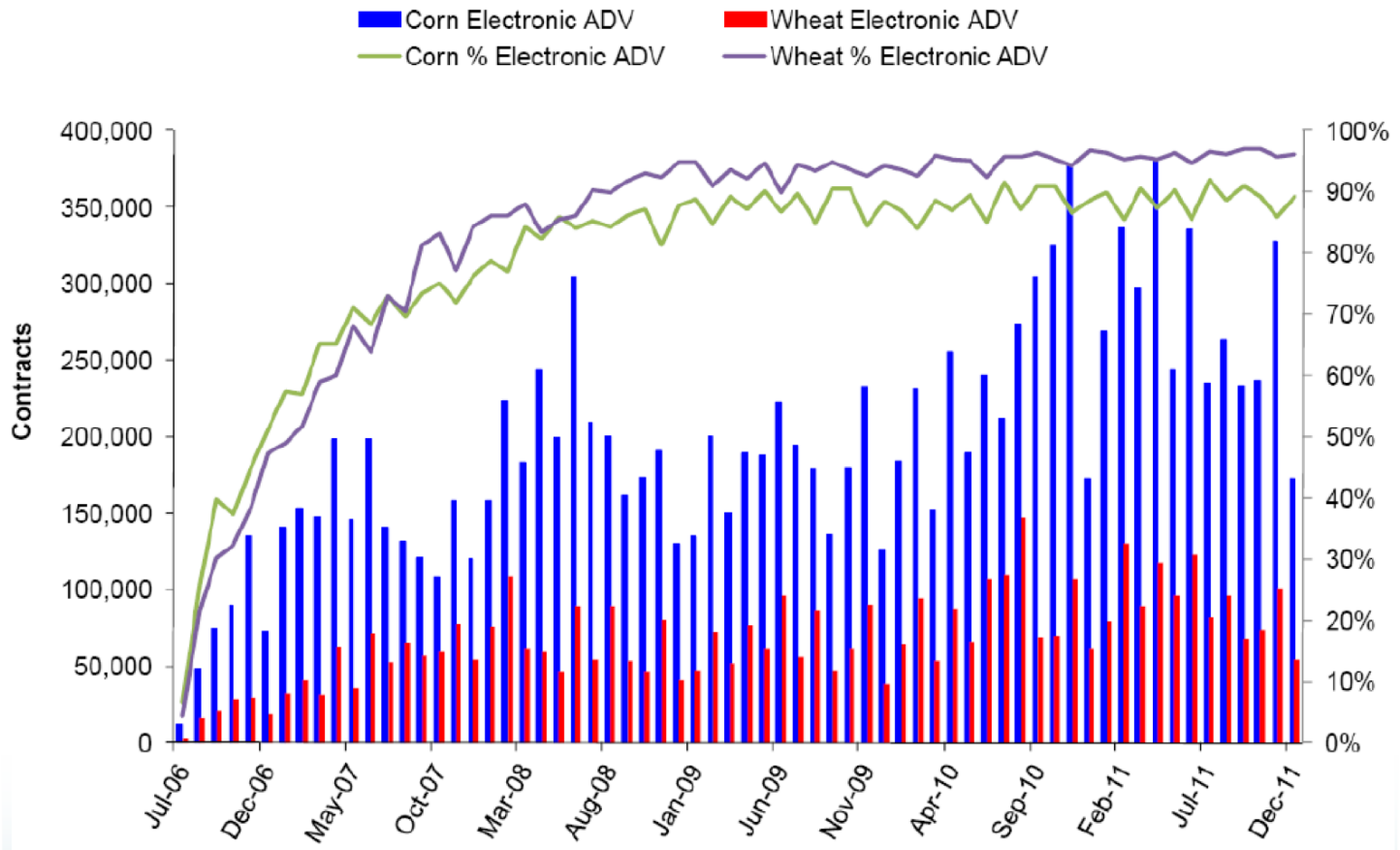
Technological developments and market infrastructure

Market infrastructure developments

- New trading technologies
  - 24/7 remote market access
  - Trading methodologies (e.g. HFT)
    - Exploit more arbitraging opportunities
- New role of market infrastructures
  - Exponential growth in recent years
  - Competitive global markets
    - Ensuring access without undermining intellectual property
  - Unintended impact of regulatory reforms on market power

Electronic trading

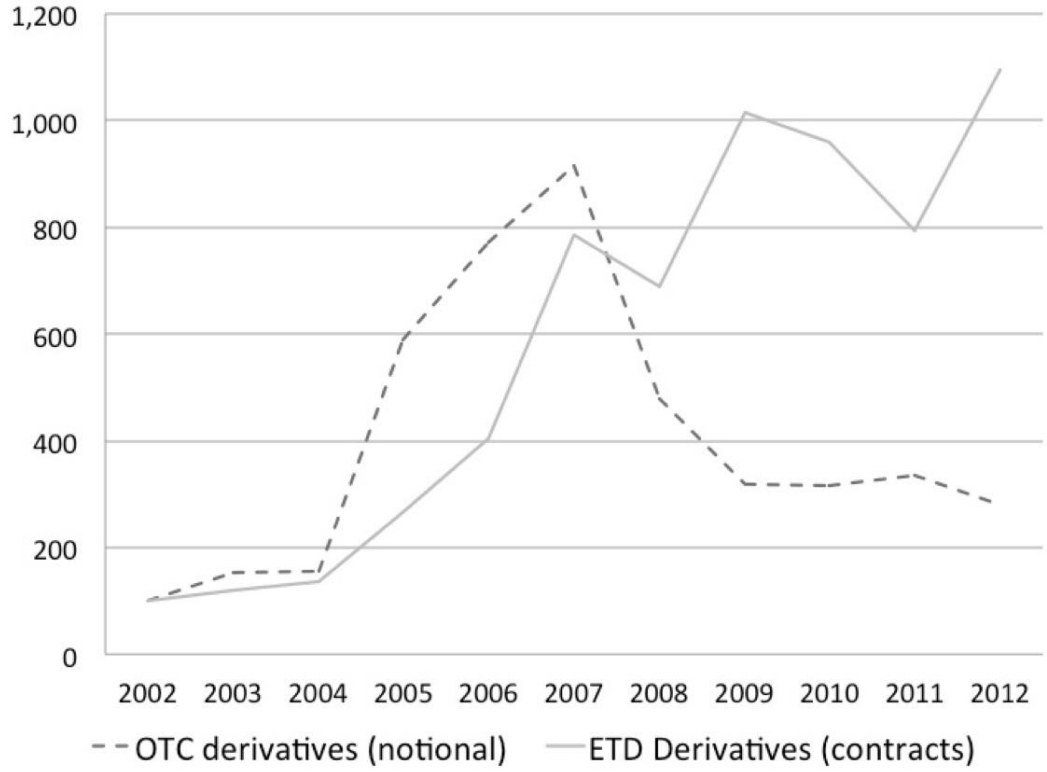
Corn and wheat electronic futures (average daily volume)



Source: CME Group.

Futures markets and OTC

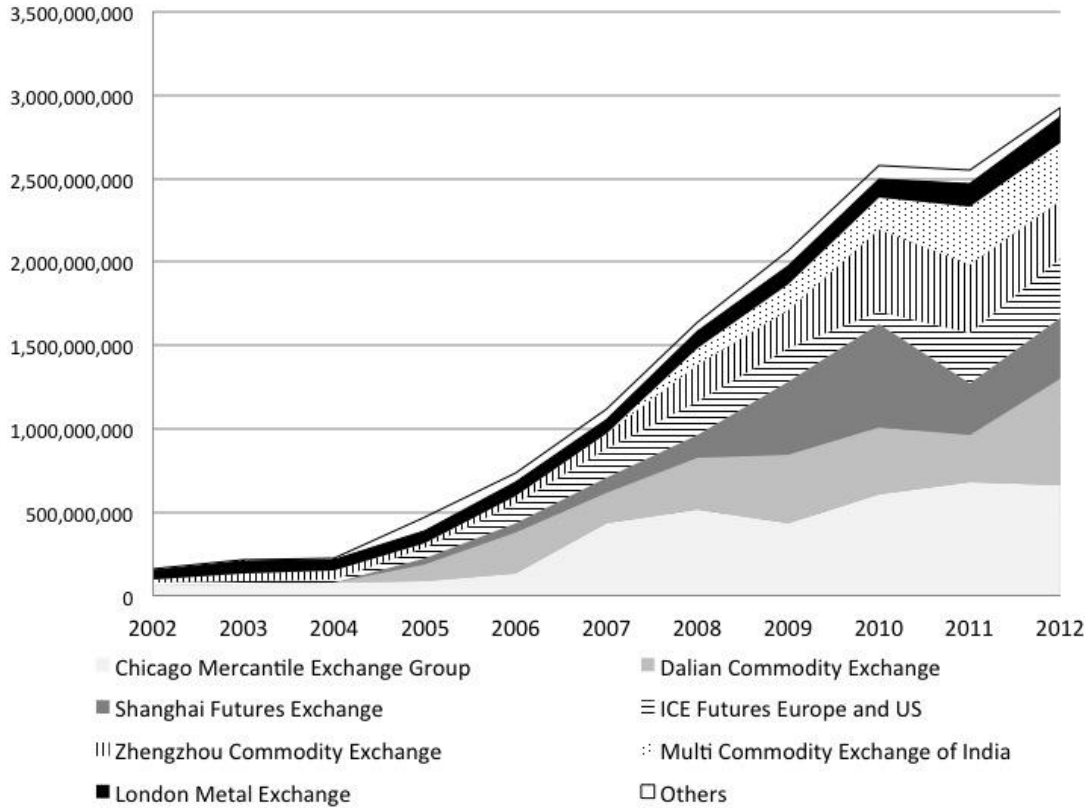
. *Growth of Exchange-traded and over-the-counter commodity derivatives (2002=100-2012)*



Source: Author's calculations from BIS, WFE, ECMI (2012). Note: Exchange-traded data on number of contracts might be underestimated before 2008. Data include futures only for exchange-traded contracts.

Global market infrastructure

Growth of commodity futures exchanges volumes by number of contracts, 2002-2012



Note: 2012 data for Multi Commodity Exchange of India is from 2011.

Source: Author's calculations from WFE and ECMI (2012).

ETD versus OTC

Notional value of outstanding commodities futures and options traded OTC and on exchange ($ bn)

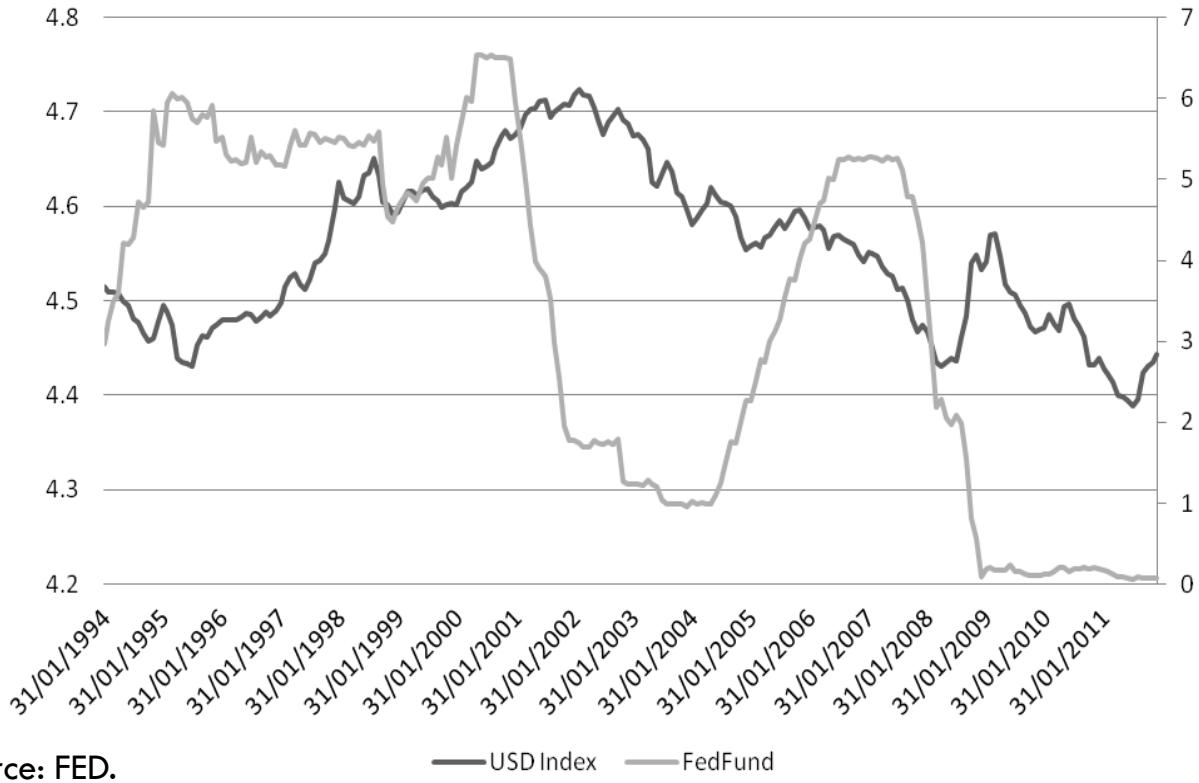
	Exchange-traded		Over-the-counter		Total	
	2011	**2012**	**2011**	**2012**	**2011**	**2012**
Futures	3,226 (65%)	3,168 (70%)	1,745 (35%)	1,363 (30%)	4,971	4,531
Futures and options	3,585 (58%)	3,485 (62%)	2,570 (42%)	2,101 (38%)	6,155	5,584

Note: Exchange-traded data are conservative estimates derived from turnover value of futures and options contracts. Value of over-the-counter positions is not daily marked-to-market.
Source: Author's estimates from WFE/IOMA, BIS, CME, LIFFE, LME, ICE, other sources.

International commodities finance

Accomodating monetary policies

- Dollar Broad Index and interbank interest rates (rhs) (1994-2011)



Source: FED.

Weight of financial institutions

- Credit channeled by big financial institutions…

Top 12 most active financial institutions in commodities derivatives, by notional/total assets

€bn – End 2011	Notional value	Gross value (fair value)*	Total assets	Revenues	% Notional/ Total assets	% Gross/ Total assets	Ratio Gross/ Revenues
Morgan Stanley	607.07	61.60	579.00	25.02	104.85%	10 64%	2 46
Goldman Sachs	614.91	57.51	712.82	2 .25	86.26%	.07%	2.59
JP Morgan	859.35	90.62	1,749.42	75.07	49.12%	5.18%	1.21
Barclays	857.09	26.89	1,876.86	38.76	45.67%	1.43%	0.69
Bank of America	639.22	29.65	1,643.84	72.91	38.89%	1.80%	0.41
Credit Suisse	281.62	n/a	862.41	21.56	32.65%	n/a	n/a
Société Générale	343.09	17.06	1,181.37	25.64	29.04%	1.44%	0.67
Deutsche Bank**	459.13	44.36	2,164.10	33.23	21.22%	2.05%	1.34
Citigroup	221.11	21.92	1,446.82	60.50	15.28%	1.52%	0.36
BNP Paribas**	156.29	13.75	1,965.28	42.38	7.95%	0.70%	0.32
Credit Agricole	69.79	8.50	1,860.00	35.13	3.75%	0.46%	0.24
HSBC	59.06	2.85	1,973.16	46.44	2.99%	0.14%	0.06
Tot.	5,167.72	374.71	18,015.09	498.88	49.71%^	3.9%^	1.15^
Global OTC	2,57	405	-	-	-	-	-
Global ETD***	3,585	-	-	-	-	-	-

Source: 2011 Annual reports, SEC K10 files, BIS (2013 update), WFE/IOMA. *Before netting adjustments. ^Weighted average (notional). "Estimates. ***Conservative estimate of value of traded futures and options contracts.

Growth of new market actors

- …gave easy access to financial leverage to exploit returns…

Key trading companies by total revenues, 2003 vs. 2011 ($bn)

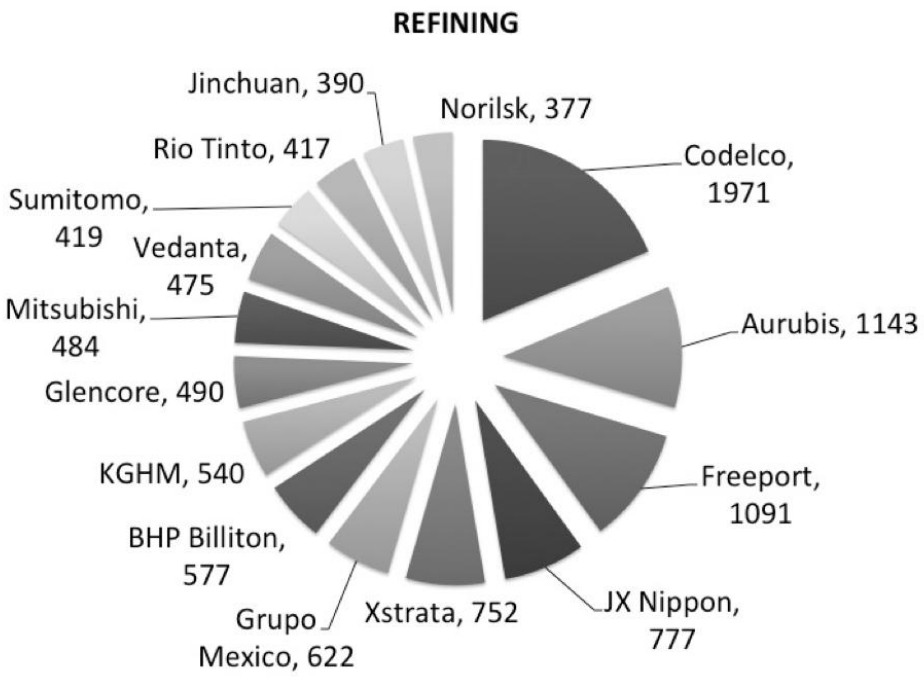
		Ownership	Country	Total assets		Total revenues		
				2003	2011	2003	2011	2003-11 CAGR
1	**Vitol**	Private	Netherlands	na	na	61*	297.00	22%*
2	**Glencore**	Public	Switzerland	59.90**	86.16	142.34**	186.15	-
3	**Trafigura**	Private	Netherlands	na	na	na	121.50	-
4	**Noble group**	Public	Hong Kong	1.07	17.34	4.28	80.73	44%
5	**Gunvor International**	Private	Cyprus	na	na	na	80.00	-
6	**Mercuria**	Private	Switzerland	na	na	na	75.00	-
7	**Marubeni*** **	Public	Japan	41	65	75.2	55.63	-
8	**Xstrata**	Public	Switzerland-UK	10.00	74.83	3.47	33.88	33%
9	**Marquard & Bahls AG**	Private	Germany	0.78	5.63	5.44	25.84	22%
10	**System Capital**	Private	Ukraine	na	28.45	na	19.55	-

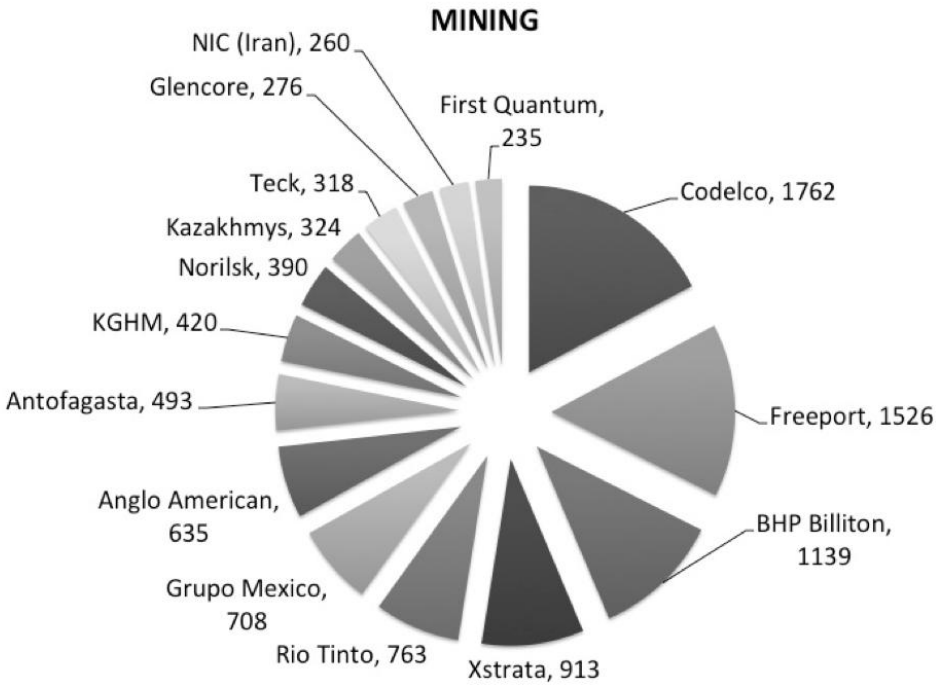
Source: Author's selection from websites, annual reports and OANDA. Note: *2004 data; **2007 data; *Fiscal year ended in March 2012. Exchange rate with USD is yearly average.

Example: Copper

- Too-physical-to-fail? → Glencore-Xstrata

Copper market concentration, 2010 (kt)



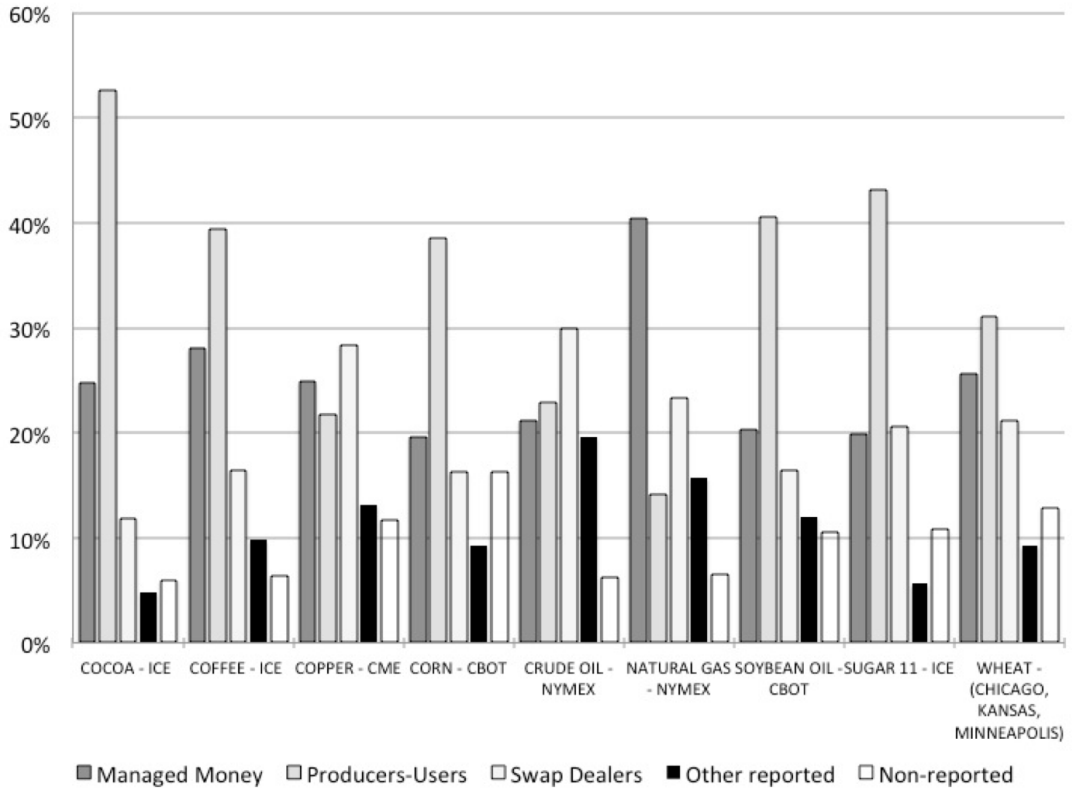


Source: Raw Materials Group.

Financial participants (1)

- Since early 2000s, returns in international commodities trade lured financial participants in…

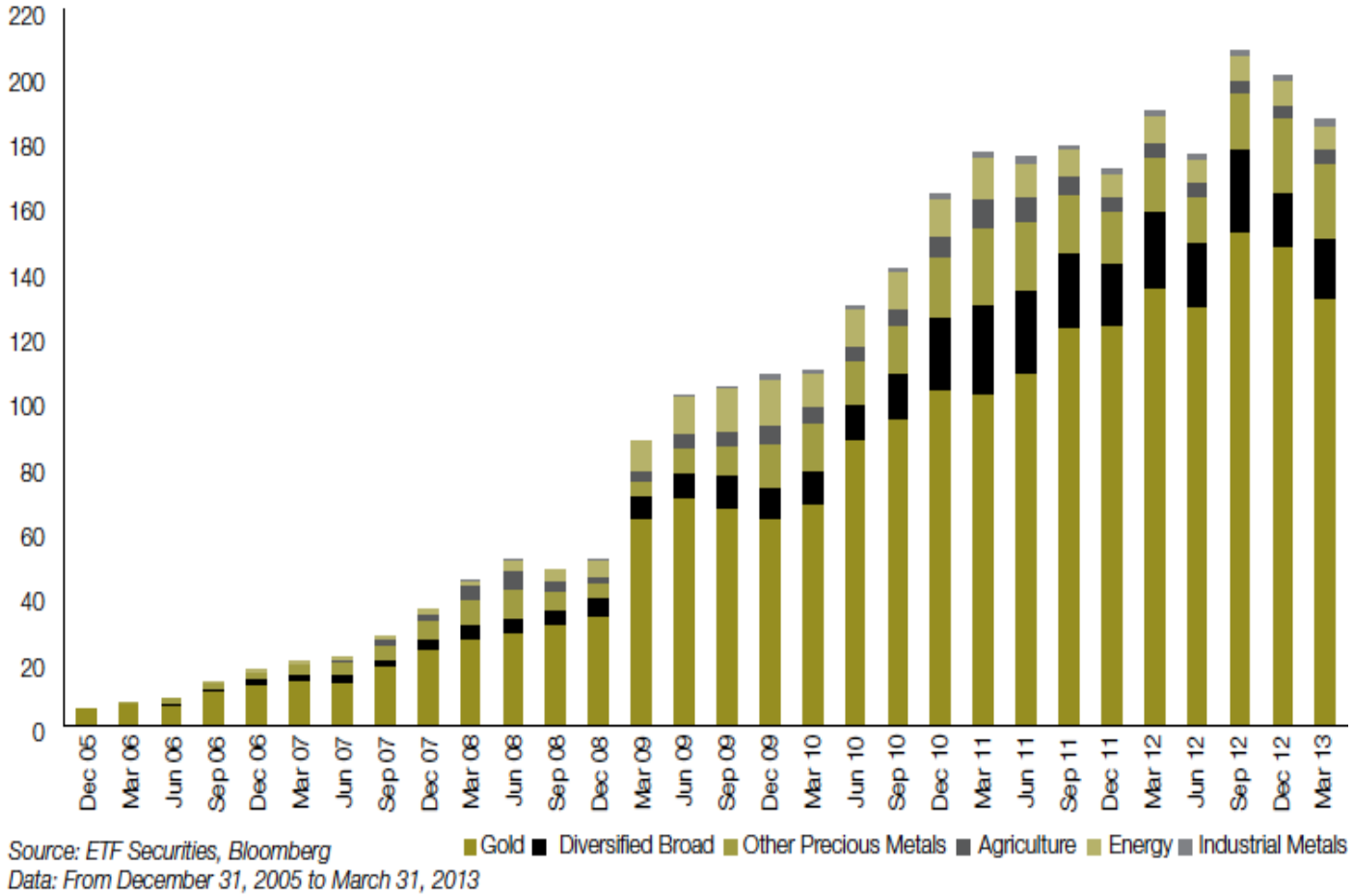
Types of traders in futures markets, 2012 (% total open interest)



Source: Author's elaboration from CFTC. Note: sum of long and short positions in 2012.

Financial participants (2)

- …and more passive investments…

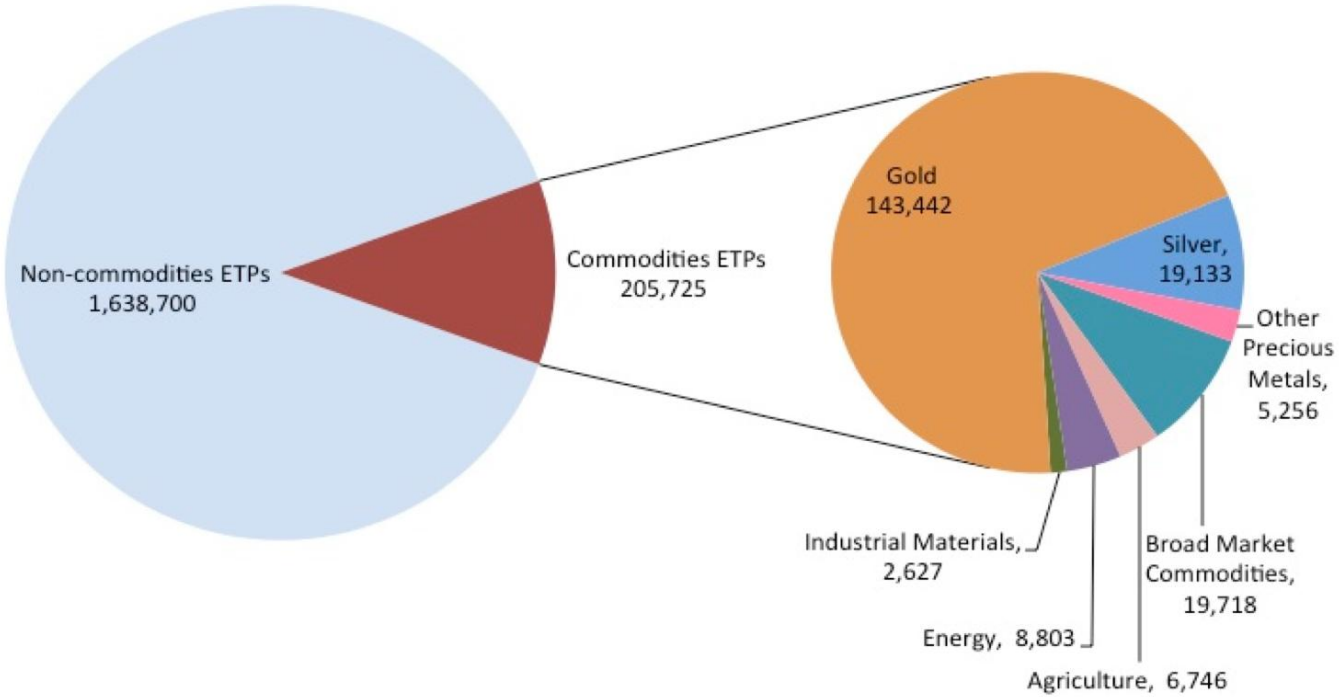


Source: ETF Securities, Bloomberg
Data: From December 31, 2005 to March 31, 2013

Financial participants (3)

- …but limited involvement in size so far…

Breakdown of commodities ETPs per underlying exposure, Q3 2012 (US$ million)

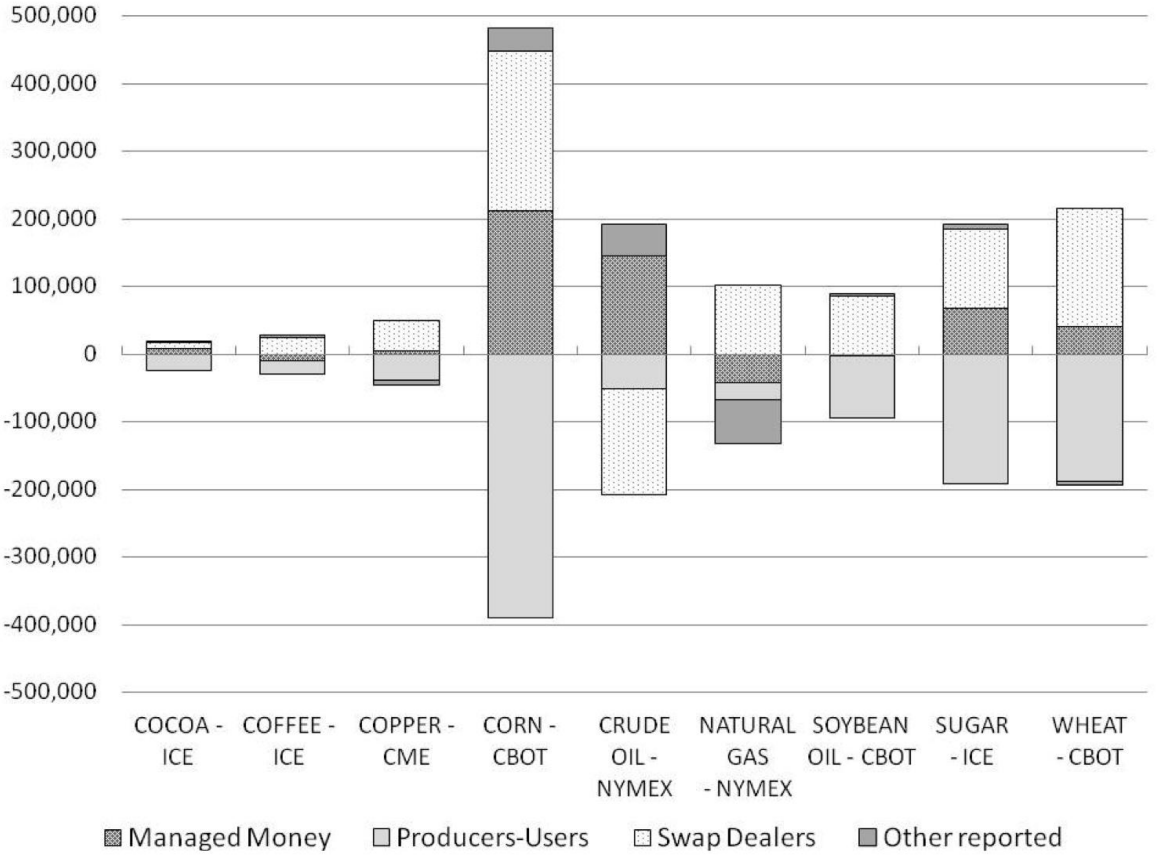


Source: Blackrock ETP Landscape.

Financial participants (4)

- … and limited net positions.

Net positions by type of trader, 2012



Source: Author's calculation from CFTC. Note: Difference between equally weighted average of long and short positions in 2012.

…but the situation has raised concerns about the process of financialisation…

Financialisation

- 'Financialisation' is the process of alignment of commodities returns with pure financial assets ('pooling effect'), so increasing co-movements among asset classes that have been historically seen as following opposite causal pattern. This process began well before the financial crisis, but it has speeded up over the years.
- On top of:
  - International trade (WTO commitments and global capital flows)
  - Technological developments
- …access to credit!
  - Accommodating monetary policies
    - Frankel (2006) → low real interest rates may push real commodities prices up by increasing interest in piling up inventories (carry trade)
  - Early evidence of counter-cyclical nature of commodities (Gorton and Rouwenhorst, 2004)

Financialisation (2)

- It is the combined effect of the three market developments above that have international commodities markets possible
- Three policy concerns are examined:
  - Pooling effect increasing pro-cyclicality and channelling shocks → Yes
  - Financial positions leading commercial positions → No
  - Size of financial over physical → Depends

Financialisation (3)

- The link with S&P 500…

Link between commodities prices and financial indexes before and after 2002

	Before 2002	After 2002	Whole sample	Model
Crude oil	No	Yes	No	ARCH
Natural Gas	No	No	No	ARIMA, Granger
Iron ore	-	-	-	-
Aluminium*	No	Yes	Yes*	ARCH, OLS
Copper	No	Yes	No	ARCH, OLS
Wheat	No	Yes	No	ARIMA, OLS
Corn	No	Yes	No	OLS
Soybean oil	No	Yes	Yes	ARCH, OLS
Sugar	-	-	-	-
Cocoa	Yes**	Yes**	Yes**	OLS
Coffee	No	Yes**	No	OLS

Note: *both ways, **Rejection at 10% level. Data up to 2011/2012.

Source: Author.

Financialisation (4)

- …and its volatility…

Granger causality test summary

Dependent Variable	Independent Variable	1992-2011	1992-2001	2002-2011
Commercial	VIX	Yes*	No	Yes***
VIX	Commercial	No	No	No
Non-commercial	VIX	No	No	No
VIX	Non-commercial	No	No	No
Non-commercial Long	VIX	Yes***	No	Yes
VIX	Non-commercial Long	No	No	No

Note: *1% **5% ***10% significance (p-value). 997 observations. See Annex for more details.

Source: Author's calculations.

Financialisation (5)

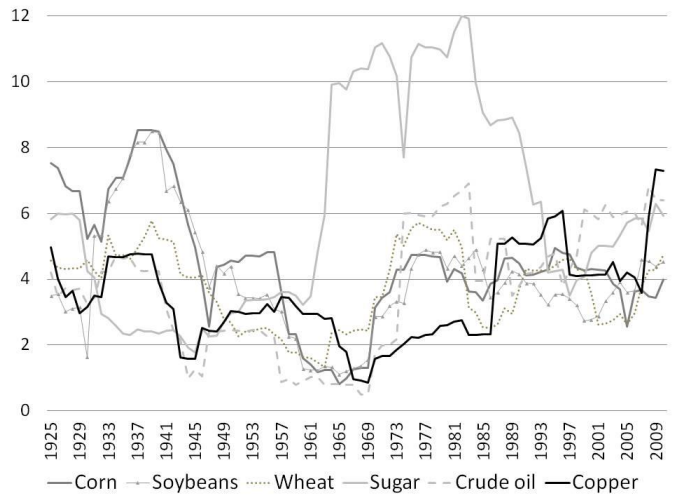
Volatility analysis and S&P 500 correlation

Periods	TRJ-CRB Total Return Index volatility*	FAO Real Price Index volatility**	CRB-TR Index / S&P 500 Annualised correlation
2000-2007	0.16	0.25	0.01
2008-2012	0.22	0.53	0.42
2008-2009	0.26	0.65	0.37
2010-2012	0.18	0.45	0.55

Source: Author's calculation from Thomson Reuters – Jefferies CRB index website, FAO Stats, IMF and Yahoo Finance. Note: Equally weighted averages of 1 year rolling volatility, as measured in footnote. *Daily data. **Monthly data.

- Short-term volatility has increased...
- ...but long-term volatility still remains within a range…

Historical real price volatility, 1925-2010*



Source: Author's calculation from Bloomberg, IMF, Morgan Stanley Commodities. Note: *Ten-years annualised rolling volatility. Annual data. 1915=100

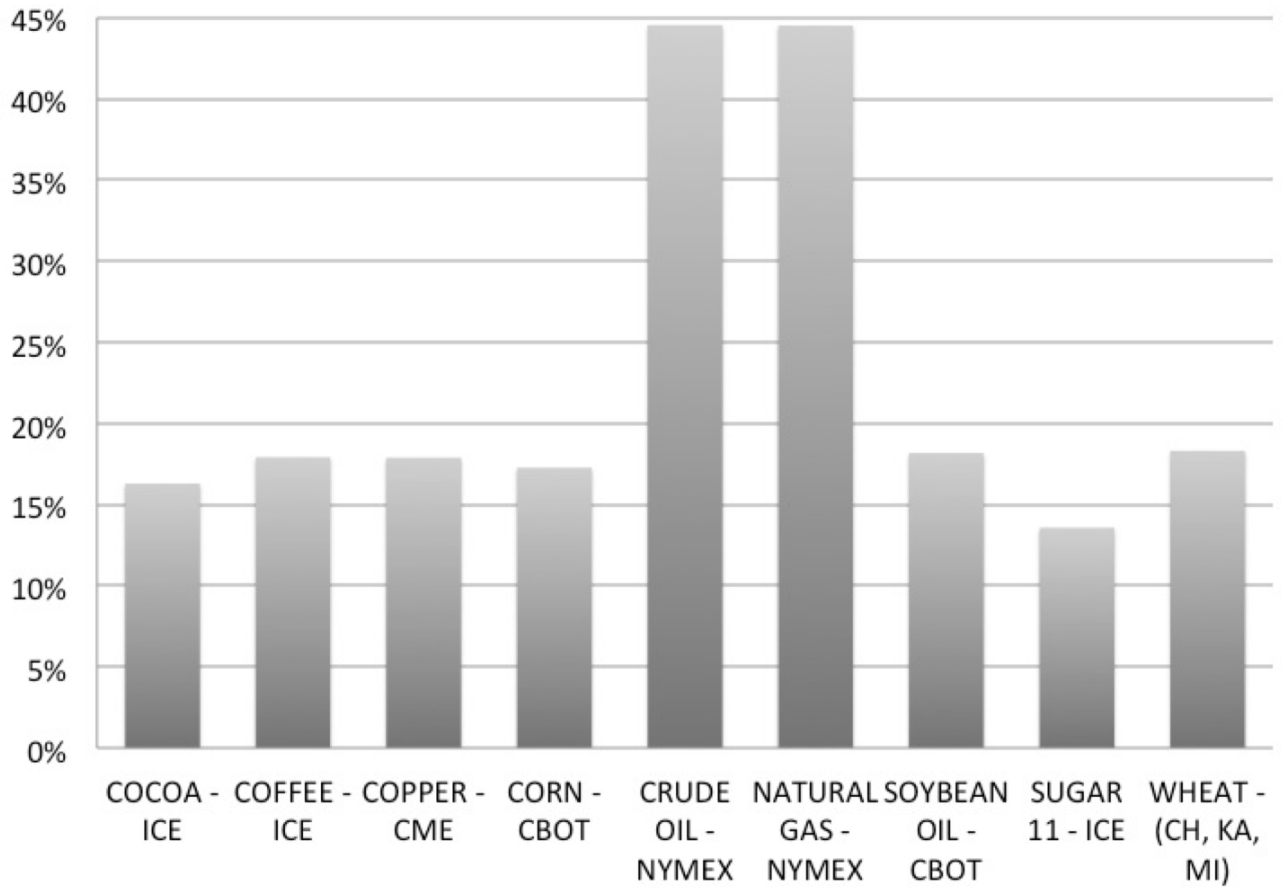
Financialisation (6)

- Commercial and non-commercial positions…
  - Crude oil data (WTI, NYMEX)
- Why crude oil?
  - Financial participants
  - Full dataset from CFTC

Source: Authors from websites, annual reports and OANDA. Note: Exchange rate with USD is yearly average. *2005 data, **2006 data, ***2010 data.

Financialisation (7)

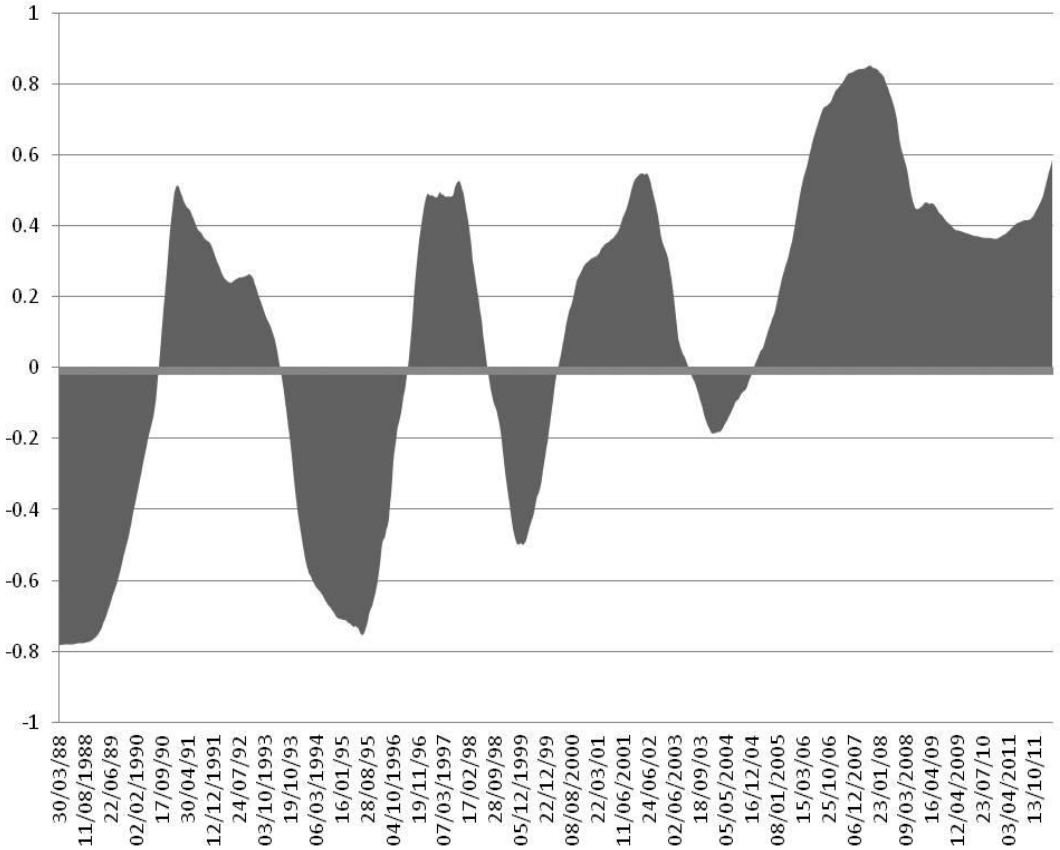
Spread trading, 2012 (% total open interest)



Source: Author's elaboration from CFTC.

Financialisation (8)

- …anomalies in price trends raise questions!



Source: Author's calculation. Note: daily data.

Financialisation (9)

- WTI regression with S&P 500

(a) 1983-2002

ARCH family regression

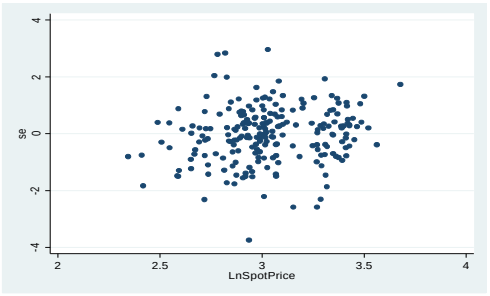
Sample: 2 - 226, but with gaps
Distribution: Gaussian
Log likelihood = 238.9838

Number of obs = 219
Wald chi2(1) = 1.41
Prob > chi2 = 0.2348

D. lnspotprice	OPG Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
lnspotprice						
lnsp500						
D1.	-.1061058	.0893056	-1.19	0.235	-.2811414	.0689299
_cons	.0000212	.0037056	0.01	0.995	-.0072416	.007284
ARCH						
arch						
L1.	.4375194	.0817145	5.35	0.000	.2773618	.5976769
garch						
L1.	.6186613	.0518285	11.94	0.000	.5170792	.7202434
_cons	.0003804	.0002303	1.65	0.099	-.000071	.0008319

Portmanteau test for white noise

Portmanteau (Q) statistic = 27.4271
Prob > chi2(40) = 0.9346



(b) 2002-2011

ARCH family regression

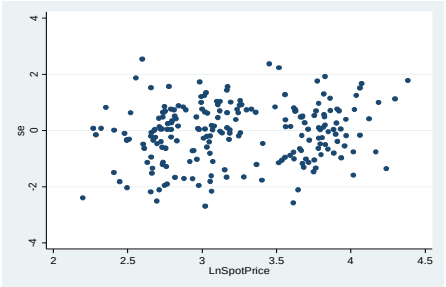
Sample: 97 - 216
Distribution: Gaussian
Log likelihood = 120.2889

Number of obs = 120
Wald chi2(1) = 25.09
Prob > chi2 = 0.0000

D. lnspotprice	OPG Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
lnspotprice						
lnsp500						
D1.	.8139862	.1625204	5.01	0.000	.4954521	1.13252
_cons	.0101848	.0075652	1.35	0.178	-.0046427	.0250124
ARCH						
arch						
L1.	.2639878	.1461696	1.81	0.071	-.0224994	.550475
garch						
L1.	.6344791	.1515962	4.19	0.000	.3373561	.9316021
_cons	.000961	.0007915	1.21	0.225	-.0005904	.0025124

Portmanteau test for white noise

Portmanteau (Q) statistic = 48.3593
Prob > chi2(40) = 0.1711



Financialisation (10)

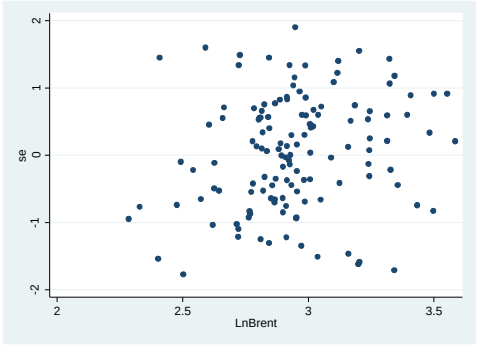
- Brent regression with S&P 500

(a) 1994-2002

ARCH family regression

Sample: **2 - 144, but with gaps** Number of obs = **137**
Distribution: **Gaussian** Wald chi2(**1**) = **2.03**
Log likelihood = **137.1215** Prob > chi2 = **0.1540**

D.lnbrent	Coef.	OPG Std. Err.	z	P>|z|	[95% Conf.	Interval]
lnbrent						
lnsp500						
D1.	-.2912692	.2043234	-1.43	0.154	-.6917357	.1091973
_cons	-.0029828	.0080204	-0.37	0.710	-.0187025	.0127368
ARCH						
arch						
L1.	.3288481	.1234064	2.66	0.008	.0869759	.5707202
_cons	.0059298	.0010507	5.64	0.000	.0038704	.0079891



Portmanteau test for white noise

Portmanteau (Q) statistic =	**43.3522**
Prob > chi2(**40**) =	**0.3304**

(b) 2002-2011

Linear regression

Number of obs = **120**
F(1, 118) = **8.09**
Prob > F = **0.0052**
R-squared = **0.1173**
Root MSE = **.08988**

D. lnbrentprice	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
lnsp500						
LD.	.6984865	.2455714	2.84	0.005	.2121883	1.184785
_cons	.0107565	.0082453	1.30	0.195	-.0055714	.0270844

. omninorm res

(n = 214)	D-H	P-value	asy.	P-value
Residuals	**7.1661**	**0.0278**	**7.5903**	**0.0225**

Ramsey RESET test using powers of the fitted values of D.lnbrentprice
Ho: model has no omitted variables
F(3, 115) = **2.42**
Prob > F = **0.0701**

Financialisation (11)

- M2 leads futures positions (VEC analysis)

Source	SS	df	MS	Number of obs =	310
Model	.177201164	3	.059067055	F(3, 306) =	9.56
Residual	1.89063841	306	.006178557	Prob > F =	0.0000
				R-squared =	0.0857
Total	2.06783957	309	.006692037	Adj R-squared =	0.0767
				Root MSE =	.0786

D.commTOT	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
commTOT						
LD.	-.104876	.0548934	-1.91	0.057	-.2128924	.0031404
lnm2						
D1.	-2.367319	1.075996	-2.20	0.029	-4.484607	-.2500303
coin1						
L1.	-.0812382	.0178908	-4.54	0.000	-.1164428	-.0460336
_cons	.0205437	.006461	3.18	0.002	.0078301	.0332574

Source	SS	df	MS	Number of obs =	310
Model	.000257564	3	.000085855	F(3, 306) =	5.04
Residual	.005211015	306	.000017029	Prob > F =	0.0020
				R-squared =	0.0471
Total	.005468579	309	.000017698	Adj R-squared =	0.0378
				Root MSE =	.00413

D.lnm2	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
lnm2						
LD.	.0947919	.0571094	1.66	0.098	-.017585	.2071687
commTOT						
D1.	-.006499	.0029625	-2.19	0.029	-.0123284	-.0006696
coin1						
L1.	-.0026633	.0009751	-2.73	0.007	-.004582	-.0007446
_cons	.0039853	.0003435	11.60	0.000	.0033093	.0046612

Source	SS	df	MS	Number of obs =	310
Model	1.90503788	3	.635012625	F(3, 306) =	14.41
Residual	13.4892931	306	.044082657	Prob > F =	0.0000
				R-squared =	0.1237
Total	15.394331	309	.049819841	Adj R-squared =	0.1152
				Root MSE =	.20996

D.NONcommTOT	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
NONcommTOT						
LD.	-.1301126	.0564883	-2.30	0.022	-.2412674	-.0189579
lnm2						
D1.	-2.868	2.843853	-1.01	0.314	-8.463982	2.727982
coin2						
L1.	-.1832619	.0365718	-5.01	0.000	-.255226	-.1112978
_cons	.0255268	.0171685	1.49	0.138	-.0082566	.0593101

Source	SS	df	MS	Number of obs =	310
Model	.000110823	3	.000036941	F(3, 306) =	2.11
Residual	.005357756	306	.000017509	Prob > F =	0.0990
				R-squared =	0.0203
Total	.005468579	309	.000017698	Adj R-squared =	0.0107
				Root MSE =	.00418

D.lnm2	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
lnm2						
LD.	.1317168	.0567432	2.32	0.021	.0200606	.243373
NONcommTOT						
D1.	-.0011387	.0011296	-1.01	0.314	-.0033616	.0010841
coin2						
L1.	.0000999	.0007302	0.14	0.891	-.0013371	.0015368
_cons	.0037679	.0003417	11.03	0.000	.0030955	.0044402

Financialisation (12)

- Commercial short leads non-commercial long (VEC analysis)

Source	SS	df	MS	Number of obs =	310
Model	13.4038046	3	4.46793487	F(3, 306) =	40.03
Residual	34.153502	306	.111612752	Prob > F =	0.0000
				R-squared =	0.2818
				Adj R-squared =	0.2748
Total	47.5573066	309	.153907141	Root MSE =	.33408

D. NONcommLONG	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
NONcommLONG						
LD.	-.1039714	.0501897	-2.07	0.039	-.202732	-.0052108
commSHORT						
D1.	1.753686	.1919461	9.14	0.000	1.375985	2.131387
coin5						
L1.	-.1598455	.0332285	-4.81	0.000	-.2252308	-.0944602
_cons	-.0038412	.0190743	-0.20	0.841	-.0413745	.0336921

Source	SS	df	MS	Number of obs =	310
Model	.729358602	4	.182339651	F(4, 305) =	24.17
Residual	2.30139603	305	.007545561	Prob > F =	0.0000
				R-squared =	0.2407
				Adj R-squared =	0.2307
Total	3.03075463	309	.009808267	Root MSE =	.08687

D.commSHORT	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
commSHORT						
LD.	-.1805889	.0559078	-3.23	0.001	-.2906028	-.0705751
NONcommLONG						
D1.	.120293	.0131884	9.12	0.000	.0943413	.1462448
LD.	.0294207	.0146473	2.01	0.045	.0005981	.0582432
coin5						
L1.	.018442	.0089171	2.07	0.039	.0008952	.0359888
_cons	.0092288	.0049606	1.86	0.064	-.0005325	.0189901

Financialisation (13)

- Also new CFTC reports confirm previous analysis based on legacy reports…

Granger causality tests

Variables	Granger causality			Reversed		
Independent→Dependent	**Crude oil**	**Natural gas**	**Corn**	**Crude oil**	**Natural gas**	**Corn**
M2→SD/MM long	Yes*	No	No	No	No	Yes***
M2→Producers short	No	Yes*	Yes*	No	Yes*	No
Producers short→SD/MM long	Yes**	Yes**	Yes**	No	No	No

Note: *1%, **5%, ***10% significance. 'SD/MM' stands for 'Swap dealers/Managed money'.

Financialisation (14)

- Size of financial markets over physical markets? Volumes…

Benchmark futures contracts volumes and ratio over equivalent physical production

	Futures volume	Futures contract (venue)	2011 global production	Ratio futures/physical	Unit
Corn	8,142,408,531	5k bushels (CBOT)	814,256,000	9.99	tonnes
Cocoa	39,072,420	10 tonnes (LIFFE)	3,899,657	10.02	tonnes
Soybean oil	289,710,107	60k pounds (CBOT)	41,174,000	7.03	tonnes
Natural gas	746,722,190	10k mmBtu Henry Hub (NYMEX)	122,338,445	6.1	bn BTU
Crude oil	163,419,527,000	1k bbl WTI (NYMEX)	32,266,000,000	5.06	bbl
Coffee	34,977,640	10 tonnes Robusta (LIFFE)	8,063,160	4.34	tonnes
Wheat	1,630,041,328	5k bushels (CBOT)	653,000,000	2.5	tonnes

Source: Author's calculations from various sources. Note: Volume of futures contracts for the year 2011 (number of contracts) with maturity up to 12 months. Data on volumes for crude oil, natural gas, cocoa, coffee may double if the other available liquid futures contract for each of these commodities (run by ICE) is included. Conservative estimates.

Financialisation (15)

- …and open interest
  - More comparable numbers

Benchmark futures contracts open interest and ratio over equivalent physical production

	90th percentile	Open Interest (in production unit)	Futures contracts	Equivalent global Production	Ratio financial/physical
Natural Gas	8 months (NYMEX)	12,954,716	NYMEX - ICE	81,558,963 (bn BTU)	15.8%
Crude oil	25 months (NYMEX)	3,248,147,760	WTI - Brent	67,220,833,333 (bbl)	4.8%
Copper	8 months (NYMEX)	6,339,000,000	LME	23,516,000,000 (pounds)	26.96%
Aluminium	n/a (LME)	18,403,025	LME	43,989,000* (tonnes)	41.84%
Cocoa	13 months (LIFFE)	3,304,711	LIFFE – ICE	4,223,917 (tonnes)	78.2%
Coffee	6 months (LIFFE)	2,921,640	LIFFE - ICE	1,343,860 (tonnes)	217.4%
Corn	11 months (CBOT)	305,474,466	CBOT	746,401,333 (tonnes)	40.09%
Soybean oil	6 months (CBOT)	2,897,568	CBOT	20,587,000 (tonnes)	14%
Wheat	10 months (CBOT)	115,932,656	CBOT	544,166,667 (tonnes)	21.3%
White sugar	9 months (LIFFE)	3,443,950	LIFFE	126,361,500 (tonnes)	2.73%

Note: conservative estimates. *12 months production.

Source: Author's calculation from CME, LME, LIFFE, ICE, Goldman Sachs Research, BP, CRB Commodity Yearbook. Conservative estimates.

Some policy conclusions

Some policy conclusions

- Internationalisation comes at cost…but ready to give it up?
  - Growing interconnection…
    - Higher pro-cyclicality and interconnection with financial system (financialisation)
    - New systemically important actors (e.g., trading houses and governments)
  - …but…
    - International markets and trade
    - Era of low prices and supply security
    - No distortion on price formation from financial participation
- Role of financial participants is benign and instrumental in supporting international commodities trade

Some policy conclusions (2)

- No one-size-fits-all approach
- Role of inventories/delivery management
  - Cross-border supervision and coordination across areas of competence
- Ensuring the well-functioning of internationally recognised benchmarks…
  - Public accountability of assessments
  - Liquid underlying physical markets
  - Proper oversight of warehousing rules
- Working on safeguards
  - Short-term trading practices (volumes-based)
  - Well-functioning of market infrastructure
  - Competitive setting
  - Transparency of physical holdings
    - Attention to the incentive design to limit moral hazard (e.g. JODI)

Thank you!

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Annex

Trading intents (1)

- The investment strategies in commodities are manifold. They can be clustered, however, in a few areas:
  - Hedging (e.g. commercial users or swap dealer)
  - Funding (e.g. index investing)
  - Arbitraging (e.g. spread trading)
  - Information trading (e.g. index investing)
- Two important market developments in recent years may have led to the growth of index investing:
  - Growing funding needs of financial institutions and business diversification (sell-side).
  - Diversification of risk strategies (buy-side).

Trading intents (2)

Comparing investment objectives

	PROs	CONs
Hedging	Risk protection and predictability	Costly
Funding	Liquidity relief	Indirect costs on operations
Arbitrage	Risk-free gain and price efficiency	Occasional
Informed trading	Investing in information, which flows into prices	Risky

Source: Author.