

Financialization of Commodities and the Impact of Monetary Policy on Prices, Volatility and Correlation



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1. Outline



- Introduction
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- Monetary Policy's Effect on Commodity Prices
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2. Introduction



- A voluminous academic literature has recently emerged on the financialization of commodities.
- The academic interest largely stems from the mid-2000s run-up in commodity prices.
- The increase in commodity prices (the “Super cycle”) peaked in summer 2008
- ... and led to widespread concern among the public and policymakers as to whether financialization (or speculation) led to the price increase.

2. Introduction



- The “bubble” view of the run-up in commodity prices would warrant increased government regulation.
- Pundits, politicians (US Senators, Gordon Brown, Nicolas Sarkozy) and part of the financial press echoed the financialization view.
- The principal evidence: investment inflows into commodity futures increased significantly (\$200 billion between early 2000 and June 30, 2008 according to the CFTC).
- Yet, until recently, most academics were skeptical of the “bubble view”.

3. The Beginnings (?) of the Debate: The Masters (2008) Hypothesis



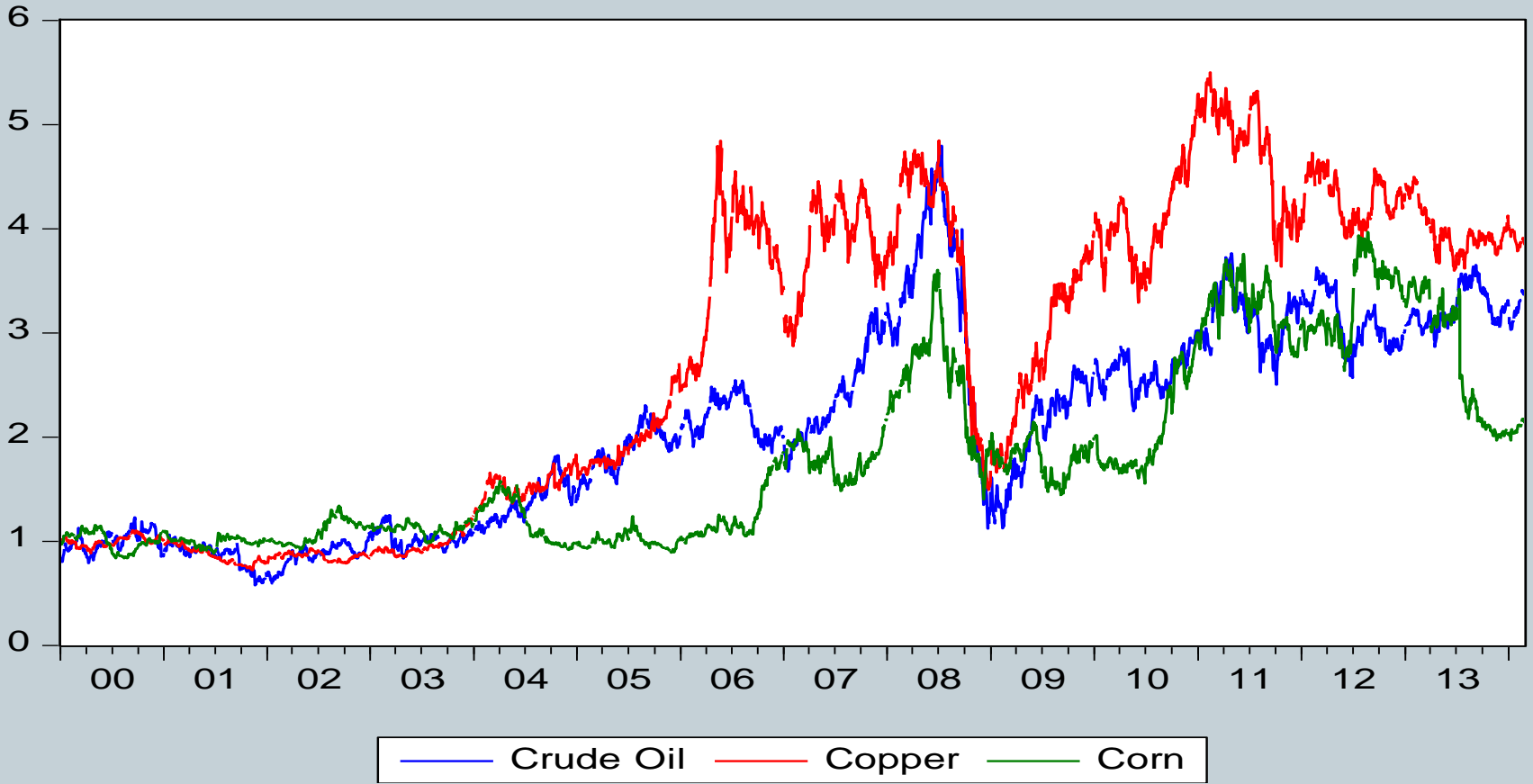
- The financialization debate garnered significantly more academic attention following the testimony of Micheal Masters before Congress in 2008.
- Masters (2008) attributed the increase in commodity prices to speculation in commodity futures markets.

4. The Empirical Evidence: Stylized Facts

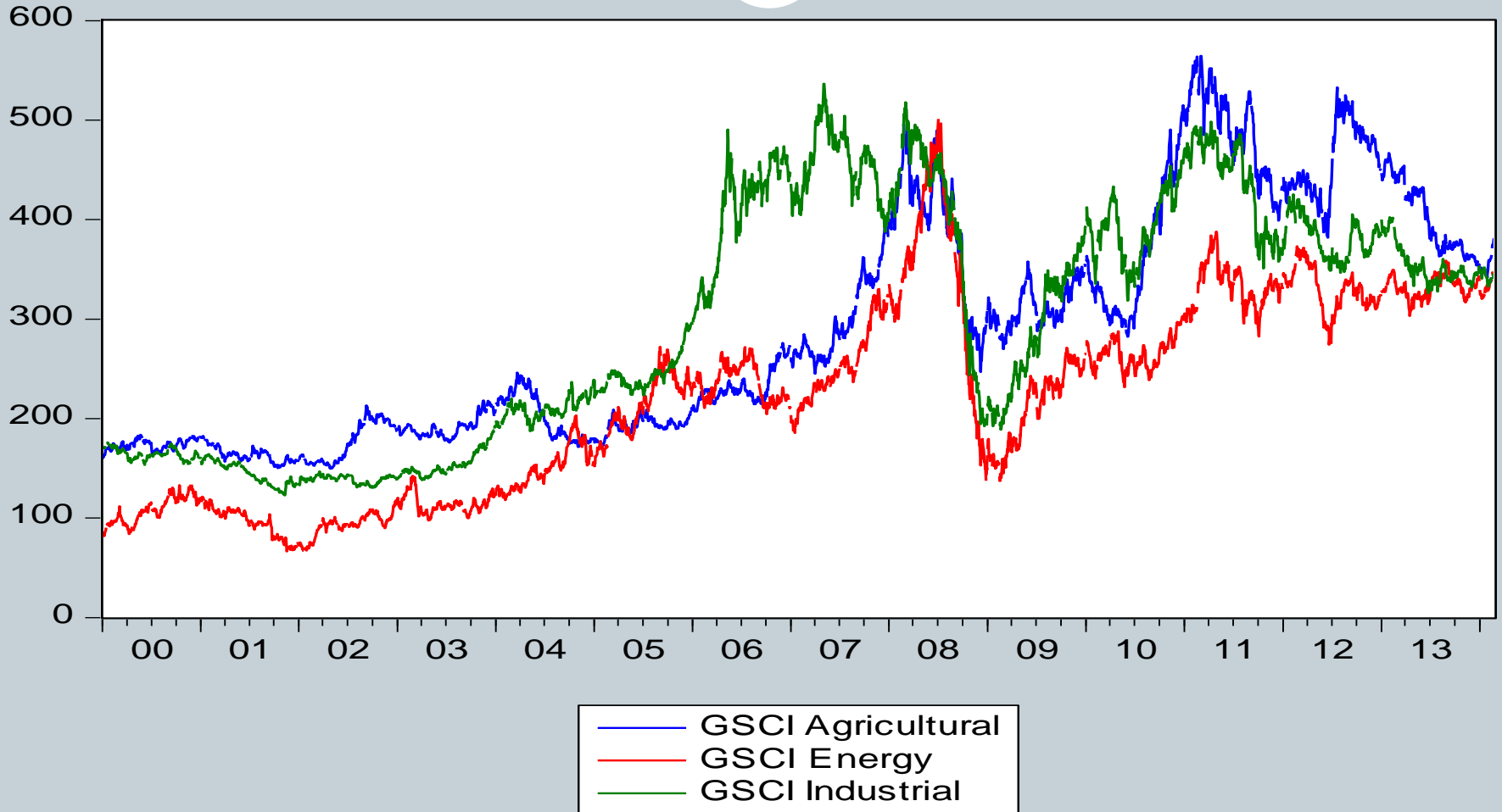


- ***Cross-commodity correlations*** have increased from a pre-2004 range of -0.2 to 0.2 to 0.7 in mid-2008 (Chen and Xiong, 2014).
- Increase in cross-commodity correlations was **not confined to certain commodity sectors**. This implies that commodity prices moved together as an ***asset class*** (Chen and Xiong, 2014).

Crude Oil, Copper and Corn Futures Prices: Higher Correlation...



GSCI Sub-Indexes: Higher Correlation...



4. The Empirical Evidence: Stylized Facts



- ***The correlation of commodity prices with the prices of other assets*** (equities, currencies, for example) also increased between 2004-2008 (Chen and Xiong, 2008).
- The increase in the correlation between commodities and other assets became particularly pronounced since the fall of Lehman Brothers in 2008 and remained elevated since.

Correlation Between Commodity and Other Asset Prices



4. The Empirical Evidence: Stylized Facts



- The nature of futures market participation also changed in the last decade.
- Inflows from **Commodity Index Traders** (CITs or index speculators) have increased.
- CITs seek exposure to commodities as they do for other asset classes. CITs are **long-only investors** (they hold a long commodity futures position)
- How does the literature view these basic facts and is there empirical evidence in favor of financialization?

4. The Empirical Evidence: For or Against?



- Academics were **largely reluctant** to adopt the financialization view before adequate theoretical models and careful empirical evidence are presented.
- The first strand of studies did not find that the increase in commodity prices can be attributed to speculative activities.
- More recent contributions ascribe a more important role for speculative inflows in commodity price fluctuations.

4. The Academic Debate: No Financialization (Business as Usual)



- **The first wave of studies found little evidence in favor of financialization.**
- Stoll and Whaley (2009): Commodities that are not part of a commodity index have also exhibited higher correlations with other assets.
- Stoll and Whaley (2010): CITs are not speculators and commodity index flows have little impact on commodity prices.
- Fattouh, Kilian and Mahadeva (2013): No evidence that speculation drives the price of oil after 2003. ***Fundamentals*** drive the price of oil.
- Irwin and Sanders (2012) reach a similar conclusion.

4. The Academic Debate: Yes, Commodities are Financialized (Speculation!)



- **Then the tide started reversing...**
- Tang and Xiong (2012): Commodities that are part of commodity indexes are more responsive to shocks to a world equity index.
- Buyuksahin and Robe (2011): Increased equity-oil correlation is due to ***hedge fund participation***.
- Mou (2011): roll strategies used by index funds have a substantial impact on commodity prices.
- Singleton (2014): “informational frictions and the associated speculative activity may induce prices to drift away from fundamental values”.

5. Monetary Policy's Effect on Commodity Prices



- Common view held by policymakers: commodity price changes are **commodity-specific demand and supply factors (fundamentals)**.
- Former Federal Reserve (Fed) Chairman Ben Bernanke; 2011. **“while supply and demand fundamentals surely account for most of the recent movements in commodity prices, some observers have attributed a significant portion of the run-up in prices to Federal Reserve policies, over and above the effects of those policies on U.S. economic growth.”**

5. Monetary Policy's Effect on Commodity Prices



- **If commodities are financialized, they should respond to monetary policy just like any other asset.**
- A number of studies examine the response of commodities to MP.
 - Frankel (2008): **negative relationship** between real commodity prices and real interest rates (loose monetary policy->higher commodity prices).
 - Gospodinov and Jamali (2013): heterogeneous response of individual commodity prices to an MP shock.
 - Anzuini, Lombardi and Pagano (2013): expansionary monetary policy leads to a modest increase in (aggregate) commodity prices.
 - High-frequency response of commodity prices to conventional and unconventional monetary policy (e.g., Basistha and Kurov, 2013; Rosa 2012).

6. The Channels of MP Transmission to Commodity Prices



- Frankel (2008) notes that increases in interest rates can impact commodity prices through:
 - i. Increasing the incentives for extracting commodities
 - ii. Increasing firms' costs for carrying (decreasing the desire to hold) inventories
 - iii. Enticing speculators to reallocate their portfolios away from commodity futures (i.e., towards T-bills, now more attractive, and away from commodity contracts)

6. The Channels of MP Transmission to Commodity Prices



- The **theory of storage** (or cost-of-carry model): the futures basis comprises two components:
 - i. A forgone interest component from having to borrow and buy the commodity.
 - ii. A **convenience yield** component which measures the benefit accruing from holding the physical commodity.

6. The Channels of MP Transmission to Commodities



- Fama and French (1987): relationship b/w basis and the convenience yield:

$$F_{jt}^{(n)} - S_{jt} = S_{jt} i_{t,n} - CY_{jt}^{(n)}$$

- The theory of normal backwardation (Keynes, 1930): investors who are long a futures contract earn a risk premium to compensate for the risk of fluctuations in the spot prices.

6. More on the Inventory Channel and the Theory of Storage



- ***Common view:*** speculation which distorts prices on the upside must be accompanied by higher inventories.
- Kilian and Murphy (2013), Juvenal and Petrella (2012) and Knittel and Pindyck (2013) find no evidence in support of this common view.
- These studies can also be considered as evidence supporting the business as usual view. Singleton (2014) challenges the theoretical underpinnings of the inventory/speculation view...

6. More “**Exotic**” Channels of MP Transmission to Commodity Prices



- ***Informational frictions***: heterogeneous beliefs about the Fed’s view of monetary policy can lead to speculative trading (Singleton, 2014).
- ***Informational feedback*** from spot and futures prices to commodity demand. MP shocks can lead to such informational feedback (Sockin and Xiong, 2012)
- ***Time-varying risk appetite***: Reduced risk appetite might lead CITs to unwind trades. If MP influences risk appetite, then it can impact commodity prices.

7. Empirical Evidence on the Effect of MP shocks on Commodity Prices



- Gospodinov and Jamali (2013) examine the response of commodity prices to positive and negative monetary policy surprises (asymmetries in the response):

$$\Delta s_{jt+1} = \alpha + \beta^e \bar{\Delta i}_t^e + \beta^{u-} \bar{\Delta i}_i^u \cdot D(\bar{\Delta i}_i^u < 0) + \beta^{u+} \bar{\Delta i}_i^u \cdot D(\bar{\Delta i}_i^u \geq 0) + \gamma \cdot cy_{jt} + \varepsilon_{jt+1}$$

7. Empirical Evidence on the Effect of MP shocks on Commodity Prices



Panel A: Nominal Commodity Prices

<i>commodity</i>	$\bar{\Delta}i_t^e$	$\bar{\Delta}i_t^u .D(\bar{\Delta}i_t^u < 0)$	$\bar{\Delta}i_t^u .D(\bar{\Delta}i_t^u \geq 0)$	cy_{jt}	R^2
Copper	5.62 (4.63)	11.05*** (3.69)	-26.69*** (9.36)	-0.18 (0.19)	0.03
Gold	-3.15 (3.38)	3.17 (3.41)	14.04** (6.45)	0.53 (2.25)	0.02
Platinum	-1.18 (3.64)	-2.02 (5.12)	23.02*** (8.06)	0.75* (0.42)	0.03
Silver	-1.66 (4.21)	3.34 (5.81)	11.71 (13.88)	-3.39 (2.01)	0.02
Crude Oil	1.26 (6.47)	19.59*** (6.53)	-13.58 (22.90)	-0.55 (0.33)	0.04
Heating Oil	3.92 (5.86)	20.85*** (5.34)	-15.41 (15.85)	-0.53*** (0.19)	0.06
Goldman Sachs Commodity Index	0.43 (3.97)	11.10*** (3.69)	-9.48 (11.51)	- -	0.02
Reuters/CRB Commodity Index	-0.07 (1.97)	3.38* (1.95)	-3.87 (3.34)	- -	0.00

7. Empirical Evidence on the Effect of MP shocks on Commodity Prices



Panel B: Real Commodity Prices

<i>commodity</i>	$\bar{\Delta}i_t^e$	$\bar{\Delta}i_t^u .D(\bar{\Delta}i_t^u < 0)$	$\bar{\Delta}i_t^u .D(\bar{\Delta}i_t^u \geq 0)$	cy_{jt}	R^2
Copper	5.20 (4.55)	10.70*** (3.70)	-26.16*** (9.18)	-0.20 (0.18)	0.03
Gold	-3.69 (3.55)	2.76 (3.52)	14.59** (6.93)	0.40 (2.16)	0.03
Platinum	-2.38 (3.74)	-2.35 (5.18)	23.57*** (8.16)	0.74* (0.40)	0.03
Silver	-2.22 (4.27)	2.93 (5.91)	12.53 (14.41)	-3.27 (2.01)	0.02
Crude Oil	-0.86 (5.85)	16.66*** (5.91)	28.77 (50.51)	-0.70** (0.35)	0.05
Heating Oil	1.99 (5.79)	18.35*** (5.03)	19.44 (19.11)	-0.60*** (0.18)	0.06
Goldman Sachs Commodity Index	-0.04 (3.82)	10.77*** (3.58)	-9.01 (10.62)	- -	0.02
Reuters/CRB Commodity Index	-0.59 (1.84)	3.05 (2.02)	-3.33 (3.21)	- -	0.00

7. Empirical Evidence on the Effect of MP shocks on Commodity Prices



- Copper, heating and crude oil prices significantly **increase** following a **lower than expected target rate change**.
- Gold and platinum prices **increase** following a **higher than expected target rate change**.
- GSCI strongly responds to lower than expected target rate surprises.
- The Reuters/Jefferies index's response to a Federal funds target rate surprise is smaller and insignificant (**financialization?**).

7. Empirical Evidence on the Effect of MP shocks on Commodity Prices



- **Substantial heterogeneity** in the responses of individual commodities.
- Positive target rate surprise are negative news to stocks.
- Lower than expected target rate change => increase in future economic activity => increase in the prices of commodities with industrial uses (platinum, copper, oil).
- Other commodities do not respond to an MP shock.

7. Empirical Evidence on the Effect of MP shocks on Commodity Prices



<i>commodity</i>	$\bar{\Delta}i_t^e$	$\bar{\Delta}i_t^u .D(\bar{\Delta}i_t^u < 0)$	$\bar{\Delta}i_t^u .D(\bar{\Delta}i_t^u \geq 0)$	cy_{jt}	R^2
Cocoa	-22.39*** (7.16)	0.91 (6.10)	0.81 (16.22)	-0.78** (0.35)	0.06
Coffee	5.92 (7.89)	6.96 (5.89)	5.07 (21.03)	-0.06 (0.20)	0.00
Orange Juice	6.50 (4.88)	9.07 (6.41)	-22.70* (12.54)	-0.67*** (0.17)	0.06
Sugar	4.32 (6.63)	2.68 (5.67)	-5.39 (10.60)	-0.59*** (0.16)	0.12

7. Empirical Evidence on the Effect of MP shocks on Commodity Prices



<i>commodity</i>	$\bar{\Delta}i_t^e$	$\bar{\Delta}i_t^u .D(\bar{\Delta}i_t^u < 0)$	$\bar{\Delta}i_t^u .D(\bar{\Delta}i_t^u \geq 0)$	cy_{jt}	R^2
Corn	-1.21 (3.17)	-1.86 (3.76)	19.56 (17.97)	-0.59*** (0.13)	0.07
Oats	-1.88 (5.92)	-0.34 (5.82)	17.00 (12.02)	-0.23 (0.14)	0.02
Soybeans	-5.90* (3.29)	1.99 (3.28)	-0.14 (12.64)	-1.16*** (0.29)	0.09
Soybean Oil	0.10 (5.08)	-3.29 (4.61)	5.09 (8.10)	-0.97 (0.59)	0.02
Wheat	4.27 (3.47)	-5.12 (5.87)	24.85* (12.75)	-0.49*** (0.10)	0.05

7. Empirical Evidence on the Effect of MP shocks on Commodity Prices



<i>commodity</i>	$\bar{\Delta i}_t^e$	$\bar{\Delta i}_t^u .D(\bar{\Delta i}_t^u < 0)$	$\bar{\Delta i}_t^u .D(\bar{\Delta i}_t^u \geq 0)$	cy_{jt}	R^2
Cotton	3.03 (6.32)	-1.85 (6.08)	8.37 (15.08)	-0.67*** (0.14)	0.10
Lumber	-1.08 (6.87)	-9.77 (8.45)	-44.65*** (16.08)	-0.69*** (0.11)	0.11
Feeder Cattle	2.43 (3.18)	-1.00 (2.63)	0.76 (5.67)	-0.84*** (0.19)	0.12
Live Cattle	2.41 (2.20)	-1.48 (2.33)	-1.60 (7.00)	-0.54*** (0.07)	0.18
Lean Hogs	0.59 (6.08)	-7.29 (5.53)	-6.03 (17.97)	-0.68*** (0.09)	0.29

7. Empirical Evidence on the Effect of MP shocks on Commodity Prices



- Only the **convenience yield** is significant (**fundamentals?**; Gospodinov and Ng, 2013).
- Non-indexed (or commodities having a small weight in the S&P GSCI index) commodities do not respond to an MP shock (financialization)?

8. What About Volatility and Correlation's Response to MP?



- Little research has been conducted on the effect of MP on equity-commodity correlations or on commodity price volatility (**research gap?**).
- This may be partly explained by the challenges inherent in modelling correlations and volatility.

8. What Do We Know About Volatility and Correlation?



- Büyüksahin and Robe (2010): hedge funds active in both equity and commodity futures markets are responsible for increased correlations between commodity and equities observed since 2008.
- Brunetti, Büyüksahin and Harris (2011): Changes in the net positions of hedge funds in corn, crude oil and natural gas) **decrease** volatility (aside: should speculation be really vilified?)
- Miffre and Brooks (2013): long–short speculators (i.e. hedge funds) do not cause changes in commodity volatility or correlations between commodities and equities.

9. The Effect of MP Shocks on Commodity Volatility: Some Evidence



- Commodity price volatility, V_t , is computed as in Gargano and Timmermann (2012) (sum of squared daily commodity returns).
- The estimated regression is:

$$\log(V_{t+1}) = \alpha + \phi \log(V_t) + \beta^e \bar{\Delta i}_t^e + \beta^{u^-} \bar{\Delta i}_t^u .D(\bar{\Delta i}_t^u < 0) + \beta^{u^+} \bar{\Delta i}_t^u .D(\bar{\Delta i}_t^u \geq 0) + \eta_{t+1}$$

9. The Effect of MP Shocks on Commodity Volatility: Some Evidence



<i>Commodity Price Volatility</i>					
<i>commodity</i>	$\log(V_{t-1})$	$\bar{\Delta}i_t^e$	$\bar{\Delta}i_t^u .D(\bar{\Delta}i_t^u < 0)$	$\bar{\Delta}i_t^u .D(\bar{\Delta}i_t^u \geq 0)$	R^2
Copper	0.54*** (0.06)	0.09 (0.19)	0.43** (0.20)	1.09** (0.54)	0.33
Gold	0.71*** (0.06)	0.09 (0.23)	-0.01 (0.27)	1.02* (0.55)	0.50
Platinum	0.59*** (0.07)	-0.28 (0.20)	0.39 (0.27)	1.26* (0.72)	0.39
Silver	0.65*** (0.07)	0.15 (0.21)	-0.05 (0.24)	0.63 (0.48)	0.42
Crude Oil	0.60*** (0.07)	-0.24 (0.26)	-0.21 (0.39)	1.11 (0.69)	0.38
Heating Oil	0.57*** (0.05)	-0.30 (0.22)	-0.27 (0.51)	1.04** (0.49)	0.35

9. The Effect of MP Shocks on Commodity Volatility: Some Evidence



- Volatility responds “less” to an MP shock than commodity prices (lesser dynamics).
- A measure of “excess” volatility might be more interesting to examine than realized volatility.
- Gruber and Vigfusson (2012): **Lower interest rates** imply lower inventory costs and **decrease commodity price volatility** (i.e. expansionary “conventional” MP leads to lower commodity volatility).

10. Concluding with Some Questions...



- What is an adequate definition of speculation?
Trading for a profit from price movements?
 - One (unfortunately?) does not observe traders' motives...
 - The usual practice is to look at the positions of traders (...some important limitations, lines are blurred between hedgers and speculators in practice)
 - Working's (1960) proposes a speculative index (Working's T)
- Should speculation be really vilified? Who would provide liquidity to markets if speculators don't?
- How would MP influence speculation (if it does at all)? Risk taking channel? Our knowledge there is limited.



THANK YOU!