

Does Financial Stress Affect Commodity Futures Traders' Positions?

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The analysis and opinions set forth are solely those of the authors and do not indicate concurrence by other members of the research staff or the Board of Governors.

Research Motivations and Key Findings

- Study how financial stress (FS) impacted traders' positions in U.S. commodity future markets during two recent major crises: the 2008 GFC and the COVID-19 pandemic (including Ukraine War event)
- Determine whether hedgers and speculators responded to FS differently in the periods, which implies differences in risk transfer
- What do different reactions imply about whether or when commodity futures markets amplify or mitigate financial stress
- Key findings:
 - ① Given the distinct natures of the two crises, commodity markets responded to the FS shocks differently
 - ② During the 2008 WFC, speculators pressured to close their long commodity exposures while hedgers reduced their short positions; commodity risk flew from speculators to hedgers, so-called convective risk flow. During the COVID-19 crisis, we did not find this flow
 - ③ In general, speculators are more reactive to financial system shocks compared with hedgers
 - ④ The impact of FS on commodity markets is nonlinear, more noticeable when the stress is severe and persistent.

Hedgers' and Speculators' Trading Behaviours

- Two Theories
 - ① The Keynes-Hicks hypothesis, hedgers pay a risk premium
 - ② The Convective risk flow theory, speculators pay a risk premium
- Contributions to literature:
 - ① Extend previous works by using a more comprehensive FS measurement
 - ② Exam whether those theories are applicable during the two crises
 - ③ Extend the study to traders' relative exposures using aggregate market positions

Data: Disaggregated Commitment of Traders (DCOT)

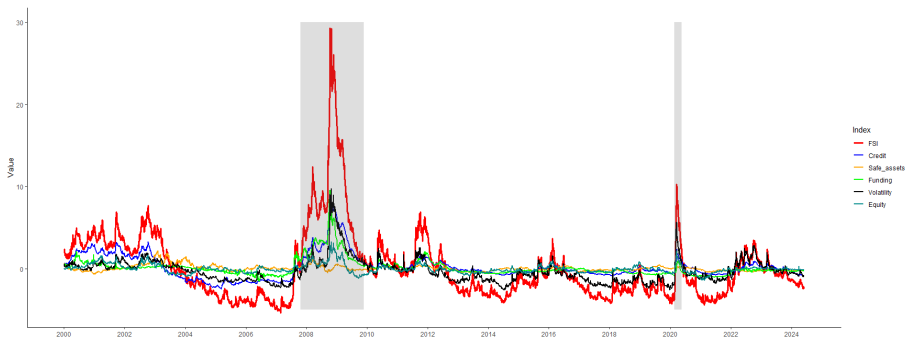
- Traders' position: DCOT report published weekly by CFTC
- Four trader categories, snapshot position of every Tuesday
- Category definitions:
 - Hedgers=Producers
 - Speculators= Swap Dealers + Money Managers
- In general, hedgers are net short while speculators are net long

Statistics

Data: Financial Stress Index (FSI)

- Positive FSI indicates stress; the index and its five sub-indexes published daily by the OFR
- FS during the COVID-19 crisis was temporary and not as severe as the 2008 GFC.
- Ukraine war only created limited impact on FS

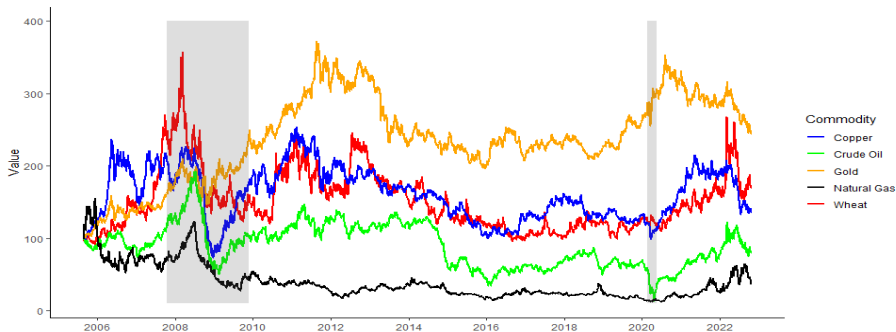
Figure 1: History of the FSI and sub-indexes



Commodity Futures Price Movements

- Commodity markets experienced a boom in the 2000s that collapsed in 2008. Many studies argue that excessive speculation was the major cause of the boom and bust.
- Market rebounded sharply after bottoming out in March 2020.

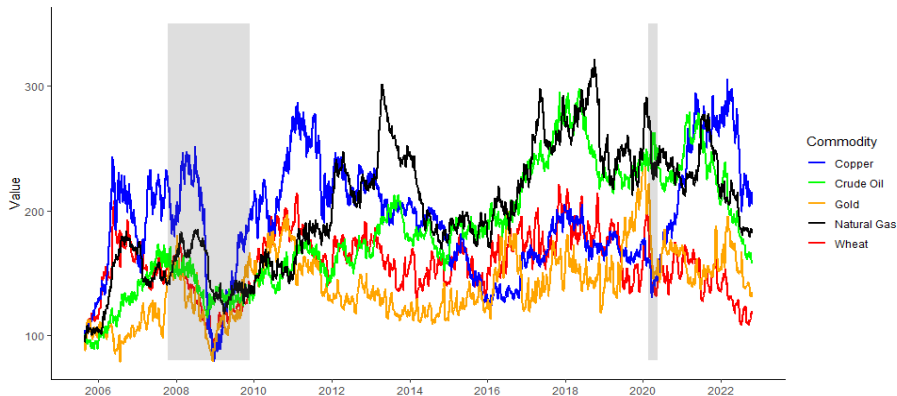
Figure 2: Normalized and Inflation-Adjusted Commodity Futures Price



Traders' Positions Overview–Open Interest

- Total open interest changes with price movements generally; it declined sharply during the 2008 GFC, but was relatively stable during COVID-19

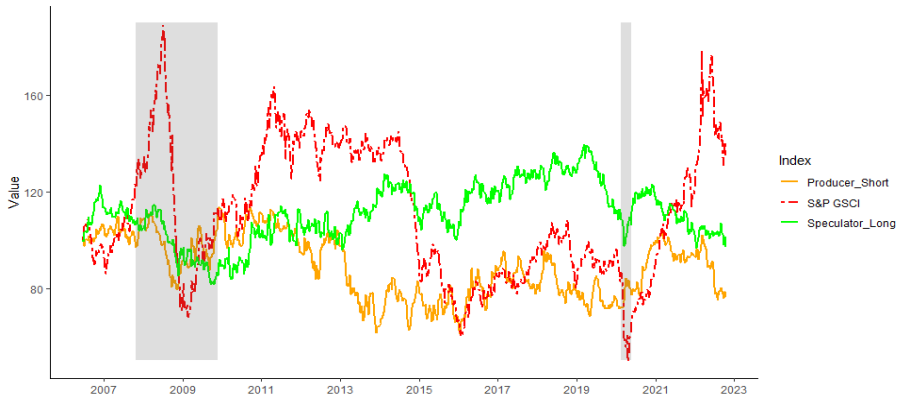
Figure 3: Daily History of Normalized Total Open Interest



Trader's Positions Overview—Aggregate Traders' Positions

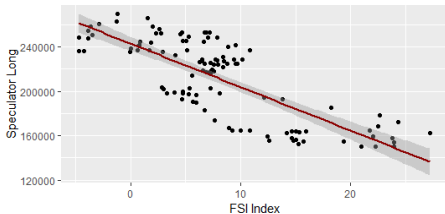
- Dropped sharply in producers' short positions and speculators' long positions during the 2008 GFC (See [Wheat Futures](#) as a specific example)

Figure 4: Normalized Value of the S&P GSCI and Traders' Positions

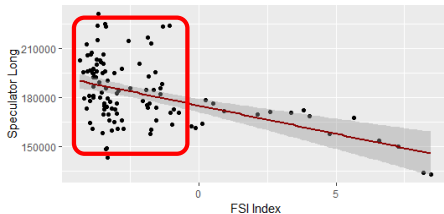


FSI and Traders' Positions in Wheat Futures

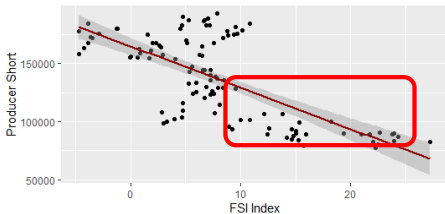
2008 GFC



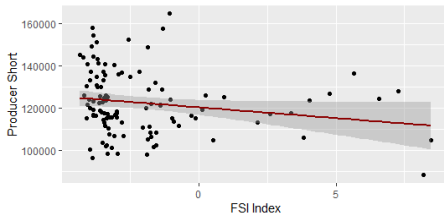
COVID-19



2008 GFC



COVID-19



FSI versus Traders' Position Changes for Wheat Futures

- Using wheat futures as an example

<i>Positions</i> ⇒	Sample					
	2008 GFC		COVID-19		All Sample	
	Hedge	Speculate	Hedge	Speculate	Hedge	Speculate
GSCI Return	0.425*** (0.137)	0.134** (0.063)	0.153 (0.199)	0.074 (0.132)	0.306*** (0.089)	0.135*** (0.045)
BDRY	0.021 (0.051)	0.045* (0.023)	-0.016 (0.064)	-0.023 (0.043)	-0.023 (0.029)	-0.016 (0.014)
GSCI Vol	0.667* (0.385)	0.149 (0.176)	-0.084 (0.382)	-0.253 (0.253)	0.279 (0.212)	-0.075 (0.106)
FSI	-0.004 (0.004)	-0.003* (0.002)	-0.011 (0.010)	-0.023*** (0.006)	-0.004 (0.004)	-0.006*** (0.002)
Margin	-0.0002** (0.0001)	-0.0001* (0.00005)	-0.0005 (0.0003)	-0.0001 (0.0002)	-0.0003*** (0.0001)	-0.0001** (0.00004)
Observations	111	111	111	111	831	831
R ²	0.199	0.225	0.056	0.186	0.041	0.053
Adjusted R ²	0.161	0.188	0.011	0.147	0.035	0.047

Note: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$; standard errors in ()

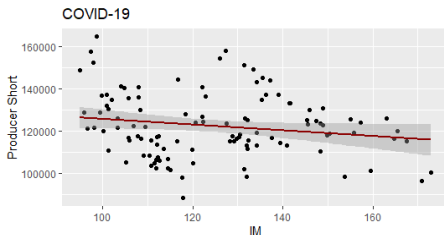
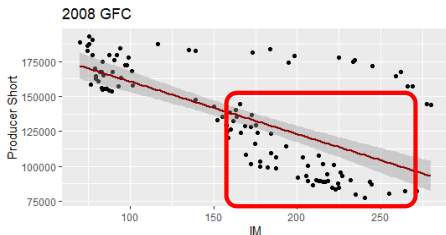
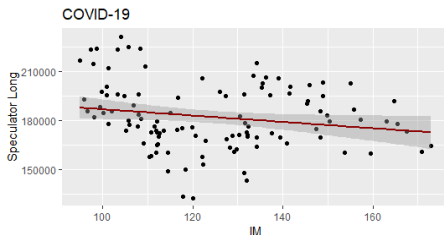
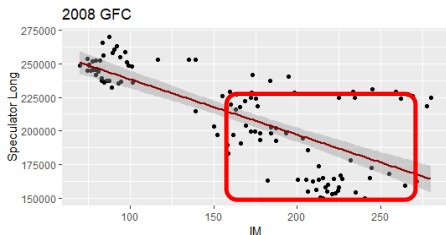
FSI Sub-Indexes versus Traders' Position Changes for Wheat Futures

<i>Positions</i> ⇒	Sample					
	2008 GFC		COVID-19		All Sample	
	Hedge	Speculate	Hedge	Speculate	Hedge	Speculate
Credit	-0.023 (0.017)	-0.021*** (0.008)	-0.022 (0.042)	-0.111*** (0.027)	-0.020 (0.017)	-0.039*** (0.009)
Funding	-0.003 (0.009)	-0.006 (0.004)	0.017 (0.059)	-0.150*** (0.039)	-0.007 (0.011)	-0.012** (0.006)
Safe Assets	-0.047 (0.049)	-0.018 (0.023)	0.120 (0.140)	0.137 (0.098)	-0.009 (0.040)	0.023 (0.020)
Volatility	-0.014 (0.009)	-0.008* (0.004)	-0.025 (0.017)	-0.031*** (0.012)	-0.005 (0.007)	-0.009*** (0.004)

Note: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$; standard errors in ()

Traders' Positions and Initial Margin (IM)

- Normalized IM and Wheat Futures Traders' Positions
- Positions dropped sharply when IM increased during the 2008 GFC



Possible Drivers for Traders' Positions Change

- Price actions lead traders' position changes (Lehecka, 2015; Ekeland et al., 2019; Boos and Grob, 2023)
- Market volatility and initial margin also drive traders' position changes (Hartzmark, 1986, Daskalaki and Skiadopoulos, 2016), as they increase the trading costs.
- Researchers found the strong interconnectedness between FS, speculative trading, and commodity market movement (Dominguez and Reinhart, 2008, Carter et al., 2011, Irwin and Sanders, 2011, Hamilton, 2009, etc.)
- We use the FSI to examine whether change in FS can significantly impact the two factors driving traders' behaviors: commodity price and market volatility

- S&P GSCI is a broad commodity futures price index

Table 1: S&P GSCI Weekly Return Regression Results versus FSI

	Sample			
	GFC (1)	COVID-19 (2)	All (3)	Between (4)
GSCI Lag Weekly Return	-0.091 (0.084)	-0.086 (0.083)	-0.038 (0.035)	0.001 (0.046)
Lag FSI	-0.001 (0.003)	0.0003 (0.004)	-0.0003 (0.001)	0.001 (0.002)
GSCI Vol	-0.519*** (0.198)	-0.136 (0.165)	-0.153** (0.074)	0.036 (0.130)
FSI	-0.013*** (0.002)	-0.027*** (0.004)	-0.017*** (0.001)	-0.020*** (0.002)
Observations	151	151	830	480
R ²	0.185	0.267	0.179	0.206
Adjusted R ²	0.163	0.247	0.175	0.199

Note: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$; standard errors in ()

VAR Estimates for FSI and S&P GSCI Volatility

- Vector Auto-Regressions (VAR) and Granger Causality (GC) tests support that FS increases commodity market volatility

<i>Dependent variable</i> ⇒	Sample					
	2008 GFC		COVID-19		All Sample	
	GSCI Vol	FSI	GSCI Vol	FSI	GSCI Vol	FSI
GSCI Vol Lag1	1.020*** (0.082)	8.671 (24.229)	1.094*** (0.093)	-3.457 (13.644)	1.048*** (0.036)	-0.081 (7.009)
FSI Lag1	0.001** (0.0003)	0.081 (0.081)	0.002*** (0.001)	0.248*** (0.094)	0.001*** (0.0002)	0.076** (0.036)
GSCI Vol Lag2	-0.047 (0.083)	-19.423 (24.461)	-0.165* (0.093)	-5.772 (13.669)	-0.100*** (0.036)	-6.492 (7.033)
FSI Lag2	0.001* (0.0003)	0.216*** (0.082)	0.001 (0.001)	0.123 (0.089)	0.0005*** (0.0002)	0.154*** (0.036)
const.	0.001 (0.001)	0.417 (0.257)	0.002*** (0.001)	0.327** (0.130)	0.001*** (0.0003)	0.185*** (0.061)
Observations	149	149	149	149	799	799
R ²	0.933	0.092	0.921	0.145	0.915	0.047
Adjusted R ²	0.931	0.067	0.919	0.121	0.915	0.042
GC F-Test	4.4637		8.8882		22.463	
GC p-value	0.01233		0.0002		0.0000	

Note: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$; standard errors in ()

Summary of FSI Impact on Commodity Futures Market

① FSI and Futures Prices

- Negative relationship between the FSI and the S&P GSCI
- FS stress adds pressures on the futures market

② FSI, Volatility, and IM

- Highly correlated during the 2008 GFC
- Less correlated during COVID-19 period

③ FSI and Traders' Positions

- Speculators are more sensitive to the FSI change
- Credit, Funding, and Market Volatility impact speculative trading significantly

Results for Individual Commodity Futures

- Regression study on the position change of six different commodity futures to test **the convective risk flow theory**
- Study four different position changes

① $\Delta \text{Net Position}_t = \text{Net Position}_t - \text{Net Position}_{t-1}$

② $\Delta \text{Net of Trade}_t = \frac{(\text{Net Position}_t - \text{Net Position}_{t-1})}{\text{Total Open Interest}_{t-1}}$

③ $\Delta \text{Hedger's Short Position}_t = \frac{(\text{Hedger's Short Position}_t - \text{Hedger's Short Position}_{t-1})}{\text{Hedger's Short Position}_{t-1}}$

④ $\Delta \text{Speculator's Long Position}_t = \frac{(\text{Speculator's Long Position}_t - \text{Speculator's Long Position}_{t-1})}{\text{Speculator's Long Position}_{t-1}}$

Net of Trade Regression–GFC

Commodities	FSI Coefficients					
	Producers		Swap Dealers		Money Managers	
	Pre-GFC	GFC	Pre-GFC	GFC	Pre-GFC	GFC
Crude Oil	−0.001 (0.001)	0.001 (0.001)	−0.0001 (0.001)	0.001 (0.001)	−0.001 (0.001)	−0.003** (0.001)
Wheat	0.001 (0.002)	0.01*** (0.002)	−0.0004 (0.001)	−0.002*** (0.001)	0.0002 (0.002)	−0.003* (0.002)
Natural Gas	−0.001 (0.001)	0.001** (0.0005)	−0.001 (0.001)	0.001 (0.001)	0.0002 (0.002)	−0.003 (0.002)
Copper	0.002 (0.003)	0.01*** (0.002)	−0.002 (0.002)	0.001 (0.002)	−0.001 (0.003)	−0.004** (0.002)
Gold	−0.001 (0.003)	0.002 (0.002)	−0.01** (0.003)	0.001 (0.001)	0.003 (0.005)	−0.003 (0.002)
Soybean	0.0001 (0.003)	0.01*** (0.002)	0.001 (0.001)	−0.002** (0.001)	−0.001 (0.002)	−0.005** (0.002)

Note: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$; standard errors in ()

Net of Trade Regression–COVID

Commodities	FSI Coefficients					
	Producers		Swap Dealers		Money Managers	
	Pre- COVID	COVID	Pre- COVID	COVID	Pre- COVID	COVID
Crude Oil	0.001 (0.001)	0.002** (0.001)	0.0001 (0.002)	−0.003* (0.002)	0.002 (0.003)	−0.003 (0.002)
Wheat	0.003 (0.004)	0.01 (0.004)	−0.003 (0.002)	−0.001 (0.002)	−0.005 (0.004)	−0.01 (0.01)
Natural Gas	−0.001 (0.001)	−0.0003 (0.001)	−0.00001 (0.002)	−0.001 (0.002)	0.002 (0.004)	−0.001 (0.004)
Copper	0.02*** (0.01)	0.01 (0.01)	−0.001 (0.001)	−0.0004 (0.002)	−0.02** (0.01)	−0.01 (0.01)
Gold	0.002 (0.003)	0.001 (0.002)	−0.01 (0.01)	0.004 (0.004)	0.01 (0.01)	−0.01 (0.01)
Soybean	0.002 (0.01)	0.01 (0.004)	−0.001 (0.001)	−0.002 (0.001)	−0.001 (0.01)	−0.003 (0.004)

Note: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$; standard errors in ()

Summary of Position Change Regression Results

- Our regressions find some evidences to support the convective risk flow during the 2008 GFC, but not during the COVID-19 period
- During the GFC, speculators closed long positions when financial system stress increased, while producers reduced their short positions
- Speculators appeared to be more responsive to change in financial stability conditions than commodity producers

Relative Exposure Analysis—Aggregate Level

- Relative exposure is the percentage of traders' long or short positions over total open interest
- Regressions run on aggregate levels across all commodity futures
- Regression using the entire data sample covering 2006-2022. A dummy variable is created to identify financial stress

Regression Results for Relative Exposures

	Position Type				
	Producer Long	Producer Short	Speculator Long	Speculator Short	Speculation Index
GSCI	-4.966*** (1.063)	3.740** (1.490)	2.434*** (0.778)	0.241 (1.087)	-0.050 (0.075)
BDRY	0.032 (0.295)	0.147 (0.414)	-0.205 (0.216)	0.733** (0.302)	-0.001 (0.021)
GSCI Vol.	-1.890 (3.487)	4.457 (4.885)	-2.476 (2.551)	-1.990 (3.564)	0.034 (0.247)
FSI Dummy	-0.136 (0.114)	0.077 (0.160)	-0.062 (0.084)	0.001 (0.117)	0.002 (0.008)
GSCI × Dummy	-0.145 (1.313)	2.244 (1.840)	-0.998 (0.961)	-1.417 (1.342)	-0.071 (0.093)
GSCI Vol × Dummy	4.468 (4.053)	-1.862 (5.678)	3.561 (2.965)	1.189 (4.143)	-0.105 (0.287)
BDRY × Dummy	-0.278 (0.449)	0.160 (0.629)	-0.119 (0.328)	-0.814* (0.459)	0.012 (0.032)
Observations	831	831	831	831	831
R ²	0.079	0.048	0.025	0.011	0.007
Adjusted R ²	0.071	0.039	0.016	0.002	-0.002

Note: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$; standard errors in ()

Different Markets and Crises—GFC vs. COVID

2008 GFC

- 1 Commodity markets collapsed during the GFC
- 2 Severe financial stress period lasted for a long period of time
- 3 Financial institution had balance sheet problems and liquidity constraints.

COVID-19

- 1 Commodity markets rebounded sharply
- 2 Less severe financial stress and lasted relatively short period of time.
- 3 Financial institutions had strong balance sheets and plenty of liquidity.

Conclusion

- Our analysis finds convective risk flows during the 2008 GFC, but not during the COVID-19 period
- Traders' responded to the the two stress periods very differently, which seems to reflect the different characteristics of the two stresses
- In general, hedgers and speculators trade with each other as a group. Speculators provide liquidity to hedgers in a normal market condition. When stress is severe and persistent, speculators demand liquidity from hedgers, so this relationship is reversed
- Speculators are generally more reactive to changes in financial stability conditions, compared with hedgers
- Speculators' sensitivity to stress and their potential to start demanding, rather than supplying, liquidity, may mean commodity markets can amplify stress. But the stress needs to be both severe and persistent so that the ability to hedge risk deteriorates
- Regulation challenges: large commodity traders are mostly private and less regulated

Appendix

Literature Review

- Alodayni (2016), Kinda et al. (2016), Eberhardt and Presbitero, (2023) studied the potential impact of commodity market shocks on financial-sector stability.
- Cheng, Kirilenko and Xiong (2015) show that speculators reduce their net long commodity exposure during the Global Financial Crisis (GFC), while producers increase their net long positions, commodity risk flows from speculator back to hedger.
- Kang and Tang (2020) showed that speculators need to pay a risk premium to commercial traders for closing their positions due to external financial conditions during GFC.
- Bonnier (2021) also found that short-term fluctuations in open interest might primarily be driven by speculators' demand for liquidity.

Table 2: Summary Statistics for Traders' Net Positions

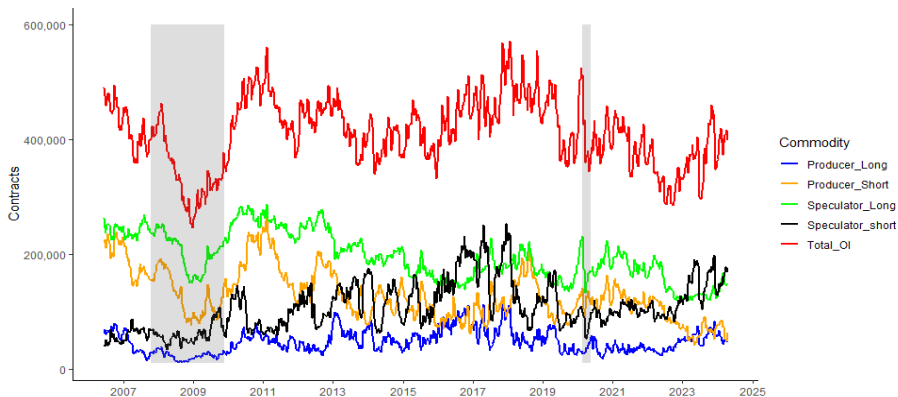
Commodities	Producers		Swap Dealers		Money Managers	
	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev
Crude Oil	-100,860	96,304	-184,264	235,129	185,870	105,634
Wheat	-85,531	47,528	109,924	37,931	-15,692	46,838
Natural Gas	-32,518	36,424	111,588	72,190	-26,872	108,789
Copper	-40,177	26,234	37,474	26,234	10,944	32,684
Gold	-105,193	55,524	-76,222	61,237	103,905	70,480
Soybean	-161,845	103,365	100,421	24,782	69,596	18,780

DCOT

Traders' Positions Overview –Wheat

- Dropped sharply in producers' short positions and speculators' long positions during the 2008 GFC [Go back](#)

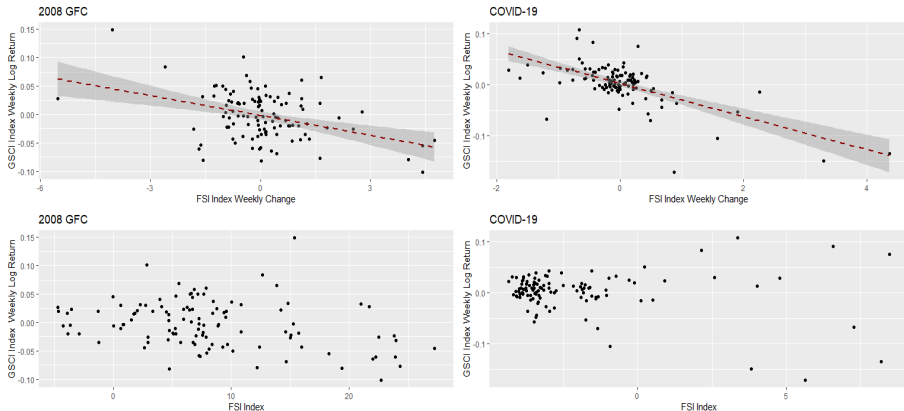
Figure 5: Wheat Futures' Open Interest for Producers and Speculators



FSI vs S&P GSCI Plot

- Price tends to lead both hedging and speculative activity

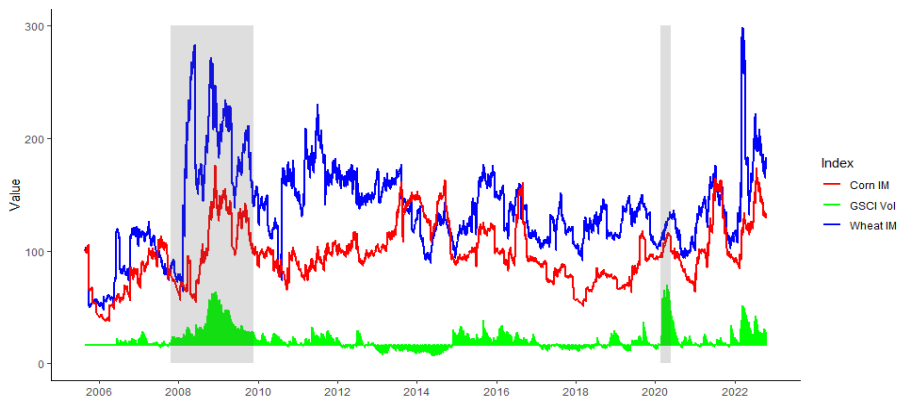
Figure 6: S&P GSCI Weekly Return vs FSI



S&P GSCI Volatility and Initial Margin

- Market volatility leads to increased IM

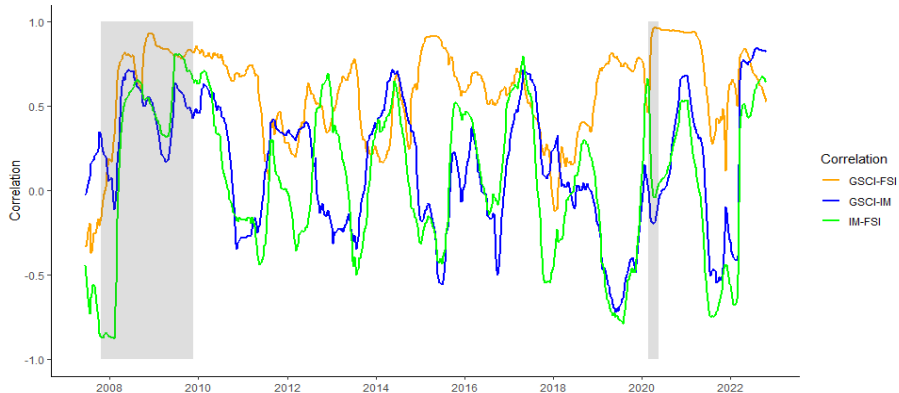
Figure 7: S&P GSCI Volatility and Normalized IM for Wheat and Corn



Correlation among FSI and Volatility/IM

- Market volatility and IM level can change trader's position

Figure 8: Moving Window Correlation between S&P GSCI Volatility, IM, and the FSI



Net Position Change Regression-GFC

Table 3: Regression Coefficient of FSI for Trader Net Position Change: GFC

Commodities	FSI Coefficients					
	Producers		Swap Dealers		Money Managers	
	Pre-GFC	GFC	Pre-GFC	GFC	Pre-GFC	GFC
Crude Oil	-1119.99 (1612.51)	674.92 (832.81)	30.28 (1604.51)	1645.59 (1299.03)	-1850.29 (1756.33)	-3415.41** (1621.53)
Wheat	133.38 (834.25)	1784.49** (690.26)	-92.90 (512.21)	-826.11** (346.64)	420.77 (887.40)	-772.12 (610.46)
Natural Gas	-443.29 (656.18)	766.58** (373.30)	-833.39 (692.33)	611.88 (657.56)	179.75 (1302.59)	-2339.93 (1420.90)
Copper	159.44 (221.54)	586.41** (248.69)	-125.88 (132.04)	10.03 (192.88)	-43.42 (247.34)	-363.34 (286.33)
Gold	-231.77 (1379.31)	830.15 (860.39)	-2245.11** (1028.18)'	340.93 (634.59)	1259.19 (1776.64)	-1035.69 (904.10)
Soybean	-4535.65 (4317.77)	4831.55 (3550.48)	1500.50 (1363.03)	-1000.64 (902.68)	2803.39 (3321.56)	-4071 (3084.28)

Note: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$; standard errors in ()

Net Position Change Regression-COVID

Table 4: Regression Coefficient of FSI for Trader Net Position Change: COVID-19

Commodities	FSI Coefficients					
	Producers		Swap Dealers		Money Managers	
	Pre-Lockdown	Lockdown	Pre-Lockdown	Lockdown	Pre-Lockdown	Lockdown
Crude Oil	1141.40 (2127.29)	2839.10 (1806.09)	-382.26 (3964.64)	-4442.99* (2578.42)	4102.71 (6073.16)	-5657.70* (3035.44)
Wheat	1740.99 (1594.58)	1615.53 (1144.67)	-1101.83 (694.16)	2.73 (600.24)	-2198.96 (2006.02)	-1889.56 (1470.11)
Natural Gas	-558.91 (1743.39)	135.73 (1121.74)	-264.12 (2628.67)	-1206.25 (1762.65)	2316.48 (4896.29)	-2236.72 (3506.02)
Copper	5109.09*** (1273.36)	2584.53** (1072.91)	-273.94 (284.65)	171.91 (303.97)	-4777.76** (1822.41)	-3323.57** (1285.22)
Gold	1657.58 (1808.85)	233.50 (926.90)	-3423.74 (3355.86)	1604.95 (1961.17)	4209.54 (4695.30)	-2052.23 (2791.77)
Soybean	2087.00 (4075.40)	2839.18 (2626.93)	-396.78 (1027.43)	-63.99 (1083.79)	-528.42 (3887.75)	-3162.72 (2582.55)

Note: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$; standard errors in ()

Hedgers' Short/Speculators' Long Regression-GFC

Table 5: Regression Coefficients of the FSI for Hedgers' Short/Speculators' Long Positions –GFC

Commodities	FSI Coefficients					
	Producers Short		Swap Dealers Long		Money Managers Long	
	Pre-GFC	GFC	Pre-GFC	GFC	Pre-GFC	GFC
Crude Oil	0.005 (0.01)	-0.002 (0.004)	0.004 (0.01)	0.01 (0.004)	-0.002 (0.01)	-0.02*** (0.01)
Wheat	-0.005 (0.01)	-0.01*** (0.005)	0.0002 (0.003)	-0.005*** (0.002)	0.003 (0.01)	-0.004 (0.01)
Natural Gas	0.01 (0.01)	-0.002 (0.005)	-0.01* (0.01)	0.001 (0.004)	-0.01 (0.01)	-0.02** (0.01)
Copper	-0.02* (0.01)	-0.01 (0.01)	-0.002 (0.003)	-0.0002 (0.003)	-0.02 (0.02)	-0.02** (0.01)
Gold	-0.003 (0.01)	-0.003 (0.004)	-0.05*** (0.01)	-0.001 (0.01)	0.01 (0.01)	-0.01 (0.005)
Soybean	0.002 (0.01)	-0.01** (0.004)	0.004 (0.003)	-0.003 (0.002)	-0.001 (0.002)	-0.005** (0.002)

Note: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$; standard errors in ()

Hedgers' Short/Speculators' Long Regression-COVID

Table 6: Regression Coefficients of the FSI for Hedgers' Short/Speculators' Long Positions –COVID-19

Commodities	FSI Coefficients					
	Producers Short		Swap Dealers Long		Money Managers Long	
	Pre-COVID	COVID	Pre-COVID	COVID	Pre-COVID	COVID
Crude Oil	0.001 (0.01)	-0.01 (0.01)	0.004 (0.01)	-0.02* (0.01)	0.01 (0.02)	-0.03*** (0.01)
Wheat	-0.02 (0.01)	-0.03** (0.01)	-0.01 (0.01)	-0.02*** (0.01)	-0.01 (0.01)	-0.03* (0.02)
Natural Gas	0.004 (0.01)	-0.001 (0.01)	-0.01 (0.01)	-0.01 (0.01)	0.004 (0.01)	-0.02* (0.01)
Copper	-0.05** (0.02)	-0.01 (0.01)	-0.01 (0.01)	-0.003 (0.01)	-0.06*** (0.02)	-0.01 (0.02)
Gold	-0.01 (0.02)	0.004 (0.01)	-0.01 (0.01)	-0.01 (0.01)	0.005 (0.02)	-0.02 (0.02)
Soybean	-0.003 (0.01)	-0.01 (0.01)	-0.01 (0.01)	-0.02*** (0.01)	-0.004 (0.02)	-0.002 (0.02)

Note: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$; standard errors in ()