Financialization and Commodity Markets[1]

V. V. Chari, University of Minnesota
Lawrence J. Christiano, Northwestern University

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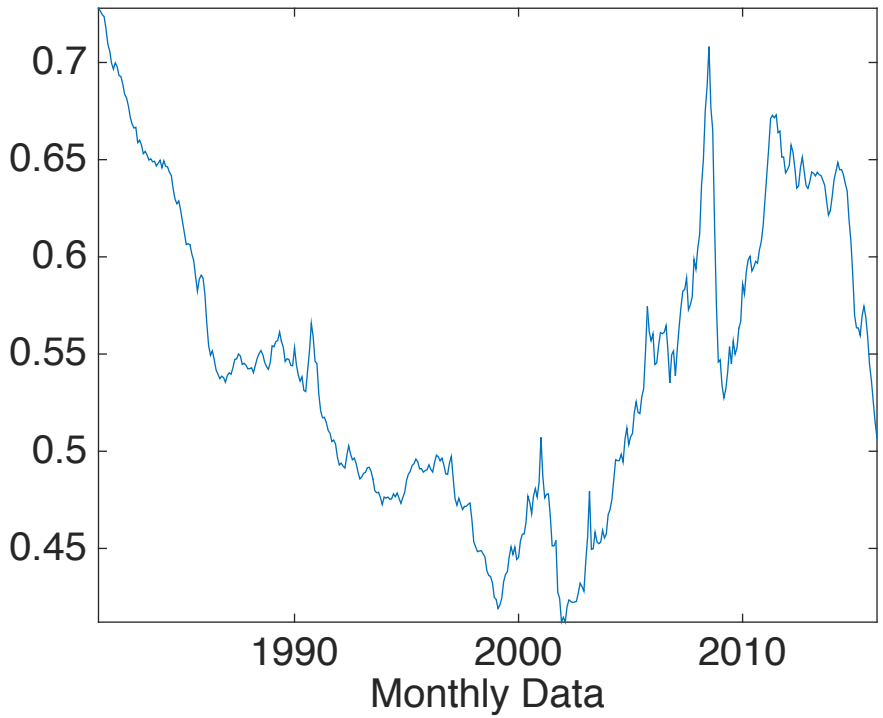
Motivation

- Commodity prices
  - since 2000, trend and volatility appear to have changed.

Figure: log(Producer Price Index: All Commodities/PCEPI)



- Trade in commodity futures markets.
  - since 2000, volume of trade has increased substantially.

Question

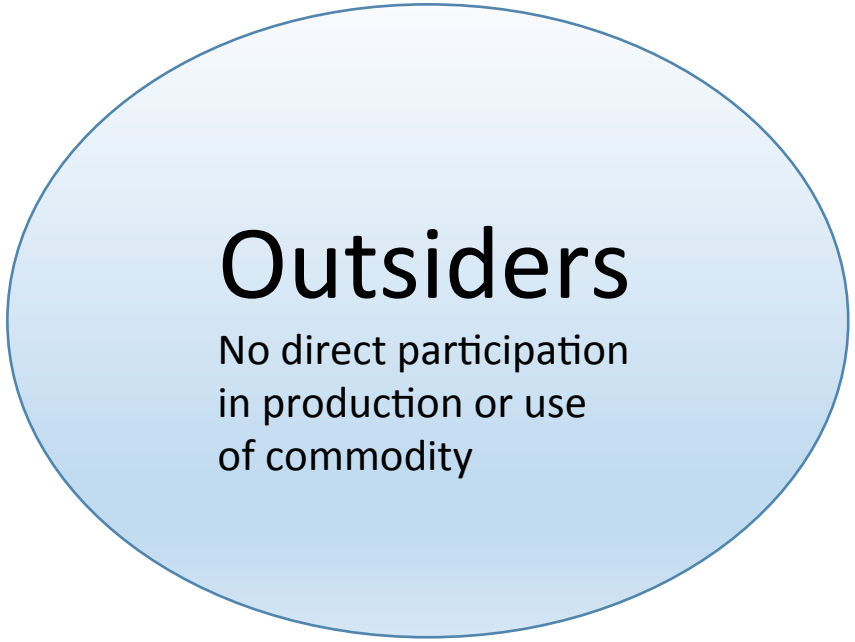
- Two measures of financialization:
  - Open interest
  - Net Financial Flows (*nff*) from outsiders.

- What is the empirical link between financialization and the behavior of commodity prices?

  - Cross-sectional evidence may be more informative than aggregates:
    - More data.
    - Reduce the role of common factors (e.g., growth in China).

- The role of futures markets: where do the data take us?

Commodity Market



Findings

- *Spot Price Result:*
  - Little systematic relation between financialization and spot prices
  - If anything, more financialization implies somewhat less spot price volatility.

- *Futures Return Result:*
  - High open interest implies high futures returns.
  - Net financial flows unrelated to futures returns.

- What do outsiders get from futures trading?
  - Conventional: outsiders provide hedging services to insiders.
    - Telser (1981) "an organized futures market furnishes legitimate [business people] with a means of hedging so that they can obtain insurance against price risk."
  - Our interpretation of the data: Insiders and outsiders provide hedging services to each other.

Is Financialization Irrelevant?

- Does Spot Price Result imply financialization irrelevant for resource allocation?
  - No.

- Framework consistent with the data implies that increased financialization leads to:
  - price *stabilization* if outsiders' hedging needs not volatile.
  - price *de-stabilization* if outsiders' hedging needs volatile.

- Although little systematic relationship in the cross section.
  - Policy changes that lead to increased financialization can have big effects on resource allocation.

Outline

- Data and notation
- The Spot Price Result
  - Decade-to-decade variation
  - Year-over-year variation
  - Month-to-month variation (not ready yet!)
- The Futures Return Result
- Model

Measuring Financialization

- Notation for futures markets:

S^L : number of long positions (e.g., 'bushels of wheat')
held by non-commercial traders ('outsiders')

S^s : number of short positions of outsiders

H^L : number of long positions
held by commercial traders ('insiders')

H^s : number of short positions held by insiders

- Data from CFTC on all trades in organized futures exchanges in the United States.

Measuring Financialization

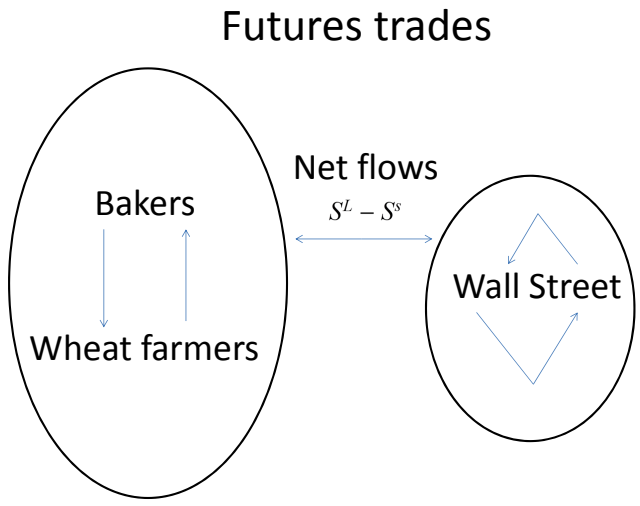
- Two indicators of financialization:
  - Open interest:

$$S^L + H^L \ \ (= S^s + H^s)$$

  - Net financial flows:

$$S^L - S^s \ \ \left(= H^s - H^L\right).$$

- Each indicator scaled by world production.



Data

- Construct panel with 135 commodities over 20 years.

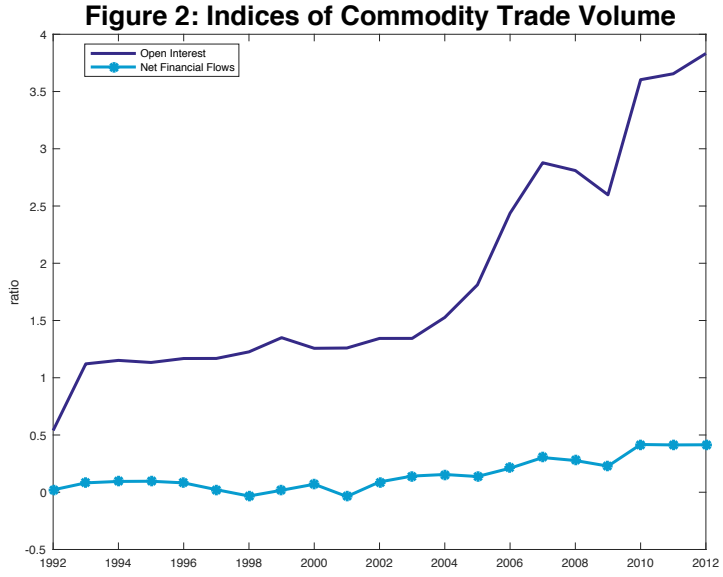
- CFTC
  - Volume of futures trades.
  - For each CFTC commodity, we identify measure of world production.

- Indices of World Production and Prices.
  - Fuels: British Petroleum.
  - Minerals: US Geological Survey.
  - Food and softs: Food and Agriculture Organization of United Nations (FAOSTAT).

- Huge variation in futures markets across commodities
  - Many commodities not traded at all in futures markets.
  - Among traded commodities, much variation in trade volume.

Magnitude of Financialization

- Indices of open interest and net flows
  - open interest jumped from on average one-half of world production to 4 times world production.
  - net financial flows rose only a tiny bit.



Outline

- Data and notation (X)
- The Spot Price Result
  - Year-over-year variation
- The Futures Return Result
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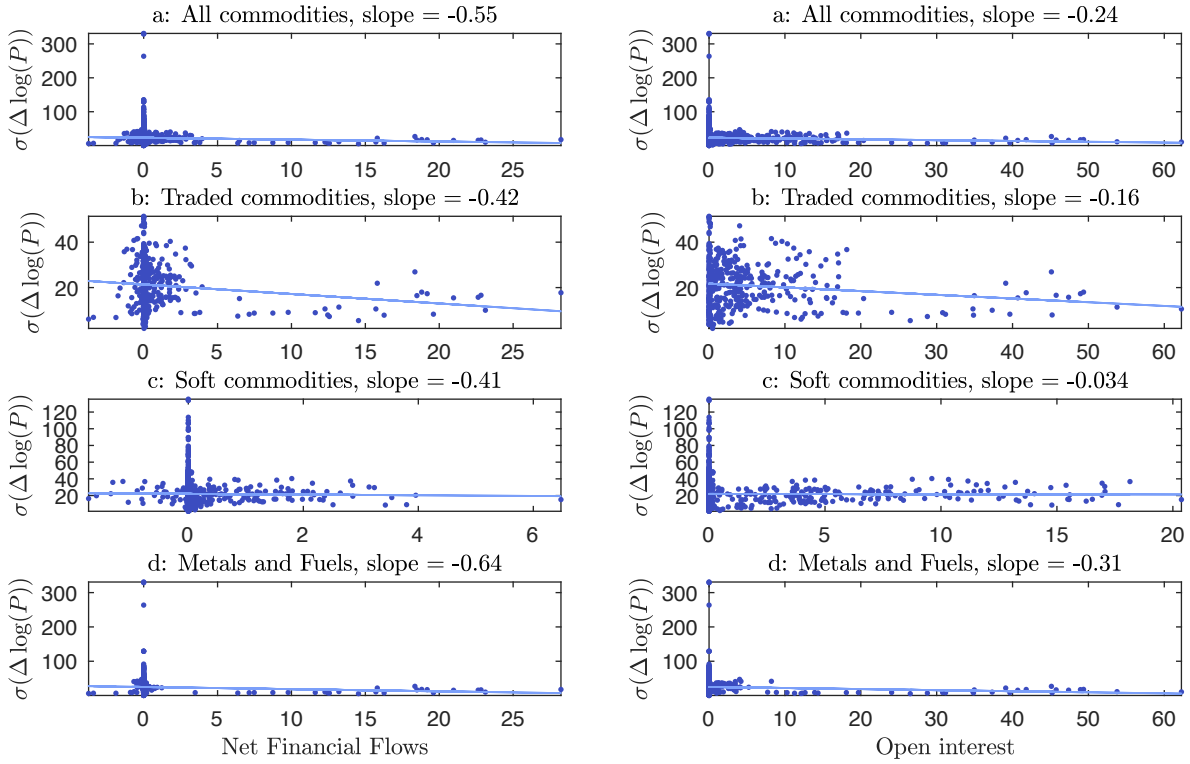
Year-to-Year Variations in Volume and Year-to-Year Changes in Spot Prices

- Compute a rolling standard deviation of the growth rate of commodity prices (5-point moving average).

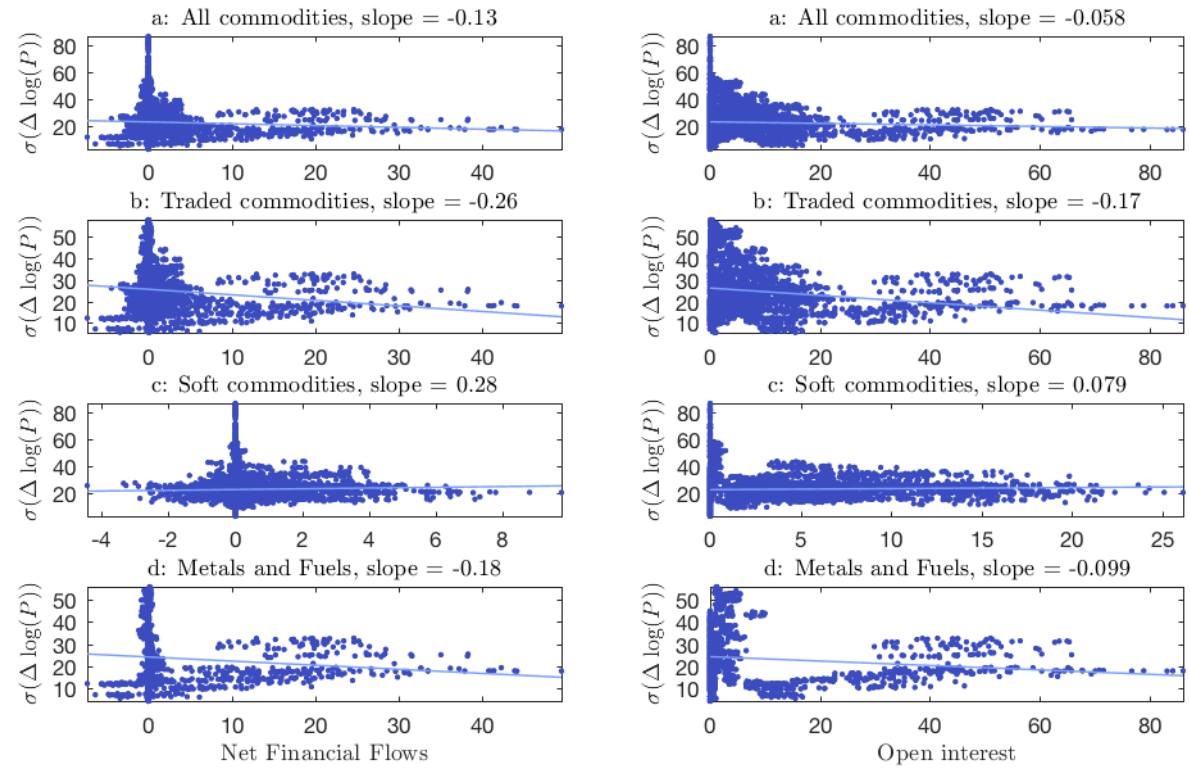
- Annual observations on volume of trade in futures markets:
  - open interest
  - net financial flows.

Figure 10: Volatility and Financialization

(a) Annual Data



(b) Monthly Data



Panel (a): each observation is a price volatility, volume pair for a particular date and commodity. The volatility is the standard deviation of real commodity price growth, expressed in annual percent terms by multiplying by100. The volatility for a particular date is based on a centered plus or minus two year window of data on the logarithmic first difference of the commodity price. We use the level of our two measures of volume (scaled by world production), as indicated in the bottom of the two columns of graphs. Panel (b): same as in Panel , except that to convert the volatility data to annual percent terms we multiply each volatility observation by$100 \times \sqrt{12}$.

Table 3: Regression, Volatility of Spot Price Growth on Volume of Futures Trades[1]

Panel A. Annual Data

$$volatility_t = control + \beta \times intensity_t$$ [2,3]

	intensity measure			
	net financial flows		open interest	
variables[4]	non adjusted[2]	adjusted[3]	non adjusted	non adjusted
all	-0.0066 (-0.0097,-0.0006)	-0.0027 (-0.0034,0.0033)	-0.0022 (-0.0032,-0.00054)	-0.00035 (-0.0019,0.0019)
traded	-0.0052 (-0.0077,0.0014)	-0.0027 (-0.0034,0.0033)	-0.0018 (-0.0025,0.00024)	-0.00035 (-0.0019,0.0019)
softs	-0.0041 (-0.019,0.0075)	-0.0041 (-0.0096,0.0096)	-0.00029 (-0.0041,0.0015)	0.0014 (-0.0034,0.0034)
minerals & fuels	-0.0083 (-0.012,-0.0019)	-0.0021 (-0.0036,0.0035)	-0.0031 (-0.0039,-0.00082)	-0.00084 (-0.0023,0.0023)

Panel B. Monthly Data

all	-0.0015 (-0.004,-0.0012)	0.00095 (-0.00029,0.00029)	-0.00046 (-0.0011,-0.00014)	0.0018 (-0.00018,0.00018)
traded	-0.0035 (-0.0058,-0.0028)	0.00095 (-0.00029,0.00029)	-0.0016 (-0.0022,-0.0011)	0.0018 (-0.00018,0.00018)
softs	0.0052 (-0.0025,0.0043)	0.00064 (-0.00086,0.00086)	0.001 (-0.00093,0.0014)	0.0019 (-0.00043,0.00043)
minerals & fuels	-0.0024 (-0.0048,-0.0015)	0.001 (-0.00031,0.00031)	-0.00095 (-0.0015,-0.00033)	0.0018 (-0.00019,0.00019)

Notes: (1) the table reports our least squares estimates of β, the (common) slope coefficient in a regression of volatility (a two-year moving, centered standard deviation of one-period real spot price growth) on our two measures of volume (net financial flows and open interest); in the case of monthly data, reported β's and boundaries of probability intervals are multiplied by $\sqrt{12}$ to make results comparable with results based on annual data (see text for discussion), (2) "non-adjusted" means that "control" is a constant that is common across all commodities, (3) "adjusted" means that "control" is a separate constant and time trend for each commodity. In the case of (3), estimation is done in two steps. In the first step, the volatility and volume data are replaced by the error in their (commodity-specific) regression on a constant term and a time trend. In the second step the error in price volatility (that is, "adjusted" price volatility) is regressed on adjusted volume and β is the common slope coefficient across all commodities. It is easy to verify that results for "all" variables and "traded" variables are mathematically identical. (4) "All" means analysis is done using all commodities, "traded" means only commodities in our CFTC data included in the analysis; "softs" and "minerals & fuels" means only commodities classified as softs and minerals&fuels included in the analysis (see text for further discussion).

Table 4: Another Way to See that Financialization Has Little Impact on Spot Price Volatility		
	(1)	(2)
	Measure of financialization	Measure of spot price dynamics
	12 month average oi growth	centered, 6 month moving average standard deviation
	2^{nd} quartile	interquartile range associated with column (1) quartiles
lower bound	-1.499	4.471
mean (median)	-0.369 (-0.343)	7.426 (6.400)
upper bound	0.690	9.062
	3^{rd} quartile	
lower bound	0.692	4.818
mean (median)	1.875 (1.831)	7.857 (6.876)
upper bound	3.178	9.573

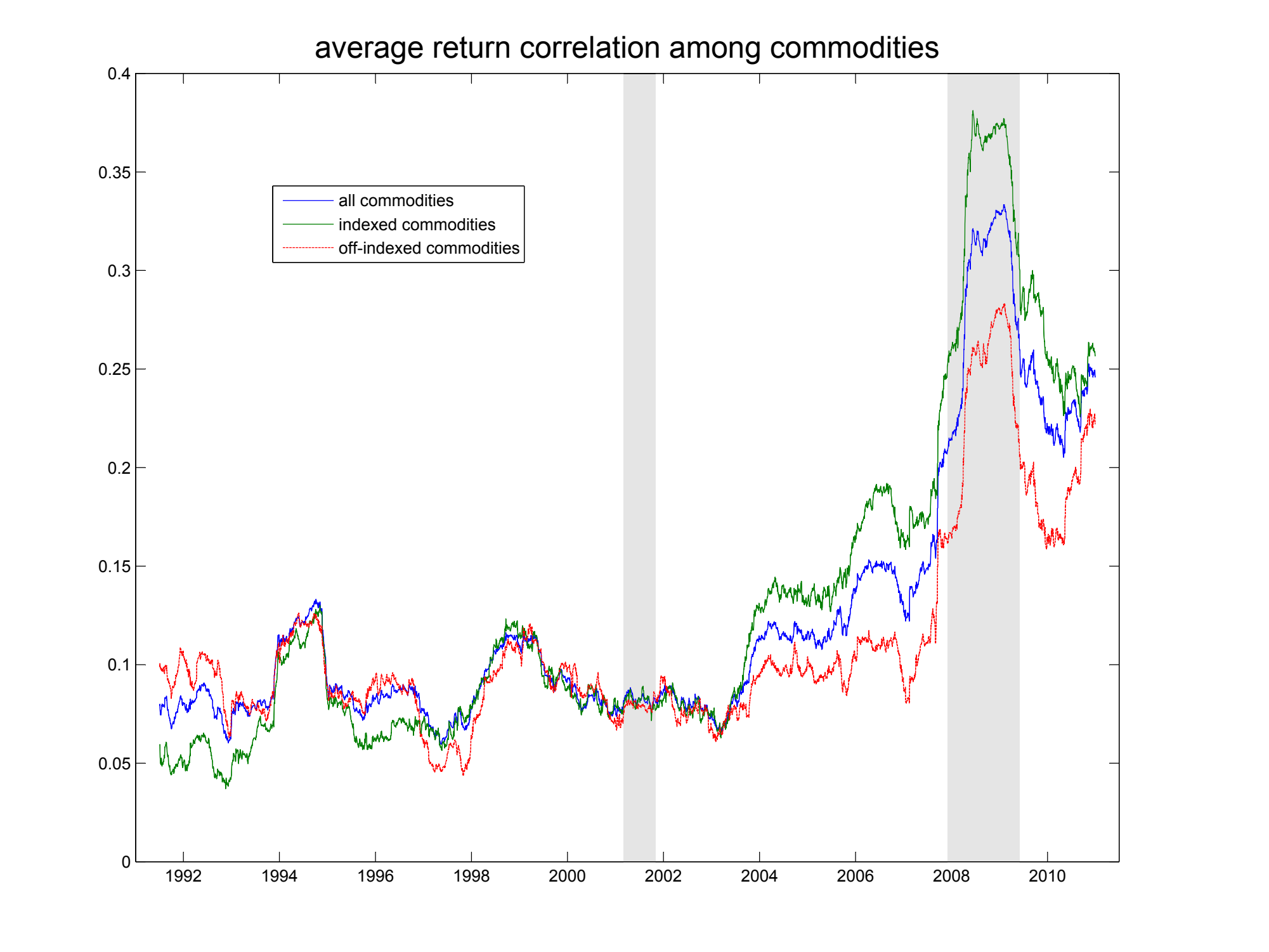
So Far

- Spot Price Result:
  - Little evidence of a systematic relationship between financialization and commodity price behavior.

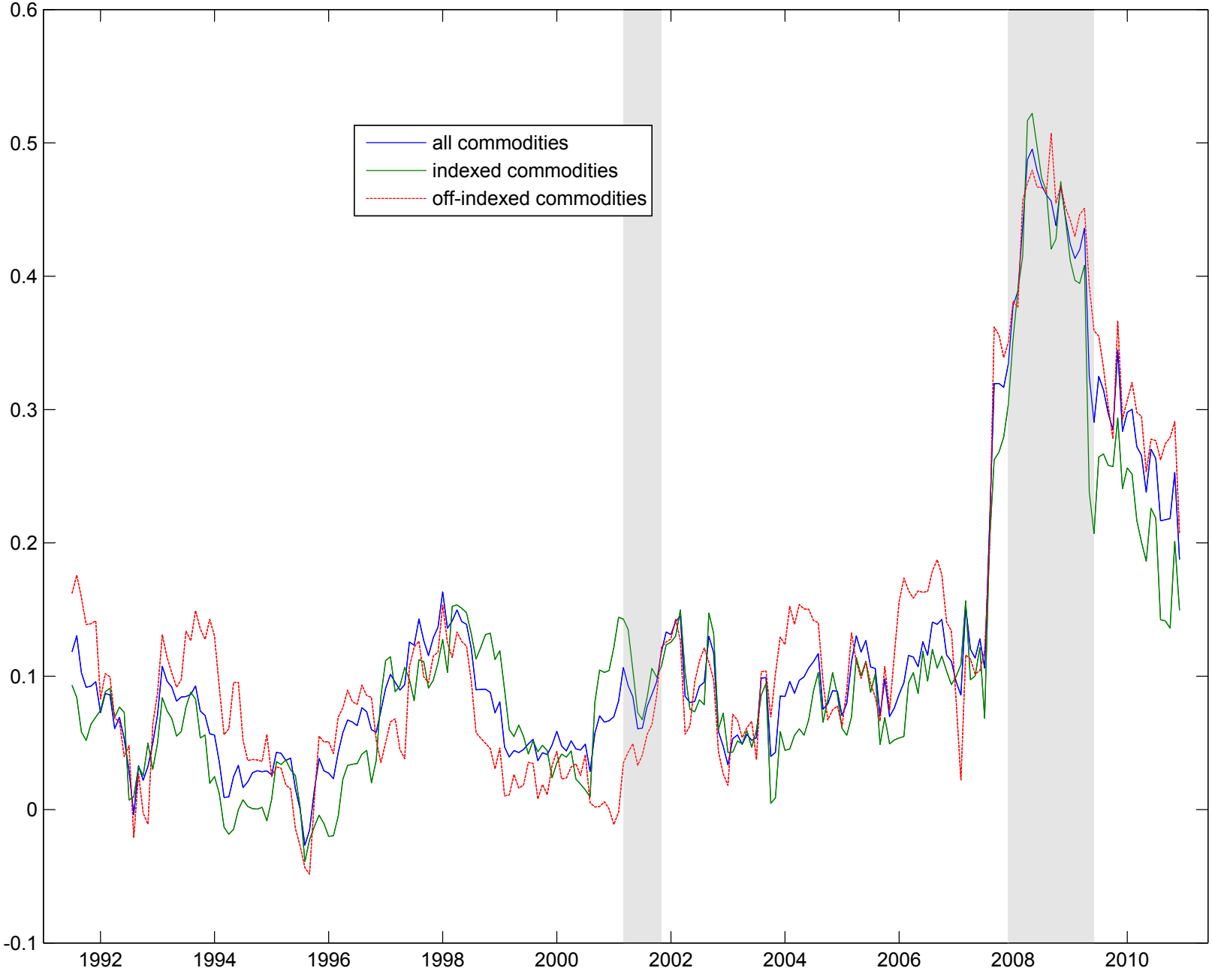
Relation to Tang and Xiong

- Tang-Xiong computed pairwise correlations between returns on commodity futures.
  - We compute pairwise correlations by centered moving average, $j = -lag, ..., lag,$
  - $lag = 130$ days in daily correlations, $lag = 6$ months in monthly data.
- Tang-Xiong found that the pairwise correlations were greater for indexed commodities and for non-indexed commodities.
  - Concluded that financialization matters.
- We obtain similar findings for daily data, but differences between indexed and non-indexed commodities appear to go away in monthly data.

Next Slide, Pairwise Correlations in Daily Returns


average return correlation among commodities
all commodities
indexed commodities
off-indexed commodities
0.4
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
1992
1994
1996
1998
2000
2002
2004
2006
2008
2010

Next Slide, Pairwise Correlations in Monthly Returns


average return correlation among commodities
all commodities
indexed commodities
off-indexed commodities
0.6
0.5
0.4
0.3
0.2
0.1
0
-0.1
1992
1994
1996
1998
2000
2002
2004
2006
2008
2010

Outline

- Data and notation (X)
- The Spot Price Result (X)
  - Year-over-year variation
- The Futures Return Result
- Model

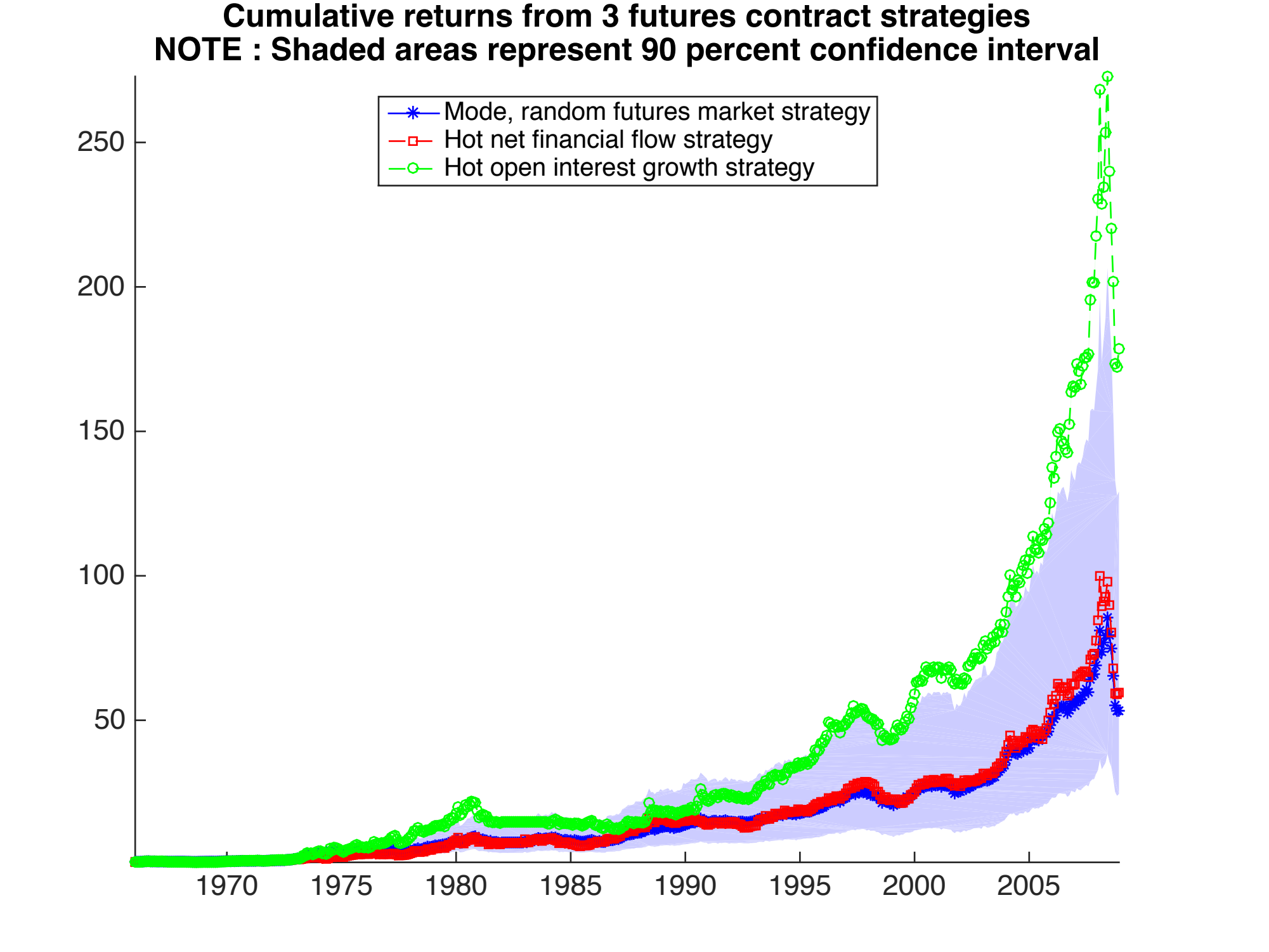
Futures Return Result

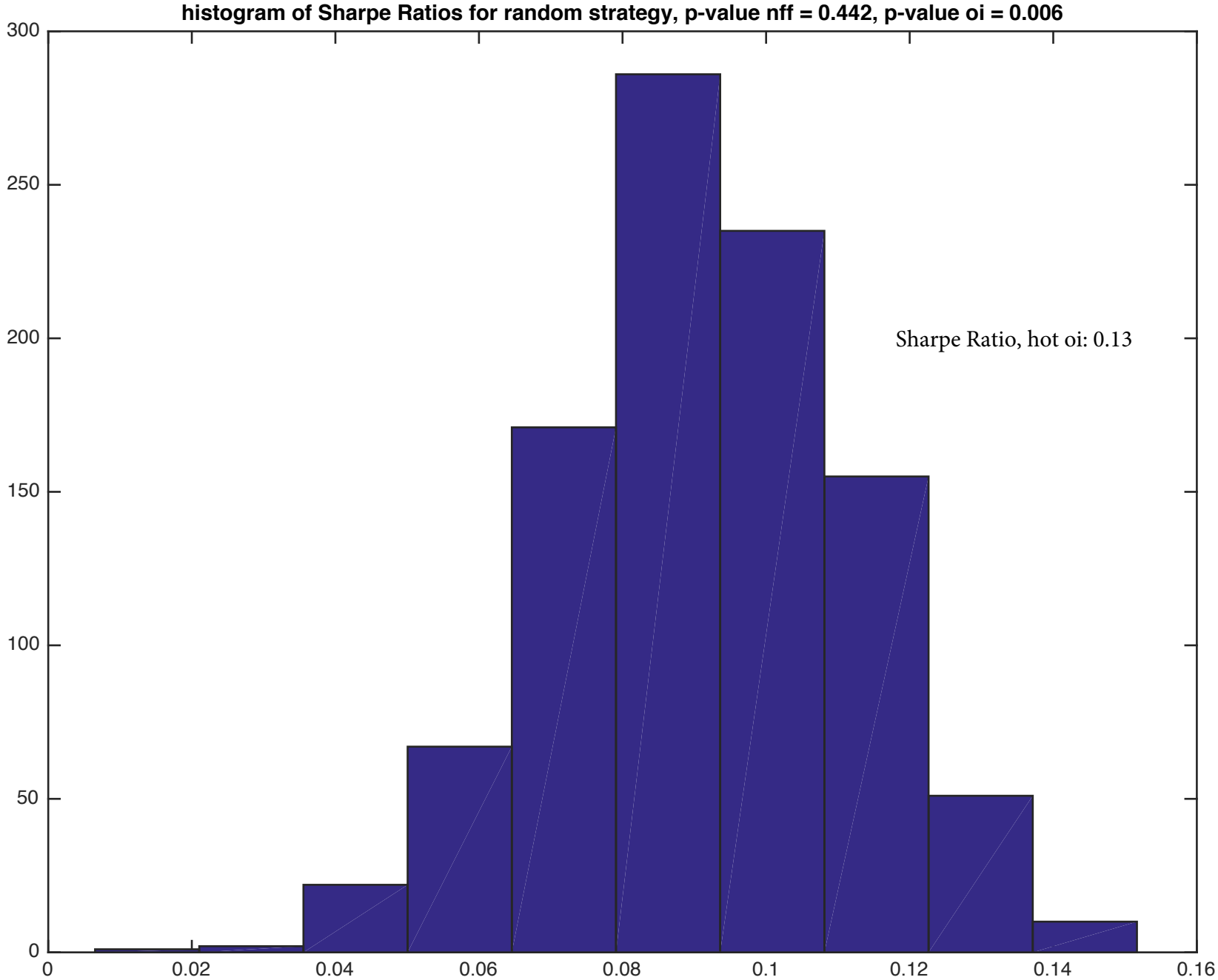
- Open interest helps to predict futures returns.
- Net financial flows do not help to predict futures returns.
  - Consistent with findings on aggregate data by Hong and Yogo (2012).

Futures Return Result

- Consider returns to following strategies:
  - In month t, look at recent volume of trade in each commodity.
  - Go long in a basket of commodities with highest volume of trade (*hot strategy*).
  - two measures of 'volume of trade':
    - net financial flows
    - open interest growth.

- Compare:
  - **hot net financial flow strategy**;
  - **hot open interest growth strategy**;
  - **random strategy**.


Cumulative returns from 3 futures contract strategies
NOTE : Shaded areas represent 90 percent confidence interval
Mode, random futures market strategy
Hot net financial flow strategy
Hot open interest growth strategy
250
200
150
100
50
1970
1975
1980
1985
1990
1995
2000
2005



Sharpe ratio, hot net financial flows: 0.09

Summary So Far

- Spot Price Result.
- Futures Price Result
- Puzzle:
  - How could open interest have a systematic relationship with futures returns but not spot prices?

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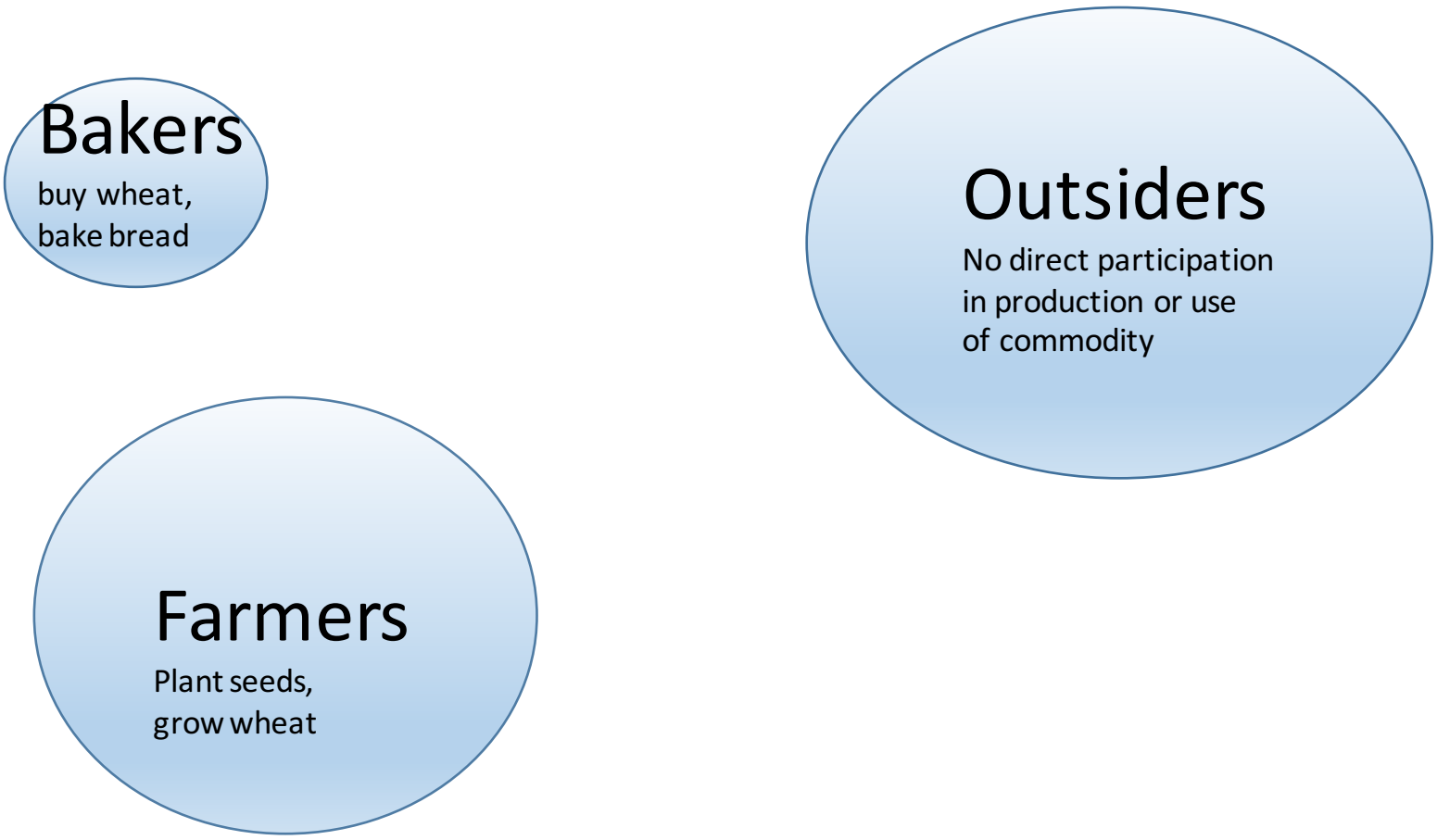
Commodity Market: Agents



Model

- Return results:
  - Getting $cov\,(nff, P - F) \simeq 0$
    - Shocks to farmers' hedging needs: $cov\,(nff, P - F) > 0$
    - Shocks to outsiders' hedging needs: $cov\,(nff, P - F) < 0$
  - Result, $cov\,(io, P - F) > 0$ emerges 'naturally'.
- Spot Price Result:
  - Depends on how outsider and insider hedging needs vary across markets.
    - Futures markets amplify price volatility with outsider variation.
    - Dampen price volatility with insider variation.
  - Effects are amplified by endogenous entry and exit.

Conclusion

- Two empirical findings:
  - *Spot Price Result*
  - *Futures Return Result*

- Data suggests:
  - Outsiders' hedging needs are important.
  - Futures markets more valuable than in conventional model.

- Spot Price Result consistent with important role for policy.