Investor Interest and the Returns to Commodity Investing

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The increased interest of financial investors in commodity futures and the volatility of commodity prices over the past decade have fueled the debate on the influence of speculative capital on commodity futures prices. Commodity futures play an important role in the global economy, allowing companies to insure the future value of their outputs or inputs. By hedging in futures markets, companies shift this future price risk to investors, who expect to receive a risk premium as compensation for bearing this risk. In the last decade, institutional investors have been an important source of new speculative capital through passive long positions linked to an index of commodity futures. The Commodity Futures Trading Commission (CFTC) estimated these allocations to be around $200 billion between 2000 and 2008 (CFTC [2008]). An important issue is whether this inflow is large enough to have altered the fundamental risk and return features of commodity futures, a phenomenon known as "financialization."[1]

There are several ways in which financialization could have influenced the price formation of commodity futures. We focus on three. First, inflows into commodity markets may have caused the futures risk premium to decline. Holding constant the demand for insurance, new competition for the provision of insurance can be expected to drive down the insurance premium to hedgers. Second, correlations among commodity prices can increase. Because institutions hold baskets (indexes), their sentiment-driven investment flows can potentially elevate the co-movement of prices among constituents of the index (basket), at least in the short term. To the extent that commodities compete with other risky assets in an institutional portfolio, the trading of commodities can become more correlated with asset classes of similar risk—for example, equities. Finally, index investments can weaken the link between futures prices and fundamentals if index weights deviate from the optimal allocation of speculative capital based on the fundamentals of individual commodity markets.

We examine the magnitude of these effects during the recent decade starting in 2005—when commodity investment gained popularity—and benchmark the recent experience against the 45-year history that precedes it. For the analysis, we mainly use the equally weighted (EW) index, which is an updated version of the index in Gorton and Rouwenhorst [2006]. This recent decade includes the global economic expansion led by the industrialization of China, a housing boom and bust in the United States, and the largest financial crisis since the Great Depression—followed by a monetary policy response that has driven interest rates toward zero. It is against this background that collateralized commodity futures gradually gained acceptance as an asset class.

We argue that variation in these business cycle conditions can explain variation in the behavior of commodity prices that is often attributed to financialization. We find that between 2005 and 2014, the risk premium on our equally weighted index was 3.67% per annum, which is similar to its long-term historical average and consistent with the fundamental economic function of futures markets. The correlation among commodities and the co-movement of commodities with equities, in particular, have varied over this period, and increased substantially during the financial crisis. Experience from previous episodes of economic turmoil shows that these correlation increases are related to the business cycle and are therefore temporary in nature; it appears that they have since returned to levels close to their long-term sample averages. Finally, the futures basis, an indicator of scarcity of physical inventories, continues to be a reliable indicator of cross-sectional differences in risk premiums among commodities.

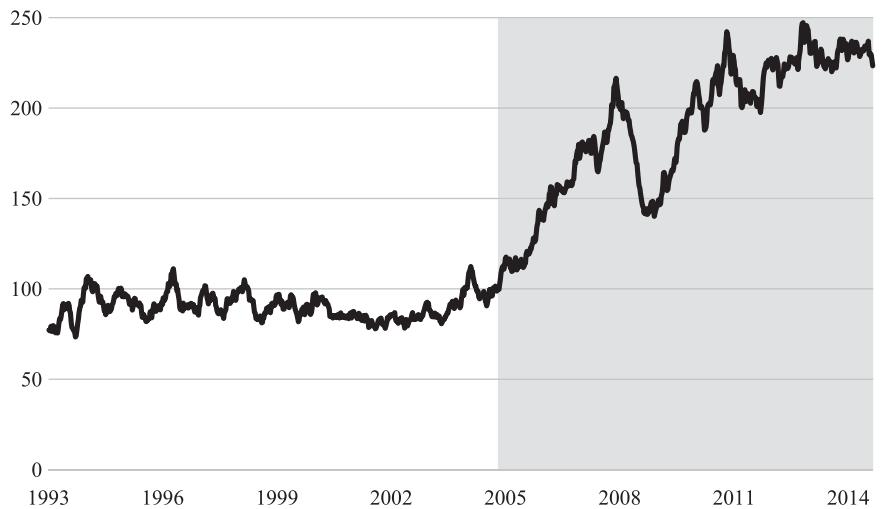
Business cycle factors provide a more comprehensive explanation of the distribution of commodity returns than financialization, which emphasizes increased speculative participation in commodity futures markets. While speculative interest has grown over the recent decade, so has commercial hedging activity. The proportional participation of hedgers and speculators has remained relatively stable.

INVESTOR COMPOSITION IN COMMODITY FUTURES MARKETS

The inflows of investment capital by institutional investors, money managers, and other speculators should be evaluated against changes in the size of the overall market. However, the analysis is complicated by a paucity of data. First, a large fraction of commodity trading takes place over the counter (OTC). The Bank for International Settlements conducts a bi-annual survey of the overall size of the OTC derivatives market, but does not provide details of participants' positions. Position data about futures is available to the exchanges and regulators, and the weekly CFTC report on positions provides a snapshot at a very high level of aggregation.

Exhibit 1 shows the growth of open interest, averaged across 27 futures markets for which the CFTC reports positions data. To construct it, we create an index of the level of open interest for each commodity, standardized such that 2004/12 = 100, and then take

EXHIBIT 1
EW Index of Open Interest (# of contracts, Dec 28, 2004 = 100)



Notes: This exhibit is based on weekly futures open interest as reported in the CFTC's Commitment of Traders report for 27 commodities in our dataset. The commodities covered are Heating Oil, Crude Oil, Gasoline, Natural Gas, Copper, Silver, Gold, Platinum, Palladium, Wheat, Corn, Soybean, Soybean Oil, Soybean Meal, Oats, Rough Rice, Pork Bellies, Live Cattle, Lean Hogs, Feeder Cattle, Milk, Cotton, Orange Juice, Lumber, Cocoa, Coffee, and Sugar. For each commodity, we create an index of open interest, standardized such that December 28, 2004 = 100. The plotted index is the average index level across all 27 futures markets.

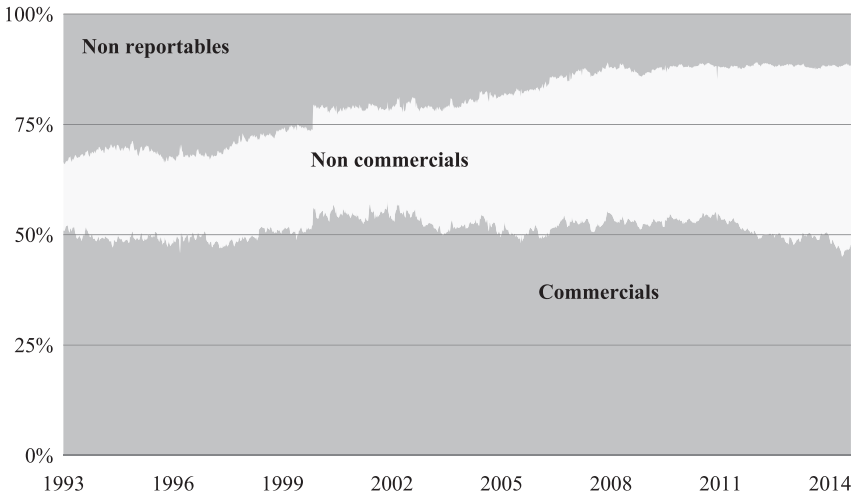
the average index level across 27 commodities. The exhibit supports our choice of 2005 as a reasonable starting date for the study of financialization. Following more than a decade of relative stability in average market size, open interest has more than doubled since the beginning of 2005. Exhibit A2 shows the breakdown of the futures open interest by individual commodity. It dramatically illustrates that growth in open interest occurred in almost every commodity futures market, with the notable exceptions of Pork Bellies and Orange Juice.

What does speculative participation look like as a fraction of open interest? If the increased participation by passive long-index investors contributed to financialization and the growth in open interest, this raises the question: who took the short side of their trades? If there were other speculators, the growth of open interest would be accompanied by an increase in the ratio of speculative positions relative to hedging positions. But to the extent that the inflow of speculative capital also attracted more hedgers, one expects to find a relatively constant proportional participation of hedgers and speculators. Exhibit 2 provides the breakdown of the positions according to the CFTC's Commitment of Traders report.

The CFTC does not classify market participants as speculators or hedgers, but instead groups participants according to their participation in physical markets (commercials versus noncommercials).[2] Although it is subject to caveats regarding misclassification of positions, the exhibit indicates that commercial activity has been a stable proportion of open interest over time. The same picture also emerges from a more recent classification of positions that separates out swap dealers from the commercial category in Exhibit 3. These data are only available starting 2006 and cover most of the recent decade.

EXHIBIT 2

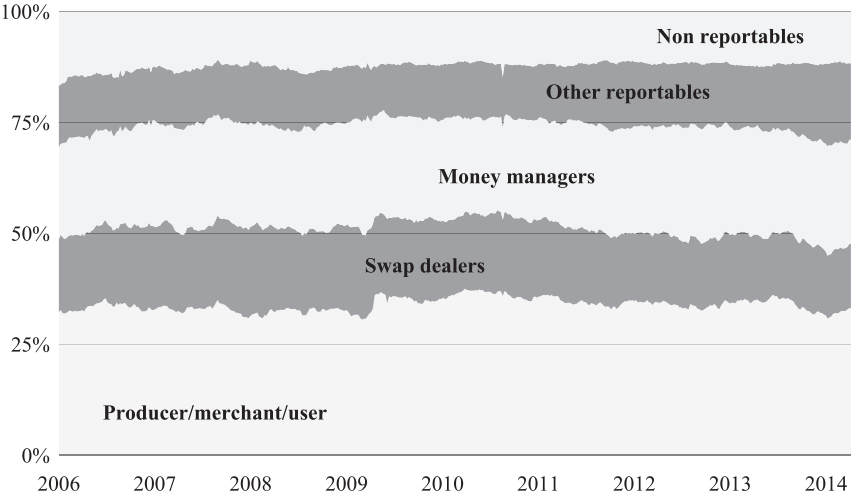
Commercials (hedgers), Noncommercials (speculators) and Nonreportables as a % of Total Open Interest



Notes: The CFTC reports long and short positions for commercials (hedgers), noncommercials (speculators), and nonreportable for 27 commodity futures. The report provides spread positions of noncommercials. Total open interest is the sum of long (short) positions across the three categories of traders and the spread positions of noncommercials. For each commodity and category, we calculate the total gross positions (long plus short and twice the spread positions) as a ratio of twice the open interest. The exhibit plots the average across all commodities.

EXHIBIT 3

Users, Swap Dealers, Money Managers, Other Reportable, and Nonreportables as a % of Total Open Interest



Note: This exhibit is based on weekly CFTC's disaggregated commitment of traders report for same 27 commodities in Exhibit 2.

Similar to the coarse trader classifications in Exhibit 2, Exhibit 3 also indicates stability in the proportions of various trader categories over time. There is little evidence that there has been disproportionate growth in any category or categories of futures market participants that has shifted the distribution of market interests. Because of the stability of the composition of market participants, it is an unlikely candidate for explaining shifts in the distribution of commodity correlations that we document later on in this article.

THE RISK PREMIUM OF COMMODITY FUTURES

What happened to the risk premium to commodity futures during the expansion of the market?

With the important caveat that 10 years of data is generally insufficient to make definitive statements about the statistical significance of risk premiums, we note that the recent decade was similar to the historical experience since 1959. Exhibit 4 shows that the average historical risk premium was 3.67% over the most recent decade, which is about 1.5% lower than its historical mean over the 1959–2004 period. The right panel of the exhibit shows that the 2005–2014 realized risk premium was at the median (49th percentile) of the historical distribution of 10-year average excess returns.[3]

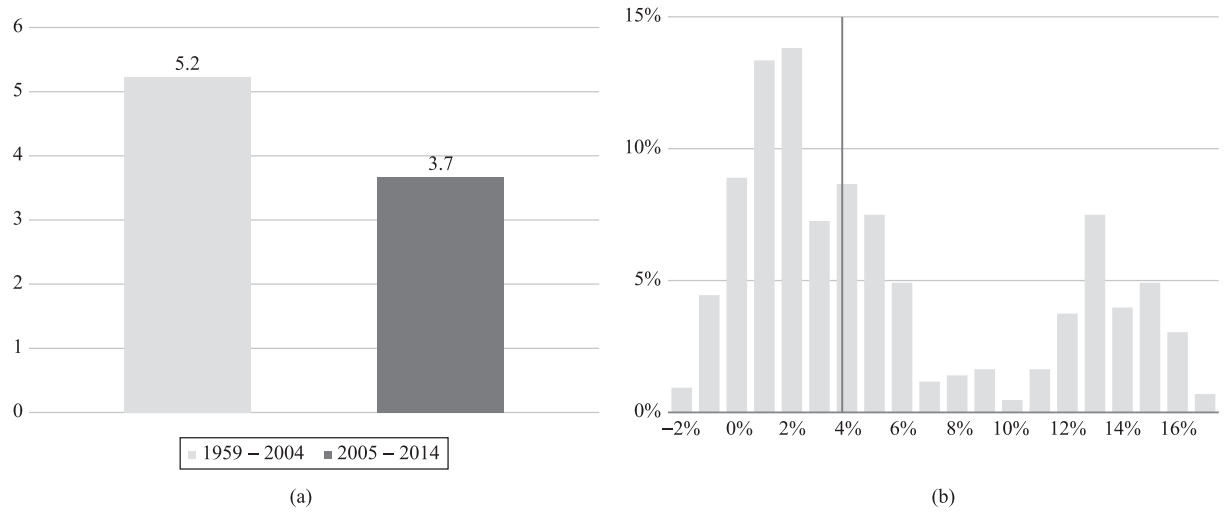
We conclude that, consistent with the positions data, the realized risk premium has been neither qualitatively nor statistically different from its long-term average since 1959.

RISK PREMIUM AND THE LINK TO THE FUNDAMENTALS OF SCARCITY (BASIS)

The *basis* is the difference between the current spot price and the futures price.[4] It is also sometimes called *backwardation* or the *roll yield*. The basis (and backwardation) can be observed on a trader's futures screen, and is distinct from *normal backwardation*, which is the difference between the futures price and the *expected* future spot price (i.e., the expected risk premium, which is unobservable).

Several papers have linked the basis (backwardation) to the risk premium (normal backwardation).[5] One suggested logic behind that relationship is that the basis is a measure of the scarcity of a commodity. Scarcity leads to price volatility, which is the risk that is transferred (insured) through commodity futures markets. When physical inventories of a commodity are high, and the risk of a shortage or stockout is low, futures prices will trade at a premium to spot prices (*contango*). However, with the threat of a shortage, the spot commodity price will be bid up relative to the futures price,

EXHIBIT 4
Commodity Risk Premium



Note: This exhibit is based on weekly CFTC's disaggregated commitment of traders report for same 27 commodities in Exhibit 2.

to secure supply by those who use the commodity as an input in the productive process. If this convenience premium becomes large enough and exceeds the full cost of storage, the futures curve will become inverted (backwardation). Scarcity is the exception rather than the rule, as we can see in Exhibit 5, which plots the percentage of backwardated commodities in the equally weighted index since 1959.

Exhibit 5 illustrates that during the majority of months since 1959, the median commodity has been in contango. For this reason, an upward sloping futures curve is considered a "normal curve." As is clear from comparison with Exhibit 4, the predominance of contango does not preclude a positive risk premium, also known as *normal backwardation*. Backwardation was slightly less prevalent during the most recent decade: the proportion of commodities in backwardation dropped from an average of 37% per month to 26% post-2004, in part because of a decline during the financial crisis.

If variation in the basis reflects differences in required risk premiums, a trading strategy that selects commodities according to the size of its basis would be expected to earn positive profits.[6] At the end of each month, index commodities are ranked according to their basis and divided into two portfolios, each containing half of the commodities in the equally weighted index.

EXHIBIT 6

Annualized Performance of High–Low Basis-Sorted Portfolios

	July 1959–Dec. 2004	Jan. 2005–Dec. 2014
Average Excess Returns (*t*-stat)	9.2% (4.60)	10.41% (3.28)
Standard Deviation	13.48%	10.02%
Sharpe Ratio	0.68	1.04
% Returns > 0	59%	59%

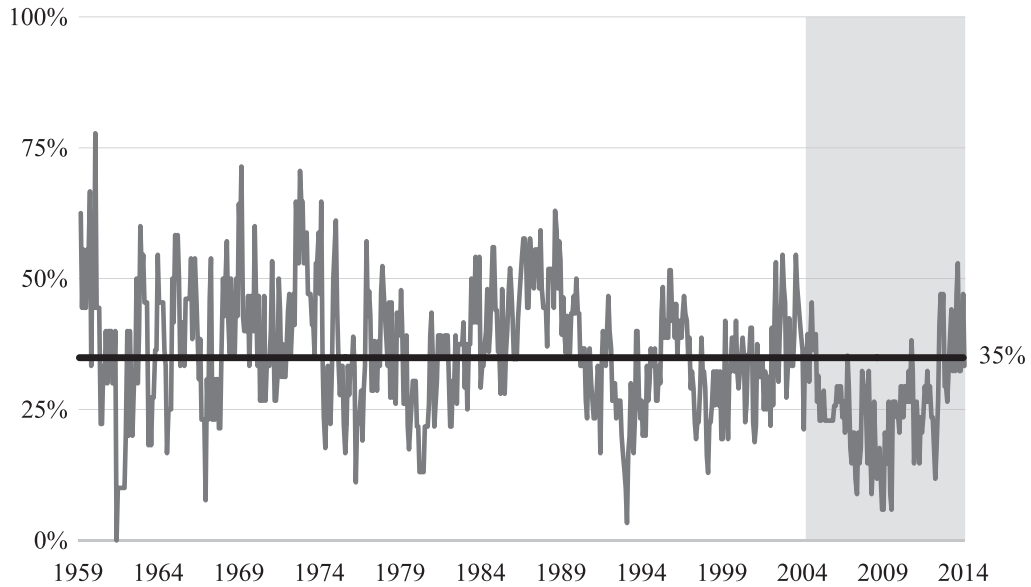
Exhibit 6 shows that during the most recent decade, the link between fundamentals and expected returns has been qualitatively similar relative to its historical average. The Sharpe Ratio has been higher because of a combination of a marginally higher excess returns and lower volatility during the decade. We conclude that financialization has had no impact on the relationship between the risk premium and fundamentals.

DIVERSIFICATION PROPERTIES OF COMMODITY FUTURES

As we have just shown, in many respects the behavior of the futures markets during the past 10 years has been similar to its prior history. The risk premium has been comparable to its long-term historical average;

EXHIBIT 5

Fraction of Commodities in Backwardation (lifetime average: 35%, pre-2004: 37%, post-2004: 26%)



and, despite the more than doubling of the market, the composition of market participants has been stable. But what has been distinct during the 2005–2014 period has been the average co-movement among stocks and commodities—and to a lesser degree, among commodities with each other, as we will examine later. Exhibit 7 illustrates the increase in the correlation of commodity futures with equities, bonds, and inflation during the most recent decade. In particular, the correlation of 0.52 with equities stands out relative to the correlation of 0.05 during prior history.

The increase in the stock–commodity correlation relates to the financialization of commodity futures markets, which has been the central focus of financialization literature.[7] We ask whether this marks a permanent change—perhaps due to financialization—or whether the change is temporary, similar to the drop in open interest during the crisis. Exhibit 8 provides more detail on the time-series variation in the commodity–equity correlation using more granular data at the weekly frequency. The exhibit shows the year-by-year average correlation of commodities with equities. Two observations stand out. First, the correlation between equities and commodities spiked during the crisis of 2009–2011, but has since fallen back to a level close to zero. Second, there were earlier spikes in the correlation of similar magnitudes as the recent spike, most notably in the 1960s and early 1980s. These earlier spikes were unnoticed by financialization studies that narrowly focused on recent data sample.

The fact that the spike in the correlation has been temporary, while the composition of participants has been relatively stable, seems inconsistent with the interpretation of financialization as the cause. Although one could attempt to imagine a scenario in which markets cyclically became "financialized" and then "de-financialized," it seems reasonable to explore what alternative explanation may be offered for the rise in correlations that could also account for its subsequent decline. We examine whether the average pairwise commodity correlations and the average stocks and commodities correlations represent primarily business cycle movements.

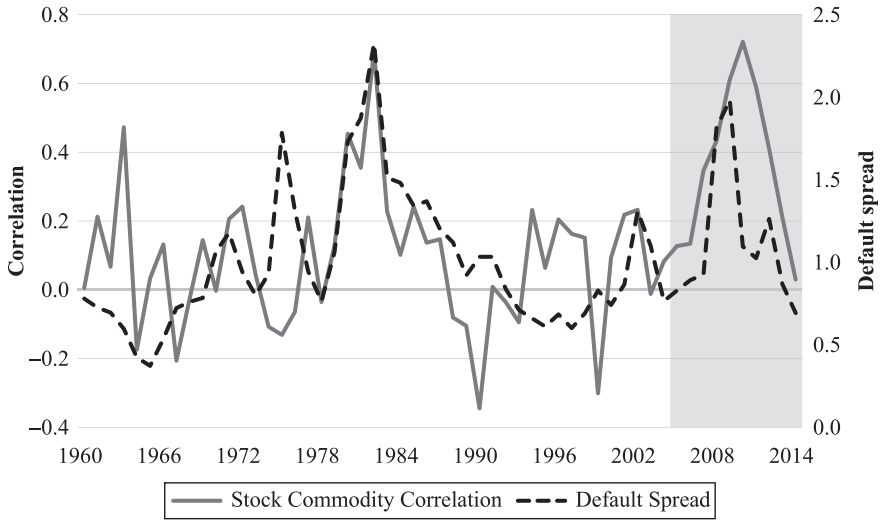
EXHIBIT 7

Correlations of Monthly Commodity Futures Returns with Stocks, Bonds, and Inflation

	July 1959–2004	2005–2014
Stocks	0.05	0.52
Bonds	–0.14	0.05
Inflation	0.02	0.25

EXHIBIT 8

Stock–Commodity Correlation: Average Commodity Returns and S&P 500 Index Return 52-Week Correlation



Notes: Correlations are calculated using weekly data. For each year, the exhibit plots the correlation between commodity and equity returns calculated based on 52 weekly return observations.

Are risk premiums earned for macroeconomic risks? If this is the case to any significant extent, the risk premiums for different commodities should move together. "Business cycles" occur when there is a high pairwise correlation among a number of important macroeconomic variables (see, for example, Sargent [1987]). The problem is that there are hundreds of macroeconomic series, and therefore economists tend to focus on an index or factor structure. The simplest way to do this is to simply select series that capture the factor structure of the macroeconomic variables. One variable that is often used is the default spread—the difference between Baa and AAA corporate yields. Chen [1991], for example, shows that the default premium tracks the health of the economy as measured by the recent growth rate of the gross national product (GNP) and consumption.[8] Exhibit 8 shows that the default spread seems to track temporary fluctuations in correlations in prior decades in a way that financialization does not.

INTRACOMMODITY CORRELATIONS

Financialization, it is argued, has also contributed to an increase in correlations among commodities (e.g., corn versus natural gas). If the average pairwise correlations among individual commodities were to go up, a portfolio of commodities would benefit less from natural diversification.

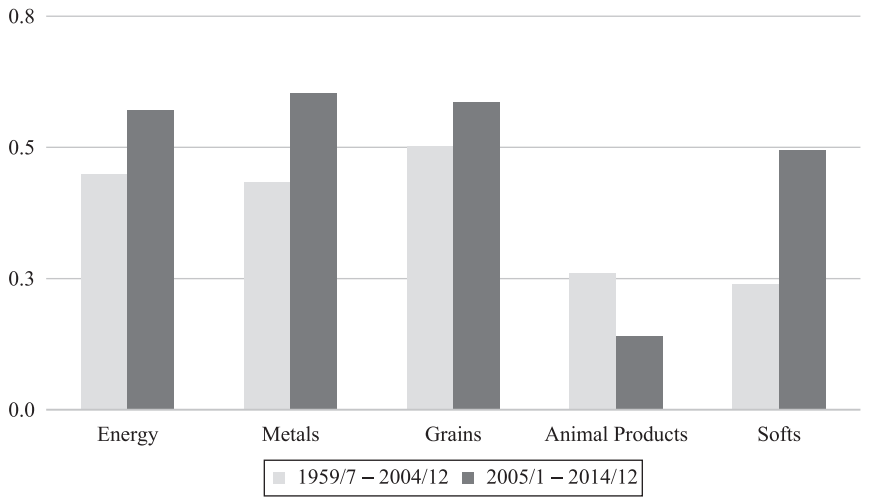
Exhibit 9 summarizes the average correlation of individual commodity returns with our equally weighted index. With the exception of the Animal Products sector, correlations since 2005 have exceeded the correlations prior to 2005. Soft commodities have experienced the largest increase among all sectors.

We next examine the average pairwise commodity correlations, which appear to be at the heart of the financialization debate. Exhibit 10 shows a similar transitory increase in the commodity co-movement during the financial crisis. As in the case of the commodity–equity correlations, we also plot the default spread for comparison.

Exhibit 10 illustrates that the average pairwise correlation among commodities spiked in 2008, albeit from a relatively low level in the context of the 55-year history. The increase has since reversed. Earlier spikes in the pairwise correlations between commodities occurred in the 1960s and 1980s. Comparing the co-movement with the default spread suggests that intracommodity correlations have a strong business cycle component. Not only does the perceived downside risk explain the rise of the commodity correlation during the period of financialization, it also explains the subsequent decline in correlations. The default spread seems to track temporary fluctuations in correlations in prior decades in a way that financialization does not.

EXHIBIT 9

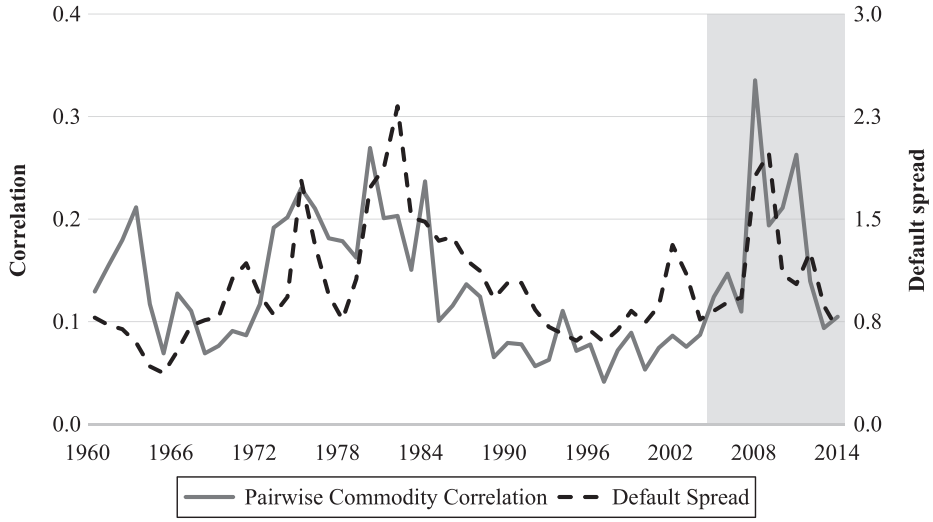
Average Correlation of Commodities with the Equally Weighted Index by Sector



Note: See Exhibit A1 for the classification of commodities into different sectors.

EXHIBIT 10

Average Intracommodity 52-Week Correlation and the default spread



Note: Correlations are calculated using weekly data. For each year, the exhibit plots the average pairwise commodity correlations based on 52 weekly return observations.

COMMODITY CORRELATIONS AND THE BUSINESS CYCLE

We examine the issue in more detail in Exhibit 11, which shows the correlations of several macroeconomic time series with the intracommodity correlations and the stock–commodity correlations. The table shows that both the intracommodity and the stock–commodity correlations move substantially with a variety of business cycle indicators—the default spread and the annual unemployment rate in particular.

EXHIBIT 11

Commodity Correlations and Business Cycle Variables

Correlation of Annual Data		
	Intracommodity Correlation	**Stock–Commodity Correlation**
Default Spread	0.56	0.45
Treasury Spread: 10 Year–3 Month	0.05	0.22
Average Unemployment Rate	0.50	0.52
Shiller Price-to-Earnings Ratio (PE)	–0.52	–0.12
IP YoY Change	–0.24	–0.10
Housing Start Annual Average (thousands of units)	–0.26	–0.34
Conference Board Coincident Composite	–0.25	–0.20

Notes: The Treasury Spread is defined as the annual average of difference of 10-Year Treasury Constant Maturity Rate, Monthly, Not Seasonally Adjusted; and 3-Month Treasury Bill: Secondary Market Rate, Monthly, Not Seasonally Adjusted. Average Unemployment Rate is defined as the annual average of Civilian Unemployment Rate, Monthly, Not Seasonally Adjusted. Shiller PE is defined as the annual average PE based on average inflation-adjusted earnings from the previous 10 years; also known as the Cyclically Adjusted PE Ratio (CAPE Ratio). IP YoY change is defined as the year-over-year change in the industrial production index.

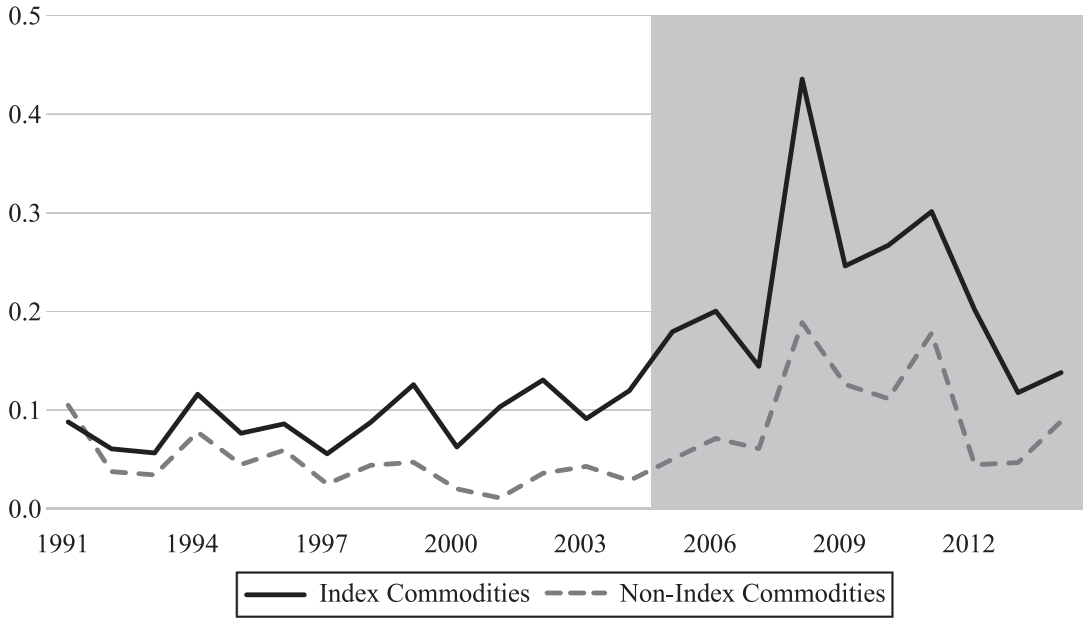
Sources: Board of Governors of the Federal Reserve System, U.S. Bureau of Labor Statistics, http://www.econ.yale.edu/~shiller/, Board of Governors of the Federal Reserve System.

INDEX VERSUS NON-INDEX COMMODITY CORRELATIONS

We can get yet another perspective on the issue of financialization by asking whether the rise in correlations was limited to commodities that were part of a major commodity index. Exhibit 12 compares the average pairwise correlations of index versus non-index commodities; "index" is defined as belonging to either the Bloomberg Commodity Index (BCOM) or the Standard & Poor's Goldman Sachs Commodity Index (S&P GSCI) in the year 2014. This would be an interesting comparison for the question of whether index investment was responsible for the rise in correlations. The exhibit shows that the intracommodity correlations are marginally higher for index commodities than for non-index commodities, although

EXHIBIT 12

Intracommodity Correlation, Index and Non-Index Commodities



Notes: Index commodities are those commodities in our dataset that are common with either the Bloomberg Commodity Index (BCOM) or the S&P GSCI. In 2014, nine commodities in our dataset are not in either of the public indices: Oats, Port Bellies, Orange Juice, Lumber, Platinum, Palladium, Rough Rice, Propane, and Tin. Over the years, Milk, Butter, Coal, and Electricity were added to our set of non-index commodities. We started the exhibit in 1991 when Goldman Sachs first published the GSCI. BCOM was launched later in the decade.

no correction has been made for the different sector composition of the two groups. However, non-index commodities similarly experienced an increase and subsequent decrease in correlations in recent years, albeit somewhat less pronounced than index commodities. Following the financial crisis, correlations among both index and non-index commodities have fallen in recent years.

CONCLUSION

Commodity markets have experienced high growth during the recent decade, as measured by open interest. Despite this growth, the proportion of hedgers (commercials) and speculators (noncommercials) participating in the market has been relatively constant, and the composition of traders appears to have remained remarkably stable over time. In terms of risk and return on commodities as an investment, the recent decade does not seem significantly different from the longer historical experience. The average risk premium to commodity futures was 3.7% per annum. The risk premium has been comparable to its long-term historical average, despite the more than doubling of the market.

The longer time-series history of commodity markets shows that a rise in correlations occurs in periods of heightened financial risk/turmoil associated with macroeconomic activity. This feature is shared by many asset classes.[9] Commodity correlations have spiked during the financial crisis—in a way that resembles previous episodes of increased risk. The fundamental relationship between return and risk (as measured by carry) has been stable over time.

We argue that cyclical variation in return correlation provides an alternative perspective to what some view as the financialization of commodity markets. It explains the recent decline in these correlations, as well as the variations in these correlations prior to institutional investor interest in the asset class.

APPENDIX

EXHIBIT A1

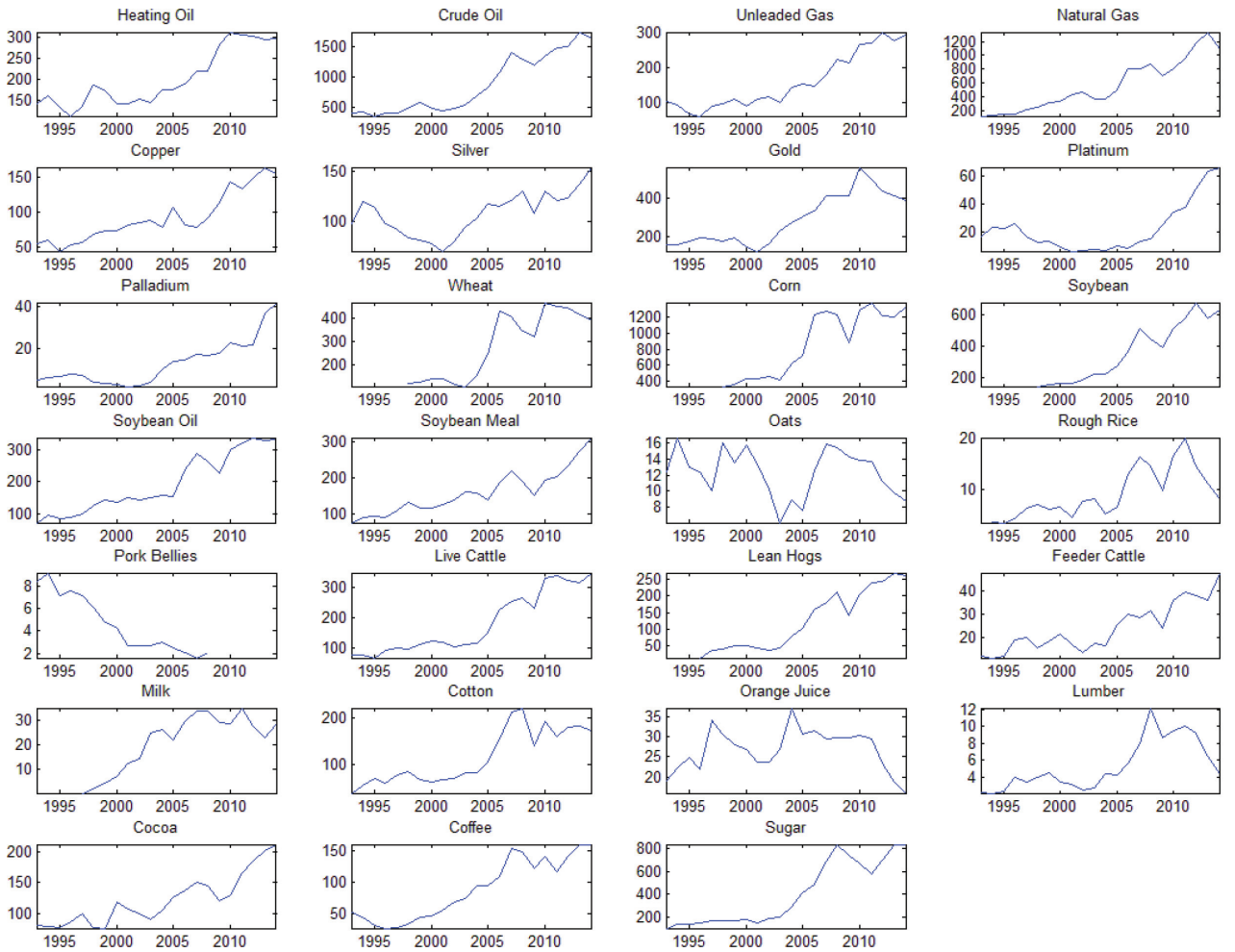
List of Commodities in the Equally Weighted Index

	Name	Quotes Start	Index Inclusion Date	Sector
1	Heating Oil	11/14/1978	11/30/1978	Energy
2	Crude Oil	3/30/1983	3/31/1983	Energy
3	Unleaded Gas	12/3/1984	12/31/1984	Energy
4	Propane*	8/21/1987	8/31/1987	Energy
5	Natural Gas	4/4/1990	4/30/1990	Energy
6	Coal	7/12/01	7/31/01	Energy
7	Electricity	4/11/03	4/30/03	Energy
8	Copper	7/1/1959	7/1/1959	Metals
9	Silver	6/12/1963	6/30/1963	Metals
10	Platinum	3/4/1968	3/31/1968	Metals
11	Gold	12/31/1974	12/31/1974	Metals
12	Palladium	1/3/1977	1/31/1977	Metals
13	Zinc	1/3/1977	1/31/1977	Metals
14	Lead	2/1/1977	2/28/1977	Metals
15	Nickel	4/23/1979	4/30/1979	Metals
16	Aluminum	6/1/1987	6/30/1987	Metals
17	Tin	7/3/1989	7/31/1989	Metals
18	Wheat	7/1/1959	7/1/1959	Grains and Oilseeds
19	Corn	7/1/1959	7/1/1959	Grains and Oilseeds
20	Soybeans	7/1/1959	7/1/1959	Grains and Oilseeds
21	Soybean Oil	7/1/1959	7/1/1959	Grains and Oilseeds
22	Soybean Meal	7/1/1959	7/1/1959	Grains and Oilseeds
23	Oats	7/1/1959	7/1/1959	Grains and Oilseeds
24	Rough Rice	8/20/1986	8/31/1986	Grains and Oilseeds
25	Pork Bellies*	9/18/1961	9/30/1961	Animal Products
26	Live Cattle	11/30/1964	11/30/1964	Animal Products
27	Lean Hogs	2/28/1966	2/28/1966	Animal Products
28	Feeder Cattle	11/30/1971	11/30/1971	Animal Products
29	Milk	1/11/1996	1/31/1996	Animal Products
30	Butter	9/5/1996	9/30/1996	Animal Products
31	Cotton	7/1/1959	7/1/1959	Softs
32	Cocoa	7/1/1959	7/1/1959	Softs
33	Sugar	1/4/1961	1/31/1961	Softs
34	Orange Juice	2/1/1967	2/28/1967	Softs
35	Lumber	10/1/1969	10/31/1969	Softs
36	Coffee	8/16/1972	8/31/1972	Softs

Notes: Propane and Pork Bellies futures were delisted. The last month of returns is September 2009 for Propane and July 2011 for Pork Bellies.

EXHIBIT A2

Average Annual Open Interest, '000 of Contracts



ENDNOTES

This article uses material from a previous paper entitled "Facts and Fantasies about Commodity Futures Ten Years Later." The article has benefited from comments by seminar participants at the 2015 Bloomberg Global Commodity Investment Roundtable, the 2015 FTSE World Investment Forum, and from Rajkumar Janardanan, Kurt Nelson, Ashraf Rizvi, and Matthew Schwab.

[1]For references to the literature, see Tang and Xiong [2012] and Cheng and Xiong [2014].

[2]Bona fide hedging activity would be classified as a commercial position, and swap dealers laying off their OTC book in the futures markets would also be included in the category. If the futures hedges were for a commodity index swap, it would be recorded as a long commercial position, which is speculative in nature. This is a commonly mentioned drawback of the CFTC's Commitment of Traders report.

[3]Our equally weighted index tracks 38 commodities, several of which are not included in traditional benchmarks such as the S&P GSCI or the Bloomberg Commodity Index. However, our conclusions are not driven by these smaller commodity contracts. In fact, during the more recent decade, many of the smaller commodities showed poor performance, comparable to the performance of some commodities that have received a very large weight in these popular benchmarks.

[4]Basis is calculated as the inverse slope of the futures curve. If F^1 is the futures price of the front contract, and F^2 is the futures price of the next contract, the basis is calculated as $[(F^1-F^2)/F^1] \times 365/(T^2-T^1)$, where T^1 and T^2 refer to the time (in days) to expiration of the two contracts.

[5]See, for example, Fama and French [1987] and Erb and Harvey [2006]. This literature is surveyed by Rouwenhorst and Tang [2012].

[6]See Gorton, Hayashi, and Rouwenhorst [2013] for more details.

[7]For example, see Tang and Xiong [2012]. This literature is surveyed by Cheng and Xiong [2014].

[8]The importance of this variable is in line with other more recent research. Gilchrist and Zakrajšek [2012] studied the predictive power of credit spreads for business cycle fluctuations. Philippon [2009] also shows the predictive content of corporate bond spreads for the real economy. Others have studied predicting asset returns with default spreads. Chen, Roll, and Ross [1986], Keim and Stambaugh [1986], Fama and French [1989], and other researchers have documented the ability of the ex-ante default premium in the bond market to forecast realized asset returns due to risk premiums that vary with the business cycle.

[9]For example, King and Wadhawani [1990] test for an increase in stock market correlations between the United States, the United Kingdom, and Japan following the 1987 U.S. market crash. They find a significant increase in cross-market correlations. Campbell et al. [2001] show that the average pairwise correlations of individual stocks on the NYSE and NASDAQ are trending downwards, because of an increase in idiosyncratic volatility. However, the correlations increase in recessions. Aggregate market volatility is countercyclical.

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