COMMODITY INDEX INVESTING AND COMMODITY FUTURES PRICES[1]

by

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September 10, 2009

[1] This research was supported by a grant from Gresham Investment Management LLC.

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Recently, commodity index investing has come under attack. A Staff Report by the U.S. Senate Permanent Subcommittee on Investigation (hereafter, the "subcommittee report") "…finds that there is significant and persuasive evidence to conclude that these commodity index traders, in the aggregate, were one of the major causes of 'unwarranted changes'—here increases—in the price of wheat futures contracts relative to the price of wheat in the cash market." (See subcommittee report (2009, p.2).) The purpose of this study is to provide a comprehensive evaluation of whether commodity index investing is a disruptive force not only in the wheat futures market in particular but in the commodity futures market in general.

The study has four main sections. In the first, we examine the practice of commodity index investing, beginning with an explanation of the economic rationale for including a commodity index investment in institutional portfolios such as those of pension funds and university endowments. The rationale is simple. The returns of commodity index investments are uncorrelated with the returns of traditional assets such as stocks and bonds, and, therefore, provide a significant opportunity to reduce the risk of traditional investment portfolios. This diversification opportunity together with the advent of deep and highly active commodity futures markets has led to considerable growth in commodity index investment over the past decade. Commodity index products have a variety of forms including managed funds, ETFs, ETNs, and OTC return swaps. Many are benchmarked to well-diversified and transparent commodity indexes like the Standard & Poor's–Goldman Sachs Commodity Index (S&P-GSCI) and the Dow Jones-UBS Commodity Index (DJ-UBSCI) and nearly all of them are based on passive, long-only, fully collateralized commodity futures positions. Based on the composition of these indexes, CFTC Commitments of Traders (COT) Supplemental reports that include the positions of Commodity Index Traders (CIT), and futures prices from the respective exchanges, we estimate the total commodity index investment in the U.S. is currently about $174 billion, which is roughly consistent with the CFTC (2008) estimate of $161 billion. About 24% of commodity index investors are index funds, 42% institutional

traders, 9% Sovereign wealth funds, and 25% retail investors holding exchange-traded commodity index products.

The second section focuses on the general issue of whether commodity index investing "causes" futures price changes. Since commodity index investing involves a portfolio of commodities, we include a broad range of commodities in our analyses. Six analyses are performed. First, we examine the co-movements of futures prices for commodities known to be part of commodity index investing programs. Since the commodity index investing involves the simultaneous purchase of a portfolio of commodities, we should expect to see a high degree of contemporaneous correlation in futures price movements through time. Second, we examine the co-movements of futures prices known not to be part of commodity index investing programs. If non-index commodity futures prices behave like index commodity futures, commodity index investing is unlikely the cause. Third, we examine prices of five spot commodities that do not have futures contracts listed on them. Again, if spot commodities with no futures contracts and hence no involvement in commodity index investment programs have similar price behavior to index commodity futures, flows into commodity index investment portfolios are unlikely the cause. Fourth, we examine the impact of futures prices resulting from the periodic futures contract rolls that are necessary to mimic well-known commodity indexes such as the S&P-GSCI and DJ-UBSCI. In a roll month, the nearby futures contracts are sold and the second nearby contracts are purchased. If commodity index investing has futures price impact, the return of the second nearby futures contract should exceed the return of the nearby contract. Fifth, we examine whether the demand for long commodity index portfolios (measured by changes in open interest) "causes" futures prices to rise and vice versa. To test for causality, we examine whether weekly futures returns are related to lagged flows into commodity index investing. Sixth, we examine the contemporaneous relation between weekly futures returns and the flows of speculators and commodity index traders during periods when commodity index traders are known to be entering and exiting the market.

The third section focuses specifically on the Chicago Board of Trade's wheat futures contract market, which is at the heart of the subcommittee report analysis. We begin by showing how the definition of the basis used in the subcommittee report

exaggerates the degree of divergence between the futures and cash prices. After correcting for the methodological problems, we show that the wheat futures price did not always converge in the 2006-2009 period, particularly in late 2008. We then go on to examine the CBT's wheat convergence over a longer period of time and show that wheat has failed to converge in periods when the amount of commodity index investing is known to be negligible. In addition, we examine the convergence behavior of the CBT's corn and soybean futures contracts over the same period and find that, while neither corn nor soybeans have had as great of divergence as wheat, grain commodity futures in general seem to experience convergence anomalies at the same points in time. Finally, we address the issue whether the failure of the wheat futures price to converge to the cash price has any meaningful economic consequences and show that the CBT's wheat futures remains an effective tool for managing the price risk of wheat.

In the fourth and final section, we summarize our main conclusions. In brief, we conclude: (a) commodity index investment is not speculation, (b) commodity index rolls have little futures price impact, and inflows and outflows from commodity index investment do not cause futures prices to change, and (c) failure of the wheat futures price to converge to the cash price at the contract's expiration has not undermined the futures contract's effectiveness as a risk management tool.

I. Commodity Index Investing

Commodity index investing refers to the practice of buying baskets of commodities, albeit synthetically, to diversify an investment portfolio. The purpose of this section is to provide the backdrop for the analyses contained in the next two sections. This section has five parts. In the first, we provide the motives of commodity index investing. In the second, we discuss common forms in commodity index funds including managed funds, exchanged-traded funds and notes, as well as commodity return swaps. We also show how the demand for commodity index investment flows through to the commodity futures market. The third part then discusses two common benchmarks for commodity index portfolios. Just as the S&P 500 and Russell 1000 indexes serve as well-known benchmarks for the stock market, the S&P-GSCI and DJ-UBSCI serve as well-known benchmarks for the commodity market. These indexes also serve as reference assets in OTC commodity swaps. The fourth section describes in detail how we go about measuring the notional value of commodity index investing and the flow of funds into commodity index portfolios. The key source of data is the Commitment of Traders (COT) reports published weekly by the CFTC. These data serve as the basis of our analysis in Sections II and III of this report. The final section describes the results of a special call survey of swap dealers and commodity index funds conducted by the CFTC in June 2008 to understand better the nature of commodity futures trading and, in a sense, audit the information provided in its weekly Supplemental reports.

A. Motives for commodity index investing

Markowitz (1952), who is considered the father of "modern portfolio theory,"[1] developed a decision-making framework within which investors decide their investment portfolio allocations by considering the expected return and expected risks of all possible combinations of risky assets. The investor's investment goal, he argues, is to identify the set of portfolios that maximize expected return for a given level of risk,[2] so-called "efficient portfolios." Then, based on the investor's risk tolerance, a particular portfolio with its unique set of allocation weights is chosen from the efficient set.

[1] Based on this work, Markowitz received the Nobel prize in economics in the year 2000.
[2] The same set of portfolios is identified by minimizing risk for a given level of expected return.

Traditionally, the investments considered by institutional investors included only stocks, bonds, and cash. The reason is, of course, that these asset classes had deep and liquid markets with relatively low trading costs. Over the decades since the inception of modern portfolio theory, trading costs in all markets including stocks and bonds fell, thereby promoting market liquidity and depth and the advent of so-called "alternative investments." One such alternative investment is physical commodities. Its appeal is driven not by the promise of high expected returns. Indeed, the expected return of this asset class is closely tied to the expected rate of inflation, which is not typically high. The primary advantage of including commodities in an investment portfolio is that commodity returns are relatively uncorrelated with the returns of traditional asset classes. The absence of correlation is attributable in part to inflation. During periods of rising inflation, traditional asset categories like stocks and bonds languish and perform poorly. Commodities, on the other hand, generally perform well. Increased demand for goods and services (i.e., rising inflation) usually implies increased demand for the commodities used in the production of those goods and services (i.e., commodity returns). In other words, holding commodities in an investment portfolio is risk-reducing, induced in part from the fact that a commodity futures position is an inflation hedge.[3]

B. Forms of commodity index investing

Prior to the development of deep and liquid exchange-traded futures markets, physical commodities were seldom included in investment portfolios. The reason is simple. Physical commodities such as grain or crude oil are costly to buy and sell as well as store. After accounting for trading and storage costs, the expected returns from commodity investments were so low they outweighed the diversification benefits. What made commodity investment a viable asset class was the growth in trading volume of exchange-traded commodity futures contracts. During the period 1998 through 2007, the trading volume in exchange-traded commodity futures and futures options experienced a

[3] The diversification advantage of commodity investment is featured prominently in the promotional materials for commodity index funds. A description of PIMCO's Commodity Real Return Fund, for example, says "Because the performance of stocks and bonds can be affected by similar market factors, diversifying into non-correlated assets, or assets that have returns that are impacted by differing market factors such as commodities, may offset losses, hence reducing portfolio risk."

five-fold increase, with growth spread fairly uniformly across underlying asset categories.[4]

With deep and liquid commodity futures contracts, the returns of physical commodities can be generated synthetically. In place of buying a physical commodity such as wheat, we buy an equivalently-sized futures position and place the cash that we would have spent on the physical commodity in money market instruments. In an efficiently-functioning marketplace, the rate of return and risk of the fully-collateralized futures position should be the same as the underlying commodity.

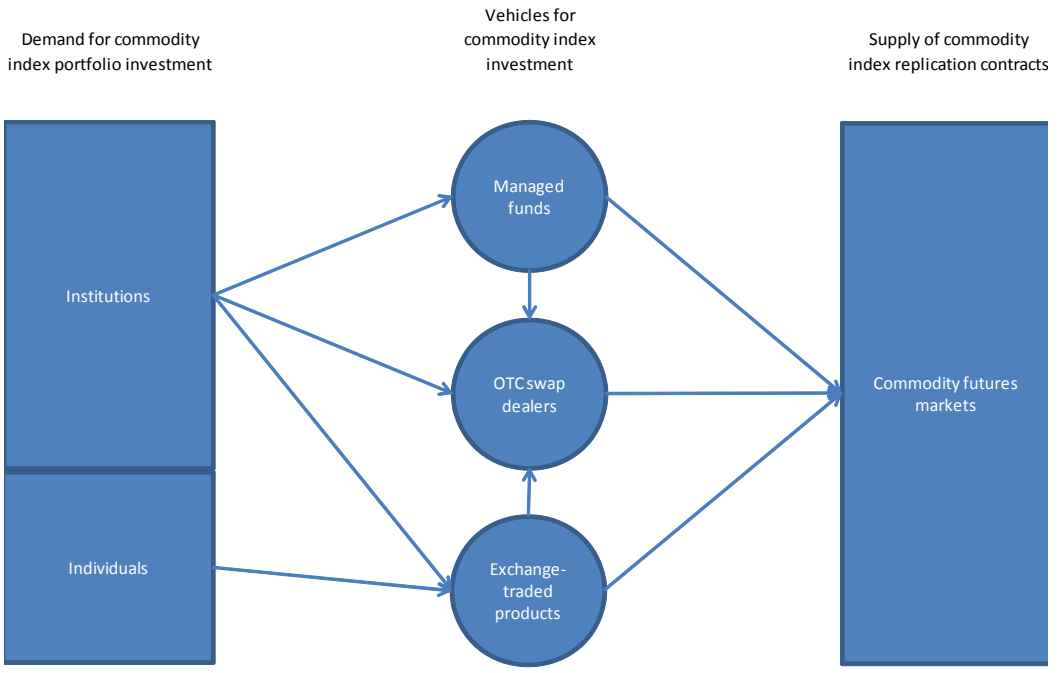
Trading commodity futures seems to have replaced one problem (i.e., the illiquidity and costs of trading in the commodity market directly) with another (i.e., most institutional investors do not have the sophisticated trading operations necessary to manage a diversified commodity index portfolio using futures contracts).[5] The solutions were twofold—commodity index funds and commodity return swaps. With commodity index funds, institutional investors pool their commodity investment with a single fund manager and the manager agrees to manage the portfolio in a manner that mimics a well-diversified commodity index portfolio benchmark. With OTC commodity return swaps, institutional investors do similarly by entering an agreement to receive the rate of return on a specified commodity index portfolio and posting the investment funds as collateral. In both cases, the investment is passive in the sense that there is no attempt to beat the market through market timing or identifying under-priced commodities. The trading rules for index replication are well-defined, with expiring futures contract positions rolled into new contract positions on a pre-determined basis. The specific allocations to the different commodity futures are also pre-determined, with the weights varying by the importance of the commodity in the marketplace (e.g., the physical production of the commodity) and the liquidity of the futures contracts written on the commodity. This practice has become known as commodity index trading although the expression is a misnomer. Trading carries with it a connotation of buying and selling of securities or commodities, hoping to make a quick profit. Given the buy-and-hold, fully-collateralized nature of this investment allocation, a more accurate term is commodity index investing.

[4] See CFTC (2008, p.8).
[5] Indeed, many institutional traders are barred from trading futures contracts.

Diversifying traditional investment portfolios with commodity investment has been practiced by large institutional investors such as pension funds and endowment funds for more than a decade, and the practice continues to grow. In recent years, an attempt has been made to capture the individual investor demand for commodity-like investment using exchange-traded funds and notes. Exchange-traded funds (ETFs) are like mutual fund shares that trade on a stock exchange and are structured in such a way that the price of the shares reflects the value of the index upon which it is based. Commodity-based exchange-traded notes (ETNs) are debt securities whose price is linked to an underlying index. On the maturity date of the note, the issuer of the note promises to pay the holder of each share of the note the value of a specified commodity index less a management fee.

Figure I-1 is a schematic showing the relation between the institutional and individual demand for commodity index portfolios and the supply of commodity index portfolio replication contracts as provided by the commodity futures market. In general, institutions channel their commodity index investment to managed funds or OTC swap agreements. Individuals, on the other hand, generally have only exchange-traded commodity index products in their investment opportunity set. Managed funds, OTC swap dealers, and exchange-traded funds are then required to provide the return of a commodity index benchmark. The OTC dealer does so directly by buying commodity futures contracts to hedge its short commodity exposure. Managed funds and exchange-traded funds can, like the OTC swap dealer, synthetically replicate the returns of a commodity index using futures contracts, or they can simply enter into an agreement with a commodity swap dealer that provides such returns, whichever is cheaper. In the latter case, the swap dealer, again, hedges the demand from commodity funds directly in the futures market. The sizes of the leftmost and rightmost boxes in Figure I-1 are identical. The demand for expected return/expected risk characteristics of commodity index portfolios equals the supply of those characteristics with fully-collateralized positions in the futures market. While the conduits for gathering the commodity exposure may vary, the effect is the same.

Figure I-1: Schematic of the relation between the demand for commodity index portfolio products and the supply of commodity index replication contracts by the futures market. The vehicles for commodity index investment include managed funds, OTC swaps, and exchange-traded products.



C. *Commodity index portfolios*

Up to this point, the term "commodity index portfolio" has been used in a generic sense. Over the past decade, two commodity indexes have emerged as industry benchmarks—the Standard and Poor's–Goldman Sachs Commodity Index (S&P-GSCI) and the Dow Jones–UBS Commodity Index (DJ-UBSCI).[6] The S&P-GSCI index is the oldest commodity index with its price levels dating back to August 1989. Its weights are determined on the basis of world production of the underlying commodities. Because the index is designed to be "tradable," futures markets representing each particular commodity are deep and liquid. Data for the DJ-UBSCI are available dating back to October 1991. Dow emphasizes the tradability of its index by placing higher weights on commodities with highly active futures markets. To avoid overexposure to any particular

[6] This index was formerly known as the Dow Jones–AIG Commodity Index or DJ-AIGCI.

commodity, Dow limits sector investment to 33% of the index. Conversely, no commodity included in the index can constitute less than 2% of its market value.

Both the S&P-GSCI and the DJ-UBSCI are reasonably well-diversified. Table I-1 shows the market value weights of the commodities in the index as of July 2009. The S&P-GSCI weights are actual market value weights as of the close of trading on July 14, 2009. The DJ-UBSCI weights are the targets market value weights for the index set by Dow Jones at the beginning of the year. The S&P-GSCI has 24 different commodities included in it, compared to the DJ-UBSCI's 19. That is not to say that the S&P index is better diversified than the DJ index, however. Over the period January 3, 2000 through August 10, 2009, the annualized standard deviation of the daily total returns of the S&P-GSCI was 25.9%, compared with 17.8% for the DJ-UBSCI index. The reason is that the S&P-GSCI, as noted above, is production-weighted and therefore very heavily in the energy sector, with 68% of its market value coming from crude oil, crude oil products, and natural gas. The DJ-UBSCI, on the other hand, limits its exposure in any one commodity sector to 33%. The energy sector is the largest, and, as the table shows, is at its cap. Agricultural commodities such as grains and livestock account for nearly as large a portion at 29%. Differences in the weights assigned to each commodity make the indexes less than perfect substitutes. During the period January 3, 2000 through August 10, 2009, the correlation between their daily returns was 0.918. Also included in the table are the exchange where the specific commodity futures contracts used in the indexes are traded and the futures ticker symbol.

Table I-1: Market value weights of the commodities in the S&P-GSCI and DJ-UBSCI commodity indexes as of July 2009.

Sector	Commodity	Exchange	Ticker	S&P - GSCI Actual weights	DJ - UBSCI Target weights
Agriculture	Cocoa	CSC	CC	0.40%	
Agriculture	Coffee "C"	CSC	KC	0.76%	2.97%
Agriculture	Corn	CBT	C	3.55%	5.72%
Agriculture	Cotton #2	NYC	CT	1.19%	2.27%
Agriculture	Wheat (Kansas)	KCBT	KW	0.82%	
Agriculture	Soybean oil	CBT	BO		2.88%
Agriculture	Soybeans	CBT	S	2.64%	7.60%
Agriculture	Sugar	CSC	SB	2.33%	2.99%
Agriculture	Wheat (Chicago)	CBT	W	3.90%	4.80%
Energy	Oil (Brent crude)	IPE	LO	13.25%	
Energy	Oil (WTI crude)	NYM	CL	37.51%	13.75%
Energy	Oil (GasOil)	IPE	QS	4.54%	
Energy	Oil (#2 Heating)	NYM	HO	4.19%	3.65%
Energy	Natural gas	NYM	NG	4.14%	11.89%
Energy	Oil (RBOB)[1]	NYM	RB	4.75%	3.71%
Industrial metals	Aluminum (High grade primary)	LME	AH	2.33%	7.00%
Industrial metals	Copper	LME	CA	3.22%	7.31%
Industrial metals	Lead	LME	PB	0.45%	
Industrial metals	Nickel	LME	NI	0.78%	2.88%
Industrial metals	Zinc (Special high grade)	LME	ZS	0.60%	3.14%
Livestock	Feeder cattle	CME	FC	0.61%	
Livestock	Lean hogs	CME	LH	1.51%	2.40%
Livestock	Live cattle	CME	LC	3.19%	4.29%
Precious metals	Gold	CMX	GC	3.01%	7.86%
Precious metals	Silver	CMX	SI	0.32%	2.89%
Total weights				99.99%	100.00%
Total number of commodities				24	19

Sector	S&P - GSCI Actual weights	DJ - UBSCI Target weights
Agriculture	15.59%	29.23%
Energy	68.38%	33.00%
Industrial metals	7.38%	20.33%
Livestock	5.31%	6.68%
Precious metals	3.33%	10.75%
Total	99.99%	100.00%

[1]Both the S&P-GSCI and DJ-UBSCI rolled from the NYM's unleaded gasoline futures contract (HU) to the RBOB gasolines futures contract (RB) in 2006.

Unlike stock indexes whose membership stays relatively constant through time, the composition of commodity price indexes changes as futures contracts expire. Before this happens, the nearby futures contracts in a particular commodity are sold and more distant futures contracts are purchased. For the S&P-GSCI and DJ-UBSCI, the hedge roll period is defined as the fifth through ninth business days of a month. During this five-day "roll period," the index mechanically rolls from one contract to the next at a uniform rate.[7] In general, the next out contract will be the second nearby contract, however, for certain commodities, the second nearby may have insufficient liquidity for the roll, in which case the third or fourth nearby contract may be used. Both Standard and Poor's and Dow Jones have made deliberate judgments regarding the specific calendar months to use in each commodity futures market, and these are summarized in Table I-2. The table entries designate what calendar month is held in the index at the beginning of the month. Consider the February entry for the CBT's wheat futures contract. The number 3 indicates that the March futures contract is included in the index at the beginning of February (in both the S&P-GSCI and DJ-UBSCI indexes). The fact that the March entry is 5 indicates that the May futures is included in the index at the beginning of March, so the wheat futures position is rolled from the March to the May contract months during the February roll period. Note that, for most commodities, S&P-GSCI and DJ-UBSCI roll contracts in the same manner. For some commodities, however, the roll patterns are different. With crude oil (CL) and natural gas (NG), the DJ-UBSCI does not use the even-numbered contract months, presumably due to greater trading activity and market depth in the odd-numbered months.

[7] Spreading the trades over a five-day period mitigates the price impact in the futures, as does the public disclosure of the mechanical trading rules.

Table I-2: Timing of futures contracts rolls for the S&P-GSCI and DJ-UBSCI commodity indexes. Rolls are executed at a uniform rate over the fifth through ninth business days during the month. The numbers in the table designate the futures contract month in the index as of the beginning of the month (e.g., the CBT wheat contracts are rolled from the March contract to the May contract in February each year for both the S&P-GSCI and DJ-UBSCI).

Panel A: S&P-GSCI

Ticker	Exchange	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
W	CBT	3	3	5	5	7	7	9	9	12	12	12	3
KW	KCBT	3	3	5	5	7	7	9	9	12	12	12	3
C	CBT	3	3	5	5	7	7	9	9	12	12	12	3
S	CBT	3	3	5	5	7	7	11	11	11	11	1	1
KC	CSC	3	3	5	5	7	7	9	9	12	12	12	3
SB	CSC	3	3	5	5	7	7	10	10	10	3	3	3
CC	CSC	3	3	5	5	7	7	9	9	12	12	12	3
CT	NYC	3	3	5	5	7	7	12	12	12	12	12	3
LH	CME	2	4	4	6	6	7	8	10	10	12	12	2
LC	CME	2	4	4	6	6	8	8	10	10	12	12	2
FC	CME	3	3	4	5	8	8	8	9	10	11	1	1
HO	NYM	2	3	4	5	6	7	8	9	10	11	12	1
QS	IPE	2	3	4	5	6	7	8	9	10	11	12	1
XB	NYM	2	3	4	5	6	7	8	9	10	11	12	1
CL	NYM	2	3	4	5	6	7	8	9	10	11	12	1
LO	IPE	3	4	5	6	7	8	9	10	11	12	1	2
NG	NYM	2	3	4	5	6	7	8	9	10	11	12	1
LA	LME	2	3	4	5	6	7	8	9	10	11	12	1
LP	LME	2	3	4	5	6	7	8	9	10	11	12	1
LL	LME	2	3	4	5	6	7	8	9	10	11	12	1
LN	LME	2	3	4	5	6	7	8	9	10	11	12	1
LX	LME	2	3	4	5	6	7	8	9	10	11	12	1
GC	CMX	2	4	4	6	6	8	8	12	12	12	12	2
SI	CMX	3	3	5	5	7	7	9	9	12	12	12	3

Panel B: DJ-UBSCI

Ticker	Exchange	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
W	CBT	3	3	5	5	7	7	9	9	12	12	12	3
BO	CBT	3	3	5	5	7	7	12	12	12	12	1	1
C	CBT	3	3	5	5	7	7	9	9	12	12	12	3
S	CBT	3	3	5	5	7	7	11	11	11	11	1	1
KC	PIT	3	3	5	5	7	7	9	9	12	12	12	3
SB	PIT	3	3	5	5	7	7	10	10	10	3	3	3
CT	PIT	3	3	5	5	7	7	12	12	12	12	12	3
LH	CME	2	4	4	6	6	7	8	10	10	12	12	2
LC	CME	2	4	4	6	6	8	8	10	10	12	12	2
HO	NYM	3	3	5	5	7	7	9	9	11	11	1	1
XB	NYM	3	3	5	5	7	7	9	9	11	11	1	1
CL	NYM	3	3	5	5	7	7	9	9	11	11	1	1
NG	NYM	3	3	5	5	7	7	9	9	11	11	1	1
LA	LME	3	3	5	5	7	7	9	9	11	11	1	1
HG	CMX	3	3	5	5	7	7	9	9	12	12	12	3
LN	LME	3	3	5	5	7	7	9	9	11	11	1	1
LX	LME	3	3	5	5	7	7	9	9	11	11	1	1
GC	CMX	2	4	4	6	6	8	8	12	12	12	12	2
SI	CMX	3	3	5	5	7	7	9	9	12	12	12	3

D. Notional value of commodity index investments

Measuring the total notional value of commodity index investment is critical in developing an understanding of the relation between net flows into commodity index programs and price movements in the underlying commodity markets. Measuring the value of commodity index investment, in its many forms, can be problematic. While detailed information about exchange-traded commodity funds and notes is available, detailed information about managed funds and OTC swap agreements is not. But, since demand for commodity index portfolios must equal supply (as shown in Figure I-1), we can use information from the futures markets to infer not only the size of the commodity investment market, but also the inflows and outflows from the market. Below we describe how such inferences can be made.

1. Commitment of Trader reports

The timeliest source of information regarding commodity index investing in the U.S. is the Commitments of Traders (COT) reports published weekly by the Commodity Futures Trading Commission (CFTC). These reports show the aggregate trader positions in certain futures and options markets. The COT reports contain a breakdown of each Tuesday's open interest for markets in which 20 or more traders hold positions equal to or above the reporting levels established by the CFTC. Trader position information is collected daily from reporting firms, clearing members, futures commission merchants, and foreign brokers. Reporting firms are required to file daily reports of the futures and option positions of traders who hold positions above specific reporting levels set by CFTC regulations. If, at the daily market close, a reporting firm has a trader with a position at or above the Commission's reporting level in any single futures month or option expiration, it must report that trader's entire position in all futures and options expiration months in that commodity, regardless of size. The aggregate of all traders' positions reported to the Commission usually represents 70 to 90 percent of the total open interest in any given market. The reporting levels are adjusted from time to time as the nature of trading in a particular market evolves. The CFTC's current reporting levels are shown in Table I-3. In the wheat futures and options contract market, for example, trader positions of 150 contracts or more are reported to the CFTC each day.

Table I-3: Reporting levels of selected U.S. futures contracts as set by the Commodity Futures Trading Commission as of July 5, 2006. If, at the daily market close, a trader has a position at or above the CFTC's reporting level in any single futures month or option expiration, his/her broker must report the entire position in all futures and options expiration months in that commodity, regardless of size.

Sector	Commodity	Number of contracts
Agriculture	Cocoa	100
Agriculture	Coffee	50
Agriculture	Corn	250
Agriculture	Cotton	100
Agriculture	Frozen concentrated orange juice	50
Agriculture	Oats	60
Agriculture	Rough rice	50
Agriculture	Soybean meal	200
Agriculture	Soybean oil	200
Agriculture	Soybeans	150
Agriculture	Sugar No. 11	500
Agriculture	Sugar No. 14	100
Agriculture	Wheat	150
Energy	Crude oil, sweet	350
Energy	Natural gas	200
Energy	No. 2 Heating oil	250
Energy	Unleaded gasoline	150
Industrial metals	Copper	100
Industrial metals	Gold	200
Livestock	Feeder cattle	50
Livestock	Lean hogs	100
Livestock	Live cattle	100
Precious metals	Platinum	50
Precious metals	Silver bullion	150

Three different COT reports are released every Friday at 3:30 p.m. Eastern time. The Futures-only reports have the longest history and are available electronically dating back to the beginning of 1986. The Futures-only report contains a breakdown of the open interest by commodity contract market. The report shows open interest separately by reportable and non-reportable positions. By definition, reportable positions are for large traders. Conversely, non-reportable positions are those of small traders. Reportable positions are then broken down by long and short commercial and noncommercial holdings and spreading. The CFTC staff classifies a trader as commercial or

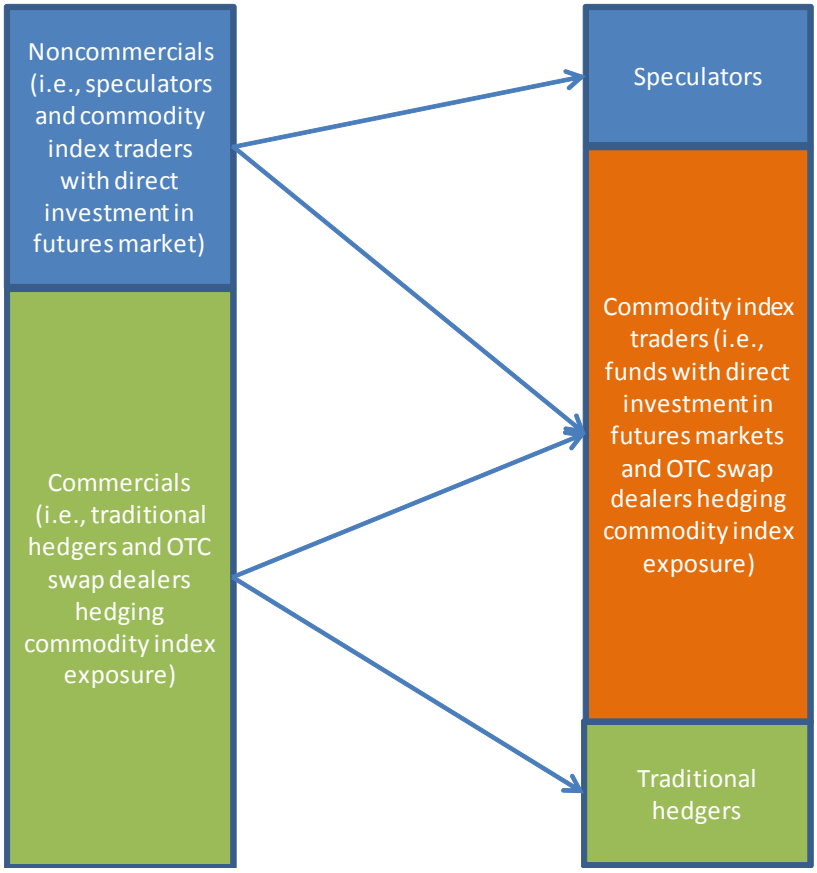
noncommercial when the trader's position first exceeds the commodity's reportable level. A trading entity[8] generally gets classified as a commercial if the CFTC Form 40 that it is required to file with the Commission states that the entity is "…commercially engaged in business activities hedged by the use of futures or options markets." In order to ensure that traders are classified with accuracy and consistency, the Commission staff reviews this self-classification and may reclassify a trader if the staff has additional information about the trader's use of the markets. Spreading measures the extent to which each noncommercial trader holds equal long and short futures positions.

The Options-and-Futures reports, available electronically since 1995, contain the same fields as the Futures-only reports, except that open interest includes not only futures but also futures options contracts. In aggregating across open positions, option open interest is converted to a futures-equivalent basis using delta factors supplied by the exchanges. Long-call and short-put open interest are converted to long futures-equivalent open interest, and short-call and long-put open interest are converted to short futures-equivalent open interest.

Most important from our standpoint is the CFTC's Supplemental report. Since 2006, the CFTC has reported the holdings of commodity index traders (CIT) separately from the standard noncommercial and commercial categories for 12 agricultural and livestock commodity futures.[9] To understand how this works, consider Figure I-2. The bar on the left shows the total long open interest of noncommercial and commercial traders as reported in the Futures and Options report. We are considering *long* open interest because commodity index traders (CIT, as labeled by the CFTC), are generally *long-only*. In the Options-and-Futures report, CIT positions were intermingled with other noncommercial (i.e., speculators) and commercial (i.e., traditional hedgers) traders.

[8] Note that it is the trader that is classified, not each individual transaction.
[9] See CFTC (2006, pp. 9-10).

Figure I-2: Schematic of reapportioning of the open interest reported in the CFTC Commitment of Traders reports for long noncommercial and commercial traders into speculator, commodity index trader, and hedger categories.



In the Supplemental report, the total long open interest of noncommercial and commercial traders remains the same, however, the noncommercial category is partitioned into speculators and commodity index traders, and the commercial category is partitioned into traditional hedgers and commodity index traders. The commodity index traders classified as noncommercials are managed funds, pension funds, ETFs and ETNs, and other institutional investors seeking a long commodity index exposure. The commodity index traders classified as commercial are financial institutions such as OTC swap dealers who sell commodity index return swaps to institutional investors and then hedge by taking long positions in commodity futures.

To illustrate the mechanics of Figure I-2, the open interest figures reported in the Options and Futures (*OF*) and Supplemental (*S*) reports for the CBT's wheat futures

contract market on June 30, 2009. They are displayed in Panel A of Table I-4. On Tuesday, June 30, 2009, the total open interest, reported in both the *OF* and *S* reports, was 383,387 contracts. Reported in the second row of Panel A are the open positions of long noncommercial traders (i.e., long speculators and long commodity index traders with direct positions in the futures market). The number drops from 80,569 in the *OF* report to 43,416 in the *S* report. The difference, 37,153, is the number of contracts of traders who are long noncommercials engaged in commodity index investing and is part of the total open interest of all long commodity index traders for that day, 170,256, as reported in the second last row of Panel A. Providing this breakdown of the noncommercial category is critical. Traditionally, the traders in the noncommercial category have been characterized as "speculators" by default since the traders in the commercial category are hedgers. But, with the advent and growth of commodity index investing, this characterization is misleading. Commodity index investors are not speculators. They do not take a directional view on commodity prices. They simply buy-and-hold futures contracts to take advantage of the risk-reducing properties they provide. Speculators, on the other hand, have a directional view, and take long (or short) positions accordingly. The Supplemental report now tells us the difference. On this day, 43,416 of the 80,569 long noncommercials were long speculators and 37,153 were long commodity index traders.

One of the more interesting results shown in Table I-4 (and in the Supplemental reports in general) is that the OTC swap dealers are by far the largest group of commodity index traders. To see this, note first that the total open interest of long commercials, as reported in the *OF* report is 176,016 contracts. After long commodity index traders are pulled from this category, the *S* report shows 44,944 contracts remain. This means that, of the 176,016 long commercial contracts, 131,072 were held by OTC swap dealers who are hedging short positions in commodity index rate-of-return swaps by going long the underlying futures contracts.

Table I-4: Selected fields from the CFTC's Options and Futures and Supplemental reports for CBT's wheat options and futures on June 30, 2009. Data are obtained from the web link,
http://www.cftc.gov/marketreports/commitmentsoftraders/cot_historical.html.

Panel A: Data reported in CFTC reports

	Long-only open interest	
Market participant position	From Futures and Options report	From Supplemental report
Total open interest	383,387	383,387
Noncommercials	80,569	43,416
Spreaders	97,271	95,240
Commercials	176,016	44,944
Small traders	29,532	29,532
Commodity index traders		170,256

Panel B: Reconciliation between reports in number of contracts

	Long-only open interest	
Source of CIT trades	Contracts	Percent of total
Noncommercials	37,153	21.8%
Spreaders	2,031	1.2%
Commercials	131,072	77.0%
Small traders	0	0.0%
Total	170,256	100%

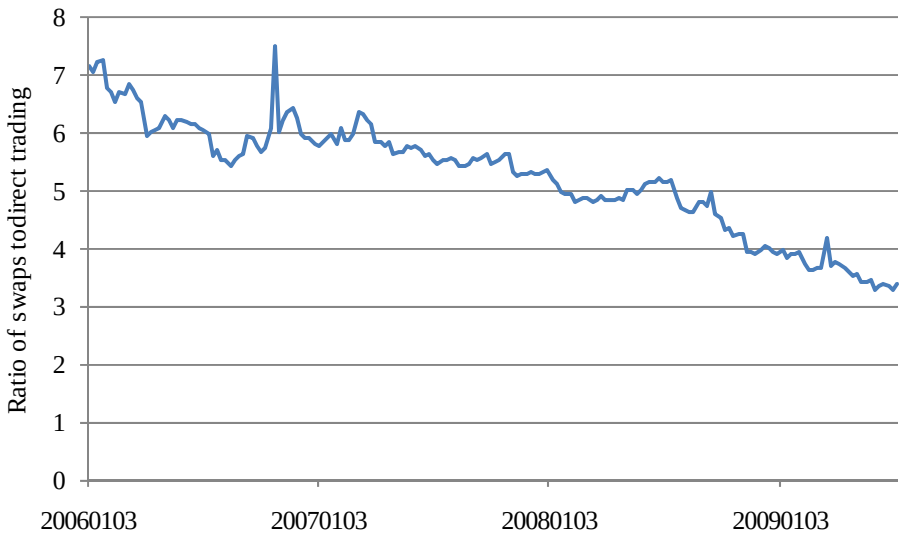
Panel B summarizes the results. Of the 170,256 long open interest categorized as commodity index trader (CIT) contracts, 37,153 or 21.8% are direct positions in the futures market by commodity index funds like managed funds, ETFs, and ETNs, and 77.0% are indirect positions conveyed through the hedging activities of OTC swap dealers.[10] In other words, in the wheat market on June 30, 2009, commodity index investing through return swaps in the OTC market was more than 3.5 times higher than through funds.

To see the relative trading activity across commodities and through time, we compute the ratio of CIT swap trading to CIT direct investments for each commodity each week and then average across commodities each week during the period January 2006 through June 2009. Figure I-3 shows the results. Early in the period, the lion's share

[10] The 2,031 accounted for by spreaders is inconsequential for our purposes. In most weeks, the number appears in the Supplemental report as 0.

of CIT positions was held by swap dealers, seven times more than by direct investment. Over the three and a half year period, however, the ratio has dropped as a result of the growth in managed commodity funds, ETFs, and ETNs.

Figure I-3: Ratio of commodity index investing through commodity swaps to direct commodity index investing during the period January 2006 through June 2009. Computed from data in the weekly CFTC Commitments of Trader Option and Futures and Supplemental files and futures prices from the CBT, CME, CSC, KCBT and NYC. Twelve agricultural and livestock commodity futures are tracked. Ratios are computed for each commodity each week, and are averaged across commodities.



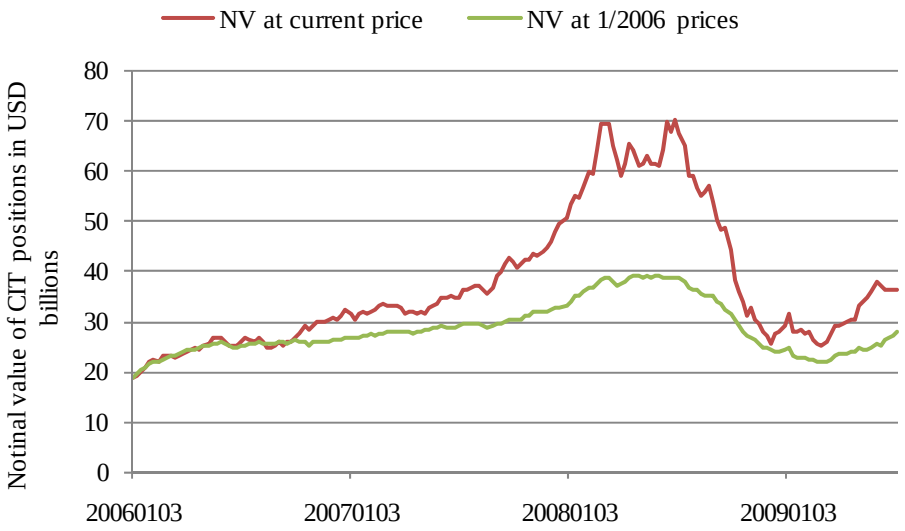
2. Monitoring commodity index investment

The value of the COT reports in assessing not only the notional value of commodity index investment but also in determining the size of inflows and outflows quickly becomes apparent. In Figure I-4, we plot the notional value of CIT positions on a week-by-week basis from January 2006 through July 2009. Two lines are shown. The first is the actual dollar value of long-only commodity index trader positions each week. This number is computed in two steps. First, we take the reported open interest for each commodity, multiply by its contract denomination, and then multiply by the futures price. Since the COT data does not specify futures contract months, we use the nearby futures contract price for all reported open interest. Second, we sum across the notional values of each commodity to determine the notional value of all contracts. At the beginning of 2006, the notional value of commodity index investing in these 12 agricultural and

livestock commodity futures is shown to be about $20 billion. The activity grew steadily through the beginning of 2008 to a level of about $50 billion, and then spiked up to $70 billion and stayed there for a few months. Then, as precipitously as it spiked up, it fell back to a level of at about $30 billion by the beginning of 2009.

On face appearance, this evidence appears to suggest that commodity index investing rose dramatically during the period and then backed off. But, part of it is illusion. Fact of the matter is that commodity prices rose precipitously in 2008. To separate growth in prices from inflows into commodity index investing, we again compute notional value, but this time using the commodity futures prices on the first date in the figure, January 3, 2006. A different picture emerges, as is shown in Figure I-4. Commodity investment begins at a level of $20 billion in 2006, rises at slow steady rate through mid-2008, peaks at about $40 billion, slowly falls through the beginning of 2009, and begins to rise again. Overall the figure is instructive in at least two ways. First, while commodity index investing doubled over the two-year period from January 2006 to January 2008, it did not more than triple, as indicated by the red line in the figure. Great care must be taken in separating price movements from net flows. Second, the growth in commodity index investment is steady. Decisions regarding commodity index investment are very deliberate asset allocation decisions made by institutions trying to manage risk. As such, they take place slowly through time.

Figure I-4: Notional value (NV) of long-only CIT open interest using contemporaneous and January 3, 2006 futures prices during the period January 2006 through June 2009. Notional value for each commodity is computed by taking the product of the long-open interest of the long-only commodity index traders reported in the weekly CFTC Commitments of Trader Supplemental report, the contract denomination, and the nearby futures contract price. The notional values are then summed across commodities to determine total notional value of commodity index investing. Twelve agricultural and livestock commodity futures are tracked.



Documenting an increase in long-only commodity index investing in isolation, however, can be deceiving. While Figure I-4 does show that long-only commodity index investing doubled from 2006 to 2008, it did not increase relative to the total open interest in the market. Both grew at about the same rate. To see this, consider Figure I-5 which shows the average ratio of long-only CIT open interest to total open interest across commodities each week. At the beginning of 2006, commodity index traders accounted for about 26% of the total long open interest of a typical commodity. In June 2009, the number was only slightly higher at about 30%. The figure at the bottom shows short commodity index positions relative to total open interest. The line at the bottom of the figure shows that short-only commodity index investing activity is negligible through the beginning of 2008, and then begins to increase. The increase is attributable in part, no doubt, to a new generation of exchange-traded funds based on the inverse return of commodity indexes. It may also be attributable to certain institutional investors shorting

futures against their long commodity index investment to reduce over-exposure to certain sectors.[11]

Figure I-5: Percentage of total open interest held by long and short commodity index traders during the period January 2006 through June 2009. Data are from weekly CFTC Commitments of Trader Supplement files. Twelve agricultural and livestock commodity futures are tracked. Percentages are average of ratios across commodities by week.

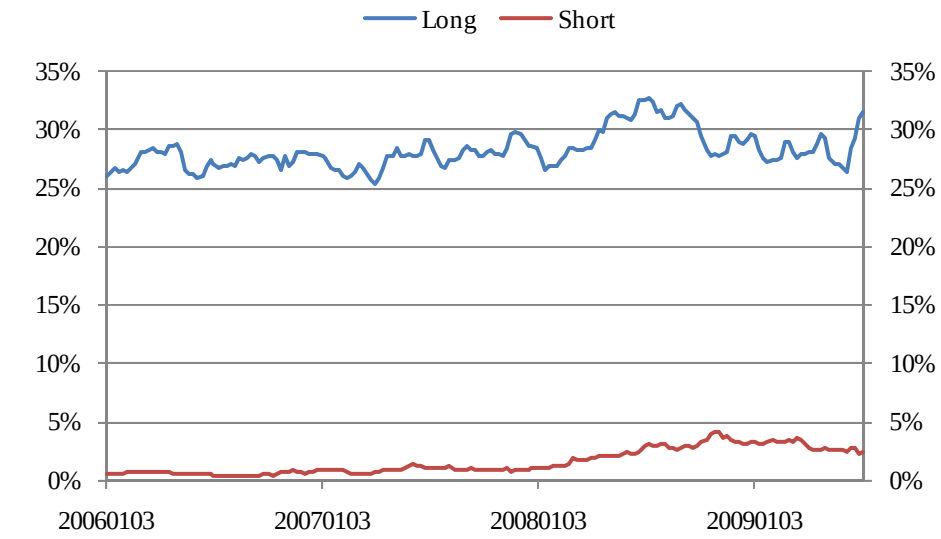


Table I-5 contains the average ratios of the weekly long CIT positions to total positions by commodity across the 184 weeks in the January 2006 through June 2009 period. The single highest ratio is for the CME's lean hog market where CIT positions account for an average of 42.51% of total open interest, ranging from a low of 30.89% to a high of 51.42%. The CBT's wheat market is next highest with CIT positions accounting for 41.15% of total open interest. The lowest ratio is for the CSC's cocoa contracts where CIT positions are about 12.5% of total. Based on the information provided in Table I-1, this should not be surprising. Only the S&P-GSCI holds cocoa, and its allocation is 0.40%.

[11] Suppose that a pension fund currently has a return swap linked to the S&P-GSCI and that the price of crude oil has recently spiked upward. To make the swap have the return properties of a more diversified commodity index exposure, the pension fund choose to sell crude oil futures contracts against the swap.

Table I-5: Percentage of total open interest held by long commodity index traders during the 184-week period January 2006 through June 2009. Data are from weekly CFTC Commitments of Trader Supplement files. Twelve agricultural and livestock commodity futures are tracked.

		Percent of open interest held by long commodity index traders		
Commodity	Exchange	Average	Minimum	Maximum
Wheat	CBT	41.15%	32.05%	51.78%
Wheat	KCBT	22.03%	12.30%	32.66%
Corn	CBT	22.98%	16.68%	30.07%
Soybeans	CBT	25.31%	19.77%	30.58%
Soybean meal	CBT	23.34%	17.84%	31.70%
Cotton No.2	NYC	31.59%	21.13%	43.94%
Lean hogs	CME	42.51%	30.89%	51.42%
Live cattle	CME	38.97%	27.24%	47.22%
Feeder cattle	CME	25.08%	14.09%	35.16%
Cocoa	CSC	12.47%	6.19%	19.70%
Suger No.11	CSC	27.77%	15.50%	37.69%
Coffee C	CSC	24.21%	18.89%	34.61%

Table I-6 contains the notional value of the open interest of commodity index traders as of the close of trading on June 30, 2009. The figures reported for each commodity are computed as the product of open interest, contract denomination, and the 6/30/09 futures price. The total market value of $36.3 billion is the value of commodity index open interest across the 12 commodities followed by the CFTC in the Supplemental reports. This value can be used to estimate the total market value of all commodity index investing. If we assume that all commodity index investing in the Supplemental reports is based on the S&P-GSCI,[12] for example, and then use the fact that the 12 commodities account for 20.90% of the market value of the S&P-GSCI (see Table 1), the total notional value of commodity index investing is $36.3/0.2090 or $173.8 billion. The implied index weight for the CBT's wheat futures contract, for example, is 2.53% if all commodity index investing is linked to the S&P-GSCI. Table I-1 shows that this compares to Standard and Poor's actual weight for this wheat futures contract, 3.90%, which is reported in Table I-1.

[12] Generally speaking, more commodity index funds are benchmarked against the S&P-GSCI than the DJ-UBSCI. The Dow index, however, is gaining in popularity because it is better diversified.

Table I-6: Total market value of contracts outstanding for the 12 commodity futures reported in the CFTC's Supplemental file on June 30, 2009. The market value outstanding is the product of the total open interest, the contract denomination, and the nearby futures contract price.

Commodity	Exchange	Ticker symbol	Notional value of contracts outstanding	Percent of total notional value	Implied index weights S&P - GSCI	Implied index weights DJ - UBSCI
Wheat	CBT	W	4,392,604,800	12.09%	2.53%	4.34%
Wheat	KCBT	KW	794,089,062	2.19%	0.46%	0.78%
Corn	CBT	C	6,102,931,900	16.79%	3.51%	6.03%
Soybeans	CBT	S	9,522,782,500	26.21%	5.48%	9.41%
Soybean oil	CBT	BO	1,388,780,190	3.82%	0.80%	1.37%
Cotton No.2	NYC	CT	1,788,173,650	4.92%	1.03%	1.77%
Lean hogs	CME	LH	1,437,941,664	3.96%	0.83%	1.42%
Live cattle	CME	LC	3,116,530,872	8.58%	1.79%	3.08%
Feeder cattle	CME	FC	377,819,475	1.04%	0.22%	0.37%
Cocoa	CSC	CC	4,530,623	0.01%	0.00%	0.00%
Suger No.11	CSC	SB	5,550,311,894	15.27%	3.19%	5.49%
Coffee C	CSC	KC	1,862,498,156	5.13%	1.07%	1.84%
Total			36,338,994,786		20.90%	35.92%

E. Special call survey of swap dealers and index traders

The CFTC's Commitment of Traders Supplemental reports are very useful to the extent that they provide timely (i.e., weekly) snapshots of the level of commodity index investing. They have two weaknesses, however. First, they cover only 12 of the 33 U.S. exchange-traded commodity futures markets that are used in the construction of the well-diversified commodity index portfolios. Second, the CIT positions contain error. As noted earlier, the long-only CIT open interest is drawn from the long-only open interest of noncommercials (e.g., index funds) and the long-only open interest of commercials (e.g., commodity swap dealers). The error arises from the manner in which the CFTC classifies traders as commercial or noncommercial and as index traders.

As noted earlier, the CFTC staff classifies a trader as commercial or noncommercial when the trader's position first exceeds the commodity's reportable level. A wheat farmer is typically a hedger who sells futures to lock in the price of his future harvest and is therefore designated as a commercial. That same farmer may, from time to time, buy wheat futures to attempt to profit from his directional view that the wheat price will rise in the short run. This wheat position, too, would be designated as commercial.

At the same time, a trader may be classified as a commercial in some commodities and as a noncommercial in other commodities.

The classification of a trader as an index trader is done in a similar manner. If the trader appears to be replicating a commodity index by establishing long positions in the constituent commodity futures markets and then rolling the positions forward from futures to futures using a fixed methodology, he/she is earmarked as an index trader even though he may be engaged in other futures activity. At the same time, the commodity index trader category will not include some traders who are engaged in index investing, but for whom it does not represent a substantial part of their overall trading activity.

Due to the importance of measuring commodity index investing levels accurately, the CFTC issued a special call to large traders in June 2008. Specifically, they requested that 16 swap dealers known to have significant commodity index swap business, 13 swap dealers known not to have significant index swap business, and 14 commodity index funds (including asset managers and sponsors of ETFs and ETNs whose returns are based on a commodity index) provide detailed data about actual index investing for the month-ends December 2007 through June 2008, and then on an ongoing basis thereafter. While they received the data in a timely fashion, their analysis of the data was limited to only four commodities and the quarters ending December 31, 2007 through June 30, 2008.[13] We highlight some of the results for the quarter ending June 2008 in Table I-7.

[13] The CFTC received that data after June 30, 2008, and were required to provide their staff report to Congress by September 15, 2008. Consequently, they limited their analyses to 4 of 33 commodities and 3 of the 7 months of the data collected.

Table I-7: Summary of commodity index investing by the CFTC (2008) Staff Report on Commodity Swap Dealers and Index Traders with Commission Recommendations. The reported values are for June 30, 2008.

Panel A: Notional amount of index open interest

	Index trading only		All futures open interest	
Category	Billions of USD	Percent of U.S. total	Billions of USD	Percent of U.S. total
All exchanges	200			
U.S. exchanges	161		945	17.0%
NYMEX crude oil futures	51	31.7%	405	12.6%
CBT wheat futures	9	5.6%	19	47.4%
CBT corn futures	13	8.1%	74	17.6%
ICE cotton futures	3	1.9%	13	23.1%

Panel B: Percent of total commodity index open interest in U.S. by participant

	Percent of U.S. total
Index funds	24%
Institutional investors	42%
Sovereign wealth funds	9%
Other traders	25%
Total	100%

Panel C: Notional amount of commodity index open interest by commodity

	Futures-equivalent	Open interest	
		Net CITs	Total
CBT wheat futures	194,000	177,817	444,081
CBT corn futures	350,000	417,279	2,049,965
ICE cotton futures	73,000	104,580	377,877

Among the special call survey results shown in Table I-7 is the total notional amount of commodity index investment. For the quarter ending June 30, 2008, it was $200 billion across all exchanges worldwide, with $161 billion being tied to commodities traded in U.S. markets regulated by the CFTC. The total number of index commodities represented in the $161 billion is 33, and the total open interest in these 33 markets is $946 billion. Commodity index investing, therefore, accounts for 17% of the open interest in the relevant commodity futures markets. While the CFTC had data on all 33 commodity futures markets, they provided detail on only four as noted earlier. Index investing of crude oil futures accounts for 31.7% of all index investing, and 12.6% of all crude oil futures outstanding. Of the agricultural contracts, corn accounts for 8.1% of

index investing and 17.6% of all corn futures contracts outstanding. Wheat is next with only 5.6% of all index investing, but with 47.4% of all contracts outstanding. Apparently index investing has a more concentrated presence in the wheat market.

Panel B breaks down index investing by market participant. Index funds account for 24% of the $161 billion of commodity index open interest in the U.S. An index fund is defined as a client/counterparty with a fiduciary obligation to match or track the results of a commodity index, including ETFs and ETNs based upon a commodity index. Institutional investors have the single largest presence at about 42%. These are pension funds, endowment funds, or other similar types of investors. Sovereign wealth funds, non-U.S. government entities such as a government investment company or a government-run pension fund, hold about 9%. Finally, the "other" category is about 25% and is largely made up of retail investors holding ETFs, ETNs, and similar instruments that are publicly traded.

The final panel in Table I-7 compares the survey's index position sizes with those reported in the CFTC's Supplemental reports. The futures-equivalent of wheat reported in CFTC's (2008) Staff Report is 194,000 contracts on June 30, 2008. The net position of the CIT category reported in the July 1, 2008 Supplemental Report was 177,817. For corn and cotton, the numbers were 350,000 vs. 417,279 and 73,000 vs. 104,580, respectively. While the differences between these estimates reinforce the importance of collecting the survey information on a monthly basis moving forward, the special call survey time-series is currently too sparse and the number of commodities too small to serve as the basis of any meaningful empirical analysis. The CFTC's COT Supplemental report data remain the premier source for accurate and timely measurement of commodity index investment.

II. Relation between commodity index investing and futures prices

The subcommittee report observes that both the level of commodity prices and the level of commodity index investing surged upward during the period 2006 and 2007 and concludes that the increased commodity index investing caused the futures price increase. This conclusion illustrates the well-known logical fallacy that correlation proves causation. Correlation does not imply causation; it is only a requirement for it. Among other things, to prove causation, one event must occur before the other. The subcommittee report presents no such evidence.

The purpose of this section is to examine the relation between commodity index investing and futures prices. In all, six analyses are carried out. First, we examine the co-movements of futures prices for commodities known to be part of commodity index investing programs. Since the commodity index investing involves the simultaneous purchase of a portfolio of commodities, we should expect to see a high degree of contemporaneous correlation in futures price movements through time. Second, we examine the co-movements of futures prices known not to be part of commodity index investing programs. If non-index commodity futures prices behave like index commodity futures during the investigation period, the conclusion that commodity index investing is the cause is undermined. Third, we examine prices of five spot commodities that do not have futures contracts listed on them. Again, if spot commodities with no futures contracts and, hence, no involvement in commodity index investment programs have price behavior similar to index commodity futures, flows into commodity index investment portfolios are unlikely the cause. Fourth, we examine the impact of futures prices resulting from the periodic futures contract rolls that are necessary to mimic well-known commodity indexes such as the S&P-GSCI and DJ-UBSCI. In a roll month, the nearby futures contracts are sold and the second nearby contracts are purchased. If commodity index investing has futures price impact, the return of the second nearby futures contract should exceed the return of the nearby contract. Fifth, we examine whether the demand for long commodity index portfolios (measured by changes in open interest) “causes” futures prices to rise and vice versa. To test for causality, we examine whether weekly futures returns are related to lagged flows into commodity index

investing. Sixth, we examine the contemporaneous relation between weekly futures returns and the flows of speculators and commodity index traders during periods when commodity index traders are known to be entering and exiting the market.

A. Price co-movements of index commodities

The first investigation focuses on daily returns of 18 different commodity futures that are included in the S&P-GSCI and DJ-UBSCI during the period January 2006 through July 2009. Daily open, high, low, and settlement prices as well as trading volume and open interest for each futures contract are from the futures exchanges. The logic underlying this analysis is straightforward. Commodity index investing is a mechanical trading strategy based on a set of well-defined and well-known rules, as was laid out in the previous section. Net funds flowing into commodity index investments are immediately redeployed into the commodity index futures market through the simultaneous purchase of all index commodities. If the commodity index trades are large enough to push prices upward, the prices in all markets should move upward concurrently. Put differently, the returns of all futures contracts used in index replication should be highly correlated.

Table II-1 contains the contemporaneous correlation matrix computed from the daily returns of 18 commodity futures contracts commonly included in commodity index investing. Surprisingly, the levels of correlation are quite low. Consider the column labeled W, the CBT's wheat futures contract. This wheat contract accounts for about 4% of well-diversified commodity indexes such as the S&P-GSCI and should be highly correlated with other futures that have a high weight in the index[14] like natural gas (NG), live cattle (LC), and gold (GC). As seen in the table, the correlations are quite low—0.134 (4% of the index), 0.178 (3%), and 0.197 (3%), respectively. The column labeled C, the CBT's corn futures contract, provides similar results. This evidence suggests that either commodity index trades have little effect on futures returns (because they fail to induce contemporaneous price movements) or the commodity return variability is being driven by factors other than commodity index investing.

[14] Recall the index weights are given in Table I-1.

Table II-1: Correlation in daily returns of 18 commodity futures included in the S&P-GSCI and DJ-UBSCI during the period January 2006 through July 2009. Ticker symbols are: CC cocoa, KC coffee, C corn, CT cotton, KW Kansas City wheat, BO soybean oil, W Chicago wheat, CL crude oil, HO heating oil, NG natural gas, RB RBOB oil, FC feeder cattle, LH lean hogs, LC live cattle, GC gold, and SI silver.

	CC	KC	C	CT	KW	BO	S	SB	W	CL	HO	NG	RB	FC	LH	LC	GC	SI
CC	1																	
KC	0.328	1																
C	0.223	0.323	1															
CT	0.217	0.376	0.393	1														
KW	0.231	0.308	0.567	0.343	1													
BO	0.291	0.348	0.587	0.440	0.479	1												
S	0.288	0.353	0.661	0.382	0.493	0.811	1											
SB	0.236	0.305	0.299	0.369	0.281	0.365	0.324	1										
W	0.230	0.308	0.602	0.356	0.943	0.481	0.492	0.292	1									
CL	0.269	0.264	0.335	0.284	0.298	0.532	0.425	0.305	0.303	1								
HO	0.233	0.271	0.337	0.299	0.279	0.539	0.417	0.305	0.287	0.769	1							
NG	0.091	0.119	0.190	0.130	0.116	0.246	0.218	0.173	0.134	0.304	0.352	1						
RB	0.210	0.243	0.328	0.271	0.266	0.527	0.422	0.282	0.274	0.697	0.777	0.300	1					
FC	0.064	0.137	-0.063	0.114	-0.001	0.088	0.063	0.098	0.018	0.140	0.113	0.067	0.162	1				
LH	-0.003	0.157	0.017	0.112	0.073	0.088	0.071	0.023	0.059	0.052	0.023	0.001	0.031	0.197	1			
LC	0.195	0.211	0.157	0.234	0.180	0.195	0.180	0.162	0.178	0.177	0.174	0.088	0.175	0.645	0.102	1		
GC	0.272	0.173	0.238	0.166	0.183	0.317	0.271	0.184	0.197	0.270	0.278	0.098	0.227	-0.022	0.013	0.044	1	
SI	0.313	0.276	0.332	0.258	0.271	0.420	0.379	0.265	0.272	0.314	0.332	0.148	0.280	0.073	0.020	0.153	0.725	1

Table II-1 also confirms a number of obvious relations. The correlation between the returns of the wheat futures contract traded at the CBT (W) and the wheat futures contract traded at the KCBT (KW), for example, is 0.943. Since the underlying commodities are simply two different types of wheat, their price movements should be highly correlated. Crude oil (CL) returns are highly correlated with the returns of its processed products—0.769 for heating oil (HO) and 0.697 for gasoline (RB)—and soybeans (S) are highly correlated with soybean meal (BO), 0.811.

Figure II-1 displays the CBT and KCBT wheat futures prices that were used to generate the correlation coefficient, 0.943. In addition, the MGEX wheat futures prices are shown. The figure is interesting in a number of respects. First, over the first year and a half, the lines are virtually on top of one another. This means that the three grades of wheat are virtually perfect substitutes from a rate of return perspective. In mid-2007 through the beginning of 2008, the prices of all wheat futures contract increase precipitously. During this interval, the CBT and KCBT futures prices remain close together; however, the MGEX price rises to a level 50% higher than the other two futures. The importance of this comparison is that the subcommittee report argues that the higher incidence of commodity index futures trading caused the abnormal price increase in wheat over this period. If such is the case, the CBT futures price should have risen to a level well in excess of the KCBT and MGEX contracts because the CBT contract is the primary contract used by commodity index traders in taking a wheat position. What the figure shows is that the behavior of the CBT price is like the KCBT price and well below the MGEX price—evidence that again suggests that the abnormal behavior is driven by factors other than commodity index investing.

Figure II-1: Daily index levels representing the nearby futures contract prices of the wheat futures contracts traded on the CBT, the KCBT, and the MGEX during the period January 2006 through July 2009. Futures prices are from CBT, KCBT, and MGEX.

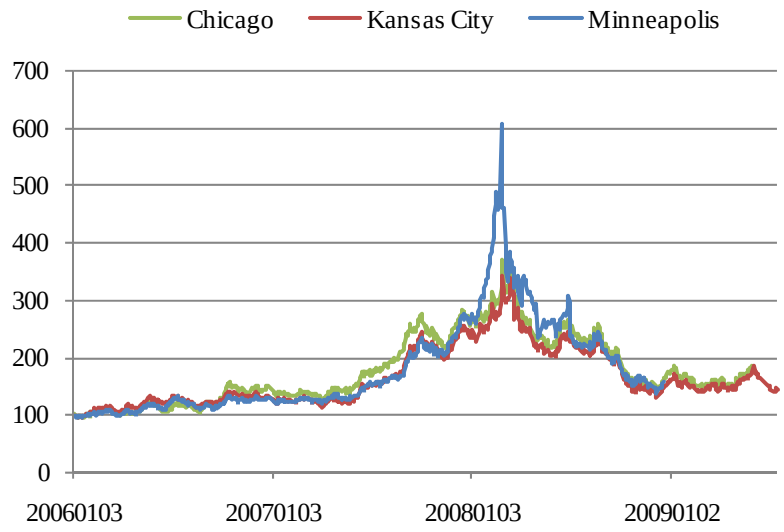
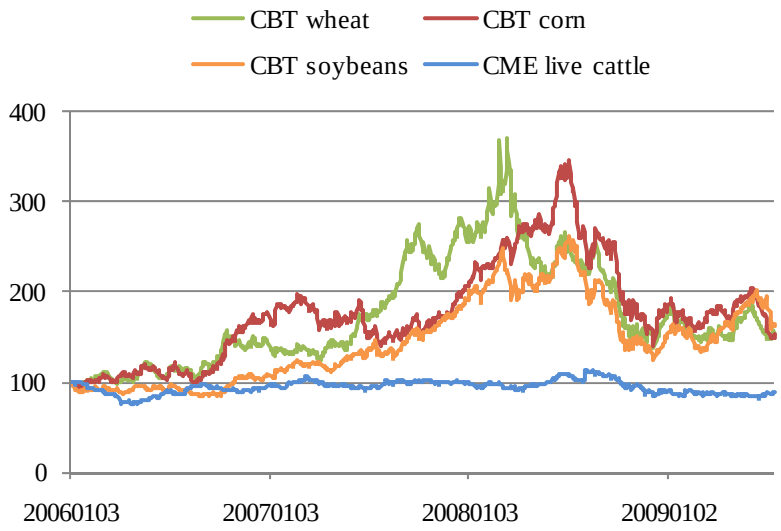


Figure II-2 displays the prices of several different agricultural futures that have significant weights in well-diversified commodity indexes. Again, in assessing these figures, recall that commodity index investing refers to buying (selling) all of these contracts simultaneously, so, if commodity index investing is responsible for the abnormal price increases, the abnormal price increases should be experienced together. As Figure II-2 shows, they are not. The price of corn begins its ascent in late 2006, levels off for most of 2007, and then rises quickly to a level nearly 3.5 times its January 2006 price in June 2008. Wheat, like corn, experiences erratic price movements during this period. But, wheat's crisis appears to have started earlier than corn and reached its maximum price three months earlier. Soybeans, too, seem to have experienced tumultuous times, rising in price by nearly 150% by June 2008. The general pattern of increasing and then decreasing of prices during this period of time undoubtedly contributes to the modest positive levels of correlation reported in Table II-1—0.602 for wheat versus corn, 0.492 for wheat versus soybeans, and 0.661 for corn versus soybeans. But, the fact that the price shifts are not contemporaneous suggests, yet again, that commodity index investing is not the culprit.

Figure II-2: Daily index levels representing the nearby futures contract prices of the agricultural futures contracts traded on the CBT and the CME during the period January 2006 through July 2009. Futures prices are from CBT and CME.



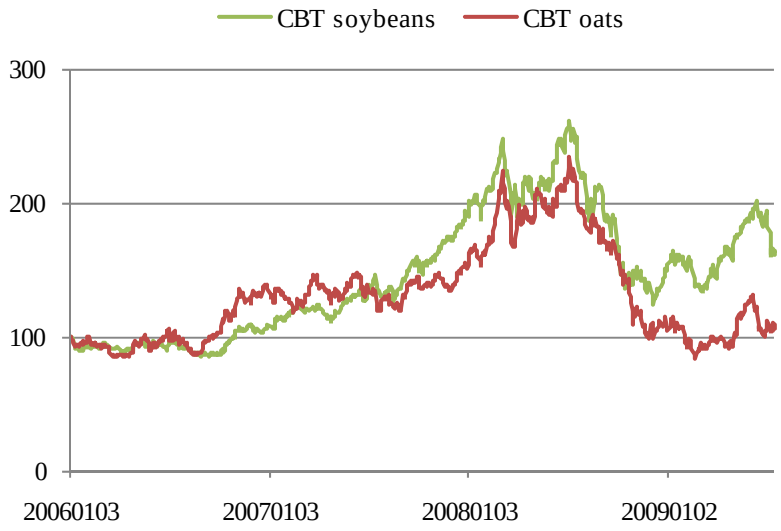
Finally, the price behavior of the live cattle futures contracts (LC) is also displayed in Figure II-2. Relative to the grains, live cattle has little price movement at all over the four-year period. This suggests that whatever was happening in the grains market was specific to the grain market sector and did not carry over into the livestock sector. It also suggests that commodity index investing is unrelated to futures price movements. Live cattle accounts for nearly 4% of the popular commodity indexes. During a period when flows into commodity index funds doubled, the live cattle futures price barely budged.

B. Price co-movements of index versus non-index commodities

Another way to gather evidence regarding the relation between commodity index investing and futures prices is to examine the co-movements in prices of like commodities that are and are not included in the index. We have already examined one such case in Figure II-1. The CBT's wheat futures contract is used by commodity index investors to capture the returns of the physical commodity wheat. The KCBT's wheat futures contract is used only in a minor way, and the MGEX's wheat futures contract is not used at all. As noted earlier, the co-movements in price are highly correlated, with the

MGEX futures price rising the most. For the subcommittee report conclusion to hold, the reverse pattern should hold. Similar results can be found for other agricultural commodities. The CBT, for example, has futures markets in both soybeans and oats. The difference between the two contracts from our perspective is that soybeans is an index commodity while oats is not. Figure II-3 shows the price behavior of the nearby futures contracts for both commodities over the period January 2006 through July 2009. As the figure shows, there is a close correspondence between the price movements of the two commodities, often rising and falling in unison as is expected if they were both part of a commodity index investing program and such a program had a significant price impact. But, oats is not included in any of the popular commodity indexes and is therefore, by definition, unaffected by index investing. In other words, the price co-movement must be dominated by factors related to the agricultural commodities market rather than commodity index investing.

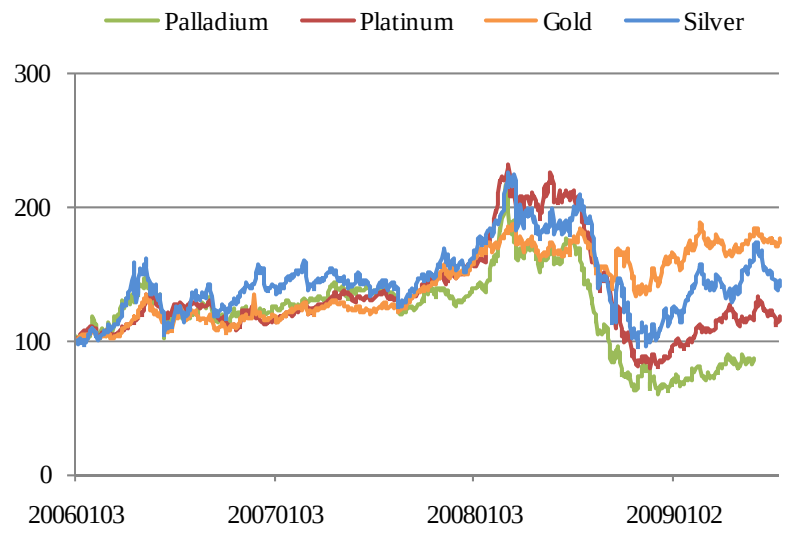
Figure II-3: Daily index levels representing the nearby futures contract prices of soybean and oats futures contracts traded on the CBT during the period January 2006 through July 2009. Futures prices are from CBT.



The precious metal contracts traded on the Comex offer another opportunity to make an index versus non-index comparison. Gold and silver are included in the S&P-GSCI and DJ-UBSCI, and palladium and platinum are not. Figure II-4 shows their price behavior over the January 2006 through July 2009 investigation period. Again, the degree

of co-movement would seem to suggest that a common factor is influencing the prices of all of these commodities simultaneously. It cannot be commodity index investing, however, since palladium and platinum are not part of index programs.

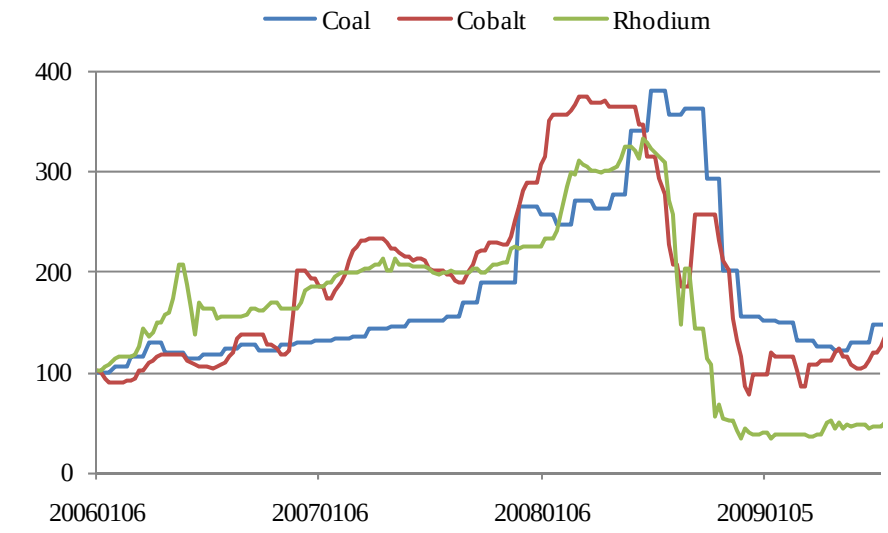
Figure II-4: Daily index levels representing the nearby futures contract prices of the precious metal futures contracts traded on the CMX during the period January 2006 through July 2009. Futures prices are from CMX.



C. Price co-movements of commodities with no futures markets

Our final examination of price co-movements identifies three important cash commodities—coal, cobalt, and rhodium—that do not have futures markets and are not part of commodity index investing programs. Figure II-5 shows the weekly price behavior of these commodities over the period January 2006 through July 2009. Like so many other commodities shown in previous figures, there is a general price increase from the beginning of 2006 through the end of 2007. Prices then jump upward during the first half of 2008, and then fall. Again, commodity index investing cannot be the culprit, at least for these cash commodities, since these cash commodities are not part of index investing programs. Indeed, they do not even have commodity futures contracts listed on them. The price patterns appear to be a reflection of some common macro-economic event that affected many commodity sectors during the beginning of 2008.

Figure II-5: Spot prices of commodities with no futures markets and not included in commodity index portfolios during the period January 2006 through July 2009. Weekly prices are from DataStream.



D. Analysis of index rolls

The first three analyses focused on commodity price co-movements and argued that their patterns are inconsistent with commodity index investing. Prices of index commodity futures contracts should move together, and they do not. Prices of index and non-index commodity futures should not move together, but they do. Prices of cash commodities with no futures markets and not included in commodity index investment programs should not move together, but they do. While the evidence that some other factor or set of factors is affecting commodity prices, the analysis would be more powerful if the futures returns were measured over an interval in which we know commodity index investing was being executed. One such interval of time is when commodity index funds and swap dealers must roll their futures positions from the nearby contract to the next nearby contract. Recall that the timing of such rolls for the S&P-GSCI and DJ-UBSCI, two indexes commonly used as benchmarks for commodity index funds and as a reference price in OTC commodity swap contracts, was provided in Table 1-2 of the last section.

In this investigation, we attempt to stack the cards in favor of finding that commodity index investing and futures returns are related. We do so by selecting the

eight commodity futures contracts that are in both the S&P-GSCI and DJ-UBSCI, and are also followed in the CFTC's COT Supplemental reports. We require the commodity to be in both indexes in order to maximize the amount of index investing over the roll period. Both indexes have investment in the same commodity futures at the same time.[15] For the CBT's wheat futures contract, which is part of the sample, 3.90% of the market value of the funds/swaps is pegged to the S&P-GSCI and 4.80% of the market value of the funds/swap is pegged to the DJ-UBSCI. We also require the commodity to have open interest data in the CFTC's Supplemental report to allow comparison between the numbers of contracts rolled in mimicking the diversified portfolio indexes and the total commodity index investing in a particular commodity. The eight commodity futures contracts used in our sample are listed in Table II-2. Five commodity futures are from the CBT, two are from the CSC, and one from the NYC. These eight commodities account for 19.1% and 33.0% of the market values of the S&P-GSCI and DJ-UBSCI indexes, respectively.

Table II-2: Commodity futures contracts included in the S&P-GSCI and DJ-UBSCI commodity indexes and the CFTC's Commitment of Traders Supplemental Reports during the period January 2006 through July 2009. Weight in commodity index is percent of market value of index accounted for by the commodity.

Commodity futures	Exchange	Ticker symbol	Weight in commodity index	
			S&P-GSCI	DJ-UBSCI
Wheat	CBT	W	3.90%	4.80%
Corn	CBT	C	3.55%	5.72%
Soybeans	CBT	S	2.64%	7.60%
Cotton No.2	NYC	CT	1.19%	2.27%
Lean hogs	CME	LH	1.51%	2.40%
Live cattle	CME	LC	3.19%	4.29%
Suger No.11	CSC	SB	2.33%	2.99%
Coffee C	CSC	KC	0.76%	2.97%
Total			19.07%	33.03%

The methodology used to conduct the analysis is straightforward. Under the hypothesis that commodity index investing has no effect on the underlying futures prices, the expected futures return of the nearby contract over the interval from the close on the

[15] For other commodity futures contracts, for example, the metal contracts traded on the London Metals Exchange, contract months are not always the same.

day before the first roll date (i.e., the fifth business day of the month) to the close on the last roll date (i.e., the ninth business day of the month) should be equal to the expected futures return of the second nearby contract. Under the alternative hypothesis that the commodity index roll has price impact in the futures market, the nearby futures return will be less than the second nearby futures return because of the selling pressure on the nearby contract and the buying pressure on the second nearby. Assuming the null hypothesis is rejected in favor of the alternative, we should also find that the price impact is larger the greater the amount of commodity index investing during the interval.

Table II-3 contains the results of the return tests by commodity. The returns are computed for the specific futures contracts rolled with the S&P-GSCI and DJ-UBSCI indexes. To understand the contents of the table, consider the wheat contract in the first row. Of the wheat futures contract rolls that occurred during the period January 2006 through July 2009, the average return of the nearby futures contract (being rolled from) was –0.03% from the settlement on the fourth business day of the roll month to the settlement on the ninth day. Over the same interval of time, the average return on the second nearby contract (being rolled into) was 0.06%. Thus, the return differential is 0.09%, less than one-tenth of one percent. Scanning down the column of return differentials for the different commodity futures, we find that all but one (soybeans) is positive, and three are significant in the statistical sense. In a practical sense, however, the roll returns and return differentials are not economically meaningful, on order of the typical bid/ask spreads observed in these markets.[16]

What is so remarkable about finding little or no price impact in these commodity futures rolls is the sheer size of the futures positions being rolled. To measure the number of contracts being rolled, we use the lesser of (a) the number of nearby contracts sold (i.e., the reduction in the open interest of the nearby contract from the fourth through the ninth business days) and (b) the number of second nearby contracts purchased (i.e., the increase in the open interest of the second nearby contract from the fourth through the ninth business days). We then divide this number by the open interest of the nearby and second nearby futures contracts at the beginning of the roll period, and then average the

[16] On average, a cost of one-half of the bid/ask spread unwinding the nearby futures contract and one-half the bid/ask spread buying the second nearby futures contract is expected on each roll.

ratios through time to get the results reported in Table II-3. For wheat, the number of contracts rolled increased the open interest of the second nearby futures contract by 46.6%, and the futures price rose ever so slightly on average. For soybeans, 17.9% of the open interest of the first nearby contract was closed out and the futures price rose. Across the eight commodity futures reported in the table, the roll activity increased the open interest of the second nearby contract by an average of 39.21%. The last column of Table II-3 places the transaction size in a different manner. Specifically, the number of contracts being rolled is multiplied by the contract denomination and the futures price to determine the notional value of the trades. The values are high. For the CBT's wheat futures contract, about $708 million of contracts are being rolled and the return differential is 0.09%. For soybeans, an average of about $1.1 billion of contracts is being rolled and the return differential is –0.16%. In all, these commodity futures markets absorbed $5.2 billion of trades over five days. Clearly, the futures market has an enormous capacity to absorb commodity index roll activity.

Table II-3: Average nearby and second nearby futures contracts returns on commodity index roll dates during the period January 2006 through July 2009. Returns are computed over the interval from the fourth through the ninth business days each roll month. Futures price data are from the CBT, CME, CSC, and NYC. The return differential is defined as the second nearby return less the nearby futures return. An asterisk (*) denotes that the return differential is significant at the 5% probability level.

			Futures return			Percent change in OI		
Commodity futures	Ticker symbol	No. of rolls	Nearby contract	Second nearby	Return differential	Nearby contract	Second nearby	Notional value
Wheat	W	48	-0.0003	0.0006	0.0009	-0.2813	0.4664	707,528,382
Corn	C	48	0.0008	0.0020	0.0012*	-0.1806	0.2644	839,694,396
Soybeans	S	48	0.0113	0.0098	-0.0016	-0.1787	0.3138	1,072,256,880
Cotton No.2	CT	39	-0.0026	-0.0026	0.0000	-0.3089	0.4358	488,603,550
Lean hogs	LH	68	-0.0022	0.0015	0.0037	-0.2446	0.4528	342,776,056
Live cattle	LC	58	-0.0023	-0.0002	0.0021*	-0.2210	0.3759	646,944,744
Suger No.11	SB	39	-0.0013	0.0006	0.0019	-0.2759	0.3808	573,820,235
Coffee C	KC	48	-0.0170	-0.0151	0.0019*	-0.2953	0.4500	494,659,947
Average			-0.0017	-0.0004	0.0013	-0.2483	0.3925	645,785,524
Total								5,166,284,190

In order to qualify for inclusion in Table II-3, we required that the commodity futures be included in both the S&P-GSCI and DJ-UBSCI and that the commodity index rolls were from and to the same futures contract expirations so as to maximize the dollar

notional value of the commodity futures positions rolled in each roll period. Because the single commodity futures contract with the single largest presence in both the indexes (37.51% of the S&P-GSCI and 13.75% of the DJ-UBSCI) was eliminated as a result of index rolls being into different contract months (see Table I-1), the average returns of crude oil futures rolls within each index were measured separately. The results are reported in Table II-4. As the table shows, the notional value of the index rolls is extremely large, with the crude oil futures rolls of the S&P-GSCI index accounting for $4.1 billion in trading activity. In contrast, all eight commodity futures in Table II-3 account for only $1 billion more. Interestingly, the return differential is positive and statistically significant for both indexes, despite the fact that the nearby futures return is (surprisingly) positive not negative. The size of the return differential for the S&P-GSCI oil futures is 26 basis points, larger than typical bid/ask spreads in the NYME crude oil futures market. Apparently the crude oil futures market shows the effects of price impact during the index roll period due to the sheer size of the notional value of the futures contracts being rolled.

Table II-4: Average nearby and second nearby crude oil futures contract returns for the DJ-UBSCI and S&P-GSCI on commodity index roll dates during the period January 2006 through July 2009. Indexes are listed separately since crude oil futures rolls do not involve the same contract months. Returns are computed over the interval from the fourth through the ninth business days each roll month. Futures price data are from the NYME. The return differential is defined as the second nearby return less the nearby futures return. An asterisk (*) denotes that the return differential is significant at the 5% probability level.

			Futures return			Percent change in OI		
Commodity index	Ticker symbol	No. of rolls	Nearby contract	Second nearby	Return differential	Nearby contract	Second nearby	Notional value
DJ-UBSCI	CL	57	0.0092	0.0147	0.0055*	-0.0728	0.2512	957,223,557
S&P-GSCI	CL	115	0.0066	0.0092	0.0026*	-0.3360	0.5340	4,097,800,039

The price impact hypothesis also carries with it an assumption that the greater the amount of index investing the greater the price impact. To test whether there is a relation between the return differential and the amount of index investing, we regress the return differential on the number of contracts traded as part of the roll, that is,

$$R_t = \alpha_0 + \alpha_1 Roll_{CIT,t} + \varepsilon_t$$

where R_t is the return differential and $Roll_{CIT,t}$ is the number of nearby futures contracts rolled into the second nearby contract. The results are reported in Table II-5. As the table shows, the slope coefficients vary randomly around 0 and are not significantly different from 0 for the eight futures contracts with common contract rolls. For these contracts, the magnitude of commodity index investing, at least as measured by the roll activity of the S&P-GSCI and DJ-UBSCI, appears to have no impact on futures prices. At the same time, the slope coefficient in the crude oil futures regression is positive and significant, indicating that the notional value of the roll varies directly with the relative futures price change.

E. Causation tests

Considering the dollar value of commodity futures contracts trading hands in a concentrated period of time, the roll-period results are quite compelling. It is important to recognize, however, that the roll-period evidence is based on the rolling of *existing* long-only commodity index investment, not on *new flows* into long-only commodity index investment. Since we can measure flows into commodity index investment using differences in the long-only commodity index trader open interest reported in the CFTC's weekly Commitment of Trader Supplemental reports, we have the opportunity to conduct a second analysis, complementary to the first analysis, of whether inflows in commodity index investing "cause" futures prices to rise.

To provide a general sense for the analysis that we are about to conduct, consider Figure II-6. In the figure, the total notional value of the net commodity index investment in the CBT's wheat futures contract in USD billions[17] is shown in blue. Shown in red is the price of the CBT's nearby wheat futures contract during the same period of time. As the figure shows, commodity index investment in wheat increased during the first few months of 2006, at which time there is little or no increase in the wheat futures prices. Commodity index investing in wheat then falls through the summer of 2006, at which time the futures price rises from about $4.00 a bushel to $5.50 a bushel. From the end of 2006 through the summer of 2007, the wheat futures price increases at an alarming rate

[17] The notional amount is computed as the net commodity index trader positions times the contract denomination times the futures price on January 3, 2006.

from $5.00 a bushel to over $9.00 a bushel—a whopping 80%! In the meantime, the level of commodity index investing in wheat falls from $3.3 billion to $3.0 billion. Other than the simultaneous decline in the commodity index investing and the wheat futures price in late 2008, there is little evidence to suggest any relation between commodity index investing and the futures price. The price behavior of wheat was erratic during the period from mid-2007 through the end of 2008; however, such bouts of volatility have been recorded in the wheat market for many years, well before the advent of commodity index investing.

Table II-5: Summary of results for regressions of the return differential of the nearby futures contracts over the roll period on the number of contracts rolled during the period January 2006 through July 2009. Regression specification is

$$R_t = \alpha_0 + \alpha_1 Roll_{CIT,t} + \varepsilon_t$$

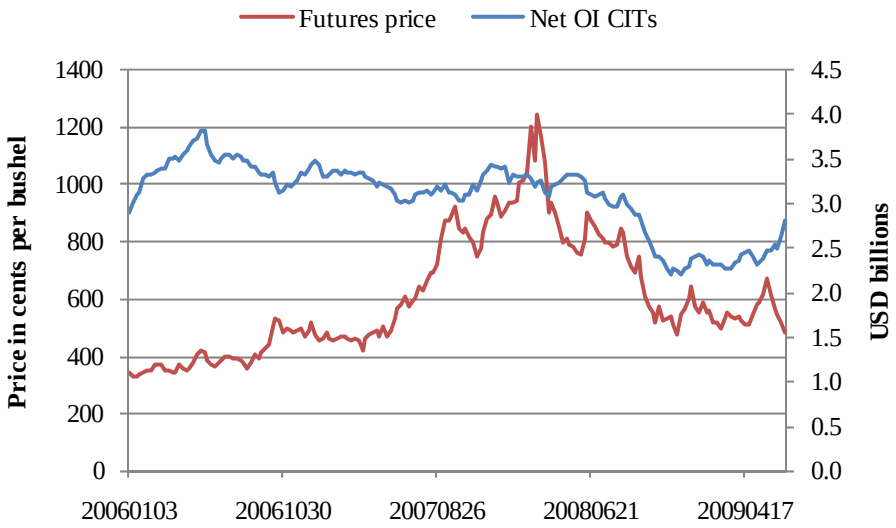
where R_t is the futures returns and $Roll_{CIT,t}$ is the number of nearby futures contracts rolled into the second nearby contract. For the crude oil futures, the two commodity indexes are listed separately since crude oil futures rolls do not involve the same contract months. Returns are computed over the interval from the fourth through the ninth business days each roll month. Futures price and open interest data are from the CBT, CME, CSC, NYC, and NYME. The return differential is defined as the second nearby return less the nearby futures return. The number of contracts rolled is the lower of the reduction in open interest of the nearby contracts and the increase of the open interest in the second nearby contract expressed in millions of contracts.

Commodity futures/index	Ticker symbol	No. of rolls	α_0	α_1	Adjusted R^2
Wheat	W	48	0.00053	0.01294	-0.0161
Corn	C	48	0.00088	0.00519	-0.0162
Soybeans	S	48	-0.00336	0.06594	-0.0082
Cotton No.2	CT	39	0.00179	-0.09844	-0.0185
Lean hogs	LH	68	0.00365	0.00336	-0.0151
Live cattle	LC	58	0.00183	0.01388	-0.0172
Suger No.11	SB	39	0.00552	-0.07462	0.0111
Coffee C	KC	48	0.00237*	-0.03208	-0.0034
DJ-UBSCI crude oil	CL	57	-0.00608	0.71844*	0.1829
S&P-GSCI crude oil	CL	115	-0.00473	0.10730*	0.0713

Figures such as II-6 are useful in uncovering potential causality between two time-series. In the end, however, formal statistical tests are necessary. Here we use the Granger (1969) causality test to determine whether commodity index investing activity

(i.e., changes in open interest) causes futures price changes, as the subcommittee report concludes, and/or changes in futures prices cause changes in commodity index investing activity. The data underlying the analysis are the 12 different commodity futures contracts followed in the CFTC's COT Supplemental report.[18] The number of weekly CIT long open interest observations for each of the 12 commodities in the period January 2006 through July 2009 is 184.

Figure II-6: Total notional value of net open interest of commodity index traders in CBT's wheat futures contracts and wheat futures price by week during the period January 2006 through June 2009. CIT data are from weekly CFTC Commitments of Trader Supplement files and futures prices are from the CBT.



To determine whether inflows into commodity index investment "Granger-causes" futures returns, we perform two regressions. In the first, we regress futures returns on lagged futures returns, that is,

$$R_t = \alpha_0 + \alpha_1 R_{t-1} + \alpha_2 R_{t-2} + \varepsilon_t ,$$

and, in the second, we regress futures returns on lagged futures returns and lagged flows into commodity index investment, that is,

$$R_t = \alpha_0 + \alpha_1 R_{t-1} + \alpha_2 R_{t-2} + \alpha_3 Flow_{CIT,t-1} + \alpha_4 Flow_{CIT,t-2} + \varepsilon_t ,$$

[18] The significance of the Granger's work is attested to by the fact he received the Nobel prize in economics in 2003.

where R_t is the return of the futures contract and $Flow_{CIT,t}$ is the flow into commodity index investment in week *t*. If the addition of the lagged flow variables adds explanatory power, the flow variable "Granger-causes" the futures return. Then, to determine whether futures returns "Granger-cause" flows into commodity index investment, we perform two additional regressions. In the first, we regress commodity index investment flows on lagged flows, that is,

$$Flow_{CIT,t} = \alpha_0 + \alpha_1 Flow_{CIT,t-1} + \alpha_2 Flow_{CIT,t-2} + \varepsilon_t ,$$

and, in the second, commodity index investment flows on lagged flows and lagged futures returns, that is,

$$Flow_{CIT,t} = \alpha_0 + \alpha_1 Flow_{CIT,t-1} + \alpha_2 Flow_{CIT,t-2} + \alpha_3 R_{t-1} + \alpha_4 R_{t-2} + \varepsilon_t$$

If the addition of the lagged futures returns adds explanatory power, the futures returns "Granger-cause" flows into commodity index investment.

The results of the Granger-causality tests are reported in Table II-6. Reported in the table are *F*-statistics (and their associated probability levels) corresponding to the hypothesis that commodity index investment flows "Granger-cause" futures returns and the hypothesis that futures returns "Granger-cause" commodity index investment flows. A probability level of less than 5% denotes Granger-causality. As the results indicate, there is scant evidence of causality in either direction. The only commodity for which commodity index investment flows "Granger-cause" futures returns is for cotton. But, the importance of this result is offset by the fact that, for Kansas City wheat, futures returns "Granger-cause" commodity index investment flows. Overall, the results of Table II-6 refute the notion that investment flows affect futures prices.

Table II-6: Granger causality tests of commodity index investing and futures returns using weekly changes in long open interest of COT Supplemental reports during the period January 2006 through July 2009. Long open interest from COT includes all open interest in any commodity index strategy on a weekly. Futures price data are from the CBT, KCBT, CME, CSC, and NYC. The asterisk (*) denotes significance at the 5% probability level.

Commodity futures	Ticker symbol	Flows to commodity index investment "Granger-cause" futures returns		Futures returns "Granger-cause" flows to commodity index investment	
		F-statistic	Probability	*F*-statistic	Probability
CBT wheat	W	0.1701	0.844	0.5231	0.594
KCBT wheat	KW	0.1591	0.853	3.1552	0.045*
Corn	C	2.0958	0.126	2.0731	0.129
Soybeans	S	2.7465	0.067	2.4341	0.091
Soybean oil	BO	2.6072	0.077	0.5804	0.561
Cotton	CT	5.8921	0.003*	0.2688	0.765
Live hogs	LH	1.8891	0.154	0.3461	0.708
Live cattle	LC	1.2080	0.301	0.2827	0.754
Feeder cattle	FC	0.3767	0.687	0.2532	0.777
Cocoa	CC	1.8098	0.167	1.3481	0.262
Sugar	SB	0.1582	0.854	0.7935	0.454
Cotton	KC	0.3346	0.716	0.5083	0.602

Finally, it is worth noting that the notional values of the weekly flows into and out of commodity index investment pale by comparison to the roll-period flows. Table II-7 reports both the average weekly flow into commodity index investment and the average absolute flow into commodity index investment by commodity. For the CBT's wheat futures contract, the average flow was –$4.7 million, which means that each week during the sample period January 2006 through July 2009, commodity index investors pulled out an average of $4.7 million. This is consistent with Figure II-6, which shows the notional value of the open interest in wheat trending downward over the period. More important, perhaps, is the average absolute flow. On average, $84.7 million of CBT wheat futures flowed into or out of commodity index investment each week. Compare this with the $789 million reported in Table II-3 that flowed from the nearby futures to the second nearby futures over the roll period (about one week). And, compare the $134.1 million of CBT corn futures that flowed into or out of commodity index investment each week in the Granger-causality tests with the $1.2 billion that flowed from the nearby futures to the second nearby futures over the roll period. While both the roll-period and Granger-

causality tests refute the notion of that commodity index investment flows "causes" futures price changes, the roll-period tests remain the most compelling.

Table II-7: Notional value of flows into commodity index investment based on weekly changes in open interest of commodity index traders during the period January 2006 through July 2009.

		Weekly commodity index investment	
Commodity futures	Ticker symbol	Average flow	Average absolute flow
CBT wheat	W	-4,724,614	84,709,738
KCBT wheat	KW	-403,232	21,840,000
Corn	C	-8,343,614	134,112,115
Soybeans	S	3,897,936	123,718,218
Soybean oil	BO	552,977	34,461,380
Cotton	CT	2,131,847	47,204,598
Live hogs	LH	1,162,131	43,650,751
Live cattle	LC	6,165,122	55,355,084
Feeder cattle	FC	613,472	11,258,944
Cocoa	CC	1,401	158,379
Sugar	SB	4,414,789	68,182,154
Cotton	KC	3,105,938	37,226,547
Average		714,513	55,156,492

F. Analysis of contemporaneous relation between returns and flows

With causality ruled out, we now turn to examining the contemporaneous relation between returns and flows using the CFTC's COT Supplemental report data. While examining the contemporaneous relation between variables cannot determine causality, it does help characterize the relation between futures returns and the demands of speculators and commodity index investors to shed some light on the subcommittee report claim that commodity index investing has led to a permanent increase in the level of futures prices, and, through arbitrage between markets, asset prices. If the subcommittee report's conclusion is correct, futures returns should be positively correlated with commodity index inflows but independent of commodity index outflows. In investigating such a relation, however, it is imperative to recognize that returns may also be correlated with the demands of other market participants, particularly speculators. To test the subcommittee report conclusion, we therefore perform the regression,

$$R_t = \alpha_0 + \alpha_1 Flow_{Spec,t} + \alpha_2 Flow_{CIT,t} + \alpha_3 d_t + \alpha_4 d_t Flow_{Spec,t} + \alpha_5 d_t Flow_{CIT,t} + \varepsilon_t$$

where R_t is the futures returns and $Flow_{Spec,t}$ and $Flow_{CIT,t}$ are the weekly net inflows of speculators and commodity index traders as designated by the CFTC's Supplemental report, respectively. If the inflows of speculators and commodity index traders are related to price increases and outflows are related to price reductions, the coefficients α_1 (for the flows of speculators) and α_2 (for the flows of commodity index investors) should be positive. But, these variables alone do not address the asymmetry in the relation. The subcommittee report concludes that it is only inflows by commodity index traders that matter. Outflows should have no effect on prices. To account for this asymmetry, we need to distinguish between commodity index inflows and outflows. We do this by using a dummy variable that takes on a value of 1 when $Flow_{CIT,t} < 0$ and is 0 otherwise. In the event that the relation is symmetric, the coefficient α_5 should be equal to 0, reflecting no asymmetry between inflows and outflows. In the event that commodity index trader inflows increase price but commodity index outflows do not, the coefficient α_5 should have a value approximately equal to $-\alpha_2$.

Table II-8 contains the results of the regression for each of the 12 commodities in our sample. A number of interesting results emerge. First, the only relation that shows up as being consistent is the relation between the net flows of speculators and futures returns. Its coefficient α_1 is positive and significant for all 12 commodities. The fact that the coefficient α_4 is generally insignificant means that the relation between speculator net flows and returns does not depend on the direction of trading by commodity index traders. Second, the coefficient α_2 varies in sign and is insignificant in all but two cases. This suggests that, after controlling for the effects of speculator demand, commodity index investor net flows have no relation to futures returns. Moreover, the fact that the coefficient α_5 is insignificant across commodities means that there is no asymmetry in the effect of commodity index investor demand and futures returns.

Table II-8: Regressions of weekly futures returns on speculator and commodity index trader flows during the period January 2006 through July 2009. Regressions are performed by commodity using 183 time-series return observations. Regression specification is

$$R_t = \alpha_0 + \alpha_1 Flow_{Spec,t} + \alpha_2 Flow_{CIT,t} + \alpha_3 d_t + \alpha_4 d_t Flow_{Spec,t} + \alpha_5 d_t Flow_{CIT,t} + \varepsilon_t$$

where R_t is the futures returns and $Flow_{Spec,t}$ and $Flow_{CIT,t}$ are the weekly net inflows of speculators and commodity index traders as designated by the CFTC's Supplemental report, respectively. The dummy variable, d_t has a value of 1 when $Flow_{CIT} < 0$ and is 0 otherwise.

Ticker symbol	α_0	α_1	α_2	α_3	α_4	α_5	Adj. R^2
W	0.005071	0.000227*	0.000095	-0.002073	0.00002	0.000078	0.3161
KW	0.009945	0.000438*	-0.000071	-0.005979	-0.00012	0.000615	0.2228
C	0.015031*	0.000088*	-0.000071	-0.016562	0.000069*	0.000115	0.4136
S	-0.000471	0.000066*	0.000120*	0.008761	0.000001	0.000050	0.4494
BO	0.013171*	0.000171*	-0.000053	-0.026055*	0.000024	-0.000103	0.3043
CT	0.008555	0.000113*	-0.000015	-0.026466*	-0.000010	-0.000164	0.2725
LH	0.000419	0.000157*	0.000054	0.012021	0.000017	0.000271	0.0996
LC	-0.000022	0.000052*	0.000018	0.004957	-0.000007	0.000100	0.1716
FC	-0.001975	0.000131*	0.000072	0.004513	-0.000028	0.000039	0.0818
CC	0.006443	0.027634*	0.054791	-0.001315	-0.005591	0.059701	0.2631
SB	-0.003738	0.000089*	0.000028	0.016122	0.000053	0.000059	0.2330
KC	0.000818	0.000147*	0.000147*	-0.004099	-0.000011	-0.000053	0.5782

III. Wheat Futures Market

The subcommittee report claims that commodity index investing not only has elevated the level of commodity prices in general but also has caused basis convergence problems in the CBT's wheat market. The causality test results reported in the last section refute the former claim. The purpose of this section is to investigate the wheat convergence issue. The section has four parts. First, we correct two methodological flaws in the way the futures basis is measured in the subcommittee report. Not only is the cash price proxy used incorrect theoretically and biased downward empirically, but also the reported basis is inflated as a result of using non-delivery periods when the futures price should exceed the cash price. Nonetheless, after correcting for the methodological deficiencies, there is some evidence to suggest that the wheat futures price did not always converge in the 2006-2009 period, particularly in late 2008. Second, we examine the CBT's wheat convergence over a period of time much longer than that used in the subcommittee report and show that wheat has failed to converge in periods when the amount of commodity index investing is known to be negligible. Third, we examine the convergence behavior of the CBT's corn and soybean futures contracts over the same historical period and find that, while neither corn nor soybeans have as great of divergence as wheat (corn is close), grain commodity futures in general seem to experience convergence anomalies at the same points in time. Finally, and most importantly perhaps, we address the issue whether the failure of the wheat futures price to converge to the cash price has any meaningful economic consequences. We show that there is no evidence to suggest that the CBT's wheat futures has become a less effective hedging tool.

A. Basis measurement

The "futures basis" or, simply, "the basis" is defined here as the futures price less the price of the underlying cash commodity. In a properly-functioning market with rational investors, the basis should converge to zero as the futures contract approaches expiration. The reason is simple. The futures contract is a binding agreement to deliver the underlying commodity at the futures expiration date at the futures price. If the futures price is above the cash price at expiration, a risk-free profit equal to the difference

between the futures and cash price can be earned by buying the cash commodity, selling the futures, and then delivering the commodity against its futures contract. If, on the other hand, the futures price is below the cash price, a risk-free profit equal to the difference between the cash price and the futures price can be earned by buying the futures, selling a forward contract to sell the cash commodity, and taking delivery on the futures contract to meet its forward obligation. The absence of "free-money" opportunities ensures prices converge.

That is not to say, however, that the futures price must equal the cash price before expiration. Early in its life, the futures price can be thought of as the expected cash price at a future point in time. Since the cash market conditions in the future can differ from present conditions, the futures price may be quite different from the current cash price. As time passes and the futures contract nears its expiration date, the link between the futures price and the cash price becomes stronger as market participants begin to actively arbitrage between the futures and the underlying cash commodity.

The subcommittee report analyzes the basis convergence of the CBT's wheat futures contract and finds that, in recent years, the basis does not converge and that the futures price expires *above* the underlying cash price. At first blush, this finding flies against reason in that costless arbitrage should generate a risk-free profit—sell the futures, buy the cash commodity, and then deliver the commodity against its futures contract. Upon closer examination of the subcommittee report's methodology for computing the basis, it becomes obvious that the failure to converge is driven, at least in part, by (a) using an inappropriate cash price, and (b) measuring the basis at times other than the delivery period when the futures price should exceed the cash price.

1. Appropriateness of cash price

The CBT's wheat futures contract calls for the delivery of U.S. No. 2 Soft Red Wheat at one of a number of delivery locations including Chicago, Burns Harbor Indiana, Ohio river, Northwest Ohio (at a discount of 20 cents), and Mississippi River (at a premium of 20 cents).[19] The price of the same grade of wheat at the different locations

[19] See CBOT Rules and Regulations, Chapter 14.
http://www.cbot.com/cbot/pub/page/0,3181,931,00.html

will vary depending on local supply and demand conditions. Costless arbitrage governs the range of prices, however. If the cash price of wheat in Chicago is $3 a bushel and the cash price of the same grade of wheat in Toledo is $2.50, arbitragers will buy the wheat in Toledo, ship it to Chicago, and sell it at $3, thereby earning an arbitrage profit of $.50. The transportation cost of shipping the wheat from Toledo to Chicago would have to be factored in. Assuming that transportation costs are $.10 a bushel, an arbitrage profit of $.40 remains possible. Arbitrage activity will continue until the Chicago and Toledo wheat prices deviate by no more than the transportation cost.

The subcommittee report attempts to circumvent the problem of identifying the appropriate cash price of the deliverable grade of wheat by using an index price of U.S. No. 2 Soft Red Wheat (SRWI) disseminated by Minneapolis Grain Exchange (MGEX). To understand why the SRWI is not an appropriate measure for the price of the cash commodity underlying the CBT's wheat futures contract, we need to understand how the SRWI is computed.

The SRWI is one of seven of grain cash price indexes created by the MGEX to serve as the underlying asset of cash-settled futures and options contracts. The seven daily spot price indexes for wheat, corn, and soybeans are:

Index	Symbol
National corn index	NCI
National soybean index	NSI
Hard red winter wheat index	HRWI
Soft red winter wheat index	SRWI
Hard red spring wheat index	HRSI
Durum wheat index	DWI
Soft white wheat index	WWI

Each spot index is calculated daily and is the simple arithmetic average of posted elevator bids. The SRWI, for example, currently includes more than 600 bid price quotes for U.S. No. 2 Soft Red Wheat collected from elevators in 20 different states. Table III-1 contains the percent of the total number of elevators accounted for by each state as of July 8, 2008. Ohio and Illinois are highest, with 27.3% and 26.1% of total, respectively. Indiana, Missouri, Michigan and Wisconsin also have shares that are 5% or higher. Among these 600 cash prices are only a handful that represent locations specified for delivery on the

CBT's wheat futures contract. Of the prices at the different delivery locations, the appropriate one is the lowest, after accounting for transportation costs. The difference between that price and the SRWI can be significant and unpredictable, as we will demonstrate shortly.

Table III-1: Percent of total number of elevators surveyed by state in the calculation of the MGEX's Soft Red Wheat Index (SRWI) as of July 8, 2008. Data are from MGEX web link,

http://www.mgex.com/documents/SRWImap071608.pdf.

No.	State	Percent of total	No. of elevators
1	Ohio	27.3%	156
2	Illinois	26.1%	149
3	Indiana	12.4%	71
4	Missouri	9.8%	56
5	Michigan	5.8%	33
6	Wisconsin	5.6%	32
7	Kentucky	3.5%	20
8	Arkansas	2.3%	13
9	Louisiana	1.4%	8
10	Georgia	1.4%	8
11	Tennessee	1.1%	6
12	Nine other states	3.3%	19

To gauge the size and direction of the error resulting from the use of the SRWI in the subcommittee report, we collect daily cash prices for two delivery locations specified in the CBT's wheat futures contract—West Chicago Terminal Elevators and West Toledo Terminal Mills—and compare them with the daily levels of the SRWI. The cash prices were obtained from the United States Department of Agriculture (USDA). Figure III-1 plots the difference between the Chicago cash price and the SRWI as well as the Toledo cash price and the SRWI during the period January 3, 2000 through July 15, 2009.[20] The price differences are quite remarkable. First, both the Chicago and Toledo price differences reveal that the SRWI is a downward biased estimate of the cash price of the wheat deliverable on the CBT's contract. In general, the price difference are greater than 0, indicating that the SRWI is too low and will give the appearance that there is no

[20] The starting date was determined by the availability of historical data for the SRWI.

convergence when there, in fact, may be. Second, there is considerable variation in the price differences through time. Naturally, this variation obfuscates the meaning of the convergence behavior documented in the subcommittee report. Since the SRWI is neither a tradable commodity nor a commodity deliverable on the CBT's wheat futures contract, it should not be used as a cash market proxy for a deliverable grade of wheat.

Figure III-1: Daily price difference between Chicago wheat cash price and the SRWI and the Toledo wheat cash price and the SRWI during the period January 3, 2000 through July 15, 2009. Data are from MGEX website and USDA.

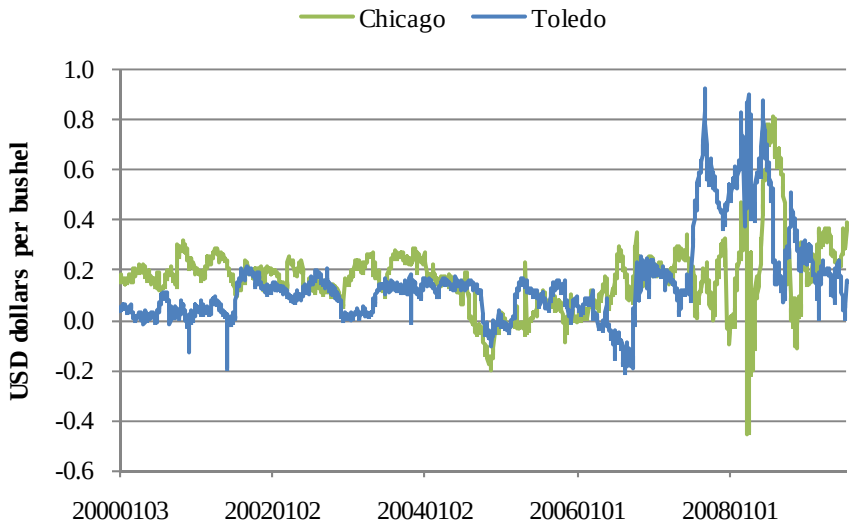


Table III-2 provides more detail regarding the price differences through time. The results show that over the period January 3, 2000 through July 15, 2009, the cash price of deliverable cash commodities, that is, Chicago wheat and Toledo wheat, are 16.5 cents and 14.5 cents higher than the SRWI, respectively.[21] Not surprisingly, the price differences are not uniformly higher for Chicago wheat versus Toledo wheat. While Chicago wheat tends to be higher, Toledo wheat is higher in 2004 and 2005 as well as 2007 and 2008. In these years, Chicago wheat was cheaper to deliver than Toledo wheat ignoring transportation costs. Nevertheless, the price differences are uniformly positive across years, indicating that the use of the SRWI as a cash market proxy will overstate the size of the futures basis. It is hardly surprising, therefore, that the subcommittee

[21] Part of the difference may be attributable to the fact that SRWI is based on bid prices rather than trade prices.

report, which uses the SRWI as a proxy for cash wheat, finds "… consistently elevated futures prices relative to the cash market." In addition, the subcommittee report finds that, "… since 2006, the difference between Chicago wheat futures prices and cash prices has steadily increased." (p. 114). This, too, is hardly surprising considering that the divergence between the cash prices of the deliverable commodities and the SRWI has increased in recent years. Assuming the purpose is to gauge actual basis convergence, the prices of tradable, deliverable cash commodities must be used.[22]

Table III-2: Average daily cash prices and cash price differences for Chicago wheat, Toledo wheat, and the SRWI during the period January 3, 2000 through July 15, 2009. Data are from MGEX website and USDA.

					Price differences	
Year	No. of days	Chicago cash price	Toledo cash price	SRWI level	Chicago less SRWI	Toledo less SRWI
2000-2009	2,382	3.8299	3.8097	3.6645	0.1654	0.1452
2000	251	2.3168	2.1596	2.1278	0.1889	0.0317
2001	248	2.5823	2.4778	2.3863	0.1960	0.0916
2002	250	3.2124	3.1808	3.0657	0.1467	0.1151
2003	250	3.3991	3.2732	3.1814	0.2177	0.0918
2004	249	3.3594	3.3911	3.2957	0.0637	0.0954
2005	251	3.0124	3.0701	2.9911	0.0213	0.0790
2006	250	3.5835	3.4663	3.4504	0.1331	0.0159
2007	249	5.8495	6.0032	5.6707	0.1789	0.3326
2008	250	6.7493	6.9058	6.4612	0.2881	0.4446
2009	134	4.5954	4.4923	4.3281	0.2673	0.1641

[22] Indeed, the fact that the SRWI is not tradable is likely the reason that the cash-settled wheat futures markets launched by the MGEX failed. In principle, cash-settled contracts should be more successful than delivery contracts like the CBT's wheat futures. Costs of delivery (e.g., transportation costs) are avoided since the futures contract is simply marked-to-market at the cash index level at expiration. But, history has shown that cash-settled futures thrive only where some set of market participants can actively trade the underlying index and arbitrage between the futures and cash markets. Indeed, the idea of program-trading of the stocks underlying the S&P 500 index emanated from the desire to arbitrage between the markets. In the case of the SRWI, the underlying commodity basket is not practically tradable. Buying or selling one dollar of wheat in 600 delivery locations is hardly practical, even for the biggest grain merchants in the marketplace. Without active arbitrage between the markets, there is no assurance that the cash-settled futures is an effective hedging vehicle, and, without the presence of hedgers in the marketplace, futures contract markets die on the vine.

2. Timing of measurement

Aside from using an incorrect proxy for the price of deliverable wheat, there is another issue that inflates the level of the basis reported in the subcommittee report. Specifically, in the subcommittee report, convergence is measured on a daily basis throughout the calendar year by subtracting the cash price from the nearby futures price.[23] For most days during the year, however, the nearby futures price will lie above the cash price due to the carry costs of the underlying asset. Only during the delivery period (i.e., the first two weeks of the contract month) should the futures price equal the cash price.

To clarify this point, recall that the CBT's wheat futures contract has only five contract months in a given year—March, May, July, September, and December. This means that we are allowed only five short opportunities to measure convergence each year—during the delivery periods (i.e., the first two weeks) of the March, May, July, September and December futures contracts. On all other days during the year, the difference between the nearby futures contract and the cash price (i.e., the basis) should be different from 0. Since the analysis in the subcommittee report uses all days during the year, we should expect to see positive basis.

To examine the convergence issue, we compute the average daily basis for the CBT's wheat futures contract for each contract month during the sample period January 2000 through July 2009. Note the delivery period for the wheat futures contract begins the first business day of the contract month, and the last day of trading for the contract is the business day before the 15th calendar day of the contract month, so the average basis is an average across about 10 days. Since we do not know the cheapest-to-deliver location for each contract expiration, we use the cash price of No. 2 Soft Red Winter Wheat deliverable in Chicago. The results are displayed in Figure III-2.

[23] See subcommittee report (2009, p.116).

Figure III-2: Absolute basis between CBT's wheat futures contract and the cash price of wheat deliverable in Chicago during the period January 3, 2000 through July 15, 2009. Futures data are from CME and cash data are from USDA. Average basis is computed over the daily levels observed during the contract delivery period.

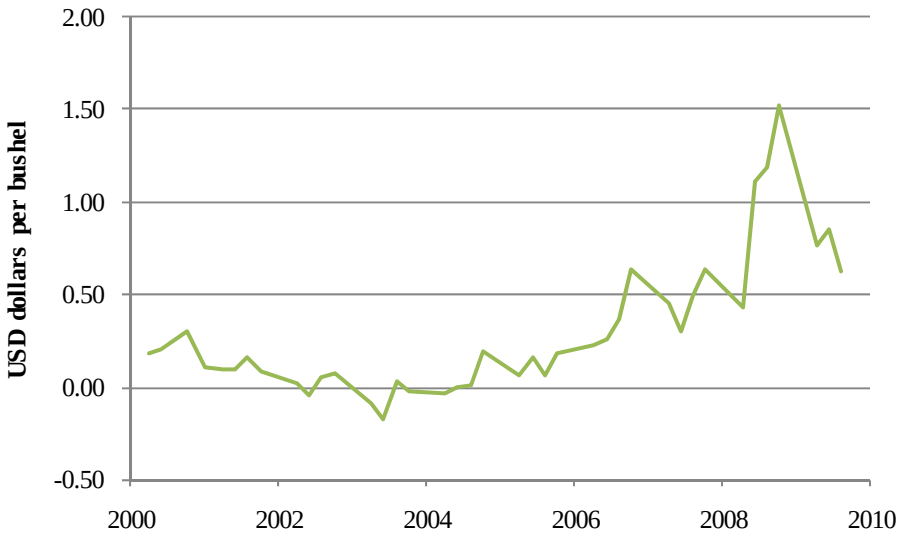


Figure III-2 is directly comparable to Figure 26 on page 116 of the subcommittee report. The critical differences are that we are using the cash prices of the commodities that can actually be delivered on the CBT's wheat futures contract and only intervals of time when the futures price should converge to the cash price. As expected, the basis shown in Figure III-2 is lower than that shown in the subcommittee report as a result of the downward bias of the cash proxy (i.e., the SRWI) discussed earlier and the inflated basis during non-delivery periods. Where the basis spiked at $2.25 per bushel in 2008 in the subcommittee report, our results show a level closer to $1.50. Our results are more comparable to Irwin, Garcia, Good, and Kunda (2009), who also use a deliverable grade of wheat to perform the basis computation. In place of taking an average of the basis over the delivery period, they use the basis on the first delivery date. And, in place of using Chicago wheat as the cash price, they use the price of wheat deliverable in the Toledo area. In summary, wheat futures prices do not appear to have converged in 2008, although the degree of divergence is not nearly as exaggerated as it appears in the subcommittee report.

B. History of convergence

An inference drawn in the subcommittee report is that the lack of convergence in the wheat market in the 2006-2009 period, particularly in late 2008, is driven by an increase in commodity index investing. While we documented no increase in commodity index investing of the CBT's wheat futures contract during the period, one could argue that the most dramatic increase in commodity index investing took place just prior to 2006 and we are only seeing its effects registered now. A simple way of addressing this issue is to examine basis behavior over a longer history. In Figure III-3, we examine the basis behavior of wheat during delivery periods for all contracts traded during January 1992 through July 2009. Because the dollar price of wheat varied dramatically over the sample period, we measure basis relative to the futures price on the last day of trading in order to gauge the levels on a common footing. Because we do not know for certain which delivery location is cheapest-to-deliver, we use two cash prices of wheat—Chicago and Toledo.

Focusing in on Chicago wheat, note the following. First, the relative basis is fairly erratic throughout the sample period. From 1992 through 1998, the basis at expiration bounces between 0% and 10%. It then proceeds to increase, reaching a maximum level of 22.6% for the September 1999 contract delivery period. From that point, the relative basis at contract expiration falls back down and hovers at a level just above 0%. Subsequently, it rises and spikes at 16.9% for the September 2006 contract and 21.6% for the September 2008 contract. Based on the figure, it is fair to say that convergence has been an issue in the wheat market dating back at least to 1992. Generally, the level of basis stays within the 0-10% range; however, periodic spikes for the September contracts are noteworthy. Given that commodity index investing had a relatively small presence in the marketplace before 2004 and virtually no presence in the marketplace in the early 1990s, commodity index investing cannot be the cause of the basis instability noted throughout the period.

Figure III-3: Relative basis between CBT's wheat futures contract and Chicago and Toledo wheat cash prices during the period January 1992 through July 2009. Futures data are from CBT and cash prices are from USDA. Average basis is computed over the daily levels observed during the contract delivery period. Futures price for computing relative basis is the settlement futures price on the last day of trading.

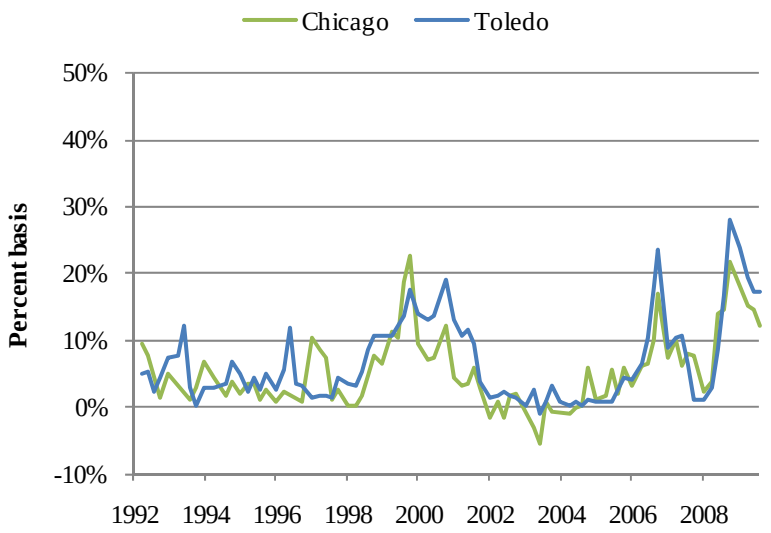


Figure III-3 is also useful in demonstrating the concept of cheapest to deliver. The average basis during the delivery period varies differently through time for Chicago and Toledo wheat. In some months, Chicago wheat has a basis closer to 0, while, in other months, Toledo does. The cheapest to deliver is the delivery location whose basis is closest to 0. So, where the basis spikes up for the September 2006 and September 2008 contract expirations, it is of no relevance to assessing convergence. Convergence is only relevant for the cheapest to deliver commodity, and, in both of these months, Chicago wheat is cheaper. In addition, there is no assurance that Chicago wheat is cheapest. Delivery at a number of other locations is possible. The Chicago and Toledo cash prices were chosen because they are frequently the cheapest to deliver locations.

C. Inter-commodity comparisons

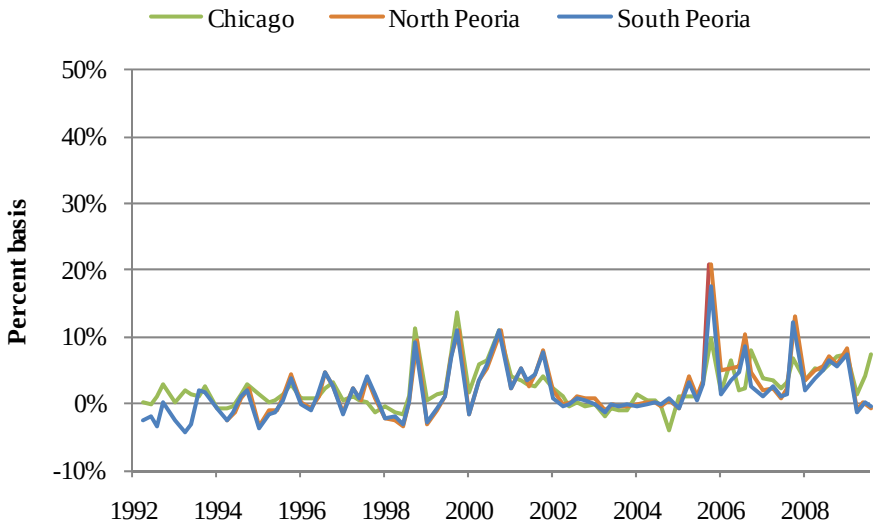
Several other agricultural commodities are included in the popular commodity indexes like the S&P-GSCI and DJ-UBSCI. The CBT's corn futures, for example, has weights of 3.55% and 5.72% in the two indexes, respectively, while the CBT's wheat futures has weights of 3.90% and 4.80%. To gauge whether the same type of basis

behavior has occurred for corn as for wheat, we examine basis convergence for all contract maturities from January 1992 through July 2009. The CBT's corn futures contract calls for delivery in Chicago, Burns Harbor Indiana, Lockport Seneca (at a premium of 2 cents), Ottawa-Chillicothe (at a premium of 2.5 cents), and Peoria-Pekin (at a premium of 3 cents). Since we do not know the cheapest-to-deliver location through history, we choose three cash prices in and around the Chicago area—Chicago, Illinois River North of Peoria, and Illinois River South of Peoria.

Figure III-4 shows the relative basis for the CBT's corn futures in the delivery periods from January 1992 through July 2009. The observed basis behavior for corn is different in at least two ways from that of wheat—the cash prices at the delivery locations are very similar, as indicated by the fact the three lines are on top of each other in many contract months, and the range of oscillations is lower, with most contract months falling in the 0-10% range. But, in other ways, they remain similar. They do oscillate from delivery month to delivery month, and the degree of variation in the oscillations changes in similar ways through time, with modest variation occurring in 1992 through 1998, high variation occurring in 1999 through 2001, low variation in 2002 through 2005, and high variation again in 2006 through 2009. While convergence appears to be less of an issue for corn than for wheat, it also appears that these two agricultural markets are driven by similar market factors and the relative basis behavior is not entirely commodity specific.

The CBT's soybean futures is another agricultural commodity typically included in diversified commodity indexes. Its weights are 2.64% and 7.60% in the S&P-GSCI and DJ-UBSCI indexes, respectively. The CBT's soybean futures contract calls for delivery in Chicago, Burns Harbor Indiana, Lockport Seneca (at a premium of 2 cents), Ottawa-Chillicothe (at a premium of 2.5 cents), Peoria-Pekin (at a premium of 3 cents), Havana-Grafton (at a premium of 3.5 cents), and St Louis and Alton (at a premium of 6 cents).

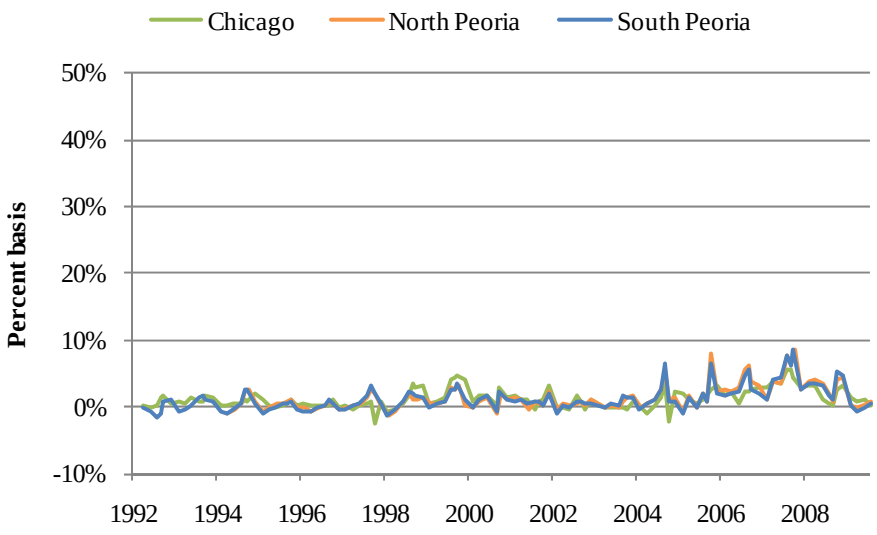
Figure III-4: Relative basis between CBT's corn futures contract and the cash prices of corn deliverable in (a) Chicago, (b) Illinois River North of Peoria, and (c) Illinois River South of Peoria during the period January 3, 2000 through July 15, 2009. Futures data are from CBT and cash data are from USDA. Average basis is computed over the daily levels observed during the contract delivery period. Futures price for computing relative basis is the settlement futures price on the last day of trading.



To gauge whether the basis behavior of soybeans is different from that of wheat and corn, we examine basis convergence for all soybean futures contract expirations during the period January 1992 through July 2009. Three cash prices are again used, with delivery locations in Chicago, Illinois River North of Peoria, and Illinois River South of Peoria. Figure III-5 shows the results. The soybean basis behavior shows greater convergence than both wheat and corn. The relative basis hovers just above 0 through most of the period. Again, the behavior is a little more erratic in 1999 through 2001 and in 2006 through 2009, suggesting a market-wide effect for grain commodities in general.[24]

[24] Recall that in Section II we showed the same seasonal behavior for the CBT's oats futures contract, and oats in not included in commodity index investing programs.

Figure III-5: Relative basis between CBT's soybean futures contract and the cash prices of soybeans deliverable in (a) Chicago, (b) Illinois River North of Peoria, and (c) Illinois River South of Peoria during the period January 3, 2000 through July 15, 2009. Futures data are from CME and cash data are from USDA. Average basis is computed over the daily levels observed during the contract delivery period. Futures price for computing relative basis is the settlement futures price on the last day of trading.



D. Economic consequences

Up to this point, we have focused in on the issue of convergence in the wheat futures market, and, to be sure, there are instances in time, both before and after the introduction of commodity index investment, that the futures price exceeded the cash price of the deliverable commodity during the delivery period. But, the importance of the convergence issues presupposes that failure to converge has dire economic consequences. The subcommittee report certainly suggests that there are.

> "The increasing gap between the futures and cash prices (basis), together with the failure of convergence, have *seriously impaired* (emphasis added) the ability of farmers, grain elevators, grain merchants, grain processors, and others in the agriculture industry to use the Chicago wheat futures market to manage and reduce the price risks arising from their operations in the wheat market." (See subcommittee report (2009, p. 113).)

But, this claim is patently false. The fact of the matter is that convergence is of limited importance considering that most of these risk managers unwind their futures positions before the delivery period. The important issue is whether or not there is evidence to indicate that the Chicago wheat futures has become a less effective hedging vehicle.

To begin our assessment of the economic consequences of Chicago wheat's failure to converge, we turn to the daily open interest of the CBT's wheat futures contracts during the period January 1992 through July 2009. For each contract month during this period, we identify the maximum daily open interest during the contract's life and the open interest on the first notice day of the contract (i.e., the last business day in the month preceding the delivery month. In Figure III-6, we plot these values. The results are quite revealing. While the maximum levels of open interest were high in 2006 and 2007, at least relative to the levels observed before 2005, the open interest on the first notice day has remained relatively constant through time. Table III-3 contains the average open interest on the first notice day across contract months for the CBT's wheat futures contract as well as the CBT's corn and soybean futures contracts. As the table shows, the average number of futures contracts carried into the delivery month was 5,284 during the sub-period 1999-2004 and 5,583 in 2005-2009. These are small numbers, at least in a relative sense. The average ratio of open interest on the first notice day to the maximum open interest over the contract's life over the period January 2005 through July 2009 is only 2.9%. This means that 97.1% of risk managers (e.g., farmers, grain elevators, grain merchants, grain processors, and others in the agriculture industry) have unwound their hedge positions before the delivery month.[25] In other words, for the vast majority of wheat price risk managers, the issue of convergence is moot.

What is relevant to the risk manager is the effectiveness of the CBT's wheat futures at hedging commodity price risk over his/her hedging horizon. In practice, hedging effectiveness is measured by the adjusted R-squared from a regression of cash commodity returns on futures returns.[26] The adjusted R-squared has a range from 0 to 1. A value near 0 indicates that the futures is an ineffective hedging tool, and a value near 1 indicates that it is a very effective tool.

[25] Of course, 100% of commodity index investors closed their positions weeks before the delivery month.
[26] See Whaley (2006, Ch.5).

Figure III-6: Maximum open interest and open interest on first notice day for CBT's wheat futures contracts during the period January 1992 through July 2009. Futures data are from CBT.

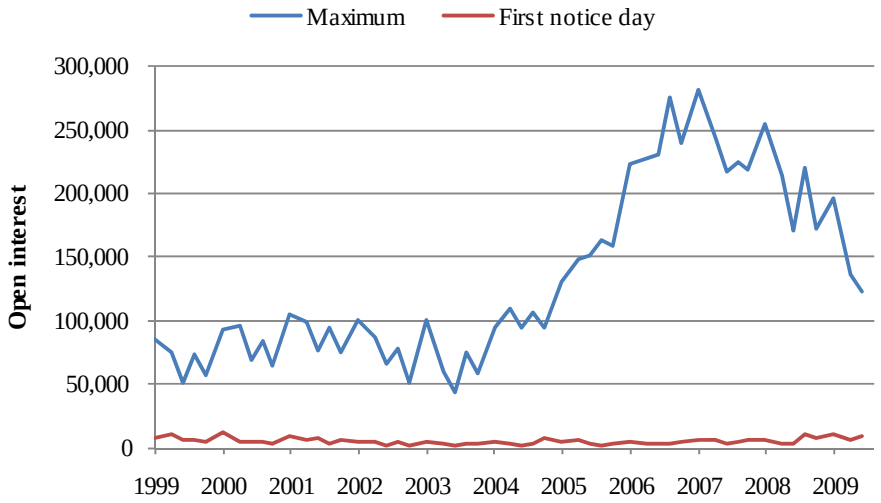


Table III-3: Average open interest of first notice day relative to maximum open interest over contract life and average open interest on first notice day for selected agricultural futures contracts during the period January 1999 through July 2009. Futures data are from the CBT.

Panel A: Open interest on first notice day

Subperiod	Wheat	Corn	Soybean
1999-2004	5,284	22,611	11,299
2005-2009	5,583	26,638	12,591

Panel B: Open interest on first notice day relative to maximum open interest

Subperiod	Wheat	Corn	Soybean
1999-2004	0.0667	0.1109	0.1581
2005-2009	0.0293	0.0557	0.1014

To assess whether the CBT's wheat futures contract has become a less effective hedging vehicle in recent times, as is suggested by the subcommittee report, we examine the returns of cash wheat and wheat futures over all contract expirations during the period January 2000 through July 2009. To proxy for the cash price of wheat, we use the daily levels of the SRWI from the MGEX. The hedge horizon is set at 126 business days (about 6 months), and the hedge period ends on the first notice day of the futures contract month. The futures price data are from the CBT. For each futures contract expiration

during the sample period, we regress cash returns on futures returns and record the adjusted R-squared. Table III-4 summarizes the results. The table entries are the average adjusted R-squared values of the contract months in each year. As the table shows, the CBT's wheat futures contract has been a highly effective hedging instrument throughout the 10-year period. For the sub-period 2006-2009, the adjusted R-squared is 0.949, which means that 94.9% of cash commodity price risk can be eliminated using the wheat futures contract.

Table III-4: Average adjusted R-squared level of regression of daily cash wheat returns on daily wheat futures returns by contract month during the period January 2000 through July 2009. Cash returns are calculated from SRWI levels and were obtained from the MGEX website. Futures returns are calculated from CBT prices. Return regressions are for the last 126 business days before and including the contract's first notice day.

Subperiod	Adjusted R-squared
1999-2004	0.943
2005-2009	0.949

IV. Summary of Main Conclusions

The subcommittee report concludes that excessive speculation by commodity index investors has caused unwarranted increases in the price of wheat futures and has seriously impaired the contract's effectiveness at being an effective risk management tool. This study questions the legitimacy of this conclusion and reaches three main conclusions.

1) Commodity index investment is not speculation.

Commodity index investment is passive, fully-collateralized, long-only investment by an institution or individual and is no different in principle from a stock index or bond index portfolio. Its fundamental contribution to investment management is in providing an effective diversification tool.

2) Commodity index rolls have little futures price impact, and inflows and outflows from commodity index investment do not cause futures prices to change

The price of a commodity reflects the cost of supplying that commodity and the demand for it by consumers. Changes in the cost of production or in demand change the price. The futures price reflects the spot price expected in the future and hence reflects the supply and demand anticipated for the commodity. For commodities that are stored, arbitrage assures that the spot and futures price are linked. We conduct six analyses to determine whether investment in commodity futures, sometimes in large amounts, diverts futures prices from their fundamental value. The first argues that, if index traders were the dominant force in the commodity futures market, the prices of all futures contracts in the index would rise or fall together. We show that the correlation in futures returns is neither high nor uniform. In the second, we show that commodities not in an index are correlated with commodities in the index approximately to the same degree as commodities in the index are correlated with each other, which suggests that fundamental forces, not index investing, is the source of the correlation. Third, commodity prices rose in 2006 and 2007. If the increase was due to index investing, one would not expect a similar rise for commodities not in an index. The prices of coal, cobalt and rhodium—commodities not in an index—also rose in price, however, which suggests the price rise

cannot be the result of commodity index investing. Fourth, commodity index investors that mimic the S&P-GSCI and DJ-UBSCI roll out of the nearby contract and into the next contract according to a known schedule. Given the hundreds of millions of dollars in futures trades being consummated at this time, this would be the most likely time to see price impact, both in the sale of the nearby futures and the purchase of the second nearby. The positive, but economically insignificant, price effects observed suggest that the futures markets are deep and fully capable of absorbing commodity index investment rolls for most commodity futures markets. A separate analysis for crude oil futures—the commodity futures with the single largest notional value in the indexes (but not rolled in the same way within the indexes)—shows a positive and significant return differential. Fifth, we analyze in a Granger causality framework the relation between investment flows of index traders as reported in the Supplement to the COT reports and subsequent price changes. There is no evidence that investment flows Granger-cause price changes or that price changes Granger-cause flows. Sixth, the Granger causality tests examine weekly lag effects, which may be too coarse a measure to see an impact. We also look at a contemporaneous relation between commodity futures returns and flows under the assumption that inflows have a different price effect than outflows. We find no indication that commodity index traders affect prices in this framework. Other traders, classified as speculators, do have an impact.

3) Failure of the wheat futures price to converge to the cash price at the contract's expiration has not undermined the futures contract's effectiveness as a risk management tool.

The subcommittee report concludes that commodity index investing is a major cause in the failure of the CBT's wheat futures price to converge in the period 2006-2009, with the futures price being particularly elevated in late 2008. What is surprising about this conclusion is that commodity index investing in wheat was actually falling, not rising, in 2008. To understand the CBT's wheat price convergence more fully, we use a period of time much longer than that used in the subcommittee report and show that wheat has failed to converge in periods when the amount of commodity index investing is known to be negligible. We also examine the convergence behavior of the CBT's corn

and soybean futures contracts over the same historical period and find that, while neither corn nor soybeans have had as great of divergence as wheat, grain commodity futures in general seem to experience convergence anomalies at the same points in time. Finally, we address the issue whether the failure of the wheat futures price to converge to the cash price has any meaningful economic consequences. We find none. For convergence to be an issue, significant numbers of futures contracts must be carried into the delivery month. In the period 2005-2009, only about 5,000 contracts remained open on the first notice day of the delivery month, less than 3% of the maximum open interest that the contract realized during its life. In other words, 97% of the risk managers who had been using the wheat futures to hedge have disposed of their positions before convergence becomes an issue. The cash price for delivering this small amount is subject to the vagaries of the delivery mechanism and the option of the short to choose the grade, location, and exact time of delivery. The apparent failure to converge does not reduce the effectiveness of the CBT's wheat futures contract as a risk management tool, however, for we show that futures returns are highly correlated with the returns of a typical grade of wheat.

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