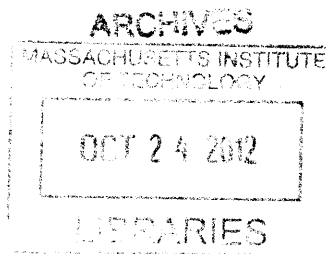


# Price Distortions in the Commodity Futures Markets

by

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SUBMITTED TO THE ENGINEERING SYSTEMS DIVISION  
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Engineering Systems Division

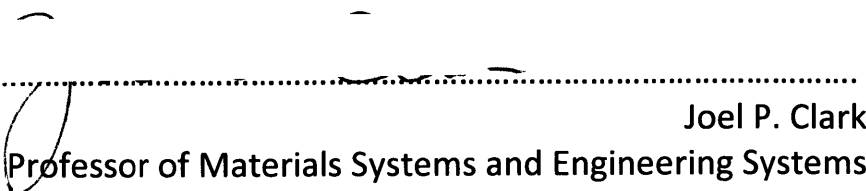
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## **ABSTRACT**

Speculation is not monolithic; it comes in many forms. A certain level of speculation is required for commodity futures markets to function. On the other hand, certain types of trading activities by speculators may damage a market's price discovery function and in turn its hedging function. However, there is great disagreement as to which types of speculation can distort commodity futures prices and the mechanisms for how a price distortion may occur.

This thesis advances three distinct categories of speculative activities alleged to distort commodity prices and reviews evidence for each. Those three categories are: corner and squeeze manipulations, nonfundamental futures demand, and large speculative demand. Case studies are presented for each of the three categories. In addition, the effectiveness of speculative position limits in decreasing the occurrence of each category is analyzed.

A question that arises, but is left unanswered, is whether the marginal benefits outweigh the possible costs of speculation once speculation rises above certain levels required for price discovery and hedging.

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## Chapter 1

### Introduction

“Speculation” has been blamed by many parties for causing price distortions in the futures markets. The recent volatility in commodity prices has returned that debate to the forefront of political conversation. In a research report, Goldman Sachs (2011, p.1) estimates that “each million barrels of net speculative length tends to add 8-10 cents to the price of a barrel of oil.” Two economists at the Federal Reserve Bank of St. Louis (2012, p.1) recently concluded “While global demand shocks account for the largest share of oil price fluctuations, speculative shocks are the second most important driver.” And U.S. Senator Carl Levin (2012) spoke from the Senate floor claiming, “...excessive speculation in the futures and swaps markets has distorted prices, overwhelmed normal supply and demand factors, and pushed up prices at the expense of consumers and American business.”

Conversely, there are also many others who believe speculation has little or no effect on futures prices. In a paper presented by two agricultural economists (Irwin, *et al.*, 2009, p.17), the authors conclude “There is little evidence that the recent boom and bust in commodity prices was driven by a speculative bubble.” The Chicago Mercantile Exchange Group (CME, 2009, p.5) asserts that “Most every competent economist who has looked at real data, rather than anecdotes, and who has applied legitimate economic analysis concludes that neither speculators, swap dealers, nor index funds are distorting commodity prices.” And the investment bank BlackRock (2011, p.4) claims that “Rather than link commodity price movements to speculation, reputable studies have uniformly found that fundamental market conditions are the driving force behind such price fluctuations.”

To make matters more confounding, not only is there disagreement about whether speculation distorts prices, there is also vast disagreement on what exactly “speculation” is. This thesis begins to answer those questions by putting speculation into a coherent framework and reviewing current evidence.

Some speculation – in the broadest sense of encompassing all those market participants who are not hedging risk – is required for futures markets to function. At a minimum, those wishing to hedge commercial risk need some speculators to accept that risk by taking opposite futures positions, since the hedgers using the market do not have perfectly balanced long and short position demands. Nevertheless, the focus of this thesis is on the subtypes of speculation that are claimed to distort prices.

To that end, this thesis divides speculation into three categories that are alleged to distort prices: corner and squeeze manipulations, nonfundamental futures demand, and large speculative demand (with a focus on indexes). These three categories do not exhaust the forms of speculation that are alleged to distort prices. For example, asset bubbles may be described as a consequence of another particular type of speculative activity that is driven by widely-held irrational beliefs.

In the next three chapters, this thesis reviews the evidence for, and magnitude of, price distortions resulting from the three categories of speculation. Chapter 5 asks how effective a particular regulatory tool – speculative position limits – could be at preventing price distortions. Each of these chapters is written to stand alone as a separate discussion of each topic. The final chapter concludes.

## Chapter 2

### Corner and Squeeze Manipulations

The first category of speculation alleged to distort prices in the commodity futures markets is the corner and squeeze manipulation. A corner and squeeze manipulation is relatively less controversial and easier to detect than the categories of speculation addressed in chapters three and four, nonfundamental demand and large speculative demand respectively.<sup>1</sup> Corner and squeeze manipulations – obtaining a dominant position in the physical product and/or futures contracts of a commodity and then using that market power to force prices to supercompetitive levels around contract expiration – were ubiquitous events in the grain markets of the early 20<sup>th</sup> century. Indeed, 121 corner and squeeze manipulations in grains and meats are documented between 1868 and 1921 (Pirrong, 1995). In addition, the futures contracts of Gold, Silver, Copper, Cotton, Potatoes, and Onions – just to name a few – have all been subject to corner and squeeze manipulations. More recently, the dramatic Hunt Brothers' silver manipulations of 1979 and 1980 contributed to a swing in the price of silver from \$9 to \$50 per ounce in 5 months, and a reported \$1 billion plus in losses for the Hunts. Corner and squeeze manipulations make and break fortunes and can occur in any commodity futures contract that is linked to physical delivery. Some of the largest corner and squeeze manipulations have forced massive flows of a commodity from across the country or world to a single market location only to be redistributed after the squeezed futures contract expires.

A corner and squeeze manipulation occurs when a manipulator (the entity executing the corner and squeeze manipulation) exercises her market power at the expiration date of a futures contract. This is when the physical commodity must be delivered by those who still hold futures contracts to sell (short positions) to the players who still hold contracts to buy (long positions). Two distinguishing features of a corner and squeeze manipulation are the manipulator's requirement of a relatively large futures and/or physical position that is used to drive up the futures price and realize a supercompetitive futures profit,<sup>2</sup> and secondly, a relative depression of prices after the contract expires and the manipulator

---

<sup>1</sup> The corner and squeeze manipulation is addressed as a distinct category of speculative price distortion outside of the nonfundamental demand category in chapter two due to its historical and economic importance and its highly unique features. Otherwise, a corner and squeeze manipulation would be a type of nonfundamental futures demand.

<sup>2</sup> For example, the Hunt Brothers and Conti Group together owned more than 50 percent of the silver deliverable against the COMEX futures contract; the total reported silver owned by the Hunts was 90.3 million ounces on December 27, 1979 (CFTC, 2010a).

subsequently sells off her position. The manipulator may use the futures market only, or both the physical and the futures markets in order to execute the corner and the squeeze. In either case, the intent of the manipulator is to profit from noncompetitive futures prices.

In a typical corner and squeeze manipulation, the manipulator uses her dominant long futures position to force other trapped short speculators and hedgers to deliver on the futures contracts they hold. Most of these market players took futures positions with the intent of squaring-out (or exiting the market by buying a position that offsets their current position) before contract expiration and were not planning to make physical delivery of the commodity. Unfortunately for them, the manipulator's squeeze requires excessive levels of delivery. To meet the demand of the manipulator, speculators are forced to acquire large quantities of the physical commodity at increasing marginal costs, which drives up the futures price. For the corner and squeeze manipulation to be profitable, the manipulator must cash out a portion of her futures position at the inflated prices, and ensure that those futures payouts that are greater than any losses on the large physical commodity stocks that the manipulator now owns. Because the manipulators' profits come directly from the pockets of speculators and hedgers who voluntarily sell futures to the manipulator, it has been aptly said that, "The victims of market power in a commodity futures market sell the executioner the rope by which they are hung" (Pirrong, 1996, p.11).

The remainder of this chapter is organized into three sections. Section I further defines corner and squeeze manipulations. Section II analyzes two relatively recent corner and squeeze manipulation events: the Ferruzzi soybean manipulation of 1989 and the alleged Arcadia *et al.* crude oil manipulation of 2008. These two corner and squeeze manipulation case studies will help us to understand the basic mechanics, results, and implications of a commodity futures corner and squeeze manipulation. Section II also reviews the efficacy of speculative position limits in the context of both case studies. Section III contains an appendix with tables that further describe the two case studies.

## **2.1 Corner and Squeeze**

To continue our analysis of corner and squeeze manipulations we must first further define a corner and squeeze. In the literature and media there is much variation in the usage of the two terms. Below I have

synthesized multiple sources, but hew closest to the Chicago Board of Trade's explanation (CBOT, 1990), and Craig Pirrong's definition of what he calls "market power manipulation" (Pirrong, 1996).<sup>3</sup>

### 2.1.1 Definition One

A most brief and inevitably incomplete explanation is as follows: a corner is controlling enough of a commodity to exert market power, and a squeeze is when a cornerer exercises her market power to force the price of futures beyond the competitive equilibrium.<sup>4</sup>

### 2.1.2 Definition Two

A more thorough definition is as follows: a corner is acquiring and controlling a sufficient quantity of physical *and/or* long futures positions so as to be able to unilaterally increase futures prices. The "sufficient quantity" means a combined physical and futures position that is greater than the number of futures contracts that would be taken to delivery in market equilibrium.<sup>5</sup> Theoretically, the "market equilibrium deliveries" represents the number of futures contracts which would have been delivered by those shorts who face lower costs of delivery than the cost of squaring-out with the exchange at the equilibrium futures price. In other words, the cornerer has to have a larger combined long physical and futures position than the quantity of commodity that would be efficiently supplied (delivered) against futures contracts in competitive market conditions. This "sufficient quantity" condition must be true at the time of futures contract expiry.

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<sup>3</sup> Also see CFTC's basic definitions: Corner: (1) Securing such relative control of a commodity that its price can be manipulated, that is, can be controlled by the creator of the corner; or (2) in the extreme situation, obtaining contracts requiring the delivery of more commodities than are available for delivery. Squeeze: A market situation in which the lack of supplies tends to force shorts to cover their positions by offset at higher prices (CFTC online glossary: <http://www.cftc.gov/ConsumerProtection/EducationCenter/CFTCGlossary/index.htm>).

<sup>4</sup> One significant divergence between this thesis' definitions and those of the majority of the existing literature is in explicitly separating the term "corner" from the term "squeeze." The terms corner and squeeze have usually been used interchangeably, and a corner and squeeze have *both* referred to the entire corner and squeeze manipulation (e.g. see Pirrong, Squeeze Play, 2008). Instead, we will limit corner to mean possessing a market power position, but *not* necessarily exercising it. This distinction has advantages and disadvantages: giving "corner" this definition separates it from the definition of squeeze and helps to unpack a corner and squeeze manipulation. However, the confusing but interchangeable usage is more common and the Commodity Exchange Act of 1936 explicitly proscribes a "corner," but does not mention the term "squeeze." For these practical reasons, it is helpful to note that the common usage of the terms "corner" or "squeeze" is equivalent to the *combination* of a corner *and* squeeze as used in this thesis.

<sup>5</sup> The "sufficient quantity" for a corner can also be covered by the combined position of the manipulator and other long traders who, for whatever reason, will also not liquidate and hold their positions until expiry.

A squeeze subsequently occurs if the cornerer then exercises her market power inherent in a corner. At this point the activity becomes a true corner and squeeze manipulation. During the squeeze, the manipulator (the entity executing the corner and squeeze) demands physical delivery on more futures contracts than the counterfactual competitive market would have supplied (i.e. the “market equilibrium deliveries”), driving prices above market equilibrium. The futures price rises since the marginal cost of supplying the commodity to market increases as the commodity is acquired from more distant locations and from higher value uses. In other words, the manipulator is pushing the shorts up the upward-sloping marginal cost of delivery curve, since the shorts are contractually required to fulfill the manipulator’s artificial long futures demand.

Taking delivery of large amounts of the physical commodity is not the (potentially) profitable part of the corner and squeeze manipulation. Indeed, after futures contract expires, the manipulator usually takes a loss on the physical commodity deliveries, since she has demanded more than she can use, and there is now a glut of the physical commodity at the delivery location, and prices will drop if she sells promptly (the so-called “burying the corpse” effect). Instead, the reason for taking the unprofitable deliveries - and the key to the squeeze and indeed the entire corner and squeeze manipulation - is for the manipulator to also *liquidate* a large portion of her *remaining* futures position at the inflated futures prices she has created. The futures price increases as the squeezed shorts are willing to pay prices to the manipulator, equal to the increasing marginal cost of delivery, in order to get out of their futures contracts. Finally, for the corner and squeeze manipulation to be profitable, the manipulator’s revenue from liquidating futures contracts (or otherwise financially settling with shorts) must exceed the losses incurred from later selling off the excessive physical commodity stocks that the manipulator has accumulated.

### **2.1.3 Final detail: Corner and Squeeze**

A final explanation consisting of 15 key characteristics of a corner and squeeze is as follows:

- 1) A corner and a squeeze are different<sup>6</sup> and together they form a corner and squeeze manipulation
- 2) A corner may or may not lead to a squeeze, but a corner is a prerequisite for a squeeze
- 3) A corner is a long supply position large enough to exercise market power
- 4) A corner can be acquired in the physical, futures, or combined physical and futures markets
- 5) A corner can be built up (ideally secretively) over time

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<sup>6</sup> See footnote 5 above

- 6) A squeeze is the use of a corner to push futures to supercompetitive prices
- 7) A squeeze occurs near the expiration of a futures contract
- 8) There must be an increasing marginal cost of supplying the commodity to market to enable a corner and squeeze manipulation
- 9) The profit making tool of the squeeze is not limited to futures contracts; a squeeze can use any financial derivative linked to the futures settlement price
- 10) A typical squeeze requires the manipulator to demand delivery on many, but not all of her futures positions in order to drive up futures contracts to supercompetitive prices
- 11) A manipulator tries to maximize the revenue from:
  - a) Selling a portion of her futures contracts at supercompetitive prices, and
  - b) Selling the excess physical delivery she has received from the corner and squeeze
- 12) The manipulator usually acquires more physical commodity than she can commercially use in the short term. Her physical stockpile accrues from taking excessive delivery on her futures contracts plus any original physical supply that supported the corner
- 13) A corner and squeeze manipulation can be a “long manipulation” or a “short manipulation”<sup>7</sup>
  - a) A “long manipulation” is much more common, and occurs when the manipulator is long and the shorts are forced to deliver excessive amounts of a commodity (“short squeeze”)
  - b) A “short manipulation” is less common, and occurs when the manipulator is short and the longs are forced to receive excessive amounts of a commodity (“long squeeze”)
- 14) A corner and squeeze produce geographic and temporal price distortions
  - a) Before the squeezed futures contract expires:
    - i) Higher prices in the squeezed, near-month futures contract, relative to the counterfactual
    - ii) Higher prices in the local spot market, relative to the counterfactual
  - b) After the squeezed futures contract expires:
    - i) Lower prices in the new near-month futures contract (relative to the counterfactual)
    - ii) Lower prices in the local spot market (relative to the counterfactual)
    - iii) These effects are called “burying the corpse”
- 15) In certain corner and squeeze manipulations, a corner can continue for longer than the expiration of a particular squeezed futures contract, i.e. multiple futures contracts can be squeezed from the same corner

## 2.2 Case Studies

This section will dissect two alleged corner and squeeze manipulations: the Ferruzzi soybean manipulation of 1989 and the Arcadia *et al.* oil manipulation of 2008. Both cases represent a form of corner and a squeeze as defined above.

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<sup>7</sup> This thesis will assume corner and squeeze manipulations are long manipulations

### 2.2.1 Case Study: Ferruzzi Soybean Manipulation of 1989

In the summer of 1989, a large Italian multinational firm attempted to manipulate the price of soybeans on the Chicago Board of Trade (CBOT). The Milan-based Ferruzzi Finanziaria sent soybean prices on fear-of-squeeze induced leaps and threatened CBOT soybean delivery defaults, provoking the Commodity Futures Trading Commission (CFTC) and the CBOT to intervene and force Ferruzzi out of the futures market. Ferruzzi's actions closely followed this thesis' definition of a typical corner with intent to squeeze. Ferruzzi cornered the market through acquisition of over 80 percent of the supply of deliverable soybeans and over 50 percent of the long open interest in the futures market. As a result of Ferruzzi's attempted squeeze, the conglomerate's futures position gained more than \$10 million, but then lost \$15 million when the squeeze was thwarted through a forced liquidation of positions and prices dropped. This case study will first describe the Ferruzzi corner and squeeze manipulation and align it with our generic definition of a corner and squeeze; second, present a detailed recreation of Ferruzzi's soybean positions, profits, and the futures price over time; and finally draw conclusions.

Ferruzzi Finanziaria was a large Italian Conglomerate that was a major player in soybeans trading, buying, processing, and exporting in the United States. Ferruzzi had been granted repeated hedging exemptions from speculative position limits by the CFTC to protect its commercial needs against adverse soybean price movements, including for the two soybean futures contracts of interest – May and July of 1989. A hedge exemption allowed the recipient to take futures positions larger than the 3 million bushel speculative position limit.<sup>8</sup> Ferruzzi claimed the need for an “anticipatory hedge” for its anticipated future purchases of soybeans for domestic processing and foreign export. This type of hedge functions like so: future upward soybean price movement would mean that Ferruzzi would have to pay more in the future to buy its bean requirements than today's price. To hedge this buying price risk, Ferruzzi went long soybeans futures so that any upward soybean price move would also mean an increasing futures payout that would offset its increased spot soybean purchase costs. In this way, the soybeans price that Ferruzzi would have to pay in the future spot market was locked in once it put on its long futures position. The understanding between the CFTC and entities with anticipatory hedge exemptions was that when the soybeans were purchased in the cash market, and the hedge was no longer needed, the futures position would be lifted (Senate Ag, 1989, p.56).

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<sup>8</sup> Spot month soybean speculative position limits remain 3 million bushels in 2012 (CBOT rulebook: <http://www.cmegroup.com/rulebook/CBOT/>)

The hedge exemption that CFTC granted Ferruzzi allowed the firm to acquire long soybeans futures positions that were much larger than the available supply of soybeans deliverable against the CBOT May and July futures contracts. As the contract expiration date grew close, Ferruzzi was not substantially lifting its hedge. In addition, Ferruzzi owned the majority of the bushels of soybeans available for delivery against the CBOT soybeans contract in the summer of 1989. These factors eventually led the CFTC and the CBOT to twice force the liquidation of the vast majority of Ferruzzi’s long futures positions because, as CFTC’s Director of Market Surveillance testified before Congress, “there was a threat of a default, a squeeze, manipulation, price distortion [in the July futures contract] (Senate Ag, p.57).” A timeline of events during the summer of 1989 follows.

<b>July 1989 Soybean Futures Contract</b>	
<b>Date</b>	<b>Event</b>
Early June	Ferruzzi futures position: 32 million bushels long
June	Traders, grain merchants, exporters, and processors express concern to CFTC about July futures contract. <i>Pro Farmer</i> warns of a squeeze in the July futures contract
6/27	Ferruzzi futures position: 24 million bushels long (25% of open interest)
6/27	CBOT warns Ferruzzi about the firm’s large July futures position
7/1	Ferruzzi physical position: 7 million bushels in deliverable locations (60-85% of total)
7/5	Ferruzzi futures position: 23 million bushels long (44% of open interest)
7/5	CBOT Business Conduct Committee meets with Ferruzzi
7/6	CFTC meet with Ferruzzi, warn hedge exemption may be revoked
7/7	Ferruzzi futures position: 22 million bushels long (49% of open interest)
7/7	CBOT asks Ferruzzi to liquidate 3 million bushels per day as a “last chance”
7/10	Ferruzzi futures position: 21 million bushels long (53% of open interest)
7/10	Ferruzzi responds to CBOT saying it intends to take delivery on its July futures position if it does not find sufficient quantities of economically priced soybeans elsewhere
7/10	July soybeans contract falls \$0.23 (3%), possibly on leak of 7/11 CBOT Emergency Order that requires Ferruzzi to liquidate its futures position
7/11	Ferruzzi futures position: 21 million bushels long (59% of open interest)
7/11	Ferruzzi physical position: 7 million bushels in deliverable locations (60-85% of total)
7/11	CFTC revokes Ferruzzi’s hedging exemption for the last three trading days of the July contract. Thus, Ferruzzi was required to have no more than 3 million bushels July 18-20

7/11	July soybeans contract falls \$0.18 (2%), possibly on leak of 7/11 CBOT Emergency Order that requires Ferruzzi to liquidate its futures position
7/11	After trading hours, CBOT issues an Emergency Order requiring any entity with a position greater than 3 million bushels to reduce that position by 20 percent per day, and to no more than 3 million bushels by end of trading on July 18 and to no more than 1 million bushels by contract expiration on July 20
7/12	July soybeans contract falls \$0.40 (5%)
7/13	Ferruzzi fails to get temporary restraining order on CBOT Emergency Order
7/18-19	July futures price spike possibly due to uncertainty in legal ability of CBOT to enforce Emergency Order
7/20	July contract has fallen \$0.78 since 7/7 (10%)
7/20	July soybean futures contract expires

Figure 1: Timeline of July Soybean Futures Contract Corner and Squeeze Manipulation  
Sources: Senate Ag (1989) and CBOT (1990)

Let us now review how the Ferruzzi episode aligns with this chapter's definition of a corner and squeeze manipulation. Ferruzzi accumulated a dominant corner of the soybean market and was in the position to squeeze the price of the May and then July soybean futures contract. For simplicity, we will focus on the July soybean futures contract.

Ferruzzi acquired its July soybean market corner through a combination of physical and futures positions. By July 11, the firm held a physical position of 7 million bushels which represented between 60 and 85 percent of total soybeans available for delivery against the CBOT July soybean futures contract (leaving between 1 and 3 million bushels not owned by Ferruzzi and available for delivery). In addition, Ferruzzi was 21 million bushels long futures contracts allegedly for hedging, but showing no signs of liquidation. Indeed, Ferruzzi wrote to the CBOT on July 10 indicating that it was not going to remove its hedge before July contract expiration if it did not find other beans at an "economic price." This was an exemplar corner. Ferruzzi could demand delivery on some 20 million bushels *more* than were readily available to the CBOT soybean delivery points of Chicago and Toledo. As CFTC Commissioner Hineman put it to Congress, "...and definitely one thing we both knew, there was nowhere close to enough beans in the delivery area to satisfy those [Ferruzzi's] long positions if they decided to take all those beans, to stand for delivery on all those beans (Senate Ag, 1989, p.40)."

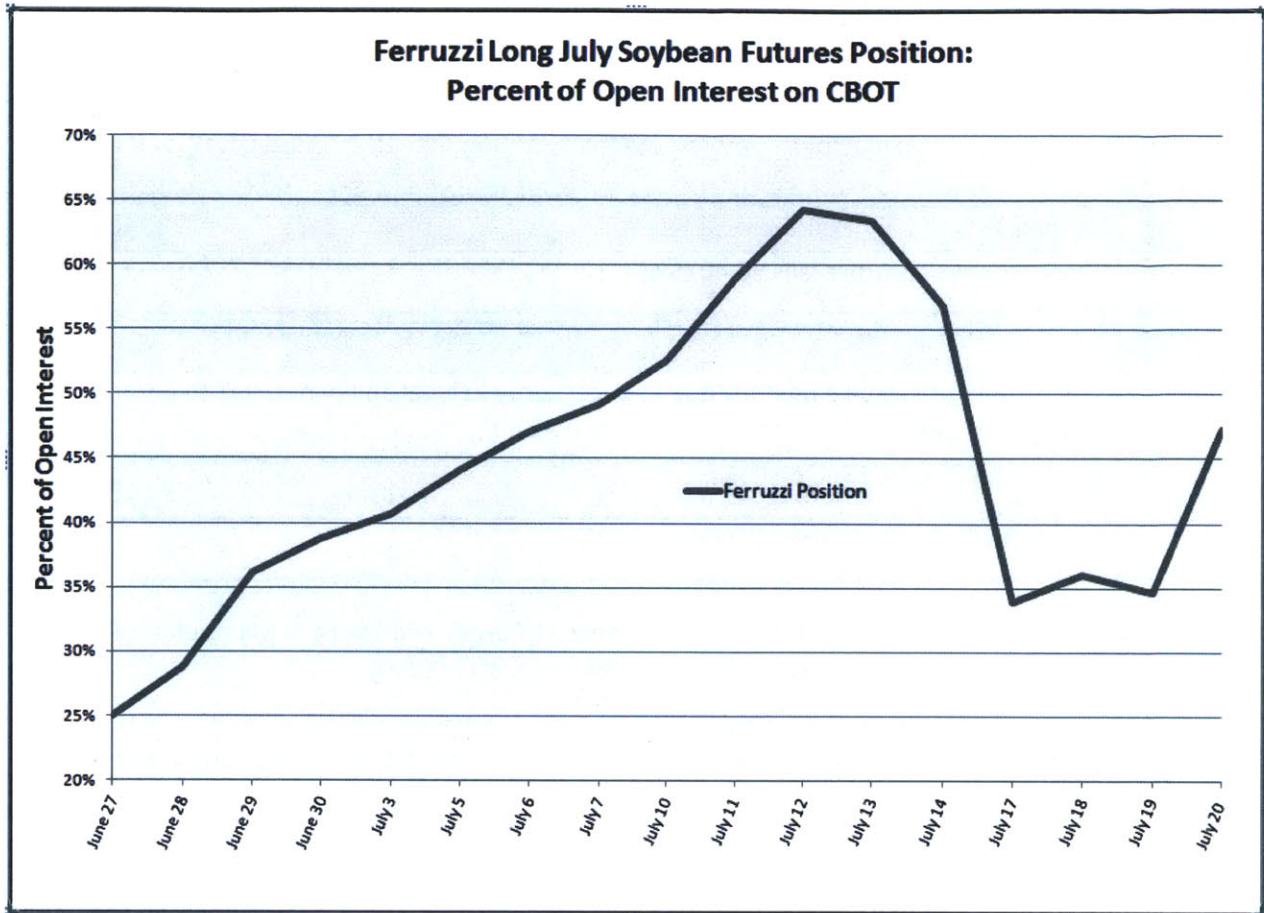


Figure 2: Ferruzzi’s Soybean Futures Position as a Percent of July Contract Open Interest

With a dominant corner in place, Ferruzzi had created the ability to squeeze the July soybeans contract. If Ferruzzi opted to begin taking delivery on any significant portion of its long futures position, the price of the futures contract would dramatically increase. The traders who remained short against Ferruzzi’s longs would be forced to acquire increasingly expensive beans from further and further away and from entities with an increasingly lower willingness to sell. In other words, shorts would be pushed up the marginal cost curve. To avoid delivery and settle their contracts with Ferruzzi, these shorts would be willing to pay an equally high price. Commissioner Hineman explained his concern of a squeeze to Congress this way: “There is another fear. I am not alleging that these things happened or did not happen, and I have no absolute knowledge that they would have happened. But these are the things that have to be foremost in your mind at that time. The other possibility is called a squeeze or a corner wherein, by the longs hanging tough, and the shorts are in the market and cannot get out, the price just spikes up which, in my opinion, does no one any good (Senate Ag, p.41).”

The Chicago Board of Trade also explained its strong worry that Ferruzzi would manipulate the soybean contract: "...there was a concern that a market corner and price squeeze could occur...Given the dominant positions held by a single firm, there can be little question as to what *might* have happened. Had the firm continued to maintain its positions throughout the seven remaining trading days, it could have caused the price of the expiring soybean futures contract to rise far above the cash market value of soybeans. Participants on the other side of the market would have been precluded from settling their contracts by the alternative mechanism of delivery *because the same firm that held most of the outstanding long soybean futures positions also controlled more than 85% of the deliverable supply.* Logistics of transportation would have made it difficult or impossible for others to quickly enough move sufficient additional soybeans into delivery position. By any name, the result of such a scenario would have been a market corner and ensuing price squeeze (CBOT, 1990, p.12)" (emphasis is original).

But a price squeeze at the delivery date did not occur. The CBOT and CFTC both issued emergency orders on July 11 that forced the liquidation of almost all of Ferruzzi's futures position before contract expiry (see Figure 1). However, because it was clear that traders were aware of the strong possibility of a squeeze at least a month before, it is highly likely that the market incorporated that risk into the price of the July contract as early as May (Pirrong, 2004; Senate Ag, 1989; CBOT, 1990, and others). In fact most soybean purchasers stopped quoting the July futures price as a basis for buying beans because they believed it to be artificial (Pirrong, 2004; Senate Ag, 1989; CBOT, 1990, and others). The next section will review in detail what occurred in the soybeans market in the summer of 1989.

### **Futures Prices, Profits, and Resources Required**

The next logical questions one may ask is: By how much were futures prices alleged to have been inflated? How long were prices inflated? Did Ferruzzi profit? And what resources did Ferruzzi need to execute the corner and squeeze manipulation? We will answer these questions one by one. Table 1 provides a summary of the answers. Detailed tables recreating the Ferruzzi corner and squeeze manipulation can be found in the appendix at the end of this chapter.

## Ferruzzi Soybean Manipulation; Summary of July 1989 Episode

	July Soybean Futures Contract [A]
[1] Maximum artificial price inflation (\$/bushel)	0.45
[2] Duration of artificial prices	2 months
[3] Maximum futures position held by Ferruzzi (bushels)	32,000,000
[4] Maximum notional value of Ferruzzi futures position (\$)	230,000,000
[5] Capital required for Ferruzzi futures position (\$)	7,000,000
[6] Maximum percent of futures open interest held by Ferruzzi	59%
[7] Profits from Ferruzzi futures position (\$)	-9,000,000
	Physical Soybeans available for July Delivery
[8] Physical soybean stocks held by Ferruzzi (bushels)	7,000,000
[9] Value of Ferruzzi physical stocks (\$)	45,500,000
[10] Percent of July deliverable physical soybean stocks held by Ferruzzi	60-85%

### Notes:

- [1] =  $\$7.44 * 6\%$ ; = July 10 price multiplied by artificial price estimate.  
This estimate relies on Pirrong's (2004) econometric work and an artificial price estimate of 6% on July 10.
- [2] Approximate time that traders incorporated the cost of the potential squeeze into the price of the futures contract.  
Based on news reports and Pirrong's (2004) econometric work.
- [3] Source: CBOT (1990)
- [4] = [3A] \* [June 1 price]
- [5] = [4A] \* [3%]
- [6] From Table 5 (on July 11; does not include positions after CBOT emergency order)
- [7] From Table 2 (from June 27 to July 20 only)
- [8] Physical deliverable against the July futures contract. Source: CBOT (1990)
- [9] = [8A] \* \$6.50 (conservative estimate of bushel value)
- [10] Range based on CFTC to CBOT estimate. Sources: Senate Ag (1989) and CBOT (1990)

Table 1: Ferruzzi Soybean Manipulation; Summary of July 1989 Episode

### Futures Prices

Was a squeeze avoided? Even though July soybeans were not ultimately squeezed at the date of delivery, and the Chicago Board of Trade and the Commodity Futures Trading Commission tout that they avoided a price squeeze, the July soybean contract was most likely artificially elevated prior to the emergency orders. It was elevated because the market knew there was a chance of a delivery price squeeze by Ferruzzi. This sentiment can be found in many places including trade magazines, major news

outlets, concerns registered with the CFTC, the unwillingness of grain sellers to quote July futures basis prices, and the foreshadowing of the July event by Ferruzzi’s activities around the May soybeans contract. Market players thus incorporated the risk of a squeeze into the price of the July soybean futures contract (Pirrong, 2004). This risk became apparent as early as May.

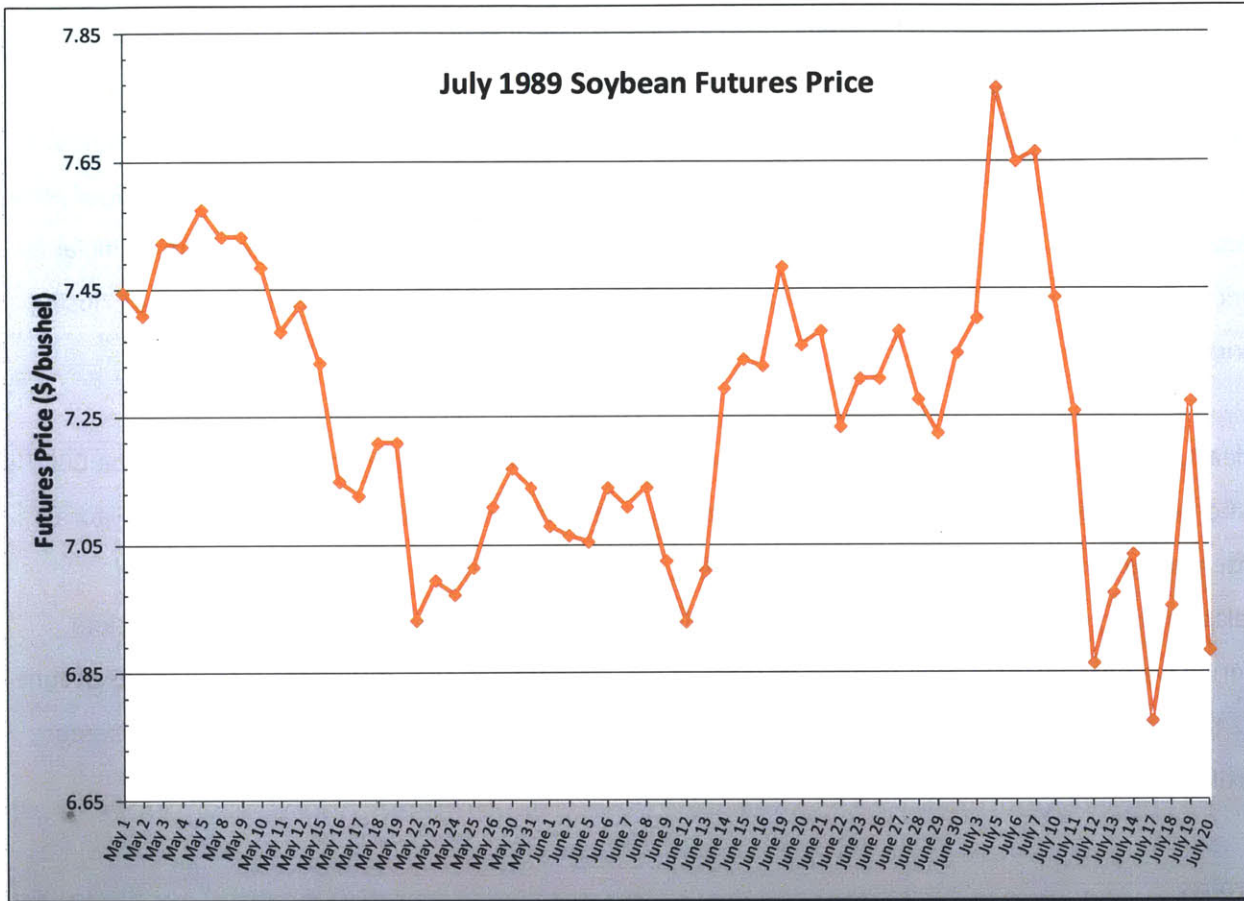


Figure 3: Futures Price of July 1989 Soybean Contract

A thorough econometric analysis of the Ferruzzi soybean manipulation was undertaken by Pirrong (2004). Pirrong regresses July futures returns on September futures returns, November futures returns, central Illinois spot returns, and a portfolio of soy meal and soy oil (crush returns). The regression uses a data set of prices for each variable from May 1 thru the expiration of the July soybeans contract for the years 1982-1995. Pirrong then determines what the econometric model predicts July 1989 soybeans futures returns “should be,” based on the observed returns from the other variables in 1989 (the September, November futures, central Illinois spot, and crush returns). The difference between the model’s fitted values and the observed July futures prices in 1989 represent the “residuals” that can

then be tested for their statistical significance.<sup>9</sup> Pirrong finds that “From these residuals, one can infer that the July price was at least 5% above the competitive price [immediately before Ferruzzi’s forced liquidation on July 12]... and as much as 10% (Pirrong, 2004, pp. 57, 67).” These inferences assume normality and independence.

Pirrong’s econometric estimates imply mean artificial prices of at least 4 percent starting May 30, and mean artificial prices of 5 percent from June 26 thru July 11. The level of artificial price decreased after July 11, but remained inflated until July 20, the last day of trading the July contract. This is equivalent to a mean artificial price inflation of \$0.29 per bushel from May 30 thru June 23, and a mean artificial price inflation of \$0.36 per bushel from June 26 to July 11. Finally, the implied one-day maximum artificial price inflation was \$0.45 per bushel on July 10, which represented 6 percent of the July futures closing price on July 10.

Clearly, July futures *absolute* prices trend upward between mid-May and immediately before the CBOT’s emergency order on July 11, with large gains as the contract advanced toward expiration (see Figure 3). Interestingly though, Pirrong’s largest residuals (i.e. the largest deviation from historical price relationships) occur *earlier*, during the time period between about May 19 and 31. During this time period we observe less absolute price increase in the July contract, than during the later periods of June 12 to 19 and June 29 to July 5. But during these two later periods, Pirrong’s model predicts *no increase* artificial price (residuals).

### **Profits**

Total profits over the entire time period that Ferruzzi had positions in the July soybeans futures contract are difficult to determine due to incomplete data available on Ferruzzi’s July futures positions prior to June 27. Nevertheless, by employing a few assumptions, we can make estimates of the returns to Ferruzzi during the month of June as well as July. Unfortunately, even less data is available on Ferruzzi’s physical positions, and so for this reason, no returns will be calculated for Ferruzzi’s physical soybean positions during this period.

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<sup>9</sup> The residuals can also be thought of as the abnormal spread between the July 1989 contract and the independent variables.

From June 1 to June 27, when the artificial price and absolute price began to rise, we can infer a partial answer to Ferruzzi's returns. The Chicago Board of Trade (1990) indicates that Ferruzzi had a long position of 32 million bushels in July futures "by early June." It is thus a reasonable assumption that Ferruzzi was already at least 20 million bushels long by June 1. And a month later, on June 27, Ferruzzi still maintained a position over 20 million bushels long. Consequently, Ferruzzi's returns for holding this position of 20 million bushels from June 1 until June 27 resulted in a profit of \$6 million. Note that these calculations do not account for profits or losses from futures positions put on beyond the 22 million bushels (of which there were 10 million) or from any positions put on before June 1.

CFTC documents provide Ferruzzi's daily positions from June 27 to July 11, and the CBOT's liquidation emergency order provides the outline of Ferruzzi's position after July 11. This data allows for a fairly accurate recreation of Ferruzzi's gains and losses from its July soybean futures positions from June 27 to the close of the contract on July 20 (see Table 2). During this period Ferruzzi's mark-to-market gain was approximately \$6 million from June 27 thru July 7, but from the next trading day of July 10 thru July 20 (when the absolute price began to drop likely due to leaks of CBOT's impending emergency action) Ferruzzi lost approximately \$16 million.

In sum, given the above assumptions, Ferruzzi lost \$4 million on its July 1989 soybeans positions between June 1 and July 20 1989.

## Ferruzzi Soybean Manipulation; July 1989 Futures Contract (Prices and Profits)

	Date	Ferruzzi Gross Long Position (Bushels) [A]	July Futures Price (\$/Bushel) [B]	Ferruzzi Profit (\$) [C]	Cumulative Residual (Pirrong, 2004) (%) [D]	July Futures Artificial Price (\$) [E]
[1]	June 27	24,291,314	7.39	NA	5.4%	0.40
[2]	June 28	24,163,161	7.28	-2,611,316	4.6%	0.33
[3]	June 29	23,240,000	7.23	-1,268,566	4.8%	0.34
[4]	June 30	22,422,212	7.35	2,905,000	4.8%	0.35
[5]	July 3	22,699,049	7.41	1,233,222	3.7%	0.27
[6]	July 5	22,655,719	7.77	8,171,658	4.2%	0.33
[7]	July 6	22,527,594	7.65	-2,605,408	4.2%	0.32
[8]	July 7	22,061,812	7.67	337,914	5.2%	0.40
[9]	July 10	21,160,000	7.44	-5,019,062	6.0%	0.45
[10]	July 11	20,475,000	7.26	-3,755,900	5.5%	0.40
[11]	July 12	16,380,000	6.87	-8,087,625	3.8%	0.26
[12]	July 13	12,285,000	6.98	1,801,800	3.8%	0.26
[13]	July 14	8,190,000	7.04	737,100	2.7%	0.19
[14]	July 17	4,095,000	6.78	-2,129,400	3.1%	0.21
[15]	July 18	3,000,000	6.96	737,100	4.2%	0.29
[16]	July 19	2,000,000	7.28	960,000	6.3%	0.46
[17]	July 20	1,000,000	6.89	-780,000	-0.1%	-0.01
[18]	Contract closed		Total Profit:	-9,373,484		

**Notes:**

The CBOT emergency order was issued after close of trading on July 11

[A] June 27 - July 11 position data based on CFTC testimony (Senate Ag, 1989);

July 12 - 20 position data based on CBOT emergency action (CBOT, 1990).

[B] CBOT July 1989 futures prices (Bloomberg Terminal, 2012)

[C] = [previous day's A] \* ([B] - [previous day's B]). For example: [2C] = ([2B] - [1B]);  
Ferruzzi's mark-to-market profit.

[D] The difference between Pirrong's (2004) econometric model predicted values and  
observed values in the July 1989 soybean futures contract.

[E] = [B] \* [D];

The estimated artificial futures price based on Pirrong's (2004) cumulative residuals.

[C18] = Sum of column [C]

Table 2: Ferruzzi Soybean Manipulation; July 1989 Futures Contract (Prices and Profits)

## **Resources Required**

To amass Ferruzzi's corner in the soybeans physical and futures markets, Ferruzzi required the commitment of large resources. Acquiring massive soybean physical stocks was a less risky proposal for a firm that had a large processing and export business. Ferruzzi could eventually use the beans it amassed during the corner – the firm processed “10 percent of all soybeans crushed within the United States...with processing plants capable of crushing 150 million bushels of soybeans annually (Senate Ag, 1989, p.34).”

At its maximum, Ferruzzi's soybean futures position in the July contract required approximately \$7 million in margin to be posted with the clearing house (see Table 2). During July as the contract neared expiration, Ferruzzi's futures positions still required approximately \$5 million to be posted as margin (See Table 5).

Ferruzzi's physical stocks of soybeans in Chicago and Toledo warehouses were valued at approximately \$46 million. These positions in the futures and physical markets provided Ferruzzi with a peak of 59% and 85% respectively of the futures open interest and the physical soybeans deliverable against the July contract (see Table 1).

## **Conclusion**

The corner and attempted squeeze manipulation of soybeans in the summer of 1989, and the emergency order response by the Chicago Board of Trade, provoked a firestorm of criticism by farmers, traders, and other soybean merchants. One result of the attention was a Congressional hearing by the Senate Committee on Agriculture, Nutrition, and Forestry on September 8, 1989. Because of this hearing, and the extensive submissions and testimony by CFTC representatives, we are given a rare inside-look at proprietary market position data, exchange documents, and the operations and thinking of the CFTC and CBOT during a corner and attempted squeeze.

A few key conclusions are evident from these documents:

1. The discretion in action that an exchange and the CFTC may take when facing a potential corner and squeeze manipulation is broad, due to the ambiguity of applicable law and regulation. This allows for inaction *or* a proactive approach.

2. The difficulty in determining *ex ante* when a corner and squeeze manipulation will occur is significant; if the corner and squeeze manipulation is averted by emergency action, the counterfactual remains difficult to prove.
3. A hedging exemption was repeatedly granted to a would-be manipulator, helping to enable the corner and squeeze manipulation; the CFTC may never know for certain if trading activity is for actual hedging. (A hedging exemption allows a firm to be exempt from speculative position limits if it is using the futures market to reduce its commercial risk).

1. Regarding the first point, an exchange has broad, independent, discretionary, “self-regulatory” power to change its rules in the event of an “emergency.” “[CFTC] Commission regulations define ‘emergency’ as ‘any occurrence or circumstance which, in the opinion of the governing board of the contract market, requires immediate action and threatens . . . the fair and orderly trading in, or the liquidation of or delivery pursuant to, any contract . . . on such contract market (Senate Ag, p.36).’” This definition of “emergency” is very broad, and open to the discretion of the board of the exchange.<sup>10</sup>

The CFTC also has the authority under the Commodity Exchange Act (CEA) to take emergency action based on broad circumstances subject to its interpretation. “The [CFTC] Commission, consistent with the provisions of Section 8a(9) of the [CEA] Act, can take emergency action when it has reason to believe that there is a threatened or actual manipulation or corner or ‘other major market disturbance which prevents the market from accurately reflecting the forces of supply and demand (Senate Ag, p.190).’”

Historically the CFTC has played the role of ensuring that the exchange follows its own rules as a self-regulated entity. In the case of Ferruzzi both acted; the CBOT took emergency action forcing the liquidation of all positions over 1 million bushels by contract close, and the CFTC revoked Ferruzzi’s hedging exemption for the last three days of trading.

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<sup>10</sup> The process to take emergency action is defined in CBOT’s rules, which had been approved by the CFTC. The CBOT does not need (immediate) CFTC approval for its emergency action. Finally, “The [CFTC] Commission is charged with reviewing the end product of that [exchange] judgment as well as the procedures followed in reaching it (Senate Ag, p190).”

2. Regarding the second point, as with any counterfactual, what “would have happened” is impossible to prove. The actions of Ferruzzi in the summer of 1989 follow closely this chapter’s typical corner and (attempted) squeeze manipulation. The CBOT and CFTC were convinced that Ferruzzi’s actions “likely would have led to severely distorted July soybean futures prices, and could have resulted in contract defaults (Senate Ag, 1989, p.25),” Nevertheless, without the final smoking gun of Ferruzzi demanding deliveries beyond the available supply, we are left inferring its intentions. Ferruzzi claimed innocence, while paying fines to the CBOT and settling for \$21.5 million in a class action lawsuit.

3. Regarding the third point, a hedging exemption to the speculative position limit of 3 million bushels of soybeans had been granted to Ferruzzi for the futures contract months of May and July by the CFTC. Indeed, Ferruzzi, as a major processor and exporter of soybeans, had been regularly granted hedging exemptions. The CFTC grants hedging exemptions according to the Commodity Exchange Act, and moreover, hedging is a primary reason for the existence of futures markets. Nevertheless, although hedging exemptions are necessary features of futures markets, this particular hedging exemption allowed Ferruzzi to create its dominant corner by using the futures market as well as the physical market. It is thus evident that acquiring a corner can be achieved with much greater ease when the perpetrator has been granted a hedging exemption.

A corner using the futures market with a hedging exemption was made possible because of the difficulty in determining if trading activity is in fact *bona fide* hedging. Even with extensive communication and investigation, the CFTC had no ultimate way to determine whether a firm’s futures positions are truly for “anticipatory hedging.” This difficulty was apparent during the summer of 1989. Ferruzzi was able to make extensive claims as to its imminent physical soybean purchases and thus its qualification for an “anticipatory hedge.” When a firm does not lift its hedge near the very end of a contract, it may become increasingly apparent that the position is not intended as a hedge, but by then it may be too late to avoid a market disruption.

A major check on commercial firms that have a genuine interest in laying-off risk in the futures market from abusing their hedging exemptions is self-regulatory in nature. Commercial firms who wish to hedge need the system to work. If they abuse the system, the hedging function of the market will break down and they may be banned from the market, irrespective of the *ex post* financial penalties they will face. Former CFTC Commissioner Hineman explained this phenomenon to Congress: “I think we have to talk

just a little bit about the fundamentals and the theory of a futures market. Futures markets basically work, in my opinion, because the large commercials want it to work. And they do not want to mess up those markets. And it is to everyone's best interest, regardless of their physical needs for product, to make sure that there is an orderly delivery or an orderly liquidation at the end of that market (Senate Ag, 1989, p.41).”

In spite of the incentive for commercial market players to have the hedging system to work, as we saw in the Ferruzzi case, that system can go wrong. However, those same self-regulatory incentives would apply much less to pure speculators without hedging interests, who instead make their business from favorable moves in the futures price. For these speculators, a one-time windfall of illicit profit from a corner and squeeze manipulation may be worth the cost of not being welcome back in that particular market and the fines imposed by the CFTC and risk of a difficult civil court prosecution. While hedging exemptions to position limits must always exist, position limits for speculators would be appropriate for the purpose of limiting corner and squeeze manipulations, given the prerequisite futures/physical position required for a price squeeze.

### **2.2.2 Case Study: Arcadia Oil Manipulation of 2008**

In 2008 a group of traders allegedly manipulated oil futures prices and reaped unlawful profits of \$50 million. The CFTC filed a civil action against Arcadia *et al.* (Arcadia) in May, 2011, alleging that Arcadia used its physical crude oil position to repeatedly force futures prices up and then back down. The allegation generally follows this thesis’ definition of a corner and squeeze manipulation, however the Arcadia corner and squeeze manipulation is not typical. This case study will first describe the allegations and compare them to our definition of a corner and squeeze manipulation; second, present a detailed recreation of Arcadia’s crude oil positions, profits, and futures price over time; and finally, draw conclusions.

The best starting point for understanding the alleged manipulation is to review the CFTC's summary of its civil case against Arcadia (CFTC, 2011a, p.1):

*The U.S. Commodity Futures Trading Commission (CFTC) today filed a civil enforcement action in the United States District Court for the Southern District of New York against Parnon Energy Inc. (Parnon) of California, Arcadia Petroleum Ltd. (Arcadia Petroleum) of the United Kingdom, Arcadia Energy (Suisse) SA (Arcadia Suisse) of Switzerland, James T. Dyer of Australia and Nicholas J. Wildgoose of California, charging them with unlawfully manipulating and attempting to manipulate New York Mercantile Exchange (NYMEX) crude oil futures prices from January 2008 to April 2008.*

*As alleged in the CFTC complaint, during the relevant period defendants traded futures and other contracts that were priced off of the price of West Texas Intermediate light sweet crude oil (WTI). WTI is delivered to commercial users at Cushing, Okla., a major crude oil delivery point. The price of WTI is a benchmark for crude oil prices around the world, and the supply of WTI at Cushing is an important driver of WTI price.*

*According to the allegations, defendants conducted a manipulative cycle, driving the price of WTI to artificial highs and then back down, to make unlawful profits. First, they purchased large quantities of physical WTI crude oil during the relevant period, even though they did not have a commercial need for crude oil. They purchased the oil pursuant to their scheme to dominate and control the already tight supply at Cushing to manipulate the price of WTI upward and to profit from the corresponding increase in value of their WTI futures and options contracts (WTI Derivatives) on NYMEX and Intercontinental Exchange (ICE). Next, once WTI reached artificially high prices and they had taken profits from their long WTI Derivative position, defendants allegedly engaged in additional trading activity – selling more WTI Derivatives short at the artificially high prices. Finally, defendants allegedly strategically sold off their physical holdings of WTI, mostly all on one day, to drive the WTI price back down and to profit from their short WTI Derivatives position. Pursuant to this manipulative cycle, driving the WTI price up and then back down, which they conducted in January and March 2008, and attempted in April 2008, defendants realized profits from their WTI Derivatives trading that exceeded \$50 million, according to the complaint.*

In addition, a helpful timeline of the alleged Arcadia manipulation can be found in the CFTC's court filing, reproduced here (CFTC, 2011b, p.10):

*Thereafter, as alleged more particularly below, the Defendants' manipulative scheme comprised taking the following steps:*

***First**, amassing a large physical WTI position, to be delivered the next month at Cushing, to dominate and control WTI supply even though they had no commercial need for crude oil;*

***Second**, contemporaneously establishing a long near month/next month WTI Derivatives calendar spread position on the NYMEX and ICE with the intent to artificially inflate the value of that position by driving WTI prices higher;*

***Third**, refraining from selling their physical WTI before the cash window opened, to lull the market into believing that they had committed their oil to storage or commercial use, and thus cause or contribute to causing the near month calendar spread to rise to an artificial level, to maximize the value of their long WTI Derivatives position;*

***Fourth**, establishing a substantial short position in the subsequent series of WTI Derivatives calendar spreads at artificially high prices, knowing they were about to surprise the market with a surplus of physical WTI;*

***Finally**, suddenly selling/dumping their physical position during the cash window, thus creating the surprise surplus they had planned all along, to drive prices back down and maximize the value of their short WTI Derivatives calendar spread position.*

The above timeline of events was repeated twice by Arcadia and attempted once more before the CFTC informed Arcadia that it was under investigation in April 2008. Figure 4 displays the physical crude oil and derivatives positions of Arcadia during January 2008. Figure 4 was created using data provided by CFTC (2011b), and graphically corroborates the storyline presented above.

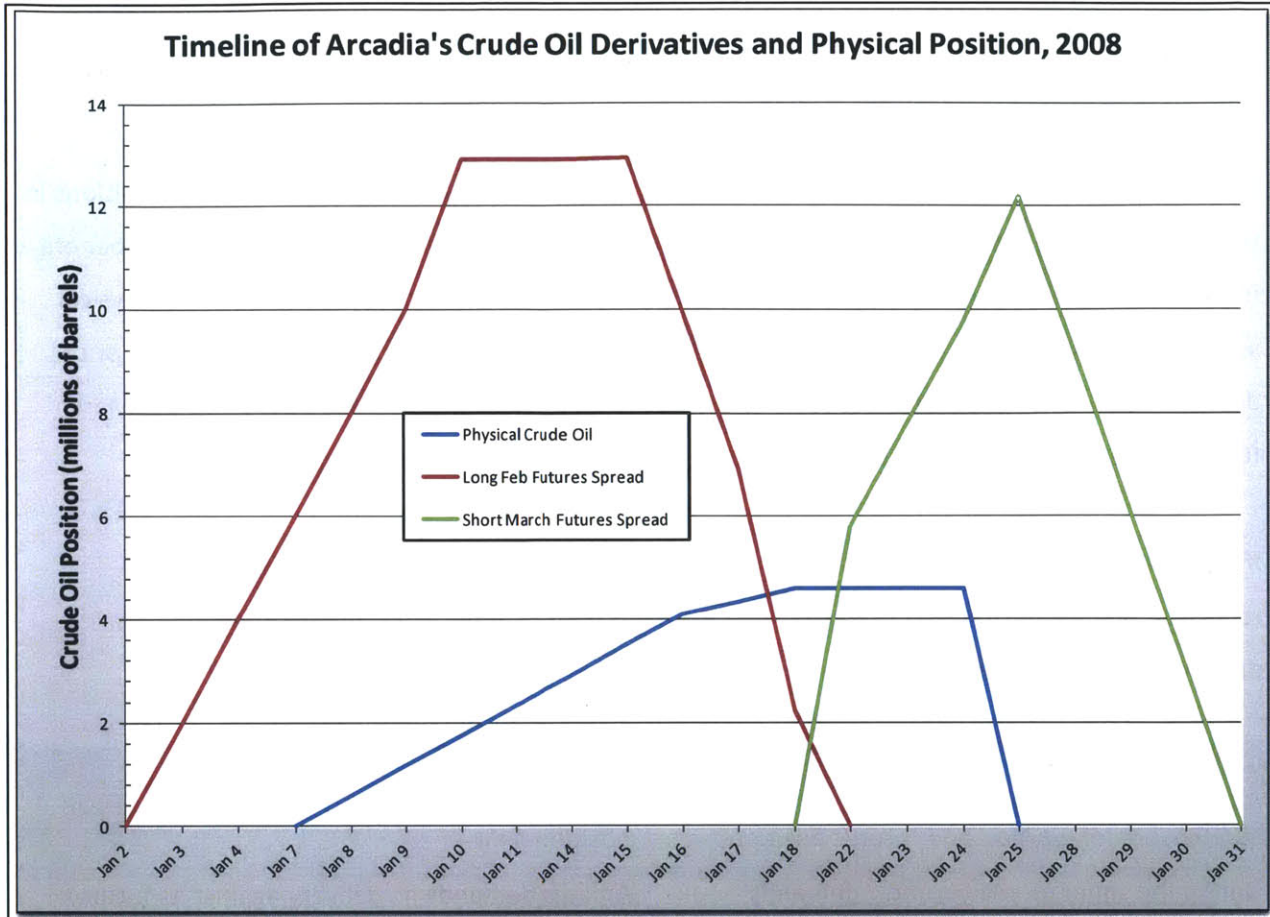


Figure 4: Arcadia's Alleged January 2008 Manipulation Timeline

Let us now compare the January 2008 events of the alleged Arcadia manipulation with the definition of a corner and squeeze manipulation proposed by this thesis. The Arcadia manipulation stretches our definition of both of these terms.

Our basic definition of a corner requires "controlling enough of a commodity to exert market power." In January, Arcadia acquires its corner position in the physical market by controlling 4.6 of an estimated 5 million barrels of crude oil available for delivery against the February WTI futures contract (CFTC, 2011b). In turn, our basic definition of a squeeze is "when a cornerer exercises her market power to force the price of futures beyond the competitive equilibrium." Arcadia executes its "squeeze" by keeping all of its approximately 90 percent of the available crude oil off of the market and effectively shifting up the oil supply curve to make it more expensive to acquire and deliver oil against a February WTI futures contract. This can be considered artificially driving up the price of the February futures contract since Arcadia did not have a commercial need for the amount of physical crude oil it acquired,

and instead was withholding the crude oil from the market with the sole intent of pushing the futures price upward (CFTC, 2011b).

To make the corner and squeeze manipulation profitable, Arcadia took long and then short positions in the futures market.<sup>11</sup> Before the squeeze, Arcadia acquired a long February futures position to benefit from the subsequent price increase near contract expiration due to the artificially restricted physical supply (see Figure 5). Arcadia then acquired a short March futures position to benefit from the price decrease that would occur when Arcadia sold off all of its physical position and depressed the March futures price (the “burying the corpse” effect).

If you have read the detailed definition of a corner and a squeeze in the section above, you will recognize that we have deviated significantly from our typical corner and squeeze manipulation description. Key differences are found in Table 3.

Typical corner and squeeze manipulation	Arcadia corner and squeeze manipulation
A corner is frequently acquired thru a combination of physical and futures positions	Arcadia’s market power was due to its physical position only
During the squeeze, the cornerer demands excessive deliveries against its futures contracts at expiry	Arcadia demands no delivery against its futures contracts
Excessive futures deliveries drive up futures prices; i.e. excessive demand drives up prices	Arcadia’s excessive physical position drives up prices; i.e. restricted supply drives up futures prices

Table 3: Key Differences between a Typical Corner and Squeeze Manipulation and the Alleged Arcadia Corner and Squeeze Manipulation

**Futures Prices, Profits, and Resources Required**

The next logical questions one may ask is: By how much were futures prices alleged to have been inflated? How long were prices inflated? How much money did Arcadia make from the different phases of the manipulation? And what resources did Arcadia need to execute the corner and squeeze

<sup>11</sup> The long and short positions acquired by Arcadia were actually long and short “spread” positions. A long spread position means long the near-month contract and short the next-month contract. Conversely, a short spread position means short the near-month contract and long the next-month contract. Thus, when Arcadia was “long February futures,” Arcadia was actually long February contracts and short the same number of March contracts. And when Arcadia was “short March futures,” Arcadia was actually short March contracts and short the same number of April contracts. This means that Arcadia profits on a long February spread (long Feb and short March) futures position when the price of Feb increases *relative to* the price of March futures.

manipulation? We will answer these questions one by one. Table 4 provides a summary of those answers. Detailed tables recreating the Arcadia corner and squeeze manipulation can be found in the appendix at the end of this chapter.

<b>Arcadia Alleged Oil Manipulation; Summary of January 2008 Cycle</b>		
	Feb WTI Crude Oil Futures Contract [A]	March WTI Crude Oil Futures Contract [B]
[1] Maximum artificial price inflation (\$/barrel)	0.41	0.18
[2] Duration of artificial prices	4 days	2 days
[3] Maximum futures position held by Arcadia (barrels)	13,600,000	12,200,000
[4] Maximum notional value of Arcadia's futures position (\$)	1,274,456,000	1,106,662,000
[5] Capital required for Arcadia's futures position (\$)	38,233,680	33,199,860
[6] Maximum percent of futures open interest held by Arcadia	6%	3%
[7] Profits from Arcadia's futures position (\$)	3,517,497	2,753,000
	Physical WTI Crude Oil for Feb Delivery	
[8] Maximum physical crude oil position held by Arcadia (barrels)	4,600,000	
[9] Maximum notional value of Arcadia's physical position (\$)	414,000,000	
[10] Credit required to be posted for Arcadia's physical position (\$)	434,700,000	
[11] Percent of Feb deliverable Physical crude oil held by Arcadia	92%	

Notes:

[1] From Table 7 and 9. To estimate artificial price movement, a Jan 3 baseline of unmanipulated prices is selected. Jan 3 is before Arcadia began acquiring its physical crude oil position, and is the date referenced by CFTC (CFTC, 2011b, p.13). Also note that price changes reference changes in the futures spread, and that all artificial price movement is attributed to the front month contract in the spread. Eg. all artificial price inflation in the long February/March spread is attributed to a (relative) increase in the February contract (and not a relative decrease in the March contract).

[2] Number of days alleged by CFTC that the futures price was manipulated by Arcadia (CFTC, 2011b, p.21).

[3] From Table 6 and 8. Includes NYMEX and ICE derivatives. Source: CFTC (2011b).

[4] From Table 7 and 9. [Futures position] x [WTI futures price]

[5] From Table 7 and 9. Capital required to be posted as margin for Arcadia's future position assuming a 3 percent margin requirement.

[6] From Table 7 and 9. Arcadia's position as a percent of total NYMEX + ICE futures open interest in the given futures contract. This assumes all of Arcadia's derivative positions were in NYMEX and ICE futures and not other derivatives (e.g. options, swaps). However, CFTC court files suggest that Arcadia may have invested in other derivatives as well as futures (CFTC, 2011b p.6). Thus, our estimates of Arcadia's share of NYMEX + ICE futures open interest are the maximum possible. Finally, if all of Arcadia's derivatives positions were in NYMEX futures only, Arcadia's max position would be 9 percent of NYMEX open interest.

[7] From Table 6 and 8. Arcadia's gains from futures positions in the given contract.

[8] Source: CFTC (2011b, p.11).

[9] = [8] x \$90 (approximation)

[10] = [9] x 1.05; credit required to be acquired from a bank as a "stand-by letter of credit." (CFTC, 2011b, p.8).

[11] The percent of physical oil supply available for delivery against the Feb WTI futures contract that Arcadia controlled (CFTC, 2011b, p.11).

Table 4: Arcadia Alleged Oil Manipulation; Summary of January 2008 Events

## **Futures Prices**

During the alleged January 2008 manipulation, the estimated maximum artificial crude oil futures price inflation was \$0.41 per barrel for the February 2008 WTI futures contract, and the maximum futures price inflation of the March 2008 WTI futures contract was \$0.18 (see Table 4). Artificial prices are alleged to have occurred for a total of six days; four days for the February contract and two days for the March 2008 contract. Complete calculations can be found in Table 6 thru 9.

These figures rely on a few key assumptions. First, the days with artificial prices inferred are based on the days that the CFTC (2011b) explicitly alleges manipulated prices occurred. Second, a baseline of unmanipulated prices is assumed in order to calculate the artificial prices. The baseline dates were picked based on prices before the alleged manipulation began. Third, artificial prices represent changes in the given futures *spread*.<sup>12</sup> Finally, all artificial price movement is attributed to the first contract month of the given spread. For instance, the \$0.41 of artificial increase in the long February/March spread is all attributed to an artificial increase in the long February contract *relative* to the March contract (see Table 7).

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<sup>12</sup> See footnote 12 above

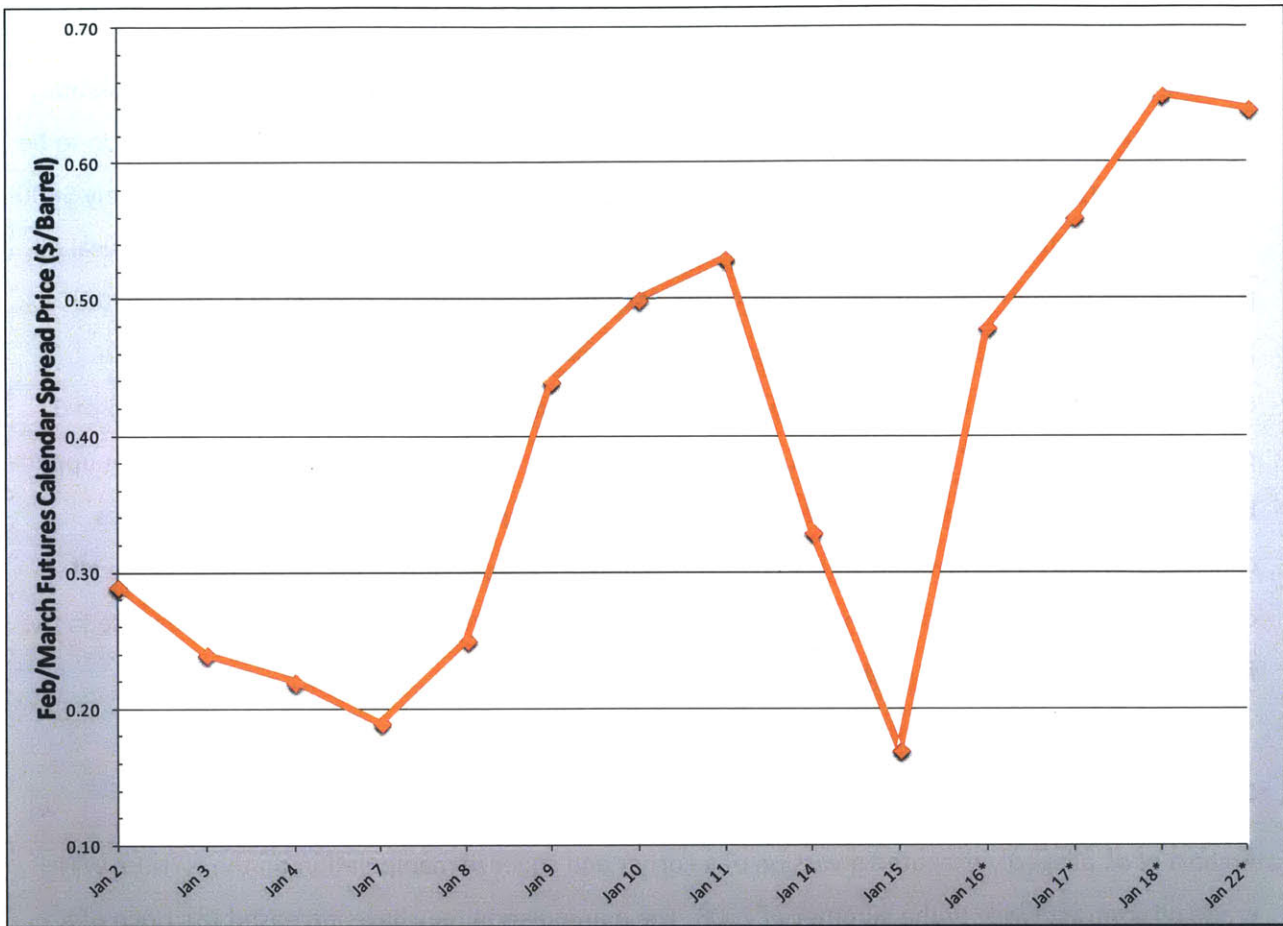


Figure 5: February/March WTI Crude Oil Futures Spread Price in January 2008

### Profits

According to the CFTC, Arcadia realized profits of \$50 million from derivatives, but losses of \$15 million from physical trades in the cash market (CFTC, 2011b). This CFTC figure includes the sum of both the January and March 2008 manipulation cycles. Using the CFTC's position data on Arcadia and concurrent futures prices, we calculate a \$6 million profit from Arcadia's derivatives positions from the January manipulation only (see Table 6 and Table 8). Insufficient information on physical prices does not allow the calculation of losses from physical trades during the January manipulation. The later alleged March manipulation was not recreated.

## Resources Required

Significant financial resources were required in order for Arcadia to execute the alleged manipulation. For the January 2008 manipulation cycle, we estimate that Arcadia required a peak of \$38 million to be posted as margin for its derivatives positions.<sup>13</sup> In addition, Arcadia needed to post approximately \$400 million in the form of a stand-by letter of credit from a bank in order to acquire its January physical oil position.<sup>14</sup> As earlier noted, Arcadia's physical oil position represented 92 percent of the estimated physical crude oil available for delivery against the February 2008 WTI contract (CFTC, 2011b). In contrast, Arcadia's fraction of futures open interest was much smaller; Arcadia held a maximum of 6 percent of the *combined* NYMEX and ICE open interest in the February 2008 WTI contract. As an upper bound (and certain overestimate), if all of Arcadia's derivative positions were in NYMEX's futures contract only, Arcadia's position would represent 9 percent of open interest.<sup>15</sup> These figures are all overestimates since Arcadia also held options and swaps which would have reduced its presence in the futures markets. See Table 7 and Table 9 for complete calculations.

## Conclusion

Arcadia *et al.* allegedly executed a version of a corner and squeeze manipulation on the NYMEX WTI crude oil contract twice in the summer of 2008. The manipulation may have increased the price of a barrel of crude oil by no more than an estimated \$0.40 for six days. A logical question to ask is whether speculative position limits would have prevented the Arcadia manipulation.

The 2008 NYMEX futures position limits would not have prevented Arcadia's corner and squeeze manipulation for three reasons. Arcadia could have moved its derivatives positions to the OTC market with no effect on its strategy of profiting from the increase in value of any derivatives linked to the settlement price of the NYMEX WTI crude oil contract. Secondly, Arcadia likely would have been able to obtain a hedging exemption from position limits. And finally, Arcadia's crude oil corner did not utilize a position in the futures market, but instead was constructed in the physical market, and so a large futures position was not required to execute the corner.

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<sup>13</sup> This assumes that Arcadia must post margin of 3 percent of the notional value of its derivatives position.

<sup>14</sup> This assumes that Arcadia's 4.6 million barrels of physical oil contracts were purchased at \$90/bbl.

<sup>15</sup> The estimates of Arcadia's percent of contract open interest assume that all of Arcadia's derivative positions were in NYMEX and/or ICE WTI futures, and not other derivatives (e.g. options, swaps, etc.). CFTC court files suggest that Arcadia may have invested in other derivatives as well as futures (CFTC, 2011b). Thus, our estimates of Arcadia's share of *futures* open interest are the maximum possible.

NYMEX's speculative position limits<sup>16</sup> for WTI crude oil are 3,000 contracts (3,000,000 barrels) in the expiration month, but are only "effective on the last three trading days of the futures contract" (NYMEX, 2012, Chapter 5, p.50). Arcadia did exceed this limit on the third to last trading day of the February contract with 5.9 million barrels, but there are two reasons why NYMEX limits were not binding. First, we do not know the proportion of Arcadia's derivatives position that was held in ICE or other OTC markets – Arcadia could have arranged the balance of its positions such that the 3 million barrels was never reached on NYMEX.

Second, Arcadia probably did or could have received a hedging exemption from speculative position limits from NYMEX. According to a Platts (2011), conversation with CFTC Commissioner Chilton, Arcadia would have qualified for a hedging exemption (probably due to its ownership of oil storage tanks). Whether Arcadia did in fact have a hedging exemption is unclear.

Finally, Arcadia's crude oil corner was in the physical market and not the derivatives market; Arcadia allegedly artificially drove up the WTI futures price due to its actions in the physical market alone. From this perspective, futures position limits again would not have prevented the corner. However, Arcadia's derivatives position was required in order to make the squeeze and the corner and squeeze manipulation a profitable endeavor.

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<sup>16</sup> For non-agricultural commodities, position limits are established by the exchange, approved by the CFTC, and violations of the exchange's limits are also violations of the Commodity Exchange Act. See CFTC "Advisory Regarding Compliance with Speculative Position Limits," 2010. <http://www.cftc.gov/ucm/groups/public/@industryoversight/documents/file/specpositionlimitsadvisory0510.pdf>

## 2.3 Appendix: Tables 5 thru 9

<b>Ferruzzi Soybean Manipulation; July 1989 Futures Contract (Resources)</b>						
Date	Ferruzzi Gross Long Position (Bushels) [A]	Ferruzzi percent of Open Interest (%) [B]	July Futures Price (\$/Bushel) [C]	Ferruzzi Position Notional Value (\$) [D]	Ferruzzi Margin Posted (\$) [E]	
[1] June 27	24,291,314	25%	7.39	179,391,355	5,381,741	
[2] June 28	24,163,161	29%	7.28	175,847,401	5,275,422	
[3] June 29	23,240,000	36%	7.23	167,909,000	5,037,270	
[4] June 30	22,422,212	39%	7.35	164,803,261	4,944,098	
[5] July 3	22,699,049	41%	7.41	168,086,460	5,042,594	
[6] July 5	22,655,719	44%	7.77	175,921,660	5,277,650	
[7] July 6	22,527,594	47%	7.65	172,336,094	5,170,083	
[8] July 7	22,061,812	49%	7.67	169,103,786	5,073,114	
[9] July 10	21,160,000	53%	7.44	157,377,500	4,721,325	
[10] July 11	20,475,000	59%	7.26	148,648,500	4,459,455	
[11] July 12	16,380,000	64%	6.87	112,448,700	3,373,461	
[12] July 13	12,285,000	63%	6.98	85,687,875	2,570,636	
[13] July 14	8,190,000	57%	7.04	57,616,650	1,728,500	
[14] July 17	4,095,000	34%	6.78	27,743,625	832,309	
[15] July 18	3,000,000	36%	6.96	20,865,000	625,950	
[16] July 19	2,000,000	35%	7.28	14,550,000	436,500	
[17] July 20	1,000,000	47%	6.89	6,885,000	206,550	

Notes:  
The CBOT emergency order was issued after close of trading on July 11

[A] June 27 - July 11 position data based on CFTC testimony (Senate Ag, 1989);  
July 12 - 20 position data based on CBOT emergency action (CBOT, 1990).  
[B] = [A] / July 1989 soybean futures contract open interest (Bloomberg Terminal, 2012)  
[C] CBOT July 1989 soybean futures prices (Bloomberg Terminal, 2012)  
[D] = [A] \* [C]  
[E] = [C] \* 3%

Table 5: Ferruzzi Soybean Manipulation; July 1989 Futures Contract (Resources)

## Arcadia Oil Manipulation; January 2008, Phase 1 (Prices and Profits)

### Long February/March Futures Spread

	Date	Arcadia Futures Spread Position (millions of barrels)	Price February WTI (\$/barrel)	Price March WTI (\$/barrel)	Spread Differential (\$/barrel)	Arcadia Profit (\$)
		[A]	[B]	[C]	[D]	[E]
[1]	Jan 2	0.0	99.62	99.33	0.29	0
[2]	Jan 3	2.3	99.18	98.94	0.24	0
[3]	Jan 4	4.5	97.91	97.69	0.22	-45,333
[4]	Jan 7	6.8	95.09	94.90	0.19	-136,000
[5]	Jan 8	9.1	96.33	96.08	0.25	408,000
[6]	Jan 9	11.3	95.67	95.23	0.44	1,722,667
[7]	Jan 10	13.6	93.71	93.21	0.50	680,000
[8]	Jan 11	13.4	92.69	92.16	0.53	408,000
[9]	Jan 14	13.2	94.20	93.87	0.33	-2,676,067
[10]	Jan 15	12.9	91.90	91.73	0.17	-2,105,707
[11]	Jan 16*	9.4	90.84	90.36	0.48	4,011,710
[12]	Jan 17*	5.8	90.13	89.57	0.56	749,947
[13]	Jan 18*	2.2	90.57	89.92	0.65	522,690
[14]	Jan 22*	0.0	89.85	89.21	0.64	-22,410
[15]	Contract Closed				Total Profit	3,517,497
[16]					Artificial Profit	4,356,067

#### Notes:

We assume all transactions occur at the end of each trading day, and at the closing price.

Calendar days not present are due to exchange closings over weekends and holidays.

Arcadia's positions in **bold** are known data points based on CFTC court files (CFTC, 2011b).

Other days without CFTC data on Arcadia's position are linearly extrapolated.

\* dates indicate days when the CFTC (2011b, p.21) alleges the WTI crude oil price was manipulated by Arcadia.

[A] Arcadia's long February/March spread position in WTI crude oil futures contracts (CFTC, 2011b).

Long Feb/March spread = long a February futures contract and short a March futures contract.

[B]-[C] NYMEX WTI crude oil futures prices (Bloomberg Terminal, 2012).

[D] = [B] - [C]

[E] = [previous day's A] \* ([D] - [previous day's D]). For example: [3E] = [2A] \* ([3D] - [2D]);

Arcadia's mark-to-market profit from its long Feb/March spread position.

[15E] = Sum of column [E]

[16E] = Sum of Arcadia's artificial profits from Jan 16-22. We only include the days CFTC alleges are manipulated.

To estimate artificial profits, a Jan 3 baseline of unmanipulated prices is selected - when the spread price is \$0.24.

Jan 3 is before Arcadia began acquiring its physical crude oil position, and is the date referenced by CFTC (2011b, p.13).

To find artificial profits we apply the counterfactual "unmanipulated" spread of \$0.24 for Jan 15-22 (see Table 4);

We then compare Arcadia's actual profits with this counterfactual spread (i.e. constant spread of \$0.24).

The Artificial profit is the difference between Arcadia's counterfactual spread profits and the realized profits

Table 6: Arcadia Alleged Crude Oil Manipulation; January 2008, Phase 1 (Prices and Profits)

### Arcadia Oil Manipulation; January 2008, Phase 1 (Resources)

#### Long February/March Futures Spread

	Date	February Futures Artificial Price Inflation (\$/barrel) [A]	February Futures Open Interest (Contracts) [B]	Arcadia Percent of Open Interest (Percent) [C]	Arcadia Position Notional Value (\$) [D]	Arcadia Margin Posted (\$) [E]
[1]	Jan 2		414,107	0%	0	0
[2]	Jan 3	Baseline date	417,870	1%	224,808,000	6,744,240
[3]	Jan 4		404,620	1%	443,858,667	13,315,760
[4]	Jan 7		376,706	2%	646,612,000	19,398,360
[5]	Jan 8		337,345	3%	873,392,000	26,201,760
[6]	Jan 9		320,262	4%	1,084,260,000	32,527,800
[7]	Jan 10		291,658	5%	1,274,456,000	38,233,680
[8]	Jan 11		261,420	5%	1,240,223,097	37,206,693
[9]	Jan 14		232,422	6%	1,239,734,800	37,192,044
[10]	Jan 15		213,259	6%	1,189,277,900	35,678,337
[11]	Jan 16*	0.24	148,779	6%	851,564,440	25,546,933
[12]	Jan 17*	0.32	99,650	6%	523,444,997	15,703,350
[13]	Jan 18*	0.41	72,391	3%	202,967,370	6,089,021
[14]	Jan 22*	0.40	0	0%	0	0

Contract closed

#### Notes:

We assume all transactions occur at the end of each trading day, and at the closing price.

Calendar days not present are due to exchange closings over weekends and holidays.

\* dates indicate days when the CFTC (2011b, p.21) alleges the WTI crude oil price was manipulated by Arcadia.

[A] Estimated artificial price movement over the alleged manipulation period.

For example, the Jan 16 closing price for the February WTI crude oil contract is \$0.24 higher than it "should be."

To estimate artificial price movement, a Jan 3 baseline of unmanipulated prices is selected (see Table 3).

Jan 3 is before Arcadia began acquiring its physical crude oil position, and is the date referenced by CFTC (CFTC, 2011b, p.13).

Also note that price changes reference changes in the futures *spread*, and that all artificial price movement is attributed to the front month contract in the spread. E.g. all artificial price inflation in the long February/March spread is attributed to a (relative) increase in the February contract (and not a relative decrease in the March contract).

[B] The February WTI futures contract open interest on NYMEX + ICE (1 contract = 1,000 barrels of WTI crude oil).

Includes futures only; does not include other derivatives (e.g. swaps, options). Sources: (Bloomberg Terminal, 2012) and (ICE, 2012)

[C] Arcadia's position as a percent of total NYMEX + ICE futures open interest.

This assumes all of Arcadia's derivative positions were in NYMEX and ICE futures and not other derivatives (e.g. options, swaps).

However, CFTC court files suggest that Arcadia may have invested in other derivatives as well as futures (CFTC, 2011b p.6).

Thus, our estimates of Arcadia's share of NYMEX + ICE futures open interest are the maximum possible.

Finally, if all of Arcadia's derivatives positions were in NYMEX futures only, Arcadia's max position would be 9 percent of NYMEX open interest.

[D] [Arcadia's long February futures position] x [NYMEX Feb WTI futures price]

[E] = [D] \* 0.03 ; Assumes margin posted by Arcadia is 3 percent of the notional value of WTI futures contracts held.

Table 7: Arcadia Alleged Crude Oil Manipulation; January 2008, Phase 1 (Resources Required)

## Arcadia Oil Manipulation; January 2008, Phase 2 (Prices and Profits)

### Short March/April Futures Spread

	Date	Arcadia Futures Spread Position (millions of barrels)	Price March WTI (\$/barrel)	Price April WTI (\$/barrel)	Spread Differential (\$/barrel)	Arcadia Profit (\$)
		[A]	[B]	[C]	[D]	[E]
[1]	Jan 18	0.0	89.92	89.49	0.43	0
[2]	Jan 22	<b>5.8</b>	89.21	88.76	0.45	0
[3]	Jan 23*	7.8	86.99	86.62	0.37	464,000
[4]	Jan 24*	<b>9.8</b>	89.41	88.99	0.42	-390,000
[5]	Jan 25	<b>12.2</b>	90.71	90.47	0.24	1,764,000
[6]	Jan 28	9.2	90.99	90.79	0.20	488,000
[7]	Jan 29	6.1	91.64	91.42	0.22	-183,000
[8]	Jan 30	3.1	92.33	92.16	0.17	305,000
[9]	Jan 31	0.0	91.75	91.68	0.07	305,000
[10]					Total Profit	2,753,000
[11]					Artificial Profit	1,838,000

#### Notes:

We assume all transactions occur at the end of each trading day, and at the closing price.

Calendar days not present are due to exchange closings over weekends and holidays.

Arcadia's positions in **bold** are known data points based on CFTC court files (CFTC, 2011b).

Other days without CFTC data on Arcadia's position are linearly extrapolated.

\* dates indicate days when the CFTC (2011b, p.21) alleges the WTI crude oil price was manipulated by Arcadia.

[A] Arcadia's short March/April spread position in WTI crude oil futures contracts (CFTC, 2011b).

March/April spread = short a March futures contract and long a April futures contract.

[B]-[C] NYMEX WTI crude oil futures prices (Bloomberg Terminal, 2012).

[D] = [B] - [C]

[E] = [previous day's A] \* -([D] - [previous day's D]). For example: [3E] = [2A] \* -([3D] - [2D]).

Arcadia's mark to market profit from its short March/April spread position.

[12E] = Sum of column [E]

[11E] = Sum of Arcadia's artificial profits from Jan 23-25.

We include the 2 days CFTC alleges are manipulated and the following 1 day when prices return to "baseline."

To estimate artificial profits, a Jan 25 baseline of unmanipulated prices is selected - when the spread price is \$0.24.

Jan 25 is the day that Arcadia sold off its physical crude oil position, and is the date referenced by CFTC (2011b, p.15).

Thus, Jan 25 is assumed to be when the market processes the true level of available physical oil supply and prices return to competitive levels. To find artificial profits we apply the counterfactual "unmanipulated" spread of \$0.24 to Jan 23-24

(see Table 7); We then compare Arcadia's actual profits with this counterfactual spread (i.e. constant spread of \$0.24 and zero profit). Thus, the artificial profit is equal to Arcadia's realized profit from Jan 23-25.

This is a conservative estimate: it does not consider price drops after Jan 25 as attributable to the manipulation, and it does not include the 2.4 million positions put on during Jan 25 toward Arcadia's Artificial Profit

(since they are assumed put on at close).

Table 8: Arcadia Alleged Crude Oil Manipulation; January 2008, Phase 2 (Prices and Profits)

### Arcadia Oil Manipulation; January 2008, Phase 2 (Resources)

#### Short March/April Futures Spread

	Date	March Futures Artificial Price (\$/barrel) [A]	March Futures Open Interest (Contracts) [B]	Arcadia Percent of Open Interest (Percent) [C]	Arcadia Position Notional Value (\$) [D]	Arcadia Margin Posted (\$) [E]
[1]	Jan 18		474,508	0%	0	0
[2]	Jan 22		486,341	1%	517,418,000	15,522,540
[3]	Jan 23*	0.13	469,741	2%	678,522,000	20,355,660
[4]	Jan 24*	0.18	478,722	2%	876,218,000	26,286,540
[5]	Jan 25	Baseline date	471,484	3%	1,106,662,000	33,199,860
[6]	Jan 28		476,494	2%	832,558,500	24,976,755
[7]	Jan 29		481,585	1%	559,004,000	16,770,120
[8]	Jan 30		487,476	1%	281,606,500	8,448,195
[9]	Jan 31		505,118	0%	0	0

**Notes:**

We assume all transactions occur at the end of each trading day, and at the closing price.

Calendar days not present are due to exchange closings over weekends and holidays.

\* dates indicate days when the CFTC (2011b, p.21) alleges the WTI crude oil price was manipulated by Arcadia.

[A] Estimated artificial price movement over the alleged manipulation period.

For example, the Jan 23 closing price for the March WTI crude oil contract is \$0.13 higher than it "should be."

To estimate artificial price movement, a Jan 25 baseline of unmanipulated prices is selected.

Jan 25 is the day that Arcadia sold off its physical crude oil position, and is the date referenced by CFTC (CFTC, 2011b, p.15).

Thus, Jan 25 is when prices return to competitive levels after the market processes the true level of available physical oil supply.

Also note that price changes reference changes in the futures spread, and that all artificial price movement is attributed to the front month contract in the spread. E.g. all artificial price inflation in the short March/April spread is attributed to a (relative) increase in the March contract (and not a relative decrease in the April contract).

[B] The February WTI futures contract open interest on NYMEX + ICE (1 contract = 1,000 barrels of WTI crude oil).

Includes futures only; does not include other derivatives (e.g. sw aps, options). Sources: (Bloomberg Terminal, 2012) and (ICE, 2012).

[C] Arcadia's position as a percent of total NYMEX + ICE futures open interest.

This assumes all of Arcadia's derivative positions were in NYMEX and ICE futures and not other derivatives (e.g. options, sw aps).

However, CFTC court files suggest that Arcadia may have invested in other derivatives as well as futures (CFTC, 2011b p.6).

Thus, our estimates of Arcadia's share of NYMEX + ICE futures open interest are the maximum possible.

Finally, if all of Arcadia's derivatives positions were in NYMEX futures only, Arcadia's max position would remain ~3% of NYMEX open interest.

[D] [Arcadia's short March futures position] x [NYMEX March WTI futures price]

[E] = [D] \* 0.03 ; Assumes margin posted by Arcadia is 3 percent of the notional value of WTI futures contracts held.

Table 9: Arcadia Alleged Crude Oil Manipulation; January 2008, Phase 2 (Resources Required)

## Chapter 3

### Nonfundamental Futures Demand

“Nonfundamental” demand is the second category of speculation that is alleged to cause price distortions in the commodity futures markets. Nonfundamental futures demand is simply the buying and selling of futures contracts based on factors outside of physical supply and demand considerations. As such it covers a diverse basket of speculation. For instance, nonfundamental demand includes certain proscribed trading activities such as “banging the close.” In contrast, a very different type of nonfundamental demand is the “rolling” or monthly mechanical buying and selling of futures positions by index funds (as opposed to the initial decision to invest in an index fund). When these nonfundamental activities move prices they can be considered speculation that creates price distortions.<sup>17</sup>

U.S. law and exchange rules proscribe certain types of price distortions that occur as a result of nonfundamental futures demand. The Commodity Exchange Act (CEA) prohibits “manipulation” broadly,<sup>18</sup> and other nonfundamental price distorting speculative trading practices specifically, e.g. “wash sales.”<sup>19</sup> Using the CEA’s “manipulation” sections, the Commodity Futures Trading Commission (CFTC) has prosecuted traders engaging in many types of nonfundamental demand trading practices, while many other types of nonfundamental demand, e.g. index rolling or irrational investing, violate no rules.

For example, in 2008 and again in 2010, the CFTC charged two firms with “banging the close” when trading energy and precious metals futures contracts (CFTC, 2008a and 2010b). The CFTC (2008b) explains “banging the close” as “the practice of acquiring a substantial position leading up to the closing period, followed by offsetting the position before the end of the close of trading for the purpose of attempting to manipulate prices.” In other words, traders employed their demand for futures contracts in an attempt to move prices, and importantly, the demand was not prompted by new fundamental

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<sup>17</sup> The corner and squeeze manipulation in chapter one is addressed as a distinct category of speculative price distortion outside of this chapter due to its historical and economic importance and its highly unique features. Otherwise, a corner and squeeze manipulation would be a type of nonfundamental futures demand.

<sup>18</sup> 7 USC §§ 9, 13b, and 13(a)(2). The CEA’s “manipulation” prohibition has been used by the Commodity Futures Trading Commission (CFTC) to prosecute *both* Targeted Price Manipulations as covered in chapter two and certain other nonfundamental demand price distortions as covered in this chapter.

<sup>19</sup> 7 USC § 6c(a)(2)

information. In fact, the opposite was true: the demand was motivated solely by a desire and strategy to move prices. In the first case, the CFTC (2008a) complaint concludes that the defendant succeeded in distorting gasoline, heating oil, and crude oil futures prices on NYMEX a total of five separate times, and in 2012 the defendant settled for \$14 million. In the second case, the CFTC (2010b) order alleges attempted price manipulation by repeated banging the close in the palladium and platinum futures contracts on NYMEX. The defendant also settled for \$25 million.

The remainder of this chapter is organized into four sections. Section I explains the difference between fundamental and nonfundamental futures demand. Section II reviews the economic theory behind nonfundamental futures demand moving prices. Section III reviews a recent empirical case for such price movements. Section IV concludes.

### **3.1 Fundamental versus Nonfundamental Futures Demand**

In this section, a distinction will be further drawn between fundamental and nonfundamental futures demand. Fundamental and nonfundamental futures demand can be broadly thought of as *price discovering* and *price distorting* respectively. But first we shall review the underlying assumption that *any* substantial demand can move futures prices in the presence of downward sloping demand curves for futures, i.e. market participants' heterogeneous price expectations.

The following is a stylized sketch of trading on a futures exchange to illustrate futures demand. Trader A wants to buy one long September 2012 futures contract (U12). The exchange has posted the last trade for U12 at \$100 (e.g. per unit of a contract with 1,000 units) and current ask prices for U12 are also \$100; i.e. there is at least one seller willing to sell for \$100. Trader A is comfortable with that price and wants to buy at the listed \$100. She submits a bid to buy one contract at \$100 which is easily able to be filled at the desired \$100 ask price, the trade is completed with the clearinghouse, and the exchange lists the latest trade again at \$100. The trade, and demand, just described had no effect on the price of the U12 futures contract.

Now let us examine a situation where big Trader B wants to go long 500 U12 contracts. The exchange again has ask prices listed at \$100. Trader B thinks \$100 a fair price and would like to fill all of his buys at that price. However, there are only four traders willing to sell a total of 300 contracts at \$100. Behind those four traders are others willing to sell, but at higher prices. Thus, to fill his order quickly, Trader B

will need to climb the “futures supply curve” and draw in other players who are willing to sell at prices greater than \$100. He ends up being able to buy the first 300 contracts at \$100 and the remaining 200 contracts at \$101. Consequently, the exchange posts the last trade at \$101, and since Trader B has momentarily exhausted all of the players willing to sell at \$100, and there are others willing to sell at \$101, the new ask price is listed at \$101. In this case, the futures price has moved up one dollar. The price may remain elevated if other traders perceive that the price rose due to new private information and their demand curves shift up, or the price may quickly drop back to \$100 if others enter the market who still value the contract at \$100.

We can see from these examples that if a large futures buy order cannot be absorbed by the market in the short-term, price moves up, and the inverse is true for a large sell order. The ability of a market to absorb a large number of buy and sell orders in a short amount of time with a minimal change in price is partially a measure of its liquidity. So far we have said little about whether the futures demand has been motivated by nonfundamental factors (e.g. to move price), or fundamental factors (e.g. news of a frost damaging a coffee crop in Brazil), but we have seen that any demand can at least temporarily move prices.

### **3.1.1 Fundamental Demand**

Fundamental demand is relatively easy to understand and foundational to the functioning of markets. When new information regarding the supply of, or demand for, the given physical commodity enters the marketplace, traders reevaluate the value of a futures contract. They buy and sell according to their new valuation, and the aggregate demand curve shifts up or down. Traders may not yet possess the new information themselves, but may perceive that the buying or selling actions by others are the result of new information, and may accept new prices as correct fundamental assessments of value. In these cases, fundamental demand has served a primary function of futures markets: price discovery.

### **3.1.2 Nonfundamental Demand**

Nonfundamental futures demand occurs when trading strategies are not based on physical supply and demand considerations. When exchange data has been available, nonfundamental trading strategies have been empirically shown to be capable of moving prices. However, nonfundamental demand may not necessarily move prices, as in the case of a highly liquid market with relatively homogenous price expectations. In addition, nonfundamental demand may *unintentionally* move prices, as in the case of

rolling a commodity index. Many of the intentional nonfundamental strategies are explicitly proscribed by U.S. law and regulation and exchange rules.

Unfortunately, in practice it is difficult to separate nonfundamental from fundamental trading. One exception is when nonfundamental demand is the result of a public and predetermined trading strategy such as the mechanical rolling of index funds (see section on Front Running the Goldman Roll below). In contrast, if the trading strategy is employed with the specific intent of moving prices, and the strategy is proscribed, traders obviously have a large incentive to keep their actions and intentions private. In addition, the limited public reporting requirements of exchanges and the CFTC with regard to these activities has produced sparse documentation. The most complete public records with accounts and data of intentional speculative price distortions are generated from CFTC legal actions and Congressional hearings. Practitioners' anecdotal accounts however are abundant.

Table 10 below is a basic list of nonfundamental demand speculative trading strategies that are intended to move futures prices. Many of these trading strategies are explicitly or implicitly proscribed by exchanges or by the Commodity Exchange Act (CEA). For example, the "banging the close" cases described in the introduction to this chapter were prosecuted under the authority of the "manipulation" sections of the CEA: Title 7 of the U.S. Code, §§ 9, 13b, and 13(a)(2).<sup>20</sup> Unfortunately, the CFTC and the exchanges do not produce public summary statistics of disciplinary actions against traders engaged in these activities.

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<sup>20</sup> These sections of the CEA are also used to prosecute corners and price squeezes as described in chapter two.

Trading Practice	Subcategory	Description
Bulling the market		Continuous buying as prices rise, driving up the price, with the goal of increasing the value of additional long positions held.
	Hitting the stops	Continuous buying in order to move the price up to a level that triggers other players' preset price buy orders, leading to an additional increase in price. This strategy can be made easier by jobbing traders who know the preset price levels of their clients. Also called "gunning the stops."
	Banging the close	Continuous buying in order to drive up the final futures settlement price of the day. This price in turn determines the settlement price of many other related contracts. The CFTC has filed civil complaints and administrative orders against banging the close under the authority of the "manipulation" sections of the CEA: 7 USC §§ 9, 13b, and 13(a)(2).
Bearing the market		Continuous selling as prices fall, driving down the price, with the goal of increasing the value of additional short positions held.
	Hitting the stops	Continuous selling in order to move the price down to a level that triggers other players' preset price sell orders, leading to an additional decrease in price. This strategy can be made easier by jobbing traders who know the preset price levels of their clients. Also called "gunning the stops."
	Banging the close	Continuous selling in order to drive down the final futures settlement price of the day. This price in turn determines the settlement price of many other related contracts. The CFTC has filed civil complaints and administrative orders against banging the close under the authority of the "manipulation" sections of the CEA: 7 USC §§ 9, 13b, and 13(a)(2).
Wash trading		One player or players working together to noncompetitively buy and sell at the same price in order to establish new traded prices, or to bring others into a quiet market. Explicitly proscribed by the CEA: 7 USC § 6c(a)(2)

Table 10: Common Nonfundamental Demand Trading Practices

### 3.2 Economic Theory

Nonfundamental demand moving prices may be explained by two primary hypotheses: downward sloping demand curves and limits to arbitrage. Downward sloping aggregate demand curves for futures contracts in turn may result from heterogeneous price expectations or from providing liquidity services to large futures orders.<sup>21</sup>

<sup>21</sup> Heterogeneous price expectations as the cause of downward sloping demand curves is in contrast with another typical explanation of downward sloping demand curves *for stocks* – imperfect substitution between stocks, which creates limited supply for each security; e.g. Loderer (1991). This cause is obviously *less* applicable to futures.

These underlying concepts may seem somewhat obvious to the non-academic observer: people have different opinions of the future value of say crude oil, and thus they are willing to pay different amounts for an oil futures contract. In addition, it is reasonable to imagine that there may be an imbalance between those buyers and sellers with the same crude oil expectations. In this setting, an individual who wishes to increase the futures price for no other reason can continue to buy contracts and exhaust those who are willing to sell at the current price and find those willing to sell at a higher price. The deeper and more liquid the market, and the more homogeneous oil price expectations are, the harder it will be to move prices. The price pressure induced price changes may be temporary or it may last longer than the few minutes needed to execute certain nonfundamental demand strategies such as “banging the close.” Whether prices remain changed also depends on whether the market perceives the incoming demand as the result of new fundamental information.

A downward sloping demand curves relies on the existence of traders who do not all agree on the value of a futures contract and are willing to buy more at lower prices and less at higher prices, without any new information. This may be a result of traders using different pricing models or having different risk appetites. If the demand curve is downward sloping, a large buy order can cause prices to increase. Since futures have no short selling restrictions, an imbalance between buyers and sellers would facilitate the shift in the demand curve. If this large buy order is not based on new fundamental information on the commodity, but rather is executed based on a trading strategy (e.g. a strategy designed solely to profit from the desired price movement), this nonfundamental futures demand has created a price distortion.

Another hypothesized reason for the existence of downward sloping demand curves is the short-term liquidity services cost as proposed by Harris and Gurel (1986) in the Price-Pressure Hypothesis (PPH). For providing liquidity services, traders demand to be “compensated for the transaction costs and portfolio risks that they bear when they agree to immediately buy or sell securities which they otherwise would not trade” (Harris and Gurel, 1986, p. 815). The PPH implies a temporary artificial price, but nevertheless, one that may still last for days.

Even if most speculators agree on the fundamental value of a futures contract, i.e. the demand curve is very close to flat, correcting a price anomaly may be difficult due to limits of arbitrage. Arbitrage in theory should allow speculators to quickly take advantage of mispriced derivatives and their underlying

commodities until the artificial price is eliminated. However, if arbitrage is limited, artificial prices may persist. The main limits to arbitrage performing this price-correcting function are: risk from imperfect arbitrage opportunity, budget constraints, knowledge of the anomaly, and speed of execution.

Thus, for example, even if most traders calculate that the fundamental value of a crude oil futures contract is worth less than its current futures price, employing arbitrage capital to take advantage of the mispricing may be limited. Arbitrageurs may be risk averse, and since they would be exposed to some risk because the payoff is not instantaneous, they may only be willing to deploy limited capital. Arbitrageurs also must have sufficient resources available to make the necessary derivatives and/or physical crude oil trades. Finally, arbitrageurs may not be aware of the fundamental value deviation. Thus, according to these hypotheses nonfundamental demand can induce price movement and these distorted prices may persist in at least the short-term.

Many empirical studies have tested for limits to arbitrage and downward sloping demand curves. Repeated evidence has been found of the inability of arbitrage to (quickly) correct price anomalies, and for the existence of downward sloping demand curves of securities, wherein demand shocks resulted in abnormal prices that lasted for several weeks or more (Shleifer, 1986; Loderer *et al.*, 1991; Bagwell, 1992; Kaul *et al.*, 2000; Diether *et al.*, 2002; Greenwood, 2005; Duffie, 2010; and Mou, 2011).

### **3.3 Empirical Evidence of Price Distortions from Nonfundamental Futures Demand**

One clear fingerprint of futures demand moving prices is the viability of the trading strategy known as “front running.”<sup>22</sup> Front running allows traders with foreknowledge of a large futures order to effectively tax the market by putting on positions in the same direction immediately *before* the large order moves prices. When the large futures order (i.e. large futures demand) moves prices, the front runner can turn a quick profit by squaring out her position after the favorable price move. Studying the profitability of these front running strategies in the context of large *nonfundamental* demand helps to illuminate the existence and magnitude of artificial price movements. In this section we will first further define front running and then analyze the case of front running a particular nonfundamental demand event: the monthly mechanical rolling of the S&P GSCI Index, called the “Goldman Roll.”

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<sup>22</sup> Front Running is also called “trading ahead”

### **3.3.1 Front Running**

Front running requires using others' futures demand to profit. If a trader has foreknowledge of a large client order, but fills her own order first and then the client's afterward, a profit can be made by taking advantage of the price effect from the large client's futures demand. For instance, Trader C is asked to fill a large futures buy order for her client, but Trader C *first* trades long on her personal account to take advantage of her foreknowledge of a probable price increase induced by her client's futures demand. Only *after* completing her personal order does Trader C fill the client's large buy order. If the price rises from the client's large buy order, trader C's own position also increases in value, at which point she can square out her position and make a fast profit.

In the previous example, we have not indicated whether the client's futures demand was fundamental or nonfundamental. A front running trading strategy can work with either type of futures demand; the essential elements of a front running strategy are simply: foreknowledge of the large futures demand, and a price impact from the futures demand.

Now let us turn to situations where the futures demand is the result of nonfundamental factors. The mechanical buying and selling or "rolling" of commodity futures contracts from earlier-month to later-month contracts by commodity indexes is an exemplar of this phenomenon. Index rolling represents nonfundamental demand since the demand is not created from a player taking a position based on their view of supply and demand information, but on a predetermined algorithm of the index (as opposed to the initial decision to invest in an index fund). In this case, it would appear appropriate to categorize any price impact from index rolling as artificial or a price distortion. Therefore, to test if nonfundamental demand moves prices, we should look for the existence of profitable front running trading strategies that take advantage of price distortions induced by index rolling (if not already removed through arbitrage, in this case, more front running).

### **3.3.2 Front Running the Goldman Roll**

An illustration of nonfundamental futures demand influencing prices can be found in the predetermined mechanical "rolling" of futures contracts that occurs when large funds are following the rules of an index. It is widely thought that the most popular commodity index is the S&P GSCI, which tracks a basket of 24 different commodities. The exact amount of funds following the S&P GSCI investment rules is not published, but Masters and White (2008) estimate market share at 63 percent. On April 30, 2012, total

long speculation was \$308 billion (\$206 billion net long) in *all* indexes tied to commodities derivatives contracts on U.S. exchanges, OTC swaps, and foreign contracts that are settled based on U.S. contracts (CFTC, 2012a). The monthly S&P GSCI index roll is based on a predetermined and public schedule described in the index's rules. The index roll requires selling the currently held futures contracts which have a relatively short maturity date and concurrently buying futures contracts with a relatively longer maturity date. S&P GSCI rolling occurs on the fifth through ninth trading days of a month, and occurs with a different monthly frequency for the different commodities in its index. This phenomenon is well understood in the industry and has been given the name the "Goldman Roll." (For more on indexes, see Chapter 4).

The buying and selling during the roll is the arbitrary creation of the index in order to have a method of maintaining its investment over time. The roll is required because commodity futures contracts have the problem of being an investment with an expiration date. Hence, the trading that results from the Goldman Roll and other index rolls is not based on new information from a crop report, oil inventories, or any other fundamental information. Since the S&P GSCI index is the largest index (i.e. is thought to have the most funds tracking its index rules), we would expect to observe the most pronounced demand price effects during the Goldman Roll and in its associated futures contract markets.

A recent study investigates just that; Yiqun Mou (2011) at Columbia University looks for price impacts from the Goldman Roll. He finds consistent price pressure from the Goldman Roll that would have yielded unleveraged mean annual excess returns<sup>23</sup> of 3.7 to 7.8 percent for a front running strategy between 2000 and 2010. The same strategy does not work pre-2000 (before commodity index investments proliferated), or for commodities not included in the S&P GSCI (or any other major index).

Mou sets up his analysis by defining two Goldman Roll front running strategies. Each strategy involves putting on (and then taking off) long calendar spreads in the same commodity futures contracts that are being tracked by S&P GSCI funds. In these spread front running strategies, the arbitrageur simultaneously puts on a short position in the contract month the index is rolling out of and a long position in the contract month the index is rolling into, and later takes both off. Thus, Mou's front running strategies take futures spread positions in the same direction that the index will roll, in an

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<sup>23</sup> "Excess return" here means returns above the risk-free rate, since the front running strategy is fully collateralized and the notional value of the futures position is invested in risk-free investments. Thus, any return on the strategy is above the risk-free rate already being received.

attempt to profit from the roll's price pressure. The two strategies differ as to when the spread positions are put on and taken off. Strategy One buys spreads on trading days 10 to 6 before the roll period begins, Strategy Two buys spreads on trading days 5 to 1 before the roll period begins, and both take off their positions during the five days of the Goldman Roll. All spreads are put on and taken off in equal 20 percent portions over each 5-day period.

Next, Mou creates a portfolio of commodity futures contracts that the front running arbitrageur could have used in the two strategies described above. The portfolio consists of the 19 commodities that are both included in the S&P GSCI and are traded on U.S. exchanges. The portfolios are equally weighted between the commodity sectors of agriculture, energy, livestock, and metals. A control portfolio was also created consisting of 18 commodities not included in the S&P GSCI or any other major index.

Mou then runs the two strategies on daily futures prices from 1980 through 2000. Returns from the two Goldman Roll front running strategies were consistently profitable, while the strategies applied to the control portfolio of commodities was not. Mou uses two measures for returns. Because futures contracts usually require less than 5 percent collateral, they can be highly leveraged investments. However, both return measures assume that each strategy is fully collateralized during its execution by investing the notional amount of the futures contracts in risk-free Treasury Bills. Thus, any return from the front running strategy is "excess" or above the risk-free rate.

The first measure of returns assumes that the arbitrage capital is always left invested in the Treasury Bills. Using this return measure, the annualized return for Strategy One is 3.7% and for Strategy Two is 1.5%. The second measure of returns incorporates the fact that Strategy One only uses the arbitrage capital for 10 days before and during the Goldman Roll and Strategy Two only uses the arbitrage capital for 5 days. This return measure assumes that the collateral capital can be used for other investment opportunities when not actually being used as collateral for the futures positions to front run the Goldman Roll. Thus, the second measure only considers the days the capital is used and annualizes the *monthly* average returns by multiplying by the trading days in the year and dividing by the number of days the arbitrage capital is actually used: i.e. multiply by 252/10 for Strategy One and by 252/5 for Strategy Two. This approach provides an annualized return for Strategy One of 7.8% and for Strategy Two of 6.4%.

In contrast to the profitability of these front running strategies, before 2000 and the growth period of indexes, both front running Strategy One and Two produced much smaller annualized returns. Between 1980 and 1999, Strategy One and Two yielded 0.7% and 0.2% annualized returns respectively when using the first measure of returns, and yielded 1.5% and 1.0% respectively when using the second measure of returns.

In order to test whether the profitability of the two front running strategies was unique to S&P GSCI commodities, Mou runs each strategy on a control portfolio of 18 commodities that are not included in the S&P GSCI. The two strategies perform poorly over both time periods. Between 2000 and 2010, Strategy One and Two yielded -1.6% and -0.7% annualized returns respectively when using the first measure of returns, and yielded -3.3% and -3.0% respectively when using the second measure of returns. Between 1980 and 1999, Strategy One and Two yielded -0.2% and 0.1% annualized returns respectively when using the first measure of returns, and yielded -0.3% and 0.3% respectively when using the second measure of returns.

To provide an additional metric of the magnitude of price movement, let us focus on the WTI crude oil contract. The S&P GSCI rolls WTI every month on the fifth through ninth trading days of each month in equal 20 percent increments, and from the near-month contract to the next-month contract. For example, on June 7, 8, 11, 12 and 13, 2012, funds tracking the index will sell (roll out of) their July contracts and buy (roll into) August contracts at 20 percent per day. We will designate those rolling days generically as 5 thru 1. Thus, day 30 is the 30th day before the last day of the roll.

Between 2000 and 2010 the average difference, or spread, each month between the S&P GSCI contract being rolled out of and the contract being rolled into *decreased* significantly over the course of the 7 days leading up to and including the first day of the Goldman Roll (days 12 thru 5). And in days 5 thru 1 the spread remained at its lowest point. In other words, for our example the dates the July contract became relatively cheaper and the August contract became relatively more expensive as the roll period drew close and began. This trend persisted for the decade of 2000 to 2010. This phenomenon fits with the hypothesis of the Goldman Roll putting downward price pressure on the near-month futures contracts and upward price pressure on the next-month contracts. In contrast, on days 30 thru 12 the spread trend was negligible during this decade. In addition, no spread trend for any of the days leading up to the roll dates is found during the period of 1983 to 1999.

Using Mou's time series data (2011, Figures 2 and 3), we can estimate that in the sample period from 2000 to 2010, and from day 12 to day 5 each month, the average spread decreased by about \$0.50 when WTI traded near \$100 per barrel, and the average spread decreased by about \$0.25 when WTI traded near \$50 per barrel. In days 5 thru 1 (during the roll) the spread remained at its new low. Again, this evidence fits well with downward price pressure being put on the contract month being rolled out of and upward pressure on the contract month being rolled into. Mou speculates that the early beginning to the drop in spreads each month may be due to other indexes that roll prior to the S&P GSCI and arbitrageurs who are already front running the Goldman Roll.

### **3.4 Conclusion**

Nonfundamental futures demand is a controversial concept that can elicit very different responses. One view is that nonfundamental demand is a common-sense theory that is frequently observed in the marketplace. This view allows for nonfundamental demand to be responsible for temporary unjustified prices and volatility.

In contrast, another view believes that nonfundamental futures demand is either an oxymoron or of little worry. This view holds that futures market participants, whether an oil refinery, an investment bank, or a high frequency trader, represent homogenous investors that have no disagreement on the value of a futures contract. Each rational investor has processed all information relevant to the commodity and they have agreed on one price. The price then only moves in response to new information. If the price does somehow leave its fundamental value, it will be quickly recognized, and fast-moving arbitrageurs will correct the anomaly. This view holds that virtually all futures demand aids in price discovery, increases liquidity, and reduces price volatility.

A large body of evidence in the securities markets supports the first view. The empirical evidence presented by Mou (2011) shows a convincing picture of nonfundamental demand in the commodity futures markets - as represented by the Goldman Roll - increasing and decreasing prices. In addition, limited arbitrage has not eliminated the consistent profitability of Goldman Roll front running strategies.

## Chapter 4

### Large Speculative Demand: Commodity Indexes

Large speculative demand is the third category of speculation that is alleged to cause price distortions in the commodity futures markets. Large speculative demand means large inflows of capital into the futures markets by speculators and subgroups of speculators. Large speculative demand comes from diverse subgroups that include actively managed hedge funds and the proprietary desks of investment banks. This chapter will focus on one particular subgroup responsible for large speculative demand: commodity indexes.

The first major commodity indexes were developed in the 1990s, when the S&P GSCI was created in 1991 and the DJ-UBS was created in 1998. The amount of money following indexes then grew dramatically in the early 2000s. Indexes were engineered to allow investors to obtain exposure to price changes in commodity markets. A large variety of investors now have index holdings in their portfolios including pension funds, hedge funds, endowments, sovereign funds, and retail investors (CFTC, 2008c). Investors also have an array of vehicles available to invest in the many indexes: from the direct purchase of commodity futures, to swaps, to exchange-traded funds.

Since December 2007, total long index investment in U.S. commodity derivatives has ranged between \$110 and \$360 billion dollars in notional value (and between \$80 and \$260 billion in *net* long notional value) (See Figure 6).<sup>24</sup> Earlier index data collected by the U.S. Commodity Futures Trading Commission (CFTC) provides an incomplete picture, but is estimated by others to be well less than \$10 billion prior to 2000 (Masters, 2008, Irwin and Sanders, 2010). This relatively recent flood of index-tracking money into the commodities markets, along with record oil prices in 2008, has drawn much attention. As we will see, there is great disagreement on the market effects of index investment. Different analytic approaches have been used in an attempt to tease out relationships between index investment and futures prices. In particular, a proliferation of econometric analysis has been undertaken in an attempt to uncover any relationship.

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<sup>24</sup> This figure includes OTC swaps and derivatives on foreign markets settled based on U.S. futures contracts.

The remainder of this chapter is organized into four sections. Section I defines commodity indexes, and Section II provides index examples. Section III supplies descriptive statistics of index investment. Section IV reviews two recent empirical studies. Section V concludes.

#### **4.1 What are Commodity Indexes?**

This section will define commodity indexes. Commodity indexes are designed to provide a return that recreates the return from holding futures in a single commodity or a basket of multiple commodities. For clarity and accuracy, a distinction should be immediately made between an index as a specific *formula*, and an index as an *investment vehicle* that uses the formula.

The *index formula* contains specific and public rules for how the commodity futures return will be recreated. It specifies which commodities are included and at what ratios. The formula also indicates how the index will deal with the fact that all futures contracts expire; the reality for long-term commodity futures speculating is that all futures must be sold and new futures purchased to maintain the investment - a process called "rolling." The index is published by the index formula owner and maintainer (e.g. Standard & Poor's), who also provides documents detailing every aspect of the index formula. In other words, anyone should be able to follow the rules of the index formula and calculate an identical return. There are many index formulas, with two of the most well-known being the S&P GSCI and the Dow Jones-UBS families of indexes.

The *index investment vehicle* on the other hand, is the financial product that speculators actually buy to gain exposure to commodity prices. These investment vehicles "promise" to provide returns to the speculator that duplicate the *index formula*. The investment vehicles include diverse financial products commonly created by investment banks, large commodity merchants, exchanges, or other swap dealers and sold to a variety of customers. Consequently, in order for the seller of an index investment vehicle to eliminate her risk exposure to her buyer, she must also take the equivalent derivatives positions that the index formula requires. These subsequent "hedging" activities of the index vehicle seller (e.g. swap dealer or bank) may involve directly purchasing commodity futures contracts. If the swap dealer or bank perfectly duplicates the index formula, it will have offset all of its risk by having the returns it will owe its customers exactly offset the returns it receives from its commodity derivatives position.

Index *Investment vehicles* can be fit into four main categories: 1. futures, 2. swaps 3. exchange-traded assets, and 4. other derivatives.<sup>25</sup> It is helpful to keep in mind that virtually all of these commodity investment vehicles are linked, if a few times removed, to a particular commodity futures contract that is settled by actual physical delivery.<sup>26</sup>

## 1. Futures

Using futures as the *investment vehicle* to create returns based on a commodity *index formula* is straight forward. There are two ways this can be done. The first, and most obvious way, is to buy the same futures contracts in the exact ratios that the particular index formula calls for. However, the recreation of the index formula ratios by buying different commodities from multiple markets and rolling the contracts monthly may be more work than most investors are willing to undertake. For example, recreating the S&P GSCI would mean buying futures contracts in 24 different commodities on 8 different trading facilities.

The second way to use futures as the index *investment vehicle* is to buy *index futures*. This option refers to buying a single exchange-traded futures contract designed to track a particular index formula. Index futures are financially settled upon their expiration based on the value of a particular index formula on that date. For example, CME offers a futures contract called the “S&P-GSCI Futures” that expires on the 11<sup>th</sup> business day of the contract month.<sup>27</sup> At the end of that trading day, the contract settlement price equals the published price of the S&P GSCI index formula. This contract is analogous to an S&P 500 Futures contract. Index futures of this type currently have a small open interest and trading volume.

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<sup>25</sup> To complicate matters, these investment vehicles may overlap by having its funds reinvested in other derivatives from within any of these same categories. However, the end customer will only be buying from one of these categories of investments.

<sup>26</sup> With some exceptions, notably ICE’s Brent Crude Oil contract, which is settled based on Platts reports.

<sup>27</sup> See: [http://www.cmegroup.com/trading/agricultural/commodity-index/gsci\\_contract\\_specifications.html](http://www.cmegroup.com/trading/agricultural/commodity-index/gsci_contract_specifications.html)

## 2. Swaps

Traditional swap contracts are bought by large investors from swap dealers in the over-the-counter market. The swap contract promises to replicate the returns of the index formula for the investor for a fee. Typical large investors are pension funds, hedge funds, mutual funds, or sovereign wealth funds, and the typical swap dealer is a commercial bank, investment bank, insurance company, or commodity producer/processor/merchant. There is very little information currently required to be collected regarding traditional swap contracts (this is changing with the implementation of the Dodd-Frank Act of 2010). These contracts may be customized, illiquid, and the risk of default is borne directly by the two counterparties (CFTC, 2008c).

More recently, standardized and cleared swap contracts that track index formulas have been developed. These swap contracts are similar to futures contracts, except they are not traded on exchanges. However, exchanges such as CME can be involved in almost every other aspect of the swap. The exchange may design the standardized contract, market the contract, and provide central counterparty clearing services (through its clearing house affiliate), including mark to market. The main difference from a futures contract is that one does not buy or sell the swap contract thru the exchange floor or trading platform, but instead the counterparties register a private bilateral sale with the clearinghouse *after* price and quantity terms are agreed to by the counterparties. Once the swap counterparties have registered the transaction, the clearinghouse handles variation margining based on the daily level of the index formula (CME, 2010).

## 3. Exchange-Traded Assets

The third category of index *investment vehicle* is the exchange-traded asset which is marketed to retail investors. Exchange-Traded Funds (ETFs) and Exchange-Traded Notes (ETNs) are the two similar types of index-tracking exchange-traded assets. Multiple different ETFs and ETNs have been created by investment banks. Each can be bought and sold on public exchanges such as the NYSE, and each track a specified *index formula*. One can go to the sponsoring bank's website and review the details of any of these products. In addition to being able to be bought and sold on its designated exchange, ETFs can be redeemed for cash from the sponsoring bank in large bundles, and ETNs financially settle upon expiry, both based on the asset's current *index formula* value. An example of an ETF is provided in the second paragraph below.

#### 4. Other Derivatives

“Other derivatives” is a catch-all for other *investment vehicle* products whose return is based on an index formula. Because financial institutions are continuously designing new products, it is impossible to capture all commodity investment vehicles in three finite categories.

##### 4.2 Index Investment Vehicle Example: iShares ETF by BlackRock

To solidify these concepts, let us now examine a particular index *investment vehicle* and the *index formula* it tracks. Take the case of the popular exchange-traded fund (ETF) by iShares (owned by the giant investment bank BlackRock) called the “S&P GSCI Commodity-Indexed Trust.”<sup>28</sup> This retail ETF is tracking the “S&P GSCI Total Return” *index formula*. As iShares advertises, “It is the objective of the Trust that the performance of the [ETF] Shares will correspond generally to the performance of the S&P GSCI Total Return Index, before payment of the Trust’s and the Investing Pool’s expenses and liabilities” (iShares, 2012).

The S&P GSCI Total Return index formula includes a specific mix of 24 agriculture, energy, industrial metals, livestock, and precious metals futures contracts listed on 8 different trading facilities (S&P, 2012). Standard & Poor’s is responsible for calculating and publishing this ETF’s *index formula* (as well as many other index formulas). BlackRock pays Standard & Poor’s to license the S&P GSCI name and formula.

iShares, along with other sister subsidiaries of the large parent investment bank BlackRock, are the financial institutions responsible for selling, marketing, and managing the ETF. This iShares ETF has a market capitalization of approximately \$1.1 billion as of June 15, 2012.<sup>29</sup> To offset its risk exposure, BlackRock has decided to purchase index futures with its investors’ funds (as described above in No.1). Namely, BlackRock is “substantially all” invested in the unleveraged “S&P-GSCI Excess Return Index” futures contract listed on CME (iShares, 2012). This futures contract financially settles based on the value of the S&P index formula in 2014.<sup>30</sup>

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<sup>28</sup> See iShares website: [http://us.ishares.com/product\\_info/fund/overview/GSG.htm](http://us.ishares.com/product_info/fund/overview/GSG.htm)

<sup>29</sup> See NYSE Arca Exchange ticker GSG

<sup>30</sup> See CME: [http://www.cmegroup.com/trading/agricultural/commodity-index/gsci-excess-return\\_contract\\_specifications.html](http://www.cmegroup.com/trading/agricultural/commodity-index/gsci-excess-return_contract_specifications.html)

An interesting feature of this type of investment vehicle is that the holder of this asset can cash out either by selling the ETF on the NYSE Arca Exchange, or by redeeming the ETF for its current index value directly from BlackRock (with certain restrictions). Thus, the exchange price should very closely follow the redemption value of the ETF, given arbitrage pressures.

BlackRock hopes that the returns from its CME index futures holdings exactly duplicate the S&P index formula, so that it can provide its customers their promised return. However, the iShares prospectus makes clear that if BlackRock's futures holdings don't perform in line with the S&P index formula, the customer is out of luck (iShares, 2012). BlackRock makes its money through fees; the ETF's management fee is 0.75%, and any other "expenses" that the fund may claim (iShares, 2012).

#### **4.3 Commodity Index Descriptive Statistics**

This section will first provide general descriptive statistics of funds tracking commodity indexes. Second we will detail index investment in crude oil, and last review index data issues.

Figure 6 represents the "big picture" of index investment; it shows the combined total notional value of derivatives held by commodity indexes from 2008 to 2012. The data is limited to contracts traded on U.S. markets, but includes any foreign contracts referenced to those domestic contracts. Importantly, this data captures all OTC as well as exchange-traded positions. The long and net long notional value of index positions peaked in June 2008 at \$256 and \$202 billion respectively, and again in April 2011 at \$358 and \$256 billion respectively. Since the beginning of 2011, long positions have remained higher than their 2008 peak.

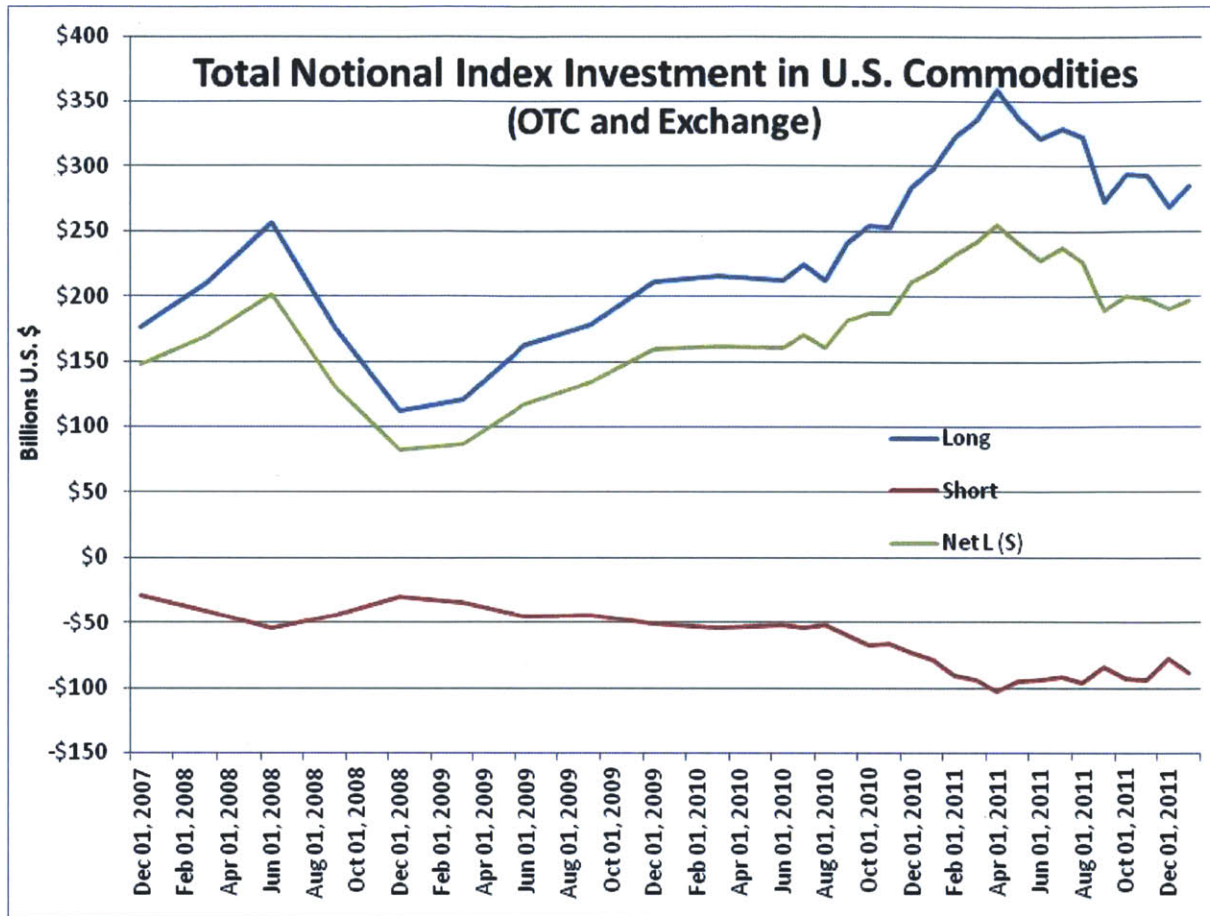


Figure 6: Index Investment in Commodities (All Months Aggregated, Futures plus Delta-adjusted Options, and includes U.S. and U.S.-linked Commodity Contracts). Source: CFTC (2012b)

Note that total index *notional* value can increase due to three factors: the inflow of index funds, the increase in the price of contracts held, and the reweighting of the index – for the S&P GSCI, reweighting is based on each commodity’s relative world production and trading volume (S&P, 2012). We cannot evaluate the percent of all commodity derivatives markets that index speculation represents because we currently do not know the size of the OTC markets. Total size (open interest) data is currently only required to be reported for the regulated exchanges.

We will now briefly review the best available index data for WTI crude oil. Figure 7 and Figure 8 represent two different measures of index investment in WTI Crude Oil from December 2007 thru January 2012. Figure 7 shows total *notional* value of index investment in the WTI Crude Oil contract, and Figure 8 shows the number of futures equivalent *contracts* held by indexes (1 contract equals 1,000 barrels of crude oil). Both figures include all derivatives: futures, delta-adjusted options, OTC contracts

(swaps) and contracts that are not traded on U.S. markets, but that are settled based on the NYMEX WTI crude oil contract. All contract months are aggregated (CFTC, 2012b).

For the sample period, the long notional value of index investment in WTI crude oil ranged from \$25 to \$78 billion (net long \$20 to \$54 billion). In turn, the number of futures-equivalent WTI crude oil contracts held by index-tracking funds ranged from 428,000 to 695,000 (net long 351,000 to 492,000). Although we currently do not know the exact size of the OTC market, to put the WTI crude oil index investment numbers in perspective we will compare them to the size of the two largest WTI markets for which we do have data: NYMEX and ICE Futures Europe. At the end of December, 2011, all long WTI crude oil index investment would represent 27 percent of the open interest on NYMEX, 135 percent of open interest on ICE Futures Europe, or 22 percent of the combined open interest of NYMEX and ICE.

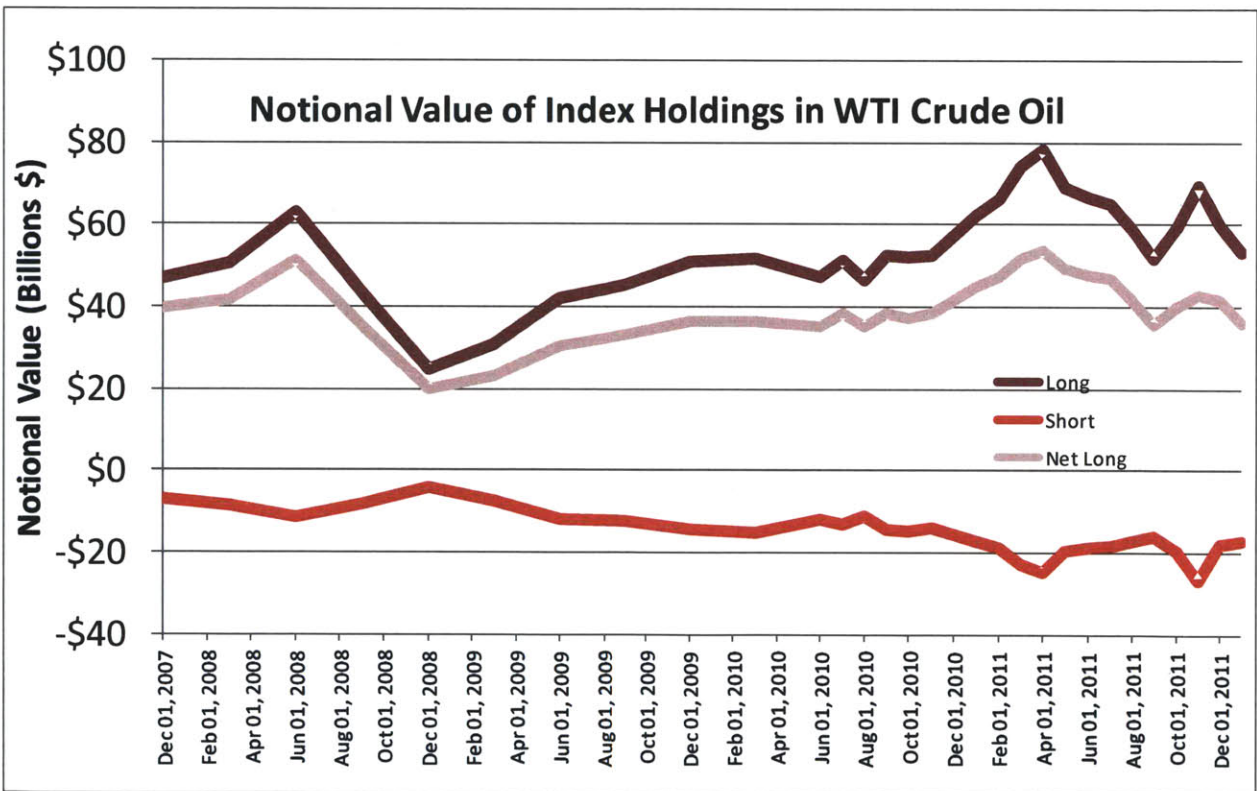


Figure 7: Notional Value of Index Holdings in WTI Crude Oil. Source: CFTC (2012b)

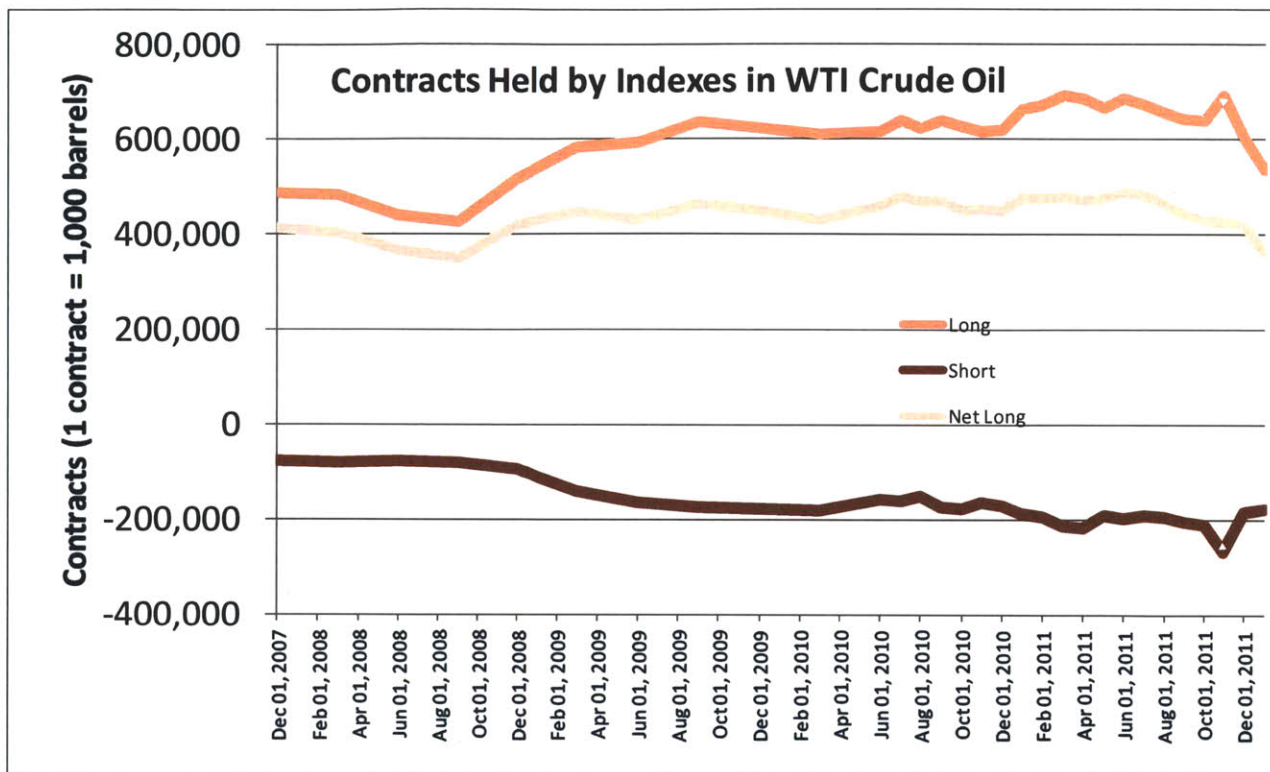


Figure 8: Number of Contracts Held by Indexes in WTI Crude Oil. Source: CFTC (2012b)

This subsection reviews the history of data collection and the types of data and data sources available for commodity derivative contracts. The U.S. regulatory body with jurisdiction over U.S. commodity derivatives is the Commodity Futures Trading Commission (CFTC).<sup>31</sup> The CFTC (and its predecessors) have collected and periodically published market data on futures since 1924. This reporting grew into a standardized report called the Commitments of Traders (COT). The CFTC’s reporting has also expanded in scope and frequency over the years, and today includes weekly position data of futures and delta-adjusted options broken down by major categories of traders.

As index investing grew in the early 2000s, it became clear that the CFTC’s old legacy COT report and its coarse classification of trader types was insufficient to accurately capture index-linked derivatives positions (CFTC, 2008c). The legacy COT reports classify traders into only two types, “Commercial” and “Non-commercial.” Commercial traders are those that use the futures market to hedge “business

<sup>31</sup> The CFTC also has joint jurisdiction with the SEC over “Security Futures” (e.g. single securities futures and narrow-based securities indexes). The CFTC has primary jurisdiction over all other futures and options which include “Financial Futures” (e.g. currency futures, broad-based securities indexes, interest rate futures); “Commodity Futures” (e.g. agriculture, energy, metals); and “Other” (e.g. weather futures).

activities,” and Non-commercial traders are everyone else (CFTC, 2012c). This course classification system does not disaggregate index investments and has many other shortcomings.

An important limitation of the COT report is the broad definition of who qualifies as a Commercial trader. At issue is whether offsetting risk from selling a swap to a speculator qualifies a swap dealer as a Commercial trader. The CFTC has answered “yes” in the past. Any OTC swap dealer who comes to the futures market to offset risk from their private deals are considered Commercials in the legacy COT report, regardless of the counterparties to the original private deal. These swap dealers may have either Commercial or Non-commercial counterparties to their original OTC swaps, but the COT report viewed all of the swap traders’ offsetting exchange-traded futures positions as Commercial hedging for the purposes of COT reporting (CFTC 2008c). Thus, if a swap dealer sold an OTC index swap to a hedge fund and then bought futures on NYMEX to offset its risk exposure, the swap dealer’s NYMEX position would be classified as Commercial. This rendered the simple Commercial and Non-commercial classification of little value - even for determining the level of participation by those who had a business in the underlying physical commodity, much less in determining index investment. For these reasons, reliable pre-2006 index data is not available.

In an effort to provide data of higher resolution and that more accurately represented the different types of trading occurring in futures markets, the CFTC has published three new reports starting in 2006. Only the third report includes OTC data. The three reports are as follows:

1. The **Disaggregated Commitments of Traders (DCOT)** report is published weekly and is available from June 2006. The DCOT attempts to provide a more granular picture of market participants. The DCOT contains exchange-traded derivatives positions disaggregated by five new trader categories: Producer/Merchant/Processor/User, Swap Dealer, Managed Money, Other Reportables, and Nonreportables. The new Swap Dealer category includes traders who would have been classified as both Commercial and Non-commercial in the legacy COT reports. However, it is still not possible to determine what portion of Swap Dealer positions have OTC counterparties that were made with Commercial hedgers versus Non-commercial speculators. The DCOT does not include position data from the OTC markets.

2. The **Commodity Index Trader Supplemental (CIT)** report is published weekly for 12 agricultural commodities and is available from January 2006. This report does provide a measure of index investment by requiring traders following indexes to separately report their positions. The CIT contains exchange-traded derivatives positions disaggregated by four trader categories: Commercial, Non-commercial, Index Traders, and Nonreportables. A major shortcoming of the CIT reports is that only 12 agricultural commodities are included and no energy or metals markets. The CIT also does not include position data from the OTC markets.
  
3. The **Index Investment Data (IID)** report is published monthly for 21 major agriculture, energy, and metal commodities. The IID is the most comprehensive report on commodity indexes, and covers index data exclusively. The IID was published quarterly from December 2007 to June 2010 and monthly thereafter. It contains exchange-traded derivatives and notably, all OTC index positions. Thus, the IID ostensibly contains all index investment positions for each of the 21 commodities, including the index holdings in contracts outside of U.S. markets, but that settle based on the U.S. contract (e.g. ICE WTI contracts).

The three CFTC reports described above (along with the legacy COT report) represent the entirety of the reliable, regularly published, public data on indexes. While the frequency and specificity of the CFTC's reports have increased, there remain gaps that make analyzing indexes difficult. For instance, the IID report is currently published monthly, leaving only 12 data points per year capturing total index investment. In addition, the CIT reports that are published weekly do not cover energy or metals index investment. Further explanation of CFTC's data can be found on the CFTC website, and in a comprehensive treatment by Irwin and Sanders (2011, p.8).

It should be mentioned here that multiple studies on indexes (e.g. Masters, 2008; Singleton, 2011) have used another indirect measure of index investment, sometimes referred to as the "Masters Imputed Method" after Michael Masters who contributed to popularizing the method. The Masters Imputed Method attempts to quantify the index funds that are tracking two large commodity indexes, the S&P GSCI and the DJ-UBS, and use these imputed values as a proxy for total index investment. The method uses the CFTC's CIT reports, and three commodities - KC Wheat, Feeder Cattle, and Soybean Oil - that are included in either the S&P GSCI or DJ-UBS indexes, but not both. It then uses the known S&P GSCI and DJ-UBS commodity index weightings to back-out the indexes' investment in the remaining S&P GSCI

and DJ-UBS's basket of commodities for which the CIT reports do not provide data (for a detailed explanation see Masters, 2008, Appendix).

Unfortunately, the Masters Imputed Method suffers from a number of difficulties. First, since the CFTC's CIT report only includes exchange-traded derivatives, the Masters Method can only capture index investment that is brought to exchanges; it does not account for OTC index deals that are never brought to the futures markets. To the extent that (long) index swaps are internally netted against (short) non-index counterparties by swap dealers, the Masters Method will tend to *underestimate* total index investment.

Second, the Masters Imputed Method assumes that indexes other than the S&P GSCI and DJ-UBS are not investing in the three key commodities used in the Masters Method calculation: KC Wheat, Feeder Cattle, and Soybean Oil. If this assumption does not hold, the Method would tend to *overestimate* total index investment.

Third, the Masters Imputed Method explicitly does not capture investment by indexes other than the S&P GSCI and DJ-UBS (e.g. it does not capture investment in the U.S. Oil Fund ETF). This is because other indexes' positions would not be backed out from the Method. This fact will tend to *underestimate* total index investment. While Masters (2008) has attempted to compensate for this fact by including estimates of other index investment, it is unclear how this data is obtained and thus not currently re-creatable.

It is not certain which of the preceding three effects dominates. In addition, the amount of deviation from actual index investment can vary over time as the three effects can vary over time. Irwin and Sanders (2011) evaluate the Masters Imputed Method and conclude that it is an overestimate of actual index investment. They build a time series of WTI crude oil index positions using the Masters Imputed Method and compare it with the CFTC's IID monthly WTI crude oil index positions. For the sample period of December 2007 to March 2011, they graphically show the Masters Method always overestimating the level of CFTC-reported index investment in WTI crude oil (Irwin and Sanders, 2011, Figure 3, p.53). However, the authors are comparing two different measures of index investment - long and net long positions. The Masters Imputed Method estimates *long* index positions, while the IID report data that Irwin and Sanders employ is *net long* positions. If instead one compares long IID positions on the same

graph, the Masters Method alternates from being an overestimate to an underestimate of index investment in WTI crude oil.

#### **4.4 Conflicting Empirical Evidence**

This section reviews two recent empirical studies on the correlation between index investment and price changes in the futures markets. There is a hot debate on the ability of index money inflows to affect futures prices. Dozens of recent academic studies have attempted to use econometric methods to infer causality or at least correlation.<sup>32</sup> The theory employed also diverges. Not surprisingly the literature is inconclusive. This section will review two prominent studies that reach competing conclusions: Singleton (2011), and Irwin and Sanders (2010).

##### **4.4.1 Singleton (2011)**

Kenneth Singleton (2011) of Stanford University finds that there is “an economically and statistically significant effect of investor [index and managed money] flows on futures prices.” Singleton presents econometric evidence of the predictive power of index and managed money positions on crude oil futures prices. Distinct from previous studies, Singleton uses an intermediate-term measure of futures speculation: the 13-week change in futures speculative positions (i.e. positions at  $t$ , minus the positions at  $t - 13$ ). As such, index investment flows are found to be “positively correlated with [3-month] *future* changes in commodity prices (p.26).” Singleton offers investor disagreement on oil price expectations and limits to arbitrage as the theoretical explanations for his results. He also suggests that these heterogeneous investors can lead to price volatility, which can in turn lead to higher risk premiums, higher cost of capital, and finally lower economic output.

The following briefly describes Singleton’s econometric model. The predicted variable is crude oil futures excess returns. Singleton computes a weekly time series of the excess returns from holding a crude oil futures contract in each of nine different maturities (1, 3, 6, 9, 12, 15, 18, 21, and 24-month expiry contracts). “Excess returns” here includes the roll yield and is calculated as the fully collateralized returns of holding a contract until just before it changes its number-of-months-to-expiration, and then rolling it into the next expiration-month. Excess return then is just the percent change in contract price,

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<sup>32</sup> The CFTC has compiled fairly comprehensive list of reports on its website:  
[http://www.cftc.gov/LawRegulation/DoddFrankAct/Rulemakings/DF\\_26\\_PosLimits/positionlimitstudies](http://www.cftc.gov/LawRegulation/DoddFrankAct/Rulemakings/DF_26_PosLimits/positionlimitstudies)

plus any change from rolling each contract once a month. Singleton's sample period is from September 2006 to January 2010.

The two key predictor variables are: the change in long index positions and the change in managed money spread positions.<sup>33</sup> The source for the former is the Masters Imputed Method (described in the previous section) and the source for the later is the CFTC's Disaggregated Commitments of Traders (DCOT) report (also described in the previous section). Both are measured over a 13-week period (i.e. positions at  $t$  minus the positions at  $t-13$ ), and both are all-contract-months aggregate figures. The control variables used in Singleton's econometric model are: all-months crude oil futures open interest, the previous week's crude oil futures excess returns, the change in differential between the futures and spot price, and two additional macroeconomic metrics. Singleton separately regresses each of the weekly excess returns from the nine separate crude oil futures contracts on the entire set of explanatory variables.

Singleton finds the coefficients for index and managed money to be positive and statistically significant (to the 0.005 level). Singleton's estimate suggests that (all else equal), a one-week increase of 0.25 million long futures contracts held by indexes predicts an expected one-week 0.068 percentage point increase in the excess returns from holding a front-month crude oil futures contract. And a one-week increase of 0.25 million spread contracts held by managed money (the max increase between 2007 and 2009) predicts an expected one-week 0.089 percentage point increase in the excess returns of the same contract. A statistically significant predictive relationship (but monotonically decreasing in economic magnitude) was found between index positions and crude oil contracts with longer maturities, and managed money positions and crude oil contracts with longer maturities.

To review the implications of the relationship Singleton finds between speculative money flows and crude oil futures prices, I analyze managed money positions and crude oil price in three consecutive periods in 2008. (A recreation of expected price pressure from indexes is not considered here due to the uncertainty of the Masters Imputed Method in determining the level of index speculation, in addition to uncertainty as to the exact index data set that Singleton used.)

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<sup>33</sup> Spread positions here means the sum of long and short spreads, as they are not disaggregated in CFTC reporting.

Period I: Between the week of February 4 and June 6, 2008, the 13-week change in managed money spread positions (MM) was positive in each week except one. The futures price also increased from \$90.02 on February 4 to \$134.86 on June 13. Singleton's econometrics results suggest that these managed money increases should partially explain the increase in crude oil futures prices. More exactly, during this time period MM put upward pressure on the futures price by an average of 0.018 percentage points per week. To illustrate, this is the equivalent to upward price pressure of \$0.016 per barrel in the first week (\$16.180 per contract), and \$0.024 in the last week (\$24.239 per contract). Of course, Singleton's econometric model includes many other variables that could dominate the price pressure from MM, not to mention the 73 percent of oil price variation that is "not explained" by his model (adjusted R-squared of 0.27).

Period II: In contrast, between the following week of June 15 and the week of August 18, 2008, Singleton's model suggests that managed money put only *negative* pressure on crude oil futures each week. During this period oil prices continued to increase, peaked at \$145.29 on the close of July 3, and then eventually declined to \$114.59 on August 22. Given the negative 13-week position changes during this time period, MM put downward pressure on the futures price by an average of  $-0.007$  percentage points per week.

Period III: During the last period that ends on the last week of 2008, Singleton's model suggests that managed money put mainly positive pressure on futures prices, with only three negative weeks. In spite of this, the front-month crude oil futures price *decreased* steadily to \$44.60 on December 31. According to Singleton's model, during this time period MM put *upward* pressure on the futures price by an average of 0.013 percentage points per week, almost as much as in the first period.

#### **4.4.2 Irwin and Sanders (2010)**

In contrast to Singleton (2011), Irwin and Sanders (2010) find that their econometric analyses "tilt the weight of the evidence even further in favor of the argument that index funds did *not* cause a bubble in commodity futures prices (p.70)." Irwin and Sanders present multiple econometric models that compare the change in index fund size to the change in commodity futures prices. While the authors find significant correlations of index positions with prices in *individual* commodity futures markets, they find that the cumulative impact of indexes across *multiple* markets is not statistically different from zero.

The following briefly describes Irwin and Sanders' econometric models. Irwin and Sanders employ Granger Tests to determine whether index positions help to forecast prices after controlling for past prices. Twelve different commodity futures markets are analyzed using a weekly time series over the sample period of June 13, 2006 to December 29, 2009. The predicted variable of concern is futures returns. Futures returns are measured as the weekly return from holding the nearest-to-expiration contract and rolling it before the delivery month is entered. In other words, futures returns is simply the weekly percent change in the futures price, plus any change from rolling each contract.

The two index variables that are tested for their ability to predict futures prices are: change in net long index positions, and percent point change in the percent of long open interest held by indexes. The Granger Test uses a bivariate model (only one predictor variable per econometric model), and controls for the effect of past (or lagged) prices on current prices. However, each variable may be lagged up to four separate times in the same model, i.e. the past four weeks' index positions and past four weeks' futures prices may be used to predict price.

For index data, Irwin and Sanders use the CFTC's weekly Commodity Index Trader Supplemental (CIT) report (described in the previous section), which contains the index positions in 12 different commodities: corn, soybeans, soybean oil, CBOT wheat, KCBOT wheat, cotton, live cattle, feeder cattle, lean hogs, coffee, sugar, and cocoa. Thus, these are the twelve commodities that Irwin and Sanders regress price on index positions in the Granger Test setting. Notably, the CIT reports do not include energy markets. The authors attempt to use the "swap dealer" category from CFTC's Disaggregated Commitments of Traders (DCOT) report (described in the previous section) as a proxy for index positions in the energy markets. However, swap dealer positions are a poor proxy for index positions as repeatedly noted by Irwin and Sanders (pp. 44, 51). The authors find no relationship between swap dealer positions in crude oil and futures prices, or swap dealer positions in natural gas and futures prices.

Indexes in some of the 12 individual commodity markets had statistically significant impacts on their prices, but "system-wide," the cumulative effect was not statistically different than zero. Index positions in the corn, cotton, sugar, and feeder cattle markets are found to have statistically significant correlations (at the 10 percent level) on their respective futures prices. However, index positions in corn and feeder cattle are *negatively* correlated to futures prices, while index positions in cotton and sugar

are *positively* correlated to future prices. As a consequence, “the evidence is not consistent with a systematic influence across the markets (p.57),” conclude Irwin and Sanders (when using a “seemingly unrelated regressions” (SUR) testing framework for combining the results from the 12 futures markets).

Next we will provide an illustration of the price change associated with a change in index positions as implied by Irwin and Sanders. We will use as examples the two commodities where the expected impact of indexes on price is statistically significant to the 5% level: corn and cotton.

Corn: A one-week increase of 37,000 net long corn contracts (the max increase between 2006 and 2011) held by index funds, (all else equal) is associated with a predicted *decrease* in weekly futures returns of 0.045 percentage points. In the spring of 2012, the July 2012 CBOT corn contract was selling at around \$6.00 per bushel (\$30,000 per contract). Thus, the Irwin and Sanders model suggests that if indexes increased their positions by 37,000 net long contracts in one week, the price of a bushel of corn would *decrease* by \$0.003 (\$13.431 per contract) in one week.

Similarly, an increase in the percent of long open interest corn futures positions that index funds hold is associated with a *decrease* in the price of corn futures. Specifically, a one-week 2.9 percentage point increase in the percent of long open interest (max increase between 2006 and 2011) held by index funds, (all else equal) is associated with a one-week \$0.001 *decrease* in price of bushel of corn (\$5.203 per contract).

Cotton: A one-week increase of 11,000 net long cotton contracts (the max increase between 2006 and 2011) held by index funds, (all else equal) is associated with a predicted *increase* in the next week’s futures returns of 0.039 percentage points. At the end of June 2012, the July 2012 NYBOT/ICE cotton contract was selling at around \$0.70 per pound (\$35,000 per contract). Thus, the Irwin and Sanders model suggests that if indexes increased their positions by 11,000 net long contracts in one week, the price of a pound of cotton would *increase* by \$0.0003 (\$13.82 per contract) in one week.

Irwin and Sanders also include Granger Tests for predicted variables other than price (realized volatility and implied volatility of the futures price) and use other predictor variables (Working’s T-index – a measure of market speculation). The authors find that an increase in index positions is associated with a decrease in price volatility. Specifically, an increase in net long index positions and an increase in the

percent of long open interest held by index positions both help forecast a future *decrease* in realized and implied volatility. Similarly, an increase in swap dealer positions is associated with a subsequent decrease in volatility. In addition, an increase in the Working's T-index is associated with a subsequent increase in realized volatility. Irwin and Sanders do not analyze "managed money" positions or OTC positions.

Despite Irwin and Sanders' decisive language: "There is no convincing evidence that positions held by index traders or swap dealers impact market returns (p.69)," there are statistically significant correlations of indexes with prices in individual commodity markets (e.g. corn and cotton), but with marginal economic significance. In the authors' own words, "while we do find causation running from net positions to returns in two markets, the evidence is not consistent with a systematic influence across the markets (p.57)." Irwin and Sander do agree with Singleton that "better data is needed" on indexes and in the energy markets.

#### 4.5 Conclusion

This chapter considers the effects of indexes and other large speculative money flows on futures prices. In contrast to chapter three, this chapter does not consider the intent of the speculator and whether the investment was motivated by fundamental or nonfundamental factors.

There are different economic theories that support conflicting conclusions regarding the price effects of large speculative money flows. We are left with an empirical question. Unfortunately our tools and data leave much to be desired; econometrics is subject to numerous pitfalls and overinterpretation, and we currently have huge holes in index and OTC data.

The two econometric studies that this chapter reviews reach different conclusions. Singleton (2011) finds that managed money (e.g. hedge funds) and index money flows into the crude oil futures market are associated with a 3-month later increase in crude oil futures prices. Singleton's model suggests that increases in managed money positions are associated with an average weekly increase of about \$0.02 per barrel of crude oil during the February through mid-June lead up to the 2008 peak oil price. Singleton finds indexes are also positively correlated with crude oil prices, but when using a questionable index data set.

Irwin and Sanders (2010) find that index money flows are associated with a one-week later increase in cotton futures prices, but a also a one-week later *decrease* in corn futures prices. In ten other commodity markets (not including energy commodities), the authors find no statistically significant impact. Given historical prices and index positions from 2006 to the end of 2011, the authors' model suggests that the maximum one-week effect of indexes was a \$13.82 *increase* in the cotton futures contract and a \$13.43 *decrease* in the corn futures contract. However, Irwin and Sanders conclude that the systematic effect of index money flow on futures prices in all 12 markets aggregated is not statistically different from zero.

## Chapter 5

### Regulation and Speculative Position Limits

This chapter will review the evolution of commodity futures speculative position limits and the hedging exemption to those limits. The CFTC provides a simple definition of speculative position limits as “The maximum position, either net long or net short, in one commodity future (or option) or in all futures (or options) of one commodity combined that may be held or controlled by one person (other than a person eligible for a hedge exemption) as prescribed by an exchange and/or by the CFTC,” and likewise, the CFTC defines a hedge exemption as “An exemption from speculative position limits for bona fide hedgers and certain other persons who meet the requirements of exchange and CFTC rules.”

Both the position limits placed on speculators and the circumstances under which a trader may be exempted from those limits have evolved extensively over the years. The evolution may be appropriately characterized as a perpetual debate on how to define speculative limits and the hedging exemption. Federally-mandated position limits of varying nature have been in place since the passage of the Commodity Exchange Act (CEA) in 1936 (and prior as a temporary measure during World War I). In advocating passage of the CEA to Congress in 1934 President Franklin D. Roosevelt stated, “It is my belief that exchanges for dealing in securities and commodities are necessary and of definite value to our commercial and agricultural life. Nevertheless, it should be our national policy to restrict, as far as possible, the use of these exchanges for purely speculative operations.”

But what are position limits intended to prevent? And how effective are they? This chapter will also attempt to address these questions. The remainder of this chapter is organized into five sections. Section I provides a brief history of positions limits and the hedging exemption. Section II discusses changes made by the Dodd-Frank Act of 2010. Section III discusses the ostensible purpose of position limits. Section IV asks whether position limits would have prevented the commodity price distortions presented in this thesis. Section V concludes.

## 5.1 History of Position Limits

This section will briefly review the history of position limits and the hedging exemption prior to the enactment of the Dodd-Frank Wall Street Reform and Consumer Protection Act in 2010. Passage of the 1936 Commodity Exchange Act (CEA), gave the changing regulatory body of jurisdiction (the Commission)<sup>34</sup> broad discretion over the setting of position limits (limits).<sup>35</sup> The original CEA provided less discretion for granting hedging exemptions to limits (exemptions), but this changed when the Commission was also provided broad discretion in this area by the Commodity Futures Trading Commission Act of 1974 (CFTCA).<sup>36</sup> This extensive discretion over limits and exemptions has led to an ebb and flow of regulation and deregulation over time as Commissions, politics, and policies have changed. Also notable is the vast growth in the number and diversity of derivatives products that have developed in the last decades. The CFTCA also extended the jurisdiction of the Commission over virtually all futures and options – to include the new financial, energy, and other contracts that were being developed.

Position Limits: The Commission has always treated different commodity futures differently when setting position limits. A major distinction in the treatment of futures contracts has always been whether a particular commodity's limits were set by the Commission, set by the exchange on which the commodity is traded, or were non-existent. The Hunt Brothers silver manipulation of 1979-80 prompted the CFTC to require all commodities to be covered by either Commission or exchange-set limits. However, starting in 1992 a new exemption from certain exchange-set limits was created called "position accountability," which allowed traders to avoid absolute speculative position limits in markets that met minimum open interest and volume requirements.

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<sup>34</sup> First the Commodity Exchange Commission, next the Commodity Exchange Authority, and currently the Commodity Futures Trading Commission.

<sup>35</sup> Sec. 4a. (1) Excessive speculation in any commodity under contracts of sale of such commodity for future delivery made on or subject to the rules of contract markets causing sudden or unreasonable fluctuations or unwarranted changes in the price of such commodity, is an undue and unnecessary burden on interstate commerce in such commodity. For the purpose of diminishing, eliminating, or preventing such burden, the commission shall, from time to time, after due notice and opportunity for hearing, by order, proclaim and fix such limits on the amount of trading under contracts of sale of such commodity for future delivery on or subject to the rules of any contract market which may be done by any person as the commission finds is necessary to diminish, eliminate, or prevent such burden. Commodity Exchange Act of 1936, P.L 74-675.

<sup>36</sup> "Par. (3). Pub. L. 93-463, § 404, directed Commission to define "bona fide hedging transactions or positions" within 90 days after the effective date of the Commodity Futures Trading Commission Act of 1974 and struck out provisions which enumerated the factors to be taken into account in determining whether a hedging transaction or position was a bona fide transaction or position." U.S.C. Title 7, §6, footnotes (2012)

Most recently, the Commission-set position limits were in place for only 9 contracts on 7 different commodities prior to the Dodd-Frank final rulemaking by CFTC in 2011: the Chicago Board of Trade contracts on corn, oats, soybeans, soybean meal, soybean oil, and wheat; the Minneapolis Grain Exchange contract on Hard Red Spring Wheat; the New York Board of Trade/ICE contract on Cotton No. 2; and the Kansas City Board of Trade contract on Hard Winter Wheat.<sup>37</sup> Hundreds of other futures contracts on “Designated Contract Markets” were under a mix of exchange-set limits and position accountability. In addition, hundreds of contracts existed in the OTC / “Exempt Markets” that prior to Dodd-Frank were largely not under the jurisdiction of the Commission.

Major position limits historical events:

- 1917, Food Control Act; temporary limits placed on corn and wheat during WWI.
- 1936, Commodity Exchange Act; provides the Commission authority to establish limits and required hedging exemptions to be provided from the limits.
- 1938, Commission rulemaking; Commission sets limits for wheat, corn, barley, flaxseed, grain sorghums, and rye.
- 1940, Commission sets cotton limits.
- 1940 forward, Commission sets limits on commodities that were subsequently eliminated, including fats, oils, lard, onions, eggs, and potatoes.
- 1951, Commission sets soybean limits.
- 1956, Statutory language broadens the hedging definition to include “anticipatory hedging.”<sup>38</sup>
- 1974, Commodity Futures Trading Commission Act; the current Commodity Futures Trading Commission is removed from the Department of Agriculture and created as an independent agency. The Commission is given jurisdiction over all commodity futures. The Commission is also given broad new discretion to define hedging.
- 1977, Commission rulemaking; hedging definition promulgated that remains until Dodd-Frank.
- 1979-80, Hunt Brothers silver market manipulation provokes reassessment of position limits.
- 1981, Commission rulemaking; requires *exchanges* to set limits on all commodities that do not already have *Commission-set* limits.

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<sup>37</sup> CFR § 150.2 (4-1-11 Edition)

<sup>38</sup> Anticipatory hedging is a hedging technique used when the physical product with price risk is not yet owned. In this case, a merchant has a commercial need for the physical product in the future, and offsets her price risk by purchasing futures contracts today to be sold when she later buys the physical product, thus locking in the current commodity price.

- 1987, The Commission (instead of exchange) sets limits on soybean oil and soybean meal.
- 1987, The Commission re-interprets its hedging definition rule (of 1977) to include new risk management activities that do not require an offsetting transaction in the underlying physical commodity (e.g. swap dealers coming to the futures market to offset their OTC transactions).
- 1991, The Commission grants hedge exemption to a swap dealer offsetting index positions.
- 1992, Commission begins to grant “position accountability”<sup>39</sup> in lieu of position limits. The exemptions begin in financial contracts and soon grow to include energy and metals contracts.
- 1999, Commission rulemaking; position accountability exemptions formally replace limits in certain markets.
- 2000, Commodity Futures Modernization Act; position accountability codified.
- 2006, The Commission grants no-action relief from limits to two Exchange Traded Funds tracking indexes, allowing the funds to exceed speculative position limits.

Source: Adapted from CFTC (2009)

Hedging Exemption: Even before the loosening of speculative position limits as described above from 1987 until the passage of Dodd-Frank Act of 2010, the hedging exemption to those position limits was being expanded. The 1974 CFTA provided the new statutory flexibility for the Commission to allow hedging exemptions that did not require the hedger to make a transaction in the underlying physical commodity cash market. The Commission used that flexibility in the subsequent years to allow much greater use of the hedging exemption. In 1987, the Commission re-interpreted its regulatory definition of a hedge to generally include all risk reducing trading strategies. These exemptions were eventually provided to swap dealers, index funds, and Exchange Traded Funds.

## **5.2 The Dodd-Frank Wall Street Reform and Consumer Protection Act of 2010**

On July 21, 2010 President Barack Obama signed H.R. 4173, the Dodd-Frank Wall Street Reform and Consumer Protection Act into law (Dodd-Frank). The 848-page Act contains a range of financial sector reforms including new statutory language regarding speculative position limits and the hedging exemption. The law gives specific direction to the Commission – instead of the exchanges – to set limits for the “physical” commodities including energy and metals contracts, which had previously not had

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<sup>39</sup> Position accountability: “A rule adopted by an exchange requiring persons holding a certain number of outstanding contracts to report the nature of the position, trading strategy, and hedging information of the position to the exchange, upon request of the exchange.” Source: CFTC online glossary. [http://www.cftc.gov/ConsumerProtection/EducationCenter/CFTCGlossary/glossary\\_p](http://www.cftc.gov/ConsumerProtection/EducationCenter/CFTCGlossary/glossary_p)

Commission-set limits. Dodd-Frank extends the CFTC’s jurisdiction over swaps contracts; the law requires swaps that are traded on execution facilities or that perform a “significant price discovery function” to now be considered as candidates for setting limits. Separate limits are to be set for the spot month, each other month, an all-months aggregate (Public Law 111–203, § 737(a)).

In addition, when limits are set for a particular commodity, those limits do not only cover the exchange contracts; the limits must also cover all other swaps that are “economically equivalent” to that contract. And finally, “aggregate position limits” are to be set for all contracts that are “based upon the same underlying commodity.” This includes swaps, contracts that are traded on exchanges, and contracts on foreign boards of trade that allow traders access from the United States (Public Law 111–203, § 737(a)). (In its rulemaking, the CFTC combined these two features of the law - limits for futures plus economically equivalent swaps, and aggregate position limits - into one position limit regime)<sup>40</sup>

The law also adds new statutory direction to the CFTC on applying the hedging exemption:

- (2) For the purposes of implementation of sub-section (a)(2) for contracts of sale for future delivery or options on the contracts or commodities, the Commission shall define what constitutes a bona fide hedging transaction or position as a transaction or position that—
  - (A)(i) represents a substitute for transactions made or to be made or positions taken or to be taken at a later time in a physical marketing channel;
  - (ii) is economically appropriate to the reduction of risks in the conduct and management of a commercial enterprise; and
  - (iii) arises from the potential change in the value of—
    - (I) assets that a person owns, produces, manufactures, processes, or merchandises or anticipates owning, producing, manufacturing, processing, or merchandising;
    - (II) liabilities that a person owns or anticipates incurring; or
    - (III) services that a person provides, purchases, or anticipates providing or purchasing;
  - (B) reduces risks attendant to a position resulting from a swap that—
    - (i) was executed opposite a counterparty for which the transaction would qualify as a bona fide hedging transaction pursuant to subparagraph (A); or
    - (ii) meets the requirements of subparagraph (A).

Source: Public Law 111–203, § 737(c)

To implement the law, the Commodity Futures trading Commission (CFTC) issued a proposed rule on January 26, 2011 and a final rule on November 18, 2011. The rule contains Commission-set position limits on 28 physical commodities; 19 for new commodities, and 9 for the “legacy” agricultural commodities that already had Commission-set limits in place. The CFTC had basic direction from Dodd-Frank on limits, but also used its discretion in picking the “core” commodities for which it set limits. As the Commission states, “These Core Referenced Futures Contracts were selected on the basis that such contracts: (1) Have high levels of open interest and significant notional value; or (2) serve as a reference price for a significant number of cash market transactions (CFTC, 2011c, p.71629).”

The 28 Core Referenced Futures Contracts are: Agricultural – cocoa, coffee, corn (legacy), cotton no. 2 (legacy), feeder cattle, frozen concentrated orange juice, lean hogs, live cattle, milk class III, oats (legacy), rough rice, soybeans (legacy), soybean meal (legacy), soybean oil (legacy), sugar no. 11, sugar no. 16, CBOT wheat (legacy), hard red spring wheat (legacy), and hard winter wheat (legacy); Metals – copper grade 1, gold, palladium, platinum, and silver; Energy – light sweet crude oil, gasoline blendstock, natural gas, and New York no. 2 heating oil (CFR, Title 17, §151.2).

Each of these core 28 commodities has 0 to 13 other derivatives contracts that are economically linked to the core contract.<sup>41</sup> Together the core contract and the linked contracts are termed “Referenced Contracts.” For each of the 28 core commodities, limits are set that cannot be exceeded by the *combined* position of a trader in *all* of the Referenced Contracts (with an exception for the spot-month, see below). The rule provides formulas for setting separate limits for the spot-month and the non-spot-month/all-months combined. Those formulas are as follows:

Spot-month position limits: In general, 25 percent of deliverable supply. These limits cannot be exceeded separately in *either* the cash-settled *or* the physical-delivery Referenced Contracts (CFR, Title 17, §151.4 9(a)).<sup>42</sup>

Non-spot-month/all-months-combined limits: In general, 10 percent of the first 25,000 contracts of average open interest plus 2.5 percent of additional open interest. Average open interest is calculated

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<sup>41</sup> See CFTC spreadsheet of Referenced Contracts:

[http://www.cftc.gov/LawRegulation/DoddFrankAct/Rulemakings/DF\\_26\\_PosLimits/PosLimitsTable](http://www.cftc.gov/LawRegulation/DoddFrankAct/Rulemakings/DF_26_PosLimits/PosLimitsTable)

<sup>42</sup> The NYMEX natural gas contract has unique position limit rules.

based on the sum of all Referenced Contracts, for all expiry months combined, and including delta-adjusted options (CFR, Title 17, §151.4 9(b)).<sup>43</sup>

The new rule allows exchanges to continue to set their own limits or position accountability for commodities that do not have Commission-set limits (CFR, Title 17, §151.11).

To implement the Dodd-Frank Act's new statutory criteria for hedging exemptions, CFTC's new rule contains eight different "enumerated hedging transactions." In order to qualify for a hedging exemption, a trader must meet the requirements of one of the eight enumerated hedging transactions. Notably, swap dealers are provided a "pass-through" hedging exemption, wherein a swap dealer is exempt from position limits if the swap dealer's counterparty is a qualified hedger or if the swap dealer has positions in Referenced Contracts that offset its swap counterparty risk (CFR, Title 17, §151.5).

### 5.3 The Purpose of Position Limits

Many commentators have asked the apropos question, "What are positions limits supposed to do, exactly, and how? (Pirrong, 2010)." The Commodity Exchange Act, as amended by the Dodd-Frank Act, explicitly provides Congress' answer:

In establishing the limits required in paragraph (2), the Commission, as appropriate, shall set limits- ...

- (i) to diminish, eliminate, or prevent excessive speculation as described under this section;
- (ii) to deter and prevent market manipulation, squeezes, and corners;
- (iii) to ensure sufficient market liquidity for bona fide hedgers; and
- (iv) to ensure that the price discovery function of the underlying market is not disrupted.

Source: USC, Title 7, §6a.

The CEA goes on to state that "excessive speculation...causing sudden or unreasonable fluctuations or unwarranted changes in the price of such commodity, is an undue and unnecessary burden on interstate commerce in such commodity (USC, Title 7, §6a.)" Thus, two separate alleged causes of price distortions are ostensibly being addressed by the imposition of position limits: "excessive speculation" and manipulation/corners/squeezes.

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<sup>43</sup> Ibid.

“Excessive speculation,” can be equated to “large speculative demand” as proposed by chapter three of this thesis. Even though the CFTC makes clear that the statutory language does not require evidence of excessive speculation causing price fluctuations,<sup>44</sup> it nevertheless cites supporting findings, for example:

As further detailed in the Proposed Rules, this long-standing statutory mandate is based on Congressional findings that market disruptions can result from excessive speculative trading. In the 1920s and into the 1930s, a series of studies and reports found that large speculative positions in the futures markets for grain, even without manipulative intent, can cause “disturbances” and “wild and erratic” price fluctuations. To address such market disturbances, Congress was urged to adopt position limits to restrict speculative trading notwithstanding the absence of manipulation. In 1936, based upon such reports and testimony, Congress provided the Commodity Exchange Authority (the predecessor of the Commission) with the authority to impose Federal speculative position limits. In doing so, Congress expressly observed the potential for market disruptions resulting from excessive speculative trading alone and the need for measures to prevent or minimize such occurrences. This mandate and underlying Congressional determination of its need has been re-affirmed through successive amendments to the CEA. See 76 FR at 4754–55. (CFTC, 2011c, p.71627)

Traditionally, the non-spot-month position limits are aimed at preventing excessive speculation, while the spot-month limits are aimed at preventing both manipulation/corners/squeezes and excessive speculation (CFTC, 2008c; CFTC, 2009). This makes sense since corners and squeezes occur near the date of physical delivery (see chapter two).

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<sup>44</sup> In its rulemaking documents published in the Federal Register, the CFTC explains that limits are prophylactic and do not require prior evidence: “Congress intended the Commission to act to prevent such [excessive speculation] burdens before they arise. The Commission does not believe it must first demonstrate the existence of excessive speculation or the resulting burdens in order to take preventive action through the imposition of position limits. Similarly, the Commission need not prove that such limits will in fact prevent such burdens (CFTC, 2011c, p.71663).”

#### **5.4 Position Limits Applied to the Cases in this Thesis**

This section asks the question, “Would speculative position limits have prevented the (claimed) commodity price distortions presented in the preceding chapters of this thesis?” Specifically we will address whether the CFTC’s newly proposed limits would be exceeded in our cases and whether the relevant entity would be eligible for a hedging exemption from these limits. We will look at the cases one by one and also briefly address a fourth category of speculation: asset bubbles.

##### Corner and squeeze manipulations

Ferruzzi soybean manipulation of 1989:

Ferruzzi exceeded the new CFTC spot-month position limits of 600 contracts every day that the July 1989 soybean contract was the spot-month contract, except for the final two trading days. But Ferruzzi never exceeded the non-spot-month/all-months limit of 33,000 contracts. Ferruzzi received an anticipatory hedging exemption to the limits as a major soybeans processor and exporter.

Arcadia oil manipulation of 2008:

Arcadia did not exceed the new CFTC spot-month position limits of 3,000 contracts for the February 2008 light sweet crude oil contract. This is because the spot-month position limits are only in effect for the last two trading days before expiration of the crude oil contract. In addition, Arcadia never exceeded the proposed non-spot-month/all-months limit of 108,000 contracts.<sup>45</sup> (Note: this analysis only considers the January 2008 manipulation.)

##### Nonfundamental futures demand

Determining whether “nonfundamental futures demand” practices would be altered by position limits is a more difficult question, largely because of the diversity of the category. Chapter 3 reviews a range of generic nonfundamental demand practices and then analyzes a specific case of nonfundamental demand resulting from the “rolling” of the S&P GSCI index fund. The generic speculative practices enumerated in Chapter 3, Table 10 would generally not be prevented by the new position limits, since all of these practices may be executed with positions smaller than the Dodd-Frank limits (however, extreme cases of nonfundamental demand using positions greater than the limits would be prevented). For example, in a 2007-2008 case of the particular nonfundamental futures demand practice called

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<sup>45</sup> See CFTC spreadsheet of hypothetical position limits using 2010 open interest data:  
[http://www.cftc.gov/LawRegulation/DoddFrankAct/Rulemakings/DF\\_26\\_PosLimits/PosLimitsTable](http://www.cftc.gov/LawRegulation/DoddFrankAct/Rulemakings/DF_26_PosLimits/PosLimitsTable)

“banging the close” in the palladium and platinum markets, the perpetrator utilized a futures position well below the new position limits, according to a CFTC (2010b) order. In this case, the perpetrator used buy orders that “generally ranged from 20 to 100 contracts (CFTC, 2010b),” while the new proposed position limits for platinum and palladium will each be approximately 2,500 contracts.<sup>46</sup> In another specific case, the “rolling” of positions tracking the S&P GSCI index, Mou (2011) found that the price effects of the rolling would be reduced proportionally as the number of contracts rolled is reduced. This implies a reduction of price distortion proportional to any reduction of index positions that occurs as a result of position limits. However, CFTC’s new limits exempt indexes. For more on indexes see the next paragraph. Finally, the hedging exemption may or may not apply to these diverse practices depending on the nature of the entity executing the practice.

### Indexes

Swap dealers who sell an index swap to a counterparty, and then recreate that same index in the futures market to offset the swap dealer’s risk exposure will generally not be subject the Dodd-Frank position limits. In addition, the counterparty who bought the index from the swap dealer will also not be subject to position limits.

The swap dealer may not be subject to position limits to the extent they qualify for two CFTC provisions: first, the netting of a swap dealer’s positions will create a zero-net position in the example above (CFR, Title 17, §151.4(c)). Second, “pass-through swaps” are provided a hedging exemption to the swap dealer. “Pass-through swaps” and their “offsets” are the positions taken 1. by a swap dealer opposite a counterparty who is qualified risk-reducing hedger, and 2. the matching positions taken by the swap dealer in the futures markets to offset its exposure the hedging counterparty. Both of these matching positions are eligible for the CFTC position limits hedging exemption (CFR, Title 17, §151.5(a)(3) and (4)).

The counterparty who buys an index contract from a swap dealer will also not be subject to position limits. This is due to the exclusion of “commodity index contracts” from the definition of “referenced contracts” subject to position limits (CFR, Title 17, §151.1).

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<sup>46</sup> See CFTC spreadsheet of Referenced Contracts:  
[http://www.cftc.gov/LawRegulation/DoddFrankAct/Rulemakings/DF\\_26\\_PosLimits/PosLimitsTable](http://www.cftc.gov/LawRegulation/DoddFrankAct/Rulemakings/DF_26_PosLimits/PosLimitsTable)

## Asset Bubbles

The new CFTC position limits will not prevent an asset bubble in any commodity market. Bubbles are driven by the irrational sentiments of many investors, small and large. And the small investors will not be restrained by position limits.

The efficacy of position limits on preventing asset bubbles is assessed by Parsons (2010): “Although this [position limits] reform is useful, it will not prevent another speculative bubble in oil. The general purpose of speculative limits is to constrain manipulation, as well as to limit the sudden rise of order flows that would disrupt an orderly market. These are smaller and shorter-lived problems quite unlike an asset bubble driven by the type of widespread and gradually evolving beliefs that may have been at work in the 2003–08 oil price. Position limits, while useful, will not be useful against an asset bubble. That is really more of a macroeconomic problem, and it is not readily managed with microeconomic levers at the individual exchange level.”<sup>47</sup>

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<sup>47</sup> Parsons (2010) goes on to explain: “The idea of an asset bubble is sometimes confused with the notion that financial investors are somehow manipulating the price. The two need not coincide. The beliefs driving a bubble can gain traction without there being any identifiable individuals behind it. There is no evidence of manipulation on any scale corresponding to the size of the oil price spike. Individual actors have sought to manipulate expectations and mask their activity—the most recent and relevant example being the company Vitol—but there are always cases of manipulation and masking in futures markets. They should be prosecuted, and an assessment should be made to ensure that the CFTC has sufficient resources for performing its task in this regard. Nevertheless, the issue of active manipulation is orthogonal to the question of an oil price bubble, at least during the 2003–08 period.”

## 5.5 Conclusion

The CFTC and its predecessors have a long history of imposing speculative position limits on commodity futures speculation. The Dodd-Frank Act of 2010 is more of a restoration and expansion of an earlier position limits-regime than uncharted policy. Where the CFTC is entering new territory is in requiring the burgeoning swap markets to comply with position limits, which it was explicitly directed to do by Congress.

Congress is clear in the Dodd-Frank Act that the intent of the new position limits is: “(i) to diminish, eliminate, or prevent excessive speculation as described under this section; (ii) to deter and prevent market manipulation, squeezes, and corners”. But are position limits the right tool for these problems? Yes and no. Yes to limiting the occurrence of corner and squeeze manipulations (see chapter two). And possibly no (and possibly yes), depending how the problem of “excessive speculation” is defined.

Position limits can be very effective in preventing corners and squeezes, as Congress intended. Although one seemingly unavoidable problem is that many historical corner and squeeze manipulations have occurred despite CFTC position limits because the manipulator has qualified for a hedging exemption from those limits. This is true for the two corner and squeeze manipulation case studies presented in chapter two of this thesis.

On the other hand, if “excessive speculation” is an asset bubble, then these position limits will not be effective in stopping the irrational beliefs of many small investors that fuel a bubble. If “excessive speculation” is certain “nonfundamental demand” practices such as “bulling the market,” then these position limits will also not prevent these practices, as they can be executed with positions under the limits. However, the position limits will stop these practices from being executed at the largest scale. If “excessive speculation” is index fund investment, this too will generally not be limited, since the CFTC’s position limits rule carves out an exemption for index investment. But if “excessive speculation” is very large money inflows from non-index speculators (e.g. hedge funds), then position limits will reduce the positions of the very largest players. The Dodd-Frank Act does provide the CFTC with the authority to limit the overall levels of speculation of entire specific subgroups of speculators, but the CFTC has decided to not exercise this authority yet.

## Chapter 6

### Conclusion

Speculation is required for a futures market to function. However, speculation is made up of many different practices grouped together under one label. For example a hedge fund that actively manages its futures positions is very different from a pension fund that takes long-term positions in an index. This thesis focuses on the subtypes of commodity speculation that are alleged to distort prices.

There is great disagreement over which subtypes of speculation do in fact distort prices and by how much. In order to begin to clarify these claims, this thesis puts speculation into three categories and reviews the evidence for each category. The three categories of speculation alleged to distort prices postulated by this thesis are: the corner and squeeze manipulation, nonfundamental futures demand, and large speculative demand (with a focus on indexes).

**The corner and squeeze manipulation** requires obtaining a dominant position in the physical product and/or futures contracts of a commodity and then using that market power to force prices to noncompetitive levels around contract expiration. Corner and squeeze manipulations have always existed in the futures markets, and were more common prior to passage of the Commodity Exchange Act in 1936. This thesis reviews two relatively recent corner and squeeze manipulation cases, the 1989 Ferruzzi soybean manipulation and the 2008 alleged Arcadia *et al.* crude oil manipulation. The Ferruzzi manipulation may have artificially increased the price of a bushel of soybeans by approximately \$0.30 to \$0.40 for a month and a half in the summer of 1989. The Arcadia manipulation may have increased the price of a barrel of crude oil by no more than an estimated \$0.40 for six days in January 2008.

**Nonfundamental futures demand** is simply the buying and selling of futures contracts based on factors outside of physical supply and demand considerations. Many different speculative trading practices fit into this category. They range from “bulling the market” or continuous buying as prices rise to drive up the price further with the goal of increasing the value of additional long positions held, to the mechanical “rolling” or selling and buying of futures by commodity index funds. Some types of nonfundamental futures demand are proscribed by U.S. statute and regulation. Not all nonfundamental futures demand moves prices. Which particular nonfundamental demand trading practices may distort prices is controversial. Minimally, the finite liquidity of any market allows price pressure to exert short-

term distortions during large orders that are not based on fundamental factors. This thesis reviews the case of the price effects of rolling the S&P GSCI Index (the Goldman Roll). The work of Mou (2011) finds that there are consistent price distortions that result from the selling and buying pressures of the Goldman Roll in the decade from 2000 to 2010. The consistent price distortions would have provided a front running arbitrageur with mean annual excess returns of up to 7.8 percent.

**Large speculative demand** is any large inflow of capital into the futures markets by speculators and subgroups of speculators. Large speculative demand comes from diverse subgroups that include actively managed hedge funds and the proprietary desks of investment banks. Which particular subgroup of large speculative demand can, if at all, create price distortions is even more controversial than the first two categories of speculation. This thesis reviews two recent econometric studies on the price effects of large speculative demand. Singleton (2011) finds that managed money (e.g. hedge fund) flows into the crude oil futures market are associated with a 3-month later increase in crude oil futures prices. Singleton's model suggests that the increases in managed money positions during the February through mid-June lead up to the 2008 peak oil price contributed an average weekly increase of about \$0.02 per barrel of crude oil. (Singleton also finds a correlation between index positions and futures prices, but when using a suspect data set for index investment).

Irwin and Sanders (2010) find that index money flows are associated with a one-week later increase in cotton futures prices, but also a one-week later *decrease* in corn futures prices. In ten other commodity markets (not including energy commodities), the authors find no statistically significant impact. Given historical prices and index positions from 2006 to the end of 2011, the authors' model suggests that the maximum one-week effect of indexes was a \$13.82 *increase* in the cotton futures contract and a \$13.43 *decrease* in the corn futures contract. However, Irwin and Sanders conclude that the systematic effect of index money flow on futures prices in all 12 markets aggregated is not statistically different from zero.

This thesis also reviews **speculative position limits** as applied to the three categories of speculation. Position limits are effective in limiting corner and squeeze manipulations, but are less effective in limiting the remaining two categories of alleged price distorting speculation, except at the largest scale, i.e. when executed with positions larger than the limits. The Dodd-Frank Act of 2010 provides additional authority to the Commodity Futures Trading Commission (CFTC) to set position limits. However, the

CFTC largely exempts indexes from position limits, and does not exercise its new statutory authority to limit the aggregate levels of speculation by specific subgroups of speculators.

The work of this thesis raises an old question: What are the costs versus benefits of these categories of speculation? Is there a point where speculation no longer provides benefits to the market? In other words, if the futures market is functioning well, and fulfilling its purposes of hedging risk and price discovery, are there additional marginal benefits to speculation above a certain level? For example, is the “portfolio balancing” effect of investments in commodity futures a sufficient benefit given the possible costs? Finally, to what extent should the government regulate activities whose potential negative impacts are uncertain, but have the ability to disrupt the entire economy?

This thesis shows that the corner and squeeze category of manipulation has undisputed costs, whereas most nonfundamental futures demand and large speculative demand have varied and many times uncertain costs.

For its part, Congress has answered many of these questions by taking precautions; it has erred on the side of avoiding the uncertain potential costs of speculation. Ever since the passage of the Commodity Exchange Act in 1936, the legal status quo has been that certain types of speculation do harm futures markets. The Commodity Exchange Act of 1936 requires the federal government to limit speculation in order to prevent corner and squeeze manipulations and “excessive speculation,” without having to show the speculation is causing harm. These actions did not come out of nowhere: ubiquitous corner and squeeze manipulations, low grain prices after WWI, Department of Agriculture reports of “wide and erratic” price fluctuations, and the ability of large traders to act with impunity all galvanized public opinion in support of the Congressional imposition of limits to speculation. In turn, the CFTC and its predecessors have repeatedly interpreted the Commodity Exchange Act’s statutory language to support the use of commodity-specific speculative position limits. The Dodd-Frank Act of 2010 continues that tradition.

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