AIR TRANSPORT ASSOCIATION

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FILED ELECTRONICALLY

David A. Stawick
Secretary, Commodity Futures Trading Commission
3 Lafayette Centre
1155 21st Street, NW
Washington, DC 20581

Re: Position Limits for Derivatives," 76 *Fed. Reg.* 4752 (Jan. 26, 2011) RIN: 3038

Dear Mr. Stawick:

The Air Transport Association of America, Inc. ("ATA") appreciates the opportunity to comment on the Commodity Futures Trading Commission's ("Commission") proposed rules, "Position Limits for Derivatives," 76 *Fed. Reg.* 4752 (Jan. 26, 2011) (the "Proposal"). The Dodd-Frank Wall Street Reform and Consumer Protection Act of 2010 ("Dodd-Frank Act"),[1] amended the Commodity Exchange Act, 7 U.S.C. §1 *et seq.* ("Act") to require that the Commission set and enforce speculative position limits on exempt and agricultural commodities. The proposed rules implement this provision of the Act.

ATA

ATA is the principal trade association for U.S. scheduled airlines. ATA members[2] and their affiliates account for more than 90% of annual U.S. passenger and cargo traffic. ATA members are significant end-users of jet fuel and have been directly harmed by high and volatile energy prices that are not supported by supply and demand fundamentals, such as the crude run

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1 Dodd-Frank Wall Street Reform and Consumer Protection Act, Public Law No. 111–203, 124 Stat. 1376 (2010).

2 The members of the association are: ABX Air, Inc.; AirTran Airways; Alaska Airlines, Inc.; American Airlines, Inc.; ASTAR Air Cargo, Inc.; Atlas Air, Inc.; Continental Airlines, Inc.; Delta Air Lines, Inc.; Evergreen International Airlines, Inc.; Federal Express Corporation.; Hawaiian Airlines; JetBlue Airways Corp.; Southwest Airlines Co.; United Air Lines, Inc.; UPS Airlines; and US Airways, Inc. Associate members are: Air Canada; Air Jamaica; and Mexicana. Southwest Airlines does not join in these comments. In its view, there is not sufficient current data to justify imposing such limits on energy markets at this time.

up to $147 per barrel and rapid collapse to $34 per barrel in 2008. ATA member airlines engage in sophisticated hedging programs to manage their fuel cost exposure and, in that respect, have also been adversely affected by the significant increase in price volatility in recent years.

Summary

Fuel is the leading cost center for airlines. Any disruption in the accurate price discovery of the energy markets adversely impacts airlines and, in turn, results in significant harm to the traveling and shipping public, including service cuts and higher ticket and shipping prices. Volatile fuel prices also have contributed to severe job losses. All of these impacts were experienced by U.S. airlines as a result of the roller-coaster swings in 2008,[3] and they are beginning to happen again now.[4]

Putting the current situation in context, rapidly climbing jet-fuel prices have outpaced crude-oil prices to reach their highest level since September 2008. At the same time, according to data recently released by the Commission, speculators have increased their positions in energy markets by 64% compared to June 2008, bringing speculation to the highest level on record.[5] From the end of 2009 to the end of 2010, the price of jet fuel rose 44 cents per gallon. From the end of 2010 to the week ending March 4, 2011, the price of jet fuel rose 67 cents per gallon. As of March 4, U.S. Gulf Coast jet fuel sold for $3.20 per gallon. The fuel bill for U.S. airlines could increase by $15 billion in 2011 if jet fuel averages $3.00 per gallon, rising from $39 billion in 2010 to an estimated $54 billion in 2011. This high level of volatility makes business planning extremely difficult. Airlines have limited options to mitigate costs, and fuel-hedging programs are increasingly expensive and provide only limited protection when jet-fuel prices are outpacing crude-oil prices. As the attached chart illustrates, increased volatility significantly increases the cost of hedging to airlines, precisely when it is most necessary.

Much has been written about the role "speculation" played in 2008.[6] The most rigorous academic paper to date regarding the role of investor flows in energy markets is one written by Kenneth J. Singleton, Adams Distinguished Professor of Management, Stanford University Graduate School of Business, entitled *Investor Flows and the 2008 Boom/Bust in Oil Prices*

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3 *See* ATA Comments to the Commission (Apr. 23, 2010) (regarding "Federal Speculative Position Limits for Referenced Contracts and Associated Regulations," 75 Fed. Reg. 4143 (Jan. 26, 2010)).

4 *See* Karen Jacobs and Kyle Peterson, *US Airlines Cut Capacity to Battle High Fuel*, REUTERS (Mar. 22, 2011), *available at* http://news.yahoo.com/s/nm/20110322/bs_nm/us_delta; Lori Ranson, *North American Airlines Start Reining in Supply as Oil Prices Bite*, FLIGHTGLOBAL (Mar. 21, 2011), *available at* http://www.flightglobal.com/articles/2011/03/21/354577/north-american-airlines-start-reining-in-supply-as-oil-prices.html.

5 *See* Silla Brush, *Energy Speculation Highest on Record, CFTC's Chilton Says*, BLOOMBERG BUSINESSWEEK (Mar. 16, 2011), *available at* http://www.businessweek.com/news/2011-03-15/energy-speculation-highest-on-record-cftc-s-chilton-says.html.

6 *See, e.g.*, Emmanuel I.S. Ajuzie and Roberto M. Ike, *Oil Speculation: The Impact On Prices, Inflation, Interest Rates and the Economy*, 7 J. BUS. & ECON. RESEARCH 59 (Oct. 2009); Kenneth B. Medlock, III and Amy Myers Jaffe, *Who is in the Oil Futures Market and How Has it Changed,* James A. Baker III Institute for Public Policy, Rice University (Aug. 26, 2009), *available at* http://www.bakerinstitute.org/publications/EF-pub-MedlockJaffeOilFuturesMarket-082609.pdf.

(March 23, 2011).[7] Professor Singleton surveyed the literature and conducted his own empirical analysis regarding the effect of financial players on the 2008 oil price surge and collapse. The empirical work by Professor Singleton confirms that investor flows had a material impact on oil futures prices in 2008. Specifically, he presents evidence that there was "an economically and statistically significant effect of investor flows on futures prices, after controlling for returns in U.S. and emerging-economy stock markets, a measure of the balance-sheet flexibility of large financial institutions, open interest, the futures/spot basis, and lagged returns on oil futures."[8] Additionally, he found that "the growth rates of index positions and managed-money spread positions, measured over intermediate-term horizons rather than the daily or weekly intervals used in many previous studies, had the largest impacts on futures prices."[9] Professor Singleton's careful, academic study answers directly those who argue that fundamental market forces alone explain the futures markets.

Given the mandate of the Dodd-Frank Act to address excessive speculation and the widespread recognition that investor flows – and not market forces alone – affected futures prices in 2008, and given that cash market prices for jet fuel are tied to futures markets (see note 44 below), establishing appropriate and meaningful speculative position limits is essential to ensuring that the energy markets perform their essential price discovery and hedging functions without distortion from excessive speculation.

As explained in our comments below, ATA:

- supports the Commission's immediate adoption of spot month speculative position limits, but urges the Commission to strictly apply the spot month limit with no expansion for cash-settled contracts;
- urges the Commission to adopt lower back month levels, based on an overall speculation target level, consistent with Congress' goal of curbing excessive speculation;
- urges the Commission to adopt single month limits that are no higher than two-thirds the all-months-combined levels;
- urges the Commission immediately to adopt a position accountability regime for the non-spot months in place of its proposed position visibility rule; and
- urges the Commission to adopt lower speculative position limits for passive, long-only traders.

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[7] Kenneth J. Singleton, *Investor Flows and the 2008 Boom/Bust in Oil Prices* (Mar. 23, 2011) ("Singleton, *Investment Flows*"), available on Social Science Research Network at http://ssrn.com/abstract=1793449. ATA retained Professor Singleton to conduct this research project and report on his findings and analysis. A copy of the paper is attached.

[8] *Id.* at i (Abstract).

[9] *Id.*

In addition, ATA does not object to delaying implementation of non-spot month position limits as proposed by the Commission.

I. Proposed Rules

The proposed rules would impose spot month, single-month, and all-months combined speculative position limits on specified physical commodity futures and options contracts ("referenced futures contracts")[10] and physical commodity swaps that are economically equivalent to such contracts (together, "referenced contracts").[11] Specifically, the spot month position limit for referenced contracts would be set for individual traders at a level equal to one-quarter of the estimated spot month deliverable supply of the physical commodity underlying a core referenced futures contract in the same commodity.[12] The proposed rules would also provide for a position limit ("conditional spot month position limit") for individual traders that is five times the above spot month position limit, in the case of a trader that holds or controls exclusively cash-settled positions in the referenced contracts based on the same commodity and that meets certain other conditions.[13]

The spot month position limits would apply separately to physically delivered and cash settled contracts, respectively, meaning that traders could have up to the spot month position limit in both the physically delivered and cash settled contracts (unless the cash settled contract positions are held pursuant to the conditional-spot month position limit).[14]

The Commission is proposing to impose non-spot month speculative position limits for referenced contracts to single-months and to all-months-combined using a formula based on open interest. Speculative position limits would be recalculated annually. The aggregate all-months-combined and single-month position limits for individual traders would each be equal to 10% of the first 25,000 contracts of the "average all-months-combined aggregated open interest," with a marginal increase of 2.5% of the open interest for amounts above 25,000 contracts.[15] In calculating the average all-months-combined aggregated open interest, referenced contracts would be divided into two contract classes, with futures and options based on the same commodity in one class, and swaps based on the same commodity in another class. The speculative position limits would apply separately to each contract class, that is, to listed futures and options and to OTC swaps, and to both classes on an aggregate basis.[16]

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10 The 28 core referenced futures contracts are specified in Proposed Rule § 151.2.

11 Referenced contracts are defined in Proposed Rule § 151.1.

12 Proposed Rule § 151.4(a)(1).

13 Proposed Rule § 151.4(a)(2).

14 Proposed Rule § 151.4(f)(1).

15 Proposed Rule § 151.4(d)(1).

16 Proposed Rule § 151.4(d)(2).

Delayed implementation

The Commission is delaying implementing back month limits on the basis that it does not now have sufficient data to establish the limits using the formula that it is adopting. The Commission chose not to adopt an alternative method of determining speculative position limits as an interim solution. Instead, the Commission has delayed its determination of such limits until the Commission receives data regarding the levels of open interest in the swap markets.[17]

As an interim step, however, the Commission proposes under its reporting authority under Section 4t of the Act to require traders above a "position visibility" trigger level to report on their physical and derivatives portfolios in the referenced commodity. The data received would enable the Commission to analyze the nature of the largest 20 or 30 traders' positions in a market.[18] This position visibility rule is strictly a reporting requirement and will not constrain traders' excessive speculative trading.

II. ATA Comments on the Proposed Rules

A. Introduction

ATA supports the Commission's proposal to immediately implement speculative position limits for the spot months as mandated by the Dodd-Frank Act. In addition to Congress' unambiguous mandate, there is strong evidence that investor flows influence futures prices.[19] And, as discussed below, spot prices are tied to futures prices. On the other hand, there is no evidence to support the proposition that position limits will cause liquidity to flee the market. To the contrary, there is ample evidence that the futures markets functioned properly and efficiently at times when there was considerably less speculative trading in the market.

ATA does not object to the Commission's decision to delay implementation of non-spot month position limits pending collection of information about open interest levels in the swaps markets. However, the Commission could take steps to achieve Congress' direction to reduce excessive speculation by adopting a position accountability regime, rather than a mere position visibility rule. As discussed below, "position accountability" rules, or "soft limits," would more closely adhere to the Congressional directive to adopt speculative position limits on a shortened time schedule. Additionally, implementation of such a regime would not be dependent upon open interest data.

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17 Proposal at 4753. The Commission has proposed regulations that would permit it to gather positional data on physical commodity swaps on a regular basis. *See* Position Reports for Physical Commodity Swaps, 75 Fed. Reg. 67258 (Nov. 2, 2010) (proposing position reports on economically equivalent swaps from clearing organizations, their members and swap dealers).

18 The Commission proposes to set the visibility reporting levels for referenced base and precious metals and referenced energy contracts where it anticipates approximately 20 unique owners over the course of a year would exceed such levels. Given their importance to the national economy, the Commission proposes to set visibility levels for the NYMEX Light Sweet Crude Oil (CL) and Henry Hub Natural Gas (NG) referenced contracts at a relatively lower level designed to capture approximately 30 unique owners over the course of a year. Proposal *at* 4761.

19 Singleton, *Investment Flows*, *supra*.

ATA is very concerned that the proposed formula for determining non-spot month position limits does not adequately address all four goals of speculative position limits as mandated by the Dodd-Frank Act. Instead of relying on an open interest-based percentage formula for determining position limits, the Commission should determine an acceptable aggregate level of speculation and set individual trader limits to be reflective of that aggregate level. This will allow the Commission to restore and maintain the historic balance between bona fide hedging and speculative/non-commercial activity, in which hedging accounted for about 60% of the market. Today, speculators predominate.

The Commission also is proposing to *raise* the individual month limit to the same level as the all-months level. This will exacerbate the problem of speculative trading in the nearby (next to expire) futures month, the month upon which energy prices typically are determined. If the Commission does not adopt levels for speculative position limits that are more likely to be effective, it should, at a minimum, implement a position accountability regime on a permanent basis to provide it with an additional tool to address market distortions caused by large speculative positions.

Finally, ATA urges the Commission to set separate, lower position limits for passive, long-only traders (*i.e.*, index funds, exchange traded funds, and other similar vehicles that generally buy without regard to price). As Professor Singleton points out, "index positions and managed-money spread positions... had the largest impacts on futures prices."[20] In moving forward with a phased approach for implementing position limits, the Commission needs to assess all of its data requirements and to assure that necessary data to support full analysis of speculative position limits issues will be available to the Commission. It is particularly important that adequate data be obtained to analyze issues related to passive, long-trading strategies.

B. The Proposed Speculative Position Limits Should be Strengthened

1. *The spot month limit should be rigorously applied*

The Commission has proposed a spot month speculative position limit calculated to be one-quarter of the deliverable supply. ATA does not object to this method of calculating the spot month limit and supports immediate implementation. However, the Commission is also proposing to permit traders to hold positions in both physically delivered and cash settled contracts at the maximum level in the spot month. Moreover, the Commission is proposing to permit speculators to hold positions of five times the spot month limits if they confine their positions to cash-settled contracts.

The Commission has offered no justification for permitting speculators to hold positions greater than the limit simply because part or all of their positions are in cash settled contracts. The Commission does not distinguish between physically delivered and cash settled contracts in the non-spot months. There is no justification to do so in the spot month, which arguably requires more rigorous enforcement of speculative position limits, not less.

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20 *Id.*

2. *The non-spot month position limits would be so high as to be ineffective*

ATA is concerned that the non-spot month position limits that would result from the proposed rules would be so high as to be ineffective, particularly in light of the speculative trading volumes experienced over the past several years. The Commission acknowledges in the Proposal that "the proposed framework sets high position levels that are reflective of the largest positions held by market participants . . . ."[21] In particular, the Commission relies exclusively on a methodology based on percentages of open interest for determining non-spot month position limits. As discussed below, that methodology was developed in the early 1990s in the context of the much smaller agricultural markets.[22] Since then, the commodity markets have changed dramatically. Accordingly, the Commission should reexamine whether continued exclusive reliance on the open interest-based formula is appropriate.

Importantly, the proposed position limits fail to address the overall impact of speculators on the futures market. Position limits that target very large positions intended to manipulate the market, such as those proposed by the Commission, do not address the problem of the cumulative effect of a large number of speculators with significant positions. As Professor Singleton notes in his paper, "[w]hen investors make small correlated errors around their optimal investment policies, financial markets amplify these errors and generate excess volatility in securities prices that is unrelated to fundamental supply/demand information."[23] *Moreover*, as discussed further below, the proposed rules do not in any way address the growing issue of passive, long-only traders.

A number of recent findings call for the establishment of meaningful speculative position limits lower than those that would result from the Proposal. For example, the U.S. Senate Permanent Subcommittee on Investigations has issued a number of staff reports finding a link between excessive speculation and high commodity prices.[24] The Commission itself has found that the capacity of contract markets to absorb speculative positions is not unlimited, noting that:

> the prevention of abrupt price movements which are attributable to extraordinarily large speculative positions is a Congressionally endorsed regulatory objective of the Commission. Further, it is the Commission's view that this objective is enhanced by speculative position limits since it appears that the capacity of any contract market to absorb the establishment and liquidation of large speculative positions in an orderly

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21 Proposal at 4762.

22 *See* Revision of Federal Speculative Position Limits, 57 Fed. Reg. 12766, 12770 (Apr. 13, 1992).

23 *See* Singleton, *Investment Flows*, *supra*, at 26 (citation omitted).

24 *See* "Excessive Speculation in the Wheat Market" (Jun. 24, 2009) *available at* http://hsgac.senate.gov/public/index.cfm?FuseAction=Files.View&FileStore_id=fb439667-dcd3-4025-b95b-1b91f8ea29d1; "Excessive Speculation in the Natural Gas Market," *reprinted in* S. Hrg. 110-235 (Jun. 25 and July 9, 2007) *at* pp. 196-710 *available at* *http://hsgac.senate.gov/public/_files/REPORTExcessiveSpeculationintheNaturalGasMarket.pdf*; and "The Role of Market Speculation in Rising Oil and Gas Prices: A Need to Put the Cop Back on the Beat," S. Prt. 109-65 (Jun. 27, 2006) *available at* http://hsgac.senate.gov/public/_files/SenatePrint10965MarketSpecReportFINAL.pdf.

manner is related to the relative size of such positions; *i.e.*, the capacity of the market is not unlimited.[25]

3. *The Commodity Exchange Act as amended by the Dodd-Frank Act requires more stringent position limits*

Section 4a(3) of the Act, as amended by the Dodd-Frank Act, explicitly sets forth the factors that the Commission should apply in setting speculative position limits. Prior to the Dodd-Frank Act, Section 4a provided that the Commission shall fix limits as the Commission "finds are necessary to diminish, eliminate, or prevent" the burden on interstate commerce caused by excessive speculation. The Dodd-Frank Act makes clear that the goals of speculative position limits are broader than restraining the market power of the very largest speculative traders. Section 4a(3) as amended by the Dodd-Frank Act instructs that speculative position limits, to the maximum extent practicable, should achieve four goals:

1. diminish, eliminate or prevent excessive speculation;
2. deter market manipulation;
3. ensure liquidity for bona fide hedgers; and
4. ensure that price discovery is not interrupted.[26]

Importantly, Congress amended section 4a(3) of the Act to clearly state that deterring manipulation and diminishing excessive speculation are <u>distinct goals.</u> Both goals must be achieved by the Commission to give effect to the Act's meaning. In addition, Congress required that speculative position limits be set to ensure liquidity for bona fide hedgers and to ensure the market properly performs its price discovery function. In light of the expanded goals enumerated by Congress, it is clear that the methodology for determining speculative position limits should be revisited with an eye to how best to meet all four enumerated goals.

The proposed open interest-based formula for setting speculative position limit levels is not sufficient to meet all four of the enumerated goals, notwithstanding contrary assertions.[27] Indeed, the Commission admits that the formula yields "limits . . . purposely designed to be

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[25] Establishment of Speculative Position Limits, 46 Fed. Reg. 50939, 50940 (Oct. 16, 1981).

[26] Section 4a(3) provides that:
In establishing the limits required in paragraph (2), the Commission, as appropriate, shall set limits—
(A) on the number of positions that may be held by any person for the spot month, each other month, and the aggregate number of positions that may be held by any person for all months; and
(B) to the maximum extent practicable, in its discretion—
(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.

[27] *See* Proposal at 4755.

high…."[28] The argument that position limits need to be high to ensure sufficient liquidity is neither supported by relevant data nor is it consistent with the primary goal of preventing excessive speculation. Liquidity was more than adequate in the past when speculation levels were much lower and bona fide hedgers predominated.

Such high speculative position limit levels as the proposed formula purposefully yields are not necessary to ensure sufficient liquidity for bona fide hedgers.[29] In this regard, we note that in 2000, the percentage of hedging open interest to speculative open interest in the oil market is estimated to have been approximately 61% hedgers to 39% speculators.[30] During the 2000 to 2003 time period, which is the period immediately prior to the unprecedented run-up in speculative trading, the market functioned well and was orderly. There is no evidence of insufficient liquidity for hedgers during this period. In contrast, it is estimated that by 2009, the percentage of hedging open interest to speculative open interest essentially reversed, although the amount of hedging open interest stayed relatively constant.[31] There is no evidence that the extra investor/speculative activity is necessary to ensure liquidity for hedgers.

4. *The open interest-based formula was derived in the context of smaller agricultural markets*

The open interest-based formula for position limits was created in 1992 in the context of trading in the agricultural markets.[32] In 1992, open interest in all markets was far lower than in today's energy markets.[33] For instance, in 1992, the Commission proposed to set an all-months position limit for corn, the agricultural contract with the greatest open interest, at 9,000. As demonstrated by the graph below, open interest in the oil futures market has grown markedly since 2004. As open interest has grown, application of the open interest-based formula has resulted in ever-higher position limits even though the amount of hedging has remained constant.

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[28] Proposal at 4759.

[29] Although the Commission's proposal sets forth a formula for calculating position limits and does not include actual position limit amounts, we note that the Commission's proposal in January 2010 that relied upon a similar formula led to all-months combined limits of 98,100 for NYMEX Light Sweet Crude Oil, far above the 65,000 limit proposed by the Chicago Mercantile Exchange itself. *See* Federal Speculative Position Limits for Referenced Energy Contracts and Associated Regulations, 75 Fed. Reg. 4144, 4162 (Jan. 26, 2010) (the "2010 Proposed Rules on Speculative Position Limits"). The Commission has provided an illustrative calculation using NYMEX data that indicates that the non-spot month limits under its proposal for light, sweet crude oil would be at least 108,000 contracts.

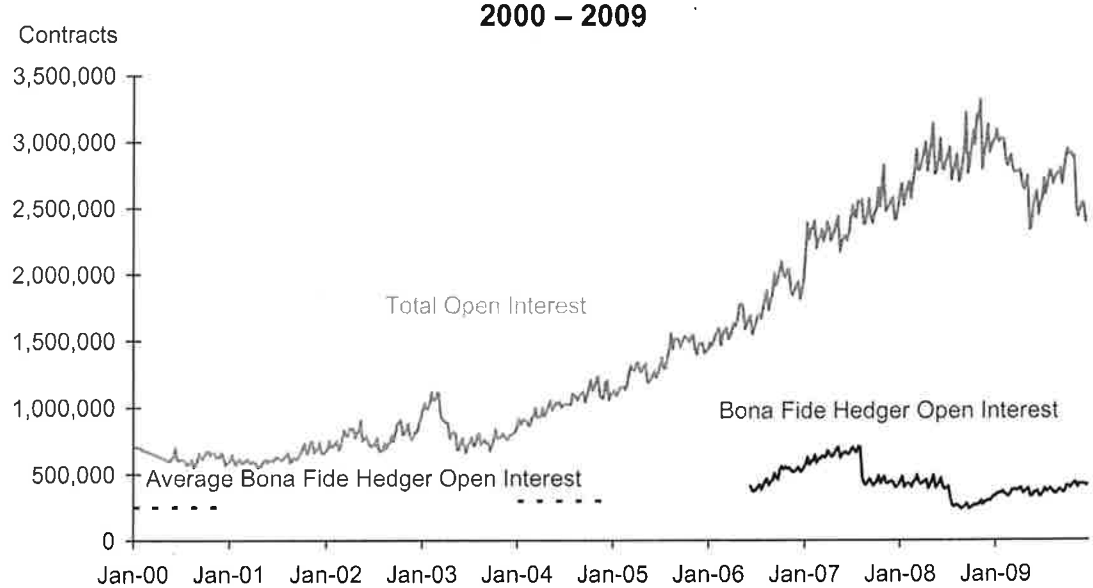
[30] *See* Comment letter from Delta Air Lines, Inc. regarding the 2010 Proposed Rules on Speculative Position Limits (Apr. 26, 2010) *at* 19, *available at* http://comments.cftc.gov/PublicComments/ViewComment.aspx?id=17387&SearchText=architzel.

[31] *Id. at* 19-20.

[32] Revision of Federal Speculative Position Limits, *supra* note 22.

[33] *See*, e.g., *id.* at 12771.

Bona Fide Hedger and Total Open Interest in NYMEX WTI Crude Oil Futures and Options 2000 – 2009



Note: Total open interest data are from weekly Commission COT reports. Bona fide hedger open interest data are from Buyuksahin 2008 and Commission disaggregated COT reports.

The Proposal would permit increasingly large absolute position sizes based on the open-interest formula even though as the Commission noted, "the size of the largest individual positions in a market do not continue to grow in proportion with increases in the overall open interest of the market."[34] Moreover, it is not just the absolute size of the positions that are permitted under the Proposal that concerns ATA. Excessive speculation is also driven by smaller (but still significant) positions held by numerous traders/investors. The Proposal would result in speculative position limits that continue to grow no matter how large open interest becomes. If the Commission retains the open interest-based formula (and not set speculative position limits based on an overall aggregate speculation target as we suggest below), then in light of the large, documented growth of investor flows it should consider revising the formula to automatically adjust as open interest grows. For example, the proposed 2.5% marginal rate could be progressively reduced as levels of open interest rise.

5. *The Commission has other precedents for how to set speculative position limits*

The traditional method of setting speculative position limits employed by the Commission relied upon an analysis of the distribution of traders and the size of their positions. This approach looked at the actual size of positions by trader and set the limits to constrain the

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[34] Revision of Federal Speculative Position Limits, *supra* note 22, at 12771.

largest positions based on the distribution.[35] Later, when first implementing the open interest-based formula approach, the Commission noted that it was comfortable with the results of applying the formula based on the knowledge it had gained from its past experience.[36] However, commodity markets generally, and the energy markets in particular, are dramatically larger and more complex today, and it is clear that the Commission is not able to voice the same view about the formula approach today. Recent experience with the energy markets suggests that the traditional method of setting speculative position limits, based on close analysis of the distribution of traders and the size of their positions, would be superior to the open interest-based formula approach. At a minimum the Commission should use such data to inform the absolute size of positions that would be permitted using the open interest formula.

6. *Instead of the individual trader open interest-based formula approach, the Commission should determine an acceptable aggregate level of speculation and set individual trader limits to achieve that aggregate target*

The Proposal's very high speculative position limits appear to address only traditional manipulation concerns. Rather than focusing solely on preventing manipulation, however, individual speculative position limits should be calculated with the aim of ensuring that the proportion of hedging open interest to speculative open interest in the market equals the ratio that existed during a period when the markets were well-functioning and orderly. This would address the cumulative, disruptive effect of a large number of speculative traders who hold large but not dominant positions.[37] To address the problem of excessive speculation, the Commission should determine an acceptable total level of speculation (that is, not excessive), which is most easily stated as a percentage of total open interest and set speculative position limits at a level which will preserve the historic ratio of hedging to investor/speculative trading.

Delta Air Lines, Inc. ("Delta") offered an illustrative methodology for such a calculation in its advance comment letter.[38] The basic concept is that speculative activity above the amount necessary to provide market liquidity for the trading of bona fide hedgers and to provide for efficient price discovery is, by definition, excessive. Specifically, for the oil futures market, the

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35 *See* Establishment of Speculative Position Limits, 46 Fed. Reg. 50939, 50945 (Oct. 16, 1981) (providing that factors used to set speculative position limits should consist of, among other factors, position sizes and size relative to the market).

36 Revision of Federal Speculative Position Limits, *supra* note 22, at 12770 (citing to the Commission's prior experience establishing speculative position limits as a basis for proposed revisions to such limits).

37 *See* Singleton, *Investment Flow, supras*; *see also* Testimony of Michael W. Masters, Masters Capital Management, LLC, before the Committee on Homeland Security And Governmental Affairs, United States Senate (Jun. 24, 2008) *available at* http://hsgac.senate.gov/public/index.cfm?FuseAction=Hearings.Hearing&Hearing_ID=b5b714c5-0b2e-4ab1-b1dc-2317a7d22e47 (noting that the commodities futures markets are now dominated by speculators and that many bona fide physical hedgers, now greatly outnumbered and having to transact in a market that is mainly driven by the activities of large institutional speculators, are questioning the value of the futures markets for hedging purposes).

38 *See* Advance comment letter from Delta Air Lines, Inc. (Dec. 13, 2010) *at* 8-14, *available at* http://www.cftc.gov/ucm/groups/public/@swaps/documents/dfsubmission/dfsubmission26_121310-1.pdf.

period between 2000 and 2003 is identified as the most recent period during which the futures market operated in an orderly manner. During this "base period" hedgers constituted approximately 60% of the market open interest and speculators constituted the remaining approximately 40% in the oil futures market.

Delta recommends establishing a "Speculative Open Interest Target" on an annual basis by looking at the immediately preceding year's hedging open interest and calculating the amount of speculative open interest that would be necessary to maintain the ratio between hedging and speculative trading that existed during the base period. The speculative position limit level that applies to individual traders would then be set at a level intended in very rough terms to maintain this ratio of speculative to bona fide hedging trading, thus meeting the four criteria of the Dodd-Frank Act.[39] ATA endorses Delta's suggested methodology.

7. *Position limits derived from an aggregate "Speculative Open Interest Target" could be phased in gradually*

If the Commission has concerns about changing its method of setting speculative position limits and whether such a change method might adversely impact commercial users' ability to hedge or the market's pricing performance, the Commission could implement the position limits in phases. The implementation could occur over a time period set by the Commission while it observes the impact of the new limits. The Commission used such a phase-in approach with great success when increasing position limits in June 1993 and March 1994.[40] This approach would provide the Commission with an opportunity to make corrections if it observed any adverse market effects from using a new methodology.

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39 The Speculative Open Interest Target would be translated into individual speculative trading limits by taking into account: 1) the size of the Speculative Open Interest Target; 2) the number of speculative traders in the market; and 3) the distribution of size of their individual positions, making use of the Commission's large trader data information. Using that data, each reportable trader in the market would be enumerated and ranked by open interest. Those amounts would be summed in order of ranking from largest to smallest, using an iterative process to find the individual speculative position limit. In this manner, the Speculative Open Interest Target would be a tool for determining the speculative position limit level that will apply to individual traders and would not be a hard cap on the overall amount of trading of speculators in the market. The Delta Air Lines, Inc. proposal would not change the current overall framework of speculative positions limits or the method of compliance by individual traders. *See id.*

40 The Commission adopted interim rules that increased position limit levels by half of the increase originally proposed, in two steps. *See* Revision of Federal Speculative Position Limits; Reopening of Comment Period, 58 Fed. Reg. 18057 (Apr. 7, 1993). The first phase, which took effect on June 7, 1993, increased speculative position limits by combining the previously separate futures and option limits. The second phase, which took effect on March 31, 1994, increased the back-month speculative position limits halfway to the level originally proposed by the Commission. When the Commission adopted the interim rules, it provided notice that the comment period on the original proposed levels would be reopened in March 1994, coinciding with implementation of the second phase. Anticipating that it would determine whether to adopt the levels originally proposed based upon trading experience under the interim rules, the Commission directed the Division of Economic Analysis to study the effects of the phased increases. *See* Revision of Federal Speculative Position Limits and Associated Rules, 63 Fed. Reg. 38525, 38527-38528 (Jul. 17, 1998).

8. *The Commission's Proposal to Raise the Single Month Limit to the All-Months Combined Level is Not Supported by the Record*

The Commission is proposing to raise the single month speculative limit to the same level as the all-months combined limit. This is contrary to its speculative position limit proposal of one year ago.[41] The speculative position limits that the Commission proposed in 2010 would have set the single month limit at a level two-thirds that of the all-months-combined level. The Chicago Mercantile Exchange also recommended that the single month limit be lower than the all-months combined limit,[42] and setting a lower single month limit has been a common practice since the Commission expanded speculative position limits for agricultural contracts in 1992.[43] However, the Commission in its Proposal offers little explanation or justification for substantially raising the single month limit to the same level as the all-months combined limit. This is particularly problematic because the Commission's Proposal expands the size of positions that can be held by speculators in the nearby, also known as the next-to-expire, trading month, the trading month that forms the basis for setting cash prices for jet fuel.[44]

Moreover, the Commission's Proposal completely fails to address the possible consequences of raising the single month limit in connection with the persistent questions that have been raised regarding the possible affect on prices caused by passive, long-only traders rolling their positions just prior to the beginning of the spot month. The Commission should reconsider this aspect of the Proposal taking into consideration the role and trading patterns of passive, long-only traders. ATA urges the Commission not to raise the single month limit until it has studied and understands the activity and effect of passive, long-only traders in the market, and particularly, the effect of their rolling positions just prior to the spot month.

In addition to retaining a lower single month limit, ATA recommends that the Commission apply a step-down approach with respect to the next-to-expire trading month position limit. Under such a structure, there would be one or more intermediate limits between the single month limit and the spot month limit. The concept of imposing progressively reduced position limits from the back month to the spot month is well established. For example, the Chicago Board of Trade provides for stepped-down position limits in the last five days of the expiring futures month in the case of rough rice futures contracts.[45] Applying this approach here would benefit the market by progressively reducing the size of speculative positions during the

41 2010 Proposed Rules on Speculative Position Limits.

42 *Id.* at 4161.

43 "Revision of Federal Speculative Position Limits," *supra* n. 22 at 12773.

44 Carriers purchase fuel months or years in advance using contracts that generally call for payment at the cash price at the time of delivery. Because jet fuel is not traded on the NYMEX, settlement prices for jet fuel are published by index services, such as Platts, the primary index used in the industry. Platts determines the jet fuel price based on market trades that are voluntarily reported on a daily basis and by reference to the next-to-expire NYMEX heating oil contract. Accordingly, the price that airlines pay for jet fuel is substantially and directly influenced by futures prices.

45 *See* CBOT Rule 5 "Interpretations & Special Notices Relating to Chapter 5."

period preceding the beginning of the spot month. This would ensure that large speculators reduce their positions in an orderly manner during the trading month that is used to set the cash price for jet fuel.

C. Passive, long-only Speculators Should Be Subject To Separate, Lower Position Limits

ATA consistently has expressed concern about the impact of passive investments in crude oil through vehicles such as index funds, exchange traded funds, mutual and sovereign wealth funds and other similar vehicles. These funds share a common characteristic that interferes with and distorts the normal functioning of the futures markets – they buy without regard to current supply and demand fundamentals and thus without regard to price. Their trading strategies are premised on factors unrelated to the physical market, but in executing them, they compete with physical commodity consumers and producers. This distorts the market and makes hedging more uncertain and, consequently, expensive. In short, their presence upsets the price discovery function.[46]

Passive, long investment began to surge in 2006, peaked in mid-2008, plummeted in the second half of 2008, and then began to rise again in early 2009. In the early to mid-2000s, financial institutions began receiving permission to create and market new kinds of securities linked to commodities and commodity indexes.[47] These included indexes based partly, or predominantly, on energy and energy derivatives. By 2006, the SEC had approved the first exchange-traded fund that was based exclusively on energy derivatives.[48] These and other commodity-based funds – which are heavily weighted toward energy futures – have been

[46] Commissioner Bart Chilton's remarks from this past November echo this view. He stated "Within the last several years. . .markets have changed because, for one, speculators have changed. More and more, the new speculators have used futures markets as an asset class. . . . Many of the new speculators also have a distinguishable trading pattern, at least during many times. . . .They have a known speculative trading strategy and many times, they are gigantic. I call them 'Massive Passives' because of their size and their trading strategy, which for the most part is, not all the time but for the most part, price insensitive. . . . The Massive Passives' size and trading strategy are fairly new to these markets, and many (myself included) think they can have an aberrant impact on markets. Other market participants trade around the Massive Passives, for example. These market participants know what the Massive Passives are going to do, so they make their own decisions based upon the Massive Passive trading strategy, which again is to simply "go long," most of the time. . . .Consumers can pay more than they should because of the Massive Passives. That's simply not right. For example, take crude oil in 2008. Crude went to the highest levels ever, $147.27 a barrel that June. Gasoline prices topped $4.00 a gallon in most states. Some people had to make a decision between food for their families and fuel for their cars or trucks. At that time, crude oil experienced some of the highest supplies and lowest demand in history, yet prices skyrocketed. Princeton and Rice universities and others conducted studies, which suggested these speculators had some impact on pushing prices. At certain times, the Massive Passives have become fortuitous bullies in these markets because they are so very large and have such a known trading strategy. What that means is that the primary goal of futures markets, which is not only to allow for hedging of business risks but to find the true price-price discovery-is harder to get to than it has been for over a hundred years." Bart Chilton, Commissioner, Speech at the University of Notre Dame (Nov. 1, 2010) *available at* http://www.cftc.gov/PressRoom/SpeechesTestimony/opachilton-34.html.

[47] *See, e.g.*, streetTRACKS Gold Trust, SEC No-Action Letter, SEC No-Act. LEXIS 860 (Nov. 17, 2004) *available at* http://www.sec.gov/divisions/marketreg/mr-noaction/stgr111704.htm.

[48] *See* United States Oil Fund, LP, SEC No-Action Letter, SEC No-Act. LEXIS 422 (Apr. 10, 2006).

aggressively marketed as a way for investors to diversify portfolios and speculate on rising commodity prices.[49] As a result, these funds have grown exponentially.

The total value of investment in commodity indexes has increased more than tenfold since 2003, from an estimated $15 billion to around $200 billion in mid-2008.[50] As of March 11, 2011, the net assets of a single fund consisting solely of NYMEX and ICE April and May crude oil futures contracts were valued at $1,726,401,242.17.[51] Moreover, from 2003 to 2008, the volume of oil futures traded on the exchanges quadrupled. In 2008, nearly 12 times the actual world consumption of oil traded daily on U.S. exchanges, and that level of activity grew to nearly 15 times actual consumption in 2010 and in 2011 has grown to nearly 20 times actual world consumption. This increase in speculative activity is closely correlated with the increased volatility of oil prices, which has caused so much harm.

ATA urges the Commission to directly address the issues raised by passive, long-only traders by adopting lower speculative position limits for such traders. The Commission is empowered to set separate position limits for different categories of traders. Although the Commission has not previously distinguished between different types of speculative trading strategies in setting speculative position limits, Section 4a of the Act empowers the Commission to do so. Section 4a provides that, "Nothing in this section shall be construed to prohibit the Commission from fixing different trading or position limits for different commodities, markets, futures … or different trading limits for buying and selling operations …."

As a first step in addressing the critically important issue of setting separate, lower speculative position limits geared specifically to passive, long traders, the Commission should undertake a study to analyze and determine the effect of such passive, long-only traders on the price discovery function of the markets. In light of the importance of this issue, the Commission should commit to completing the study within the next six months.

ATA notes that if the Commission determines that it needs additional data and information to conduct a study, Congress in the Dodd-Frank Act provided the Commission with enhanced reporting authorities. Accordingly, the Commission has the authority to craft a reporting program designed to provide the necessary information. In light of the importance of this issue and the increasing role of passive, long-only traders in the market, the Commission should propose reporting requirements for passive, long-only traders which would provide the factual predicate for informed decision making.

More generally, in moving forward with a phased approach for implementing position limits, the Commission needs to assess all of its data requirements and to assure that necessary data to support full analysis of speculative position limits issues will be available to the Commission.

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49 *See* "Excessive Speculation in the Wheat Market" *supra* note 24, *at* 5.

50 *Id.*

51 Daily holdings of United States Oil Fund, LP are disclosed at http://www.unitedstatesoilfund.com/uso-holdings.php.

D. Position Visibility Requirements Should Be Replaced by Position Accountability Rules

The Commission's proposed position visibility rules should be enhanced to include a prophylactic surveillance function similar to that of exchange "position accountability" rules. Position accountability rules impose "soft limits" that require a trader that is over the triggering level to consent to an order of the exchange to not increase its position.

If the Commission is delaying setting speculative position limits in the back months due to lack of information on how to complete the open interest-based formula, there is no reason that the Commission could not immediately adopt position accountability rules under its speculative position limit authorities. Position accountability rules would impose a "conditional" limit set at a level lower than the level established by the "hard" limit derived from the Commission's open interest-based formula. The "conditional" limit would not be dependent on application of the open interest-based formula, so it could be set immediately, and could remain in place after the open interest-based formula is implemented as well.

A position accountability regime would provide that, upon reaching the triggering level, a trader must provide additional information on its positions to the Commission and consent to refrain from further increasing its position upon instruction of the Commission, as delegated to the Commission's staff. The Commission could direct traders not to increase positions, for example, if trading volume or prices increased or decreased by more than 10% over the course of a year, in cases where the particular trader constitutes a systemic risk, or in other instances of market instability as defined by the Commission.

Imposing position accountability requirements would allow the Commission to address the Congressional mandate to impose position limits on an aggressive timetable while it gathers additional information to guide its decision-making with respect to the "hard" limits. The requirements would not constrain large traders in orderly markets, but would be available to constrain speculative traders as appropriate when market conditions warrant.

* * *

ATA appreciates the opportunity to comment on the Proposal. We would be happy to discuss our comments at length with the Commission staff. If you have any questions regarding ATA's comments, please feel free to contact the undersigned.

Respectfully submitted,

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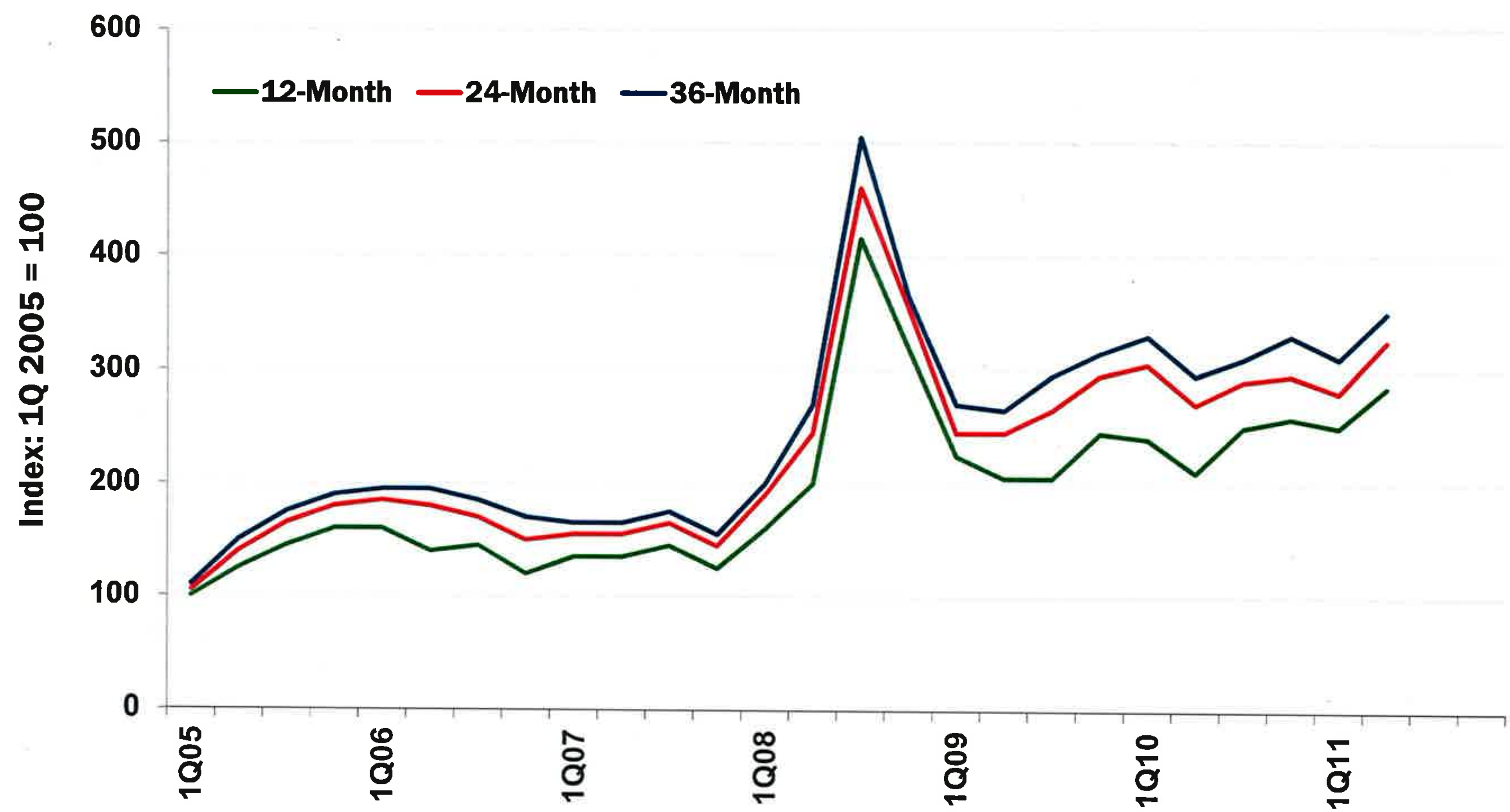
Historical Indications for Call Option Forward Premium

Based on NYMEX WTI Calendar Average



Source: ATA and company reports

Investor Flows and the 2008 Boom/Bust in Oil Prices

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Abstract

This paper explores the impact of investor flows and financial market conditions on returns in crude-oil futures markets. I begin with a review of the economic mechanisms by which informational frictions and the associated speculative activity may induce prices to drift away from "fundamental" values and show increased volatility. This is followed by a discussion of the interplay between imperfect information about real economic activity, including supply, demand, and inventory accumulation, and speculative activity. Finally, I present new evidence that there was an economically and statistically significant effect of investor flows on futures prices, after controlling for returns in US and emerging-economy stock markets, a measure of the balance-sheet flexibility of large financial institutions, open interest, the futures/spot basis, and lagged returns on oil futures. The intermediate-term growth rates of index positions and managed-money spread positions had the largest impacts on futures prices.

1 Introduction

The dramatic rise and subsequent sharp decline in crude oil prices during 2008 has been a catalyst for extensive debate about the roles of speculative trading activity in price determination in energy markets.[1] Many attribute these swings to changes in fundamentals of supply and demand with the price effects and volatility actually moderated by the participation of non-user speculators and passive investors in oil futures markets and other energy-related derivatives.[2] At the same time there is mounting evidence that the "financialization" of commodity markets and the associated flows of funds into these markets from various categories of investors have had substantial impacts on the drifts and volatilities of commodity prices.[3] This paper builds upon the latter literature and undertakes an in depth analysis of the impact of investor flows and financial market conditions on returns in crude-oil futures markets.

The prototypical dynamic models referenced in discussions of the oil boom (e.g., Hamilton (2009a), Pirrong (2009)) have representative agent-types (producer, storage operator, commercial consumer, etc.) and simplified forms of demand/supply uncertainty. Moreover, these models, as well as the price-setting environment underlying Irwin and Sanders (2010)'s case against a role for speculative trading, do not allow for learning under imperfect information, heterogeneity of beliefs, and capital market and agency-related frictions that limit arbitrage activity. As such, they abstract entirely from the consequent rational motives for many categories of market participants to speculate in commodity markets based on their individual circumstances and views about fundamental economic factors.

Detailed information about the origins of most of the open interest in OTC commodity derivatives that could in principle shed light on the historical contributions of information- and learning-based speculative activity is not publicly available. However, indirect inferences suggest that traders' investment strategies did impact prices. Tang and Xiong (2009) show that, after 2004, agricultural commodities that are part of the GSCI and DJ-AIG indices became much more responsive to shocks to a world equity index, changes in the U.S. dollar exchange rate, and oil prices. These trends are stronger for those commodities that are part of a major index than for other commodities. Tang and Xiong attribute their findings to "spillover effects brought on by the increasing presence of index investors to individual commodities (page 17)." Using proprietary data from the Commodity Futures

[1]This debate is surely stimulated in part by the large costs that oil price booms and busts potentially impose on the real economy. See, for example, Hooker (1996), Rotemberg and Woodford (1996), Hamilton (2003), and the survey by Sauter and Awerbuch (2003).

[2]The conceptual arguments and empirical evidence favoring this view are summarized in a recent Organization of Economic Cooperation and Development report by Irwin and Sanders (2010).

[3]See, for example, Tang and Xiong (2009), Masters (2009), and Mou (2010).

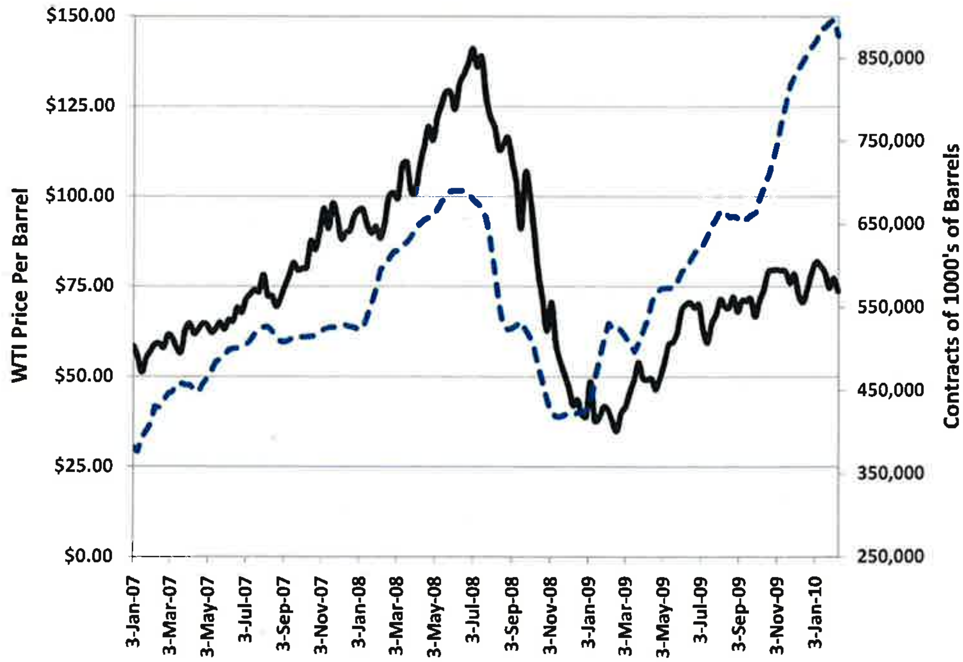


Figure 1: Commodity index long positions inferred from the CIT reports (dashed line, right sale) plotted against the front-month NYMEX WTI futures price (solid line, left scale).

Trading Commission (CFTC), Buyuksahin and Robe (2010a) link increased high-frequency correlations among equity and commodity returns to trading patterns of hedge funds. Less formally, Masters (2009) imputes flows into crude oil positions by index investors using the *CFTC*'s commodity index trader (*CIT*) reports. The imputed index long positions based on his methodology (Figure 1), displayed against the near-contract forward price of WTI crude oil, shows a strikingly high degree of comovement. Additionally, Mou (2010) documents substantial impacts on futures prices of the "roll strategies" employed by index funds, and finds a link between the implicit transactions cost born by index investors and the level of speculative capital deployed to "front run" these rolls.

To place these as well as my own empirical findings in an economic context, I begin in Section 2 with a review of the economic mechanisms by which informational frictions, and the associated speculative activity, may lead prices to drift away from "fundamental" values and induce higher market volatility. Section 3 discusses the interplay between imperfect information about real economic activity, including supply, demand, and inventory accumulation, and speculative activity. Section 4 presents new evidence that, even after controlling for many of the other conditioning variables in recent students of price behavior and risk premiums in oil futures markets, there were economically and statistically significant effects of investor flows on futures prices. Concluding remarks are presented in Section 5.

2 Speculation and Booms/Busts in Commodity Prices

As background to the subsequent empirical analysis of the impact of investor flows on futures prices I briefly review some of the potential consequences of heterogeneity of views, and associated speculative trading, on commodity prices. Absent near stock-out conditions in a commodity market, and (for simplicity) assuming a constant interest rate r, the current spot commodity price is related to a market participant's expected future price according to:[4]

$$S_t = \frac{1}{1+r} E_t^{\mathbb{Q}} \left[S_{t+1} \right] + S_t \mathcal{C}_t, \tag{1}$$

where $\mathcal{C}_t$ denotes the convenience yield net of storage costs, and $E_t^{\mathbb{Q}}$ denotes the expectation under the risk-neutral pricing distribution conditional on date t information.

Much of the literature arguing for a "supply/demand" explanation of the oil price boom focuses on representative producers and refiners and arrives at the similar expression

$$S_t^* = \frac{1}{1+r} E_t^{\mathbb{P}} \left[S_{t+1}^* + G_{t+1} \mathcal{C}_{t+1} \right], \tag{2}$$

where S_t^* denotes the price of crude oil S_t adjusted for storage costs, G_t is the price of refined gasoline, and $E_t^{\mathbb{P}}$ denotes the expectation of market participants under the distribution generating the historical data. The perfect-foresight model of Hamilton (2009a), for instance, leads to a special case of (2) without the expectation operator (since there is no uncertainty about future oil prices, inventory accumulations, or supply). The similarity between (1) and (2) arises in extant supply/demand models when market participants are assumed to be risk-neutral. If refiners and investors are risk averse, or if they face capital constraints that lead them to behave effectively as if they are risk averse, then (1) continues to hold but (2) is no longer valid. Accordingly, I henceforth focus on (1).

Implicit in (1) are the risk premiums that market participants demand when trading commodities in futures and spot markets. In an arbitrage-free setting the futures price today for delivery of a commodity τ periods in the future, F_t^τ, is equal to the expected future spot

[4]See, for example, equation (4) of Casassus and Collin-Dufresne (2005).

price: $E_t^{\mathbb{Q}}[S_{t+\tau}] = F_t^\tau$. Therefore,

$$F_t^\tau = E_t^{\mathbb{P}}[S_{t+\tau}] + \left(E_t^{\mathbb{Q}}[S_{t+\tau}] - E_t^{\mathbb{P}}[S_{t+\tau}]\right) \equiv E_t^{\mathbb{P}}[S_{t+\tau}] + RP_t^\tau, \tag{3}$$

where RP_t^τ is the *risk premium* associated with the economic forces that determine oil prices over the horizon τ. More generally, RP also captures the consequences of any limits to arbitrage, including financial market frictions that impinge on the flexibility of market participants to finance their commodity positions. Combining expressions (1) and (3) gives

$$S_t = \frac{1}{1+r} E_t^{\mathbb{P}}[S_{t+1}] + S_t \mathcal{C}_t + \frac{1}{1+r} RP_t^1. \tag{4}$$

An analogous expression holds for each investor who is participating in oil markets.

Expression (4) is not a structural relationship. Rather it summarizes the intertemporal trade-offs of a market participant who is unconstrained in trading in the spot and futures markets in circumstances where inventories are not near stock-out conditions. To sustain this expression in equilibrium, it is not necessary that participants in the spot and futures markets, or those refining or holding inventories of crude oil, be one and the same individual.[5] Nor must one assume that investors hold the same beliefs about future market conditions (i.e., that there is a representative investor).[6]

It follows that: (i) Spot prices are influenced not only by current oil market and macroeconomic conditions, but also by investors' expectations about future economic activity. (ii) Supply and demand pressures in the futures and commodity swap markets will in general affect prices in the spot market. Indeed, these relationships are fully consistent with price discovery taking place in either the futures, the cash, or the commodity swap markets, or in all three. (iii) Risk premiums will typically change over time as investors' willingness to bear risk changes. As I discuss in more depth below, the capacity of financial institutions to bear risk also changes over time, and this also may affect equilibrium futures and spot prices. (iv) Higher-order moments of prices and yields in financial markets also affect spot, futures, and swap prices through risk premiums and precautionary demands.

In addition these pricing relationships accommodate the possibility that investors hold different beliefs about the future course of economic events that impinge on commodity prices, and hence that there is not a representative investor in commodity markets. There is likely to

[5] In particular, the claim that "index fund investors ... only participated in futures markets... In order to impact the equilibrium price of commodities in the cash market, index investors would have to take delivery and/or buy quantities in the cash market and hold these inventories off of the market. (IS_{OECD}, page 8)" is not true in the economic environment considered here.

[6] The same observations apply to the trading in and pricing of commodity swap contracts.

be some disagreement among market participants about virtually every source of fundamental risk, including the future of global demands, the prospects for supply, future financing costs, etc. Saporta, Trott, and Tudela (2009) document large errors in forecasting demand for oil, typically on the side of under estimation of demand and mostly related to the non-OECD Asia and the Middle East regions. Additionally, they document substantial revisions to forecasts of market tightness, based on data reported by the U.S. Energy Information Administration (EIA), especially during 2007.[7] The International Energy Agency (IEA (2009)) points to substantial revisions to their monthly estimates of demands for the U.S. and, regarding non-OECD inventories, IEA (2008b) observes that "detailed inventory data [for China] continues to test observers' powers of deduction. As we have repeatedly stressed in this report, these data are key to any assessment of underlying demand trends... (page 15)" Sornette, Woodard, and Zhou (2008) document significant differences in the total world supplies for liquid fuels published by the IEA and the EIA, particularly from 2006 until 2008. The timeliness of non-OECD data is highly variable (IEA), and OPEC quotas and measured production levels are quite vague (Hamilton (2009b)).

Direct evidence on the extent of disagreement about future oil prices on the part of professional market participants comes from comparing the patterns in the cross-sectional standard deviations of the one-year ahead forecasts of oil prices by the professionals surveyed by Consensus Economics.[8] Larger values of this dispersion measure correspond to greater disagreement among the professional forecasters surveyed. Figure 2 shows a strong positive correlation between the degree of disagreement among forecasters and the level of the WTI oil price. This comovement is consistent with the positive relation between price drift and greater dispersion in investors beliefs found in theory and documented in equity markets.

How do heterogeneous beliefs get impounded into spot and futures commodity prices; and what are the potential implications for booms and busts in commodity prices? Virtually all classes of participants in commodity markets are, at one time or another, taking speculative positions.[9] Certainly in this category are the large financial institutions that make markets

[7] Market tightness is defined as total consumption (excluding stocks) minus the sum of non-OPEC and OPEC production. After comparing news about, and revisions in forecasts of, supply and demand for oil during 2008, these authors conclude that "Based on the news about the balance of demand and supply in 2008 ... it seems that one can justify neither the rise in prices in the first half of 2008, nor the fall in prices in the second half (page 222)."

[8] Consensus Economics surveys over thirty of (in their words) "the world's most prominent commodity forecasters" and asks for their forecasts of oil prices in the future. The series plotted in Figure 2 is the cross-forecaster standard deviation for each month of their reported forecasts. I am grateful to the IMF for providing this series, as reported in their *World Economic Forum*.

[9] The primary exception would be participants that hold futures or options positions that precisely offset their current spot exposures and who adjust their derivative positions frequently enough to rebalance as new exposures arrive and old exposures dissipate.

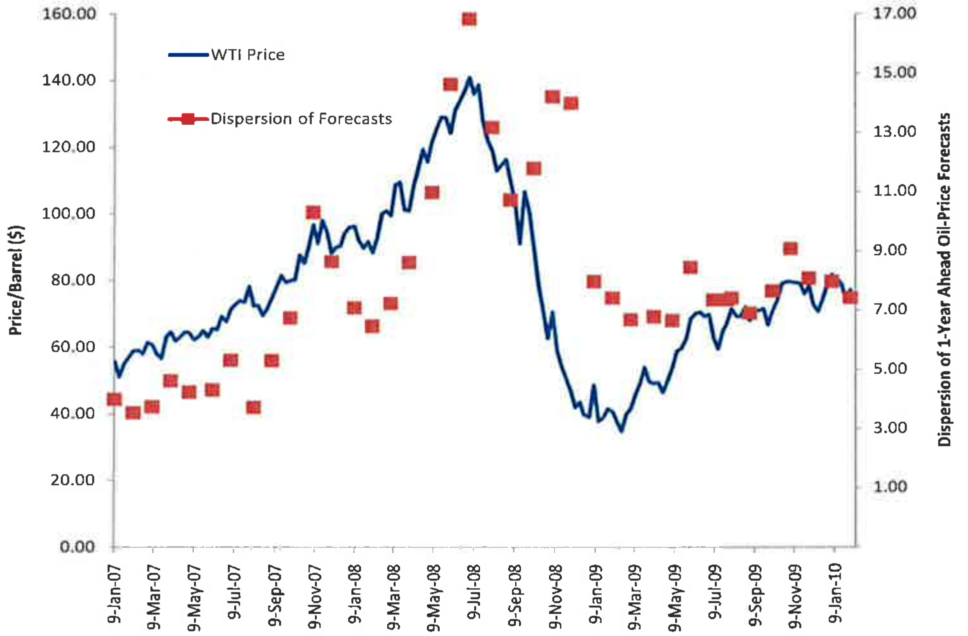


Figure 2: The front-month NYMEX WTI futures price (solid line, left scale) plotted against the cross-sectional dispersion of forecasts of oil prices one-year ahead by the professionals surveyed by Consensus Economics (squares, right scale).

in commodity-related instruments; refiners and others who hold sizable inventories; hedge funds and investment management companies; and commodity index investors.

How might this heterogeneity of beliefs impact oil prices? In a "rational expectations" equilibrium (REE) the source of different views across investors is private information. Investors share common priors and they do not disagree about public information. In contrast, in a "differences of opinion" equilibrium (DOE) investors can disagree even when their views are common knowledge. Accordingly, in a DOE investors can agree to disagree even when they share common information– they disagree about the interpretation of public information. Under a REE it is difficult to generate the volume of trade observed in commodity markets, because investors share common beliefs (see the "no-trade" theorems of Milgrom and Stokey (1982) and Tirole (1982)). In contrast in a DOE, because investors may disagree about the interpretation of public information, it is possible to generate rich patterns of comovement among asset returns, trading volume, and market price volatility (e.g., Cao and Ou-Yang (2009) and Banerjee and Kremer (2010)).

When market participants have different information sets, behavior in the spirit of Keynes' "beauty contest" may arise naturally. It is typically optimal for each participant to forecast the forecasts of others (Townsend (1983), Singleton (1987)). That is, participants will try to guess what other participants are thinking and to adjust their investment strategies accordingly. Within present value models that share many of the same intertemporal considerations involved in pricing commodities,[10] Xiong and Yan (2009) and Nimark (2009) show that groups of traders that hold different views will naturally engage in speculative activity with each other. Indeed, Allen, Morris, and Shin (2006) show that this heterogeneity leads investors to overweight public opinion and this, in turn, exacerbates volatility in financial markets.

In addition to excessive volatility, differences of opinion can give rise to drift in commodity prices and momentum-like trading in response to public announcements.[11] Conditional on past performance, there may be periods when commodity prices tend to drift in the same direction. Banerjee, Kaniel, and Kremer (2009) show that such price drift does not arise naturally in a REE, but it typically symptomatic of a DOE in which investors disagree about the interpretation of public information and in which they are uncertain about the views held by other investors. Both of these suppositions seem plausible in commodity markets.

Adam and Marcet (2010a), taking a complementary approach, show how boom and bust cycles in asset prices can result from Bayesian learning by investors. Investors in their model are "internally" rational in the sense of Adam and Marcet (2010b)– they make fully optimal dynamic decisions given their subjective beliefs about variables that impact prices and are beyond their control. However investors may not agree on how public information about fundamentals translate into a specific price level. Nor do investors know the utility weights that other investors assign to specific economic events. For both of these reasons internally rational investors try to infer from market prices information about fundamental economic variables and the end result is not a REE. They show that a model of stock price formation embodying these features produces boom/bust cycles in stock prices that match those experienced historically.

Three implications of this literature, particularly as they relate to the roles of speculation in commodity markets, warrant emphasis. First, it is not necessary for investors with heterogeneous beliefs to have private information in order for their actions to impact commodity prices. Rather, so long as they have differences of opinion about the interpretation of public information and find it useful to learn from past prices, then their actions can induce higher volatility, price drift, and booms and busts in prices. Second, the documented comovement among futures prices on commodities that are and are not in an index, or among spot prices

[10]These authors study bond marktes. As we have seen, analogous to the discounting in bond markets, commodity markets involve present values tied to financing cost, convenience yields, and storage costs.

[11]There is extensive empirical evidence that announcements of public information lead post-announcement drift and momentum in common stock markets; see, for instance, Zhang (2006) and Verardo (2009).

across markets with and without associated futures contracts, is not evidence against an important role for speculation underlying this comovement.[12] Participants in all commodity markets should find it optimal to condition on prices in other markets when drawing inferences about future spot prices, and this includes wholesalers and speculators.[13]

Third, the fact that investors are learning about both fundamentals and what other investors know or believe about future commodity prices may mean that the release of a seemingly small amount of new information about supply or demand has large effects on prices. Indeed, it is possible that prices change owing to changes in investors perceptions or risk appetite and absent the release of any new information.[14]

3 Demand/Supply, Inventories, and Speculation

Many of the arguments against a significant role for speculative trading in the recent boom/bust in oil prices highlight the historical linkages between supply/demand and inventory accumulation. Specifically, a widely held view is that speculative trading that distorts prices on the upside must be accompanied by increases in inventories.[15] This supposition has been used by both sides of the speculation/fundamentals debate. Some arguing for fundamentals have noted that we did not see large accumulations in inventories on the parts of refiners (e.g, Hamilton (2009a)), while others (e.g., U.S. Senate Permanent Subcommittee on Investigations (2006)) argue that the coincident increases in U.S. inventories and oil prices from 2004 to 2006 is evidence of speculative activity inducing higher spot prices. From Figure 3 it is seen that prior to 2003 there was a strong negative relationship between the price of oil and the amount of oil stored in the U.S. for commercial use (net of strategic petroleum reserves). This price/inventory relationship turned significantly positive from 2004 to 2007. It weakened in 2007 and turned negative, and then was weakly positive again during the first half of 2008.

[12]It follows that the presence of heterogeneous beliefs and learning could invalidate both of the following claims in Irwin and Sanders (2010): (i) for index investors to have had a material affect on commodity prices "would have required a large number of sophisticated and experienced traders in commodity futures markets to reach a conclusion that index fund investors possessed valuable information that they themselves did not possess (page 8)." and (ii) "if index buying drove commodity prices higher then markets without index fund investment should not have seen prices advance (page 9)."

[13]The perception that there are links between flows into index funds and agricultural commodity prices is evident from Corkery and Cui (2010) who cite concerns about pension fund investments in commodities exacerbating fluctuation in food prices and, thereby, food shortages in poorer nations.

[14]Tang and Xiong (2009) conclude that "the price of an individual commodity is no longer simply determined by its supply and demand. Instead, prices are also determined by ... the risk appetite for financial assets, and investment behavior of diversified commodity index investors (page 30)."

[15]For instance, the IEA expresses the view that "if speculators are driving spot oil prices, an imbalance in the form of higher stocks should be apparent (IEA (2008a))."

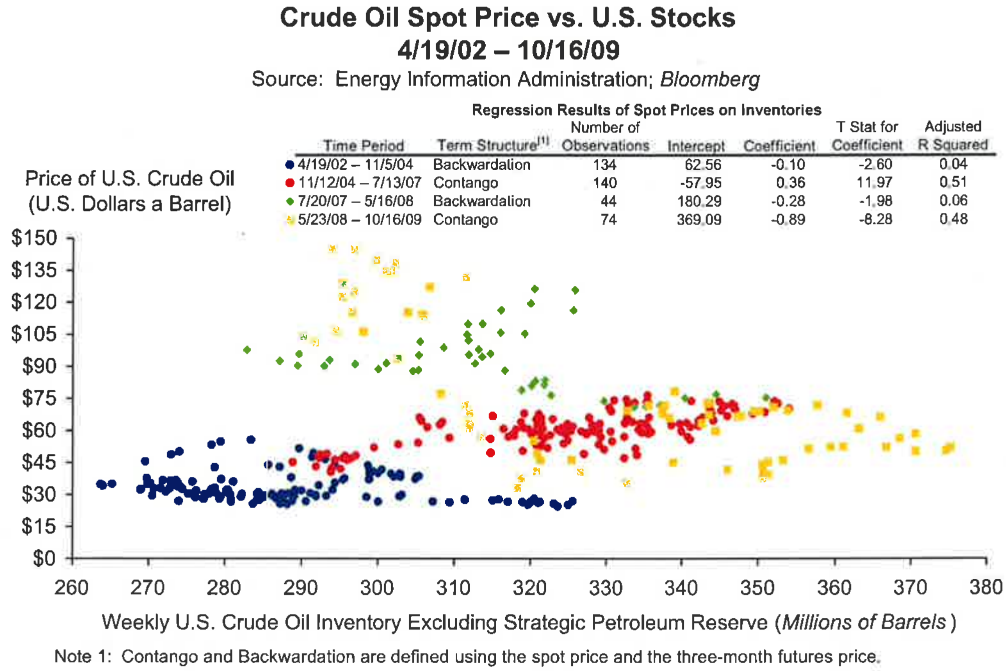


Figure 3: U.S. commercial inventories of crude oil plotted against the spot price of oil, for various recent subperiods.

Several caveats about the theoretically predicted price/inventory relationship and the historical evidence warrant emphasis. First, the price of oil is set in global markets, so it is potentially misleading to carry out a debate about inventory/price relationships by focusing on U.S. inventory levels alone. As I discussed above, during this period several major emerging economies where stockpiling crude oil in strategic reserves. These reserves are omitted from Figure 3 and, even if one wanted to include them, the inventory data for emerging economies has been much less reliable than for the G7.

Under the assumption that there is time-varying volatility (risk) related to either the demand or supply of oil, those with storage capacity may also have a precautionary demand for oil. An inherent feature of precautionary demand is that it increases with the degree of risk. In a model of rational market participants in which there is time-varying economic uncertainty about the future, but otherwise similar features to Hamilton's framework, Pirrong (2009) shows that there is not a stable relationship between inventories and prices and that a positive inventory-price relationship may arise as a consequence of increased demand- or supply-side uncertainty. Thus, there is not an unambiguously positive theoretical relationship between changes in prices and inventories, even absent accommodation of important roles in price setting of trading patterns induced by investor beliefs and learning.

Equally importantly, the impact of inventory adjustments on the volatility of prices depends critically on what one assumes about the nature of uncertainty about supply and demand. Many storage models (e.g., Deaton and Laroque (1996)) assume that, subsequent to a surprise change in inventories induced by a shock to demand, inventories revert to a long-run mean. It is this response pattern that led Verleger (2010), among others, to expect inventory adjustments to have a stabilizing effect on oil prices. However, these models of storage cannot simultaneously explain the high degree of persistence in oil prices and the high level of oil price volatility over the past 30 years (Dvir and Rogoff (2009)).

Arbitrageurs (those who store to make a profit from price changes) are confronted with two opposing implications of a positive income or demand shock. The price of oil increases and there is a drop in effective availability, both of which encourage a reduction in optimal storage. On the other hand, the persistent nature of aggregate demand means that both income and prices are expected to be higher in the future. Dvir and Rogoff (2009) show that when growth has a trend component, the expectation that prices will be higher in the future encourages an *increase* in inventories and this effect dominates the reduction in storage induced by the immediate post-shock increase in prices. On balance, storage (by arbitrageurs, refiners or consumers) may amplify the effects of demand shocks on prices.[16] Aguiar and Gopinath (2007) argue that shocks to growth contribute more to variability in output in emerging than in developed economies.

These observations, together with the inherent difficulty of accurately predicting future growth, suggest that there were (i) differences of opinion about future growth in emerging economies, and hence about demand for oil; (ii) market participants were, in part, drawing inferences from market prices about the "consensus" view about economic growth; and (iii) at least some subsets of participants were taking speculative (risky) positions in commodities and emerging market equities, or both, based on their views. The literature summarized in Section 2 shows that the resulting trading patterns could well have had destabilizing effects on prices. Optimal inventory management, through the channels just discussed, can potentially amplify the effects of differences of opinion and learning on commodity prices.

Figure 4 plots the level of non-strategic U.S. crude oil inventories against the spread between the futures prices for two- and four-month contracts ($M2 - M4$, inverted scale). Spreads that are above the zero line occur when the futures market is in contango, and spreads

[16]While this amplification mechanism has some characteristics of the precautionary demand studied by Pirrong, the economic mechanism underlying it is not driven by uncertainty about demand, but rather by expectations of rising prices.

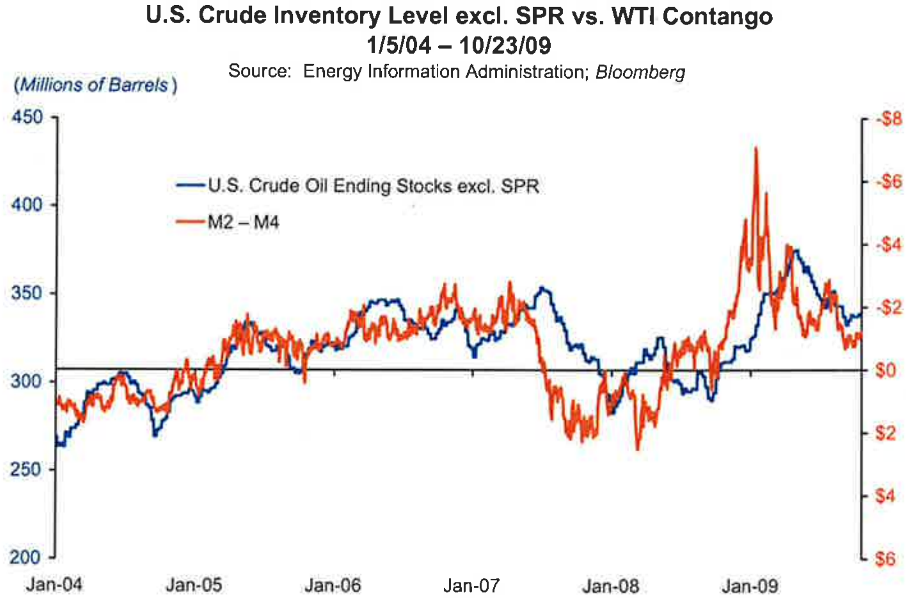


Figure 4: U.S. Commercial Inventories of Crude Oil Plotted Against the Spread Between Two-Month and Four-Month Futures Prices

below this line indicate backwardation. There is a clear tendency throughout the period of 2004 through 2009 for inventories to increase when the futures market is in contango.[17] The positive correlation between inventory levels and the futures basis is consistent with the modern theory of storage as developed by, for instance, Deaton and Laroque (1996) and Routledge, Seppi, and Spatt (2000). However their models embody the "leaning against the wind" view of inventory management and, hence, omit the possibility that expectations of higher prices in the future may encourage inventory accumulation in response to a price increase today. A notable feature of Figure 4 that seems consistent with the latter amplification effect, at least from 2007 onwards, is that steepening and flattening of the forward curve preceded changes in inventories: a steeper forward curve anticipated accumulations of inventories.

These theories of storage typically presume that market participants are risk neutral and, hence, there is no risk premium embedded in futures returns. Gorton, Hayashi, and Rouwenhorst (2007) extend the model of Deaton and Laroque (1996) to allow for risk averse speculators (maintaining mean reverting demand) and show that inventories are negatively related to expected excess returns in futures markets. They also establish a link between the futures basis and inventories. These authors and Hong and Yogo (2010), among others,

[17]These patterns are even stronger when inventory levels from Cushing or Padd2 are used.

present empirical evidence that a high basis (high $M2 - M4$ in Figure 4) predicts a high excess returns on futures positions, consistent with the theory of normal backwardation and compatible with the theory of storage. I revisit these correlations for the recent period of the oil boom as part of the following analysis of investor flows and oil prices.

4 Investor Flows and Oil Prices

Teasing out the relative contributions of the risks associated with fundamental factors in demand and supply through the channels encompassed in models such those of Hamilton (2009a) and Pirrong (2009) from the effects of price drift owing to learning and speculation based on differences of opinion will require much richer structural models than have heretofore been examined. In an attempt to provide some guidance to such endeavors, the remainder of this paper explores the historical correlations between differences of opinion, trader flows, and excess returns in oil markets, particularly for the 2008/09 boom and bust.

The comovement of the price of oil and the dispersion of forecasts of this price documented in Figure 2 suggests that professional participants in this market held different views and that these differences of opinion increased during this period. Of relevance to the subsequent discussion is whether this increase in dispersion coincided with increased dispersion in forecasts of world economic growth. Some evidence on this question is provided in Figure 5 which plots the ratio of the forecast dispersion for the price of oil to the corresponding dispersion of forecasts of growth for the world economy.[18] At least relative to the dispersion in opinions about world economic growth, there was something special about oil markets during 2008. Dispersion in views about economic growth did not rise substantially from its mid-2008 value until the spring of 2009 when the financial crisis was more pronounced.

4.1 What Is Known About Investor Flows and Commodity Prices?

A contentious issue related to the recent behavior of commodity prices is the degree to which growth in index investing– exposure to commodities through index-linked products– contributed to price volatility, a higher level of oil prices and greater disagreement among market participants about the future course of oil prices. Surely the entry of index investors as a new class of market participants affected the trading strategies of at least some other large investors. In particular, Buyuksahin et al. (2008) argue that prior to the early 2000's, the prices of long- and short-dated futures contracts behaved as if these contracts were traded

[18]For the purpose of these calculations the world is considered to be the G7 plus Brazil, China, India, Mexico, and Russia. I am grateful to the IMF for providing me with these dispersion measures.

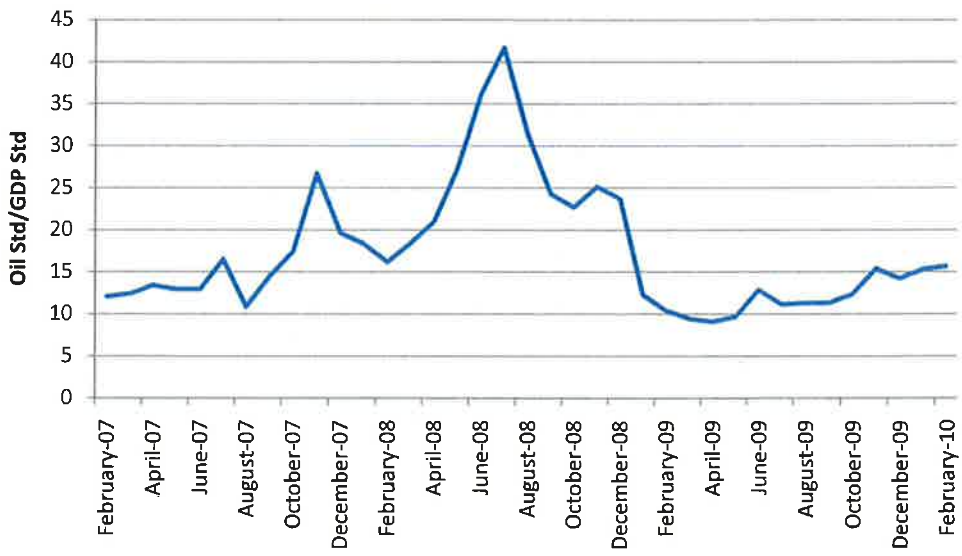


Figure 5: Ratio of the dispersions in forecasts for the price of oil and world economic growth (real GDP growth).

in segmented markets. They find that, since the middle of 2004, the prices of one- and two-year futures have been "cointegrated" with the nearby contract; that is, that all of these prices trend together. This closer integration of futures along the maturity spectrum was no doubt a consequence of several developments, including the increased trading activities of hedge funds engaged in spread trades (Buyuksahin et al. (2008)) and the incentives for index-fund managers to purchase longer-dated exposures through futures when the market is in contango. Very little is known publicly about the degree to which different groups of commodity investors were effectively trading against each other, either based on revealed positions of classes of investors, observed order flow, or by following momentum strategies.[19]

Many have characterized index traders as "passive investors."[20] As noted by Stoll and Whaley (2009), patterns similar to Figure 1 (in their case for agricultural commodities) reflect the fact that a portion of the imputed position of index traders in any given commodity is

[19]Some information about positions was available from the CFTC and mutual funds, or was observed (by traders) through financial institutions' own trading operations. There is extensive empirical evidence that order flow information in markets is a valuable input into the trading strategies of large financial institutions. See, for example, the evidence on currency markets in Evans and Lyons (2009).

[20]For instance, Stoll and Whaley (2009) express the view that commodity index investors "do not take a directional view on commodity prices. They simply buy-and-hold futures contracts to take advantage of the risk-reducing properties they provide (Stoll and Whaley (2009), page 17)."

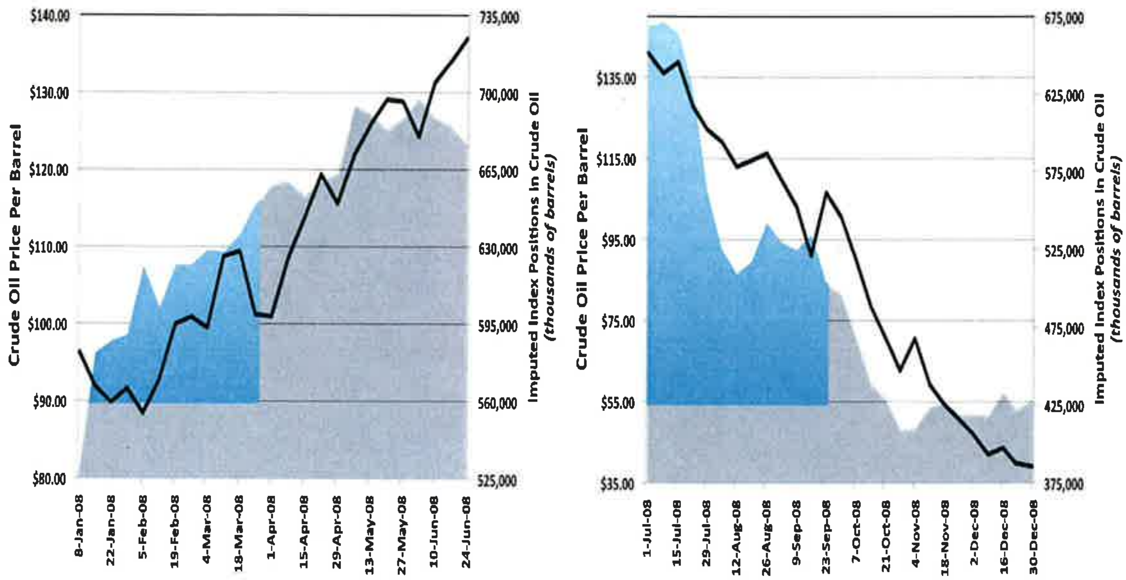


Figure 6: Crude oil prices (near futures contract) and imputed positions of index investors (barrels of oil) during the first (left) and second (right) halves of 2008.

driven by the movement in the underlying commodity price, as opposed to changes in the sizes of the positions of index traders. Nevertheless, overall position sizes did change. Even under the conservative estimates of position sizes by index investors in Stoll and Whaley, they doubled between 2006 and the middle of 2008, and then declined rapidly by nearly one half as of early 2009. Figure 6 overlays time paths of crude oil prices and the imputed positions of index investors in crude oil during the first and second halves of 2008. This data also shows a substantial increase and then decline in index positions, with medium-term patterns that closely track those of oil prices during the "boom and bust."

Moreover, the increased correlation between excess returns on commodities and global equity returns during 2004 - 2009 documented in Tang and Xiong (2009) and Buyuksahin and Robe (2010b) suggests that either index investors held positions in both asset classes until the global economy weakened, at which point many simultaneously unwound their long positions, or that different investors were engaged in correlated trading strategies induced by similarly optimistic views about emerging economies.

More generally, changes in aggregate positions reflect purchases by new investors and changes in existing positions of established investors. Even if the horizons of a majority of index investors are relatively long (weeks and months, not days), their positions are surely not immune to changes in their assessments of future economic growth, nor of their subjective assessments of the reliability of their forecasts.

Another, complementary issue that naturally arises in discussions of the impact of any given class of investors on commodity prices is whether large increases in desired long or short positions can impact prices in the futures and spot markets. In any market setting where there are limits to the amount of capital investors are willing to commit to an asset class– that is, where there are limits to arbitrage– the answer is generally yes. Price increases in responses to increased demands for long positions are typically necessary to induce other investors to commit more capital to taking the opposite side of these transactions. Acharya, Lochstoer, and Ramadorai (2009) and Etula (2010) document a significant connection between the risk-bearing capacity of broker-dealers and risk premiums in commodity markets.

Though index traders have received much of the negative publicity in discussions of the 2008 boom/bust in oil prices, it is of interest to examine the impacts of the trading activities of all large classes of investors on prices during this period. The CFTC is now making available position reports on four categories of traders, back to 2006: traditional commercial (commodity wholesalers, producers, etc.), managed money (e.g., hedge funds), commodity swap dealers, and "other." In addition, research staff at the CFTC have undertaken several studies of trader positions using internal proprietary data that has a much finer breakdown of market participants into categories of traders and is available daily.

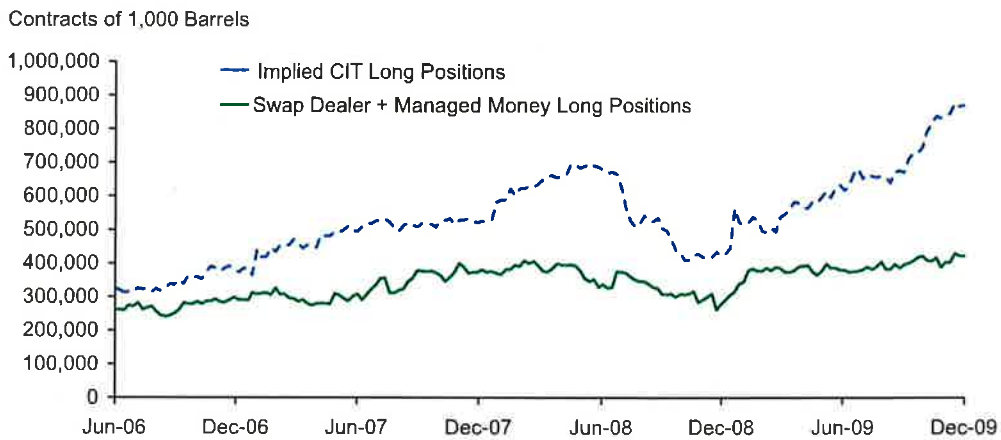
Overall, most of the evidence from this literature suggests that position changes in futures markets by managed money or commodity swap dealers either have weak or no (statistically significant) impact on prices and there is some evidence that hedging activity tends to stabilize prices (reduce price volatility).[21] However, knowing whether price changes lead or lag position changes over short horizons (a few days) is of limited value for assessing the price pressure effects of flows into commodity derivatives markets. Of more relevance is whether flows affect returns and risk premiums over weeks or months.[22] The imputed flows of funds into index positions displayed in Figure 1 suggests that such intermediate-term price-pressure effects may well have been present.

Prior to 2009 the Commitment of Traders Report (COT) only reported information for the broad categories of "commercial" and "non-commercial" traders. Figure 7 redisplays the imputed long positions of index investors from the CIT reports that is in Figure 1,[23] along with the "swap dealers and managed money" category from the COT report. The latter is the data often used in empirical studies of the impact of index investor flows on futures prices. Clearly these two series are very different, particularly from the fourth quarter of 2007

[21] See, for example, Boyd, Buyuksahin, Harris, and Haigh (2009), Buyuksahin and Robe (2009), Buyuksahin and Harris (2009), and Brunetti and Buyuksahin (2009).

[22] Similarly, evidence that any particular group of investors acquires positions after say a price decline does not contradict the view that this group is inducing systematic pressure for prices to move up or down.

[23] Implied CIT positions are calculated by dividing the imputed dollar amount of total index positions in NYMEX WTI crude oil futures by the value of a contract, calculated as the front-month futures contract price per barrel multiplied by 1000.



Source: Commodity Futures Trading Commission; Energy Information Administration; *Bloomberg*

Figure 7: CIT-imputed commodity index long positions plotted against the swap dealer and managed money positions as reported by the CFTC's Commitment of Traders report.

through the third quarter of 2008, and then again through the second half of 2009. This graph lends support to the view that the CFTC's COT data does not give a reliable picture of the overall demand for and supply of commodity risk exposure.[24]

Perhaps the most compelling evidence to date that index flows and "limits to arbitrage" have, together, had economically important effects on futures prices is provided by Mou (2010)'s analysis of excess returns around the dates of the rolls of the futures positions in the GSCI index. He shows that, by taking certain spread positions in commodity futures prior to the publicly known schedules for rolling the futures positions in commodity index funds, speculators made substantial profits effectively at the expense of index investors. The price-pressure effects were substantial, particularly for energy-related contracts. Moreover, the profitability of the trading strategies Mou examines were decreasing in the amount of arbitrage capital deployed in the futures markets and increasing in the proportion of futures positions attributable to index fund investments. A striking aspect of Mou's findings is that simple and low-cost trade strategies could have been used to arbitrage away the large profits

[24]There is an extensive literature examining links between net positions of hedgers and the forecastability of commodity returns– the "hedging pressure" hypothesis (Keynes (1930), Hicks (1939)). In two recent explorations of this issue Gorton, Hayashi, and Rouwenhorst (2007) find no support for the hedging pressure hypothesis, while Basu and Miffre (2010) argue that systematic hedging pressure is an important determinant of risk premiums. Both use the aggregated CFTC data on commercial and non-commercial traders in futures markets, a very course categorization that, as can be seen from Figure 7, is not reliably informative about the trading activities of such classes of investors as index investors or hedge funds.

from positioning ahead of the Goldman roll. Yet, while the profitability of such positions declined leading up to the boom of 2008, they remained positive suggesting that there were limits to the amount of speculative capital investors were willing to deploy.

4.2 New Evidence on the Impact of Trader Flows on Oil Prices

In the light of this conflicting evidence on the impact of trader positions on futures prices, I explored complementary statistical relationships using the imputed flows by index and managed-money investors. Specifically, I computed weekly time-series of excess returns from holding positions in futures at different maturity points along the yield curve. The maturities included were the 1, 3, 6, 9, 12, 15, 18, 21, and 24 month contracts, and the sample period was September 12, 2006 through January 12, 2010. Details of the excess return calculations are presented in the Appendix.

I included the following list of predictor variables for excess returns:

RSP1 and ***REM1***: the one-week returns on the S&P500 and the MSCI Emerging Asia indices, respectively. Inclusion of these returns controls for the possibility that investors were pursuing trading strategies in oil futures that conditioned on recent developments in global equity markets.

REPO1: the one-week change in overnight repo positions on Treasury bonds by primary dealers. Etula (2010) in the context of futures trading, and Adrian, Moench, and Shin (2010) more generally, argue that the balance sheets of financial institutions affect their willingness to commit capital to risky investments. This in turn implies that risk premiums may depend on the costs to these institutions of financing their trading activities. The growth in overnight repo positions is one indicator of balance-sheet flexibility.

IIP13: the thirteen-week change in the imputed positions of index investors in millions, computed using the same algorithm as in Masters (2009). In contrast to most of the extant literature, I focus on changes in index positions measured over three months (thirteen weeks) rather than over a few days or a week.[25]

MMSPD13: the thirteen-week change in managed-money spread positions in millions, as constructed by the CFTC. Erb and Harvey (2006) and Fuertes, Miffre, and Rallis (2008)

[25]The flows computed using the methodology in Masters (2009) is not without its limitations. However, for analyzing forecasts of changes in futures prices, it is not necessary that $IIP13$ be a perfect measure of the flow of funds into index positions. Some measurement errors seem inevitable. If the proportion of each index made up of any one agricultural product is small, mismeasurement is likely to be amplified through the scaling process. Further, valuation is done at the near-contract futures price (as was the case in Tang and Xiong (2009)), and this might not have been how index traders positioned the actual fund flows in oil markets. The evidence in Buyuksahin et al. (2008), based on proprietary CFTC data, suggests that the net positions of commodity swap dealers were primarily in short-dated futures contracts (three months or under).

document that simple spread trades based on the term structure of futures prices led to large historical returns. Spread positions were the largest component of open interest during my sample period (Buyuksahin et al. (2008)), and the disaggregated COT reports show that managed money accounts showed substantial growth in spread positions. Spread trades are not signed: trades that are long or short the long-dated futures are treated symmetrically.
OI13: the thirteen-week change in aggregate open interest in millions, as constructed by the CFTC. Hong and Yogo (2010) find that increases in open interest over an annual window predict monthly excess returns on futures. One explanation for this finding is that investors are learning about fundamental macroeconomic information from both past prices and open interest.[26] I account for this potential effect for weekly holding periods by conditioning on the three-month change in aggregate open interest in oil futures.
AVBAS1: the one-week change in average basis. Defining the basis at time t of a futures contract with maturity $T_i(t)$ to be[27]

$$B_i(t) = \left(\frac{F_t^{T_i}}{S_t}\right)^{1/(T_i(t)-t)} - 1, \tag{5}$$

as in Hong and Yogo (2010), then *AVBAS1* is the average of these values for maturities $i \in \{1, 3, 6, 9, 12, 15, 18, 21, 24\}$. In computing (5) I account for the time-varying maturity of the futures contracts. Hong and Yogo condition on their measure of basis to capture possible effects of hedging pressures on subsequent returns on futures positions. It is also a proxy for the net convenience yield in commodity markets.

Finally, I condition on the lagged value of the realized weekly excess return on oil futures positions. Stoll and Whaley (2009) find that, once lagged returns on futures positions are included in predictive regressions, there is no incremental predictive power for flows into commodity index investment. Similar points related to lagged open interest have been made by others. However, using data over a longer sample period and for a much broader set of commodities, Hong and Yogo (2010) find a very strong predictive relationship between current open interest and subsequent returns on futures positions. Moreover, when both open interest and lagged returns are included in predictive regressions, open interest drives out the forecasting power of returns.

I estimated the forecasting equations

$$ERmM_{t+1} = \mu_m + \Pi_m X_t + \Psi_m ERmM_t + \varepsilon_{m,t+1}, \tag{6}$$

[26]Consistent with this interpretation, Hong and Yogo (2010) find that open interest also has predictive content for future inflation and short-term bond yields.

[27]Note that this measure of the basis has the opposite sign of the basis in Figure 4.

Variable	RSP1	REM1	REPO1	IIP13	MMSPD13	OI13	AVBAS1
			Contemporaneous Predictors				
ER1M	0.35	0.40	0.10	0.21	0.16	0.12	-0.43
ER3M	0.43	0.48	0.08	0.24	0.19	0.15	-0.26
ER6M	0.45	0.50	0.06	0.25	0.17	0.15	-0.21
ER12M	0.44	0.51	0.04	0.25	0.15	0.14	-0.17
ER24M	0.41	0.48	0.04	0.25	0.12	0.13	-0.12
			Lagged Predictors				
ER1M	0.03	-0.17	-0.21	0.25	0.18	0.12	-0.25
ER3M	0.11	-0.10	-0.20	0.26	0.19	0.13	-0.32
ER6M	0.13	-0.09	-0.19	0.26	0.18	0.13	-0.30
ER12M	0.16	-0.10	-0.19	0.26	0.16	0.12	-0.24
ER24M	0.15	-0.11	-0.17	0.25	0.13	0.11	-0.18

Table 1: Correlations among the one-week excess returns on futures positions and the contemporaneous and lagged values of the predictor variables.

where $ERmM_t$ is the realized excess return for a one-week investment horizon on a futures position that expires in m months, X_t is the set of predictor variables, and the data were sampled at weekly intervals. The fitted values from these regressions are typically interpreted as expected excess returns or, equivalently, as risk premiums in futures markets. This is a natural interpretation when X_t represents information that was readily available to at least some market participants at the time the forecasts were formed. The variables $IIP13$ and $MMSPD13$ were constructed (by the CFTC) based on information at the time of the forecast. However this data was released by the CFTC starting in 2009 and, as such, was not readily available to market participants during my sample period. Therefore, a finding of economically important effects of these variables on $ERmM_{t+1}$ represents evidence of price pressure effects of flows by these investor classes on futures prices (controlling for other variables in X_t), but not necessarily evidence of market participants adjusting their risk premiums at the time in response to releases of information about these flows.

The correlations among the $ERmM$ and both contemporaneous and first-lagged values of the conditioning variables X are displayed in Table 1. All of the contemporaneous correlations between the excess returns and the predictor variables have signs that are consistent with previous findings in the literature. The correlations of the excess returns with emerging market stock returns ($REM1$) and the growth in repo positions by primary dealers ($REPO1$) change sign when these conditioning variables are lagged one period. Moreover, when investor flows are measured over periods of weeks, rather than days as in much of the literature, they have sizable correlations with excess returns. I elaborate on these findings below.

The correlations between changes in oil futures prices and both index and managed-money flows are positive. For the signed index positions, this is consistent with positive (momentum-type) price pressure effects. Notice also that the thirteen-week change in open interest is positively correlated with oil price changes. This finding is consistent with the strong positive correlation of these variables found by Hong and Yogo (2010) using monthly data over a much longer sample period. They interpret these correlations as indicative of open interest embodying information about future economic activity that investors find useful for predicting future commodity prices. Such a role of open interest would naturally arise in economic environments where investors learn from past prices and trading volumes as in the models discussed in Section 2. Supporting such an informational role, Hong and Yogo also find that open interest has predictive content for future bond returns and inflation in the U.S.

To explore these comovements more systematically and jointly, I estimated the parameters in (6) using linear least-squares projection. The null hypotheses are that the elements of Π are zero: excess returns on futures positions are not predictable by the variables in X_t, after conditioning on lagged information about excess returns. The economic theories of the dynamic properties of excess returns reviewed above allow for the possibility that other transformations of the conditioning information (more lags or nonlinear transformations) have incremental predictive content for excess returns. Accordingly, following Hansen (1982) and Hansen and Singleton (1982), robust standard errors are computed allowing for serial correlation and conditional heteroskedasticity in ε_{t+1}.[28] Estimates of Π along with their asymptotic "t-statistics" are displayed in Table 2.

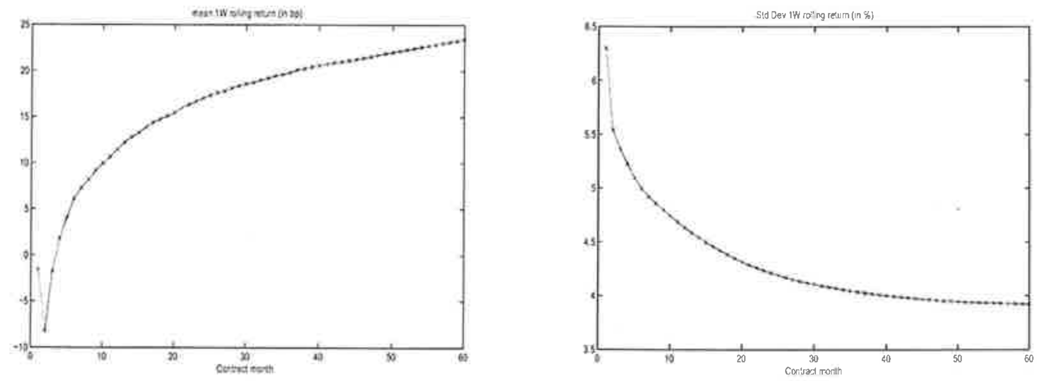
Note, first of all, that the adjusted R^2's in these projections provide compelling evidence that excess returns on futures positions in oil markets had a significant predictable component during this sample period. From Figure 8 it is seen that the volatilities of the excess returns decline, and the mean excess returns are increasing, in the contract month. Thus, the low adjusted R^2's for the longer maturity contracts imply that the predictor variables explain a smaller percentages of relatively less volatile, but larger on average, returns.

The coefficients on most of the conditioning variables and for most of the contract months are statistically different from zero at conventional significance levels. The two primary exceptions are the coefficients on the lagged returns (second to last column) and the growth in open interest ($OI13$). Interestingly, the coefficients on $OI13$ (partial correlations) switch sign and shrink in absolute value relative to the correlations in Table 1, and they are small relative to their estimated standard errors. After conditioning on the trading patterns of index investors and hedge funds, at least for the sample period around the 2008 boom/bust, open interest does not have significant predictive content for excess returns.

[28]Specifically, I use the Newey and West (1987) construction allowing for five lags.

Contract	RSP1	REM1	REPO1	IIP13	MMSPD13	OI13	AVBAS1	R_{Lag}	Adj R^2
1	0.332	-0.342	-0.201	0.272	0.357	-0.103	-4.165	-0.219	0.27
	(1.44)	(-2.44)	(-2.89)	(3.51)	(4.36)	(-2.17)	(-6.26)	(-2.05)	
3	0.361	-0.242	-0.170	0.218	0.284	-0.082	-3.661	-0.152	0.27
	(1.99)	(-2.02)	(-2.76)	(3.71)	(4.43)	(-1.87)	(-6.48)	(-2.10)	
6	0.391	-0.261	-0.150	0.197	0.245	-0.072	-3.022	-0.105	0.25
	(2.35)	(-2.27)	(-2.64)	(3.49)	(4.14)	(-1.74)	(-5.59)	(-1.62)	
9	0.424	-0.275	-0.142	0.187	0.222	-0.067	-2.551	-0.090	0.24
	(2.67)	(-2.46)	(-2.58)	(3.45)	(3.95)	(-1.73)	(-4.72)	(-1.40)	
12	0.437	-0.283	-0.133	0.179	0.202	-0.064	-2.141	-0.075	0.22
	(2.84)	(-2.60)	(-2.49)	(3.42)	(3.83)	(-1.73)	(-3.97)	(-1.14)	
18	0.430	-0.286	-0.119	0.166	0.174	-0.058	-1.657	-0.054	0.20
	(2.99)	(-2.79)	(-2.35)	(3.42)	(3.61)	(-1.72)	(-3.13)	(-0.75)	
24	0.412	-0.287	-0.107	0.157	0.159	-0.053	-1.329	-0.046	0.18
	(2.98)	(-2.87)	(-2.21)	(3.46)	(3.40)	(-1.67)	(-2.60)	(-0.59)	
36	0.378	-0.294	-0.093	0.145	0.144	-0.048	-0.981	-0.033	0.16
	(2.85)	(-2.99)	(-2.05)	(3.52)	(3.02)	(-1.60)	(-2.10)	(-0.40)	

Table 2: Estimates and robust test statistics for the futures excess return forecasting model.



(a) Sample Mean (b) Sample Standard Deviation

Figure 8: Sample moments in basis points of the weekly excess returns on futures.

That intermediate-term changes in index positions largely drive out open interest as a predictor of changes in oil prices suggests that at least a portion of the predictive content of open interest found in previous studies was a consequence of it serving as a proxy for the information in index and hedge fund positions. Consistent with this interpretation is the sample correlation between $IIP13$ ($MMSPD13$) and $OI13$ of 0.56 (0.45). By conditioning on order flow, absent information about $IIP13$ and $MMSPR13$, market participants may well have captured a substantial part of the impact of index and manage-money flows on prices, and this would show up in required risk premiums in oil markets.

There does appear to be a small remaining negative effect of open interest on futures returns, particularly for the shortest maturity futures contracts. (The negative coefficients on $OI13$ decline monotonically with the maturity of the futures contract.) A plausible interpretation of these negative coefficients is that some market participants were taking contrarian positions based on the view that oil prices had over-reacted to new information. Some evidence that hedge funds played such a stabilizing role over very short horizons (much shorter than what I am considering) is provided in Brunetti and Buyuksahin (2009). For the intermediate term horizons investigated here, such (statistically weak) feedback effects are dominated by flows from index and managed-money accounts.

The coefficients on the lagged futures returns for the one- and three-month contracts are marginally significant, but for all other contracts they are statistically insignificant. Additionally, the absolute values of the estimates decline rapidly with the maturity of the futures contract. Thus, there is weak evidence of reversals in the prices of the short-dated futures contracts, after conditioning on the information in the other components of X_t. More generally, and importantly for interpreting the evidence regarding the boom and bust in oil prices, these findings suggest that the significant predictive content of the conditioning variables X_t is fully robust to inclusion of the lagged return (see also below). This stands in contrast to the results from focusing on returns and conditioning variables over daily intervals as, for instance, in Buyuksahin and Harris (2009) and Stoll and Whaley (2009).

The large positive correlation between returns on commodity futures positions and stocks in emerging economies reported in Table 1 is often noted in discussions of investor flows. An interesting aspect of both the correlations in Table 1 and the coefficients in Table 2 is that the lagged returns on emerging market equity positions are negatively correlated with futures returns. The negative (and statistically significant) partial correlation coefficients indicate that, after for controlling for all of the other components of X_t, an increase in $REM1$ predicts a decline in futures prices in the subsequent week. These findings suggest that positive news about emerging economies leads to *contemporaneous* changes in oil futures and emerging market equity prices in the same direction. However, $REM1$ predicts subsequent reversals in futures prices. Limits to capital market intermediation and the consequent slow commitment of capital to new OTC commodity derivatives positions is a plausible explanation for these reversals (see Duffie (2010) and the references therein). Spot and futures prices respond immediately to new information about emerging market growth, but broker-dealers take time to adjust their own inventory and OTC derivatives positions.

Similarly, the negative and statistically significant effects of $REPO1$ on excess returns are consistent with model of Etula (2010) in which risk limits and funding pressures faced by broker-dealers impact risk premiums in commodity markets. The OTC commodity derivatives market is substantially larger than the markets for exchange traded products and servicing the OTC markets requires a substantial commitment of capital by broker-dealers. As funding conditions improve– reflected here through an increase in the repo positions of primary dealers– the effective risk aversion of broker-dealers declines and, hence, so should the expected excess returns in commodity futures markets. This effect of funding liquidity on excess returns declines (in absolute value) with contract maturity, while remaining statistically significant.

Perhaps the most striking findings in Table 2 are the statistically significant predictive powers of changes in the index investor ($IIP13$) and managed money spread ($MMSPD13$) positions on excess returns in crude oil futures markets. Increases in flows into index funds over the preceding three months predict higher subsequent futures prices. These effects are significant for contracts of all maturities, and this is after controlling for lagged futures returns and all of the other conditioning variables in X_t. The flow variable $IIP13$ is capturing price pressures associated with intermediate-term persistent flows of funds into index positions.

Elaborating, assuming that futures returns and the predictor variables are covariance stationary, the null hypothesis that the coefficient on investor flows in projections of weekly returns on intermediate-term growth rates in these flows has the same economic content as the null hypothesis that short-term flows impact futures prices over intermediate-term horizons (Hodrick (1992), Singleton (2006)). Consistent with most prior studies, including weekly changes in index positions has little predictive content for the weekly excess returns. These observations suggest that, if present, the price drift in futures markets related to learning and speculative trade is manifested over return horizons of a few weeks or months. Correlations between futures prices and flow variables sampled at high frequency are likely to be dominated by noise that obscures the presence of this longer-horizon comovement.

There is also a significantly positive effect of flows into managed money spread positions on future oil prices. The weekly excess returns embody the roll returns once per month. Therefore, the predictive power of $MMSPD13$ might in part reflect the growth in spread trading by hedge funds in anticipation of the Goldman roll for index funds (Mou (2010)). Alternatively, Boyd, Buyuksahin, Harris, and Haigh (2010) present evidence of herding behavior by hedge funds during this sample period. Whatever the motives of the professionals categorized as "managed money" traders, their net effect on excess returns was positive: increases in spread positions were associated with future increases in oil contract prices. Ceterus paribus, the marginal effects of growth in index or managed-money positions on excess returns were comparable: the hypothesis that the matching coefficients in columns five and six of Table 2 are the same cannot be rejected for any of the contract months.

Finally, increases in the average basis ($AVBAS1$) are associated with declines in excess returns. The coefficients on $AVBAS1$ are both more negative and statistically significant for the short-maturity contracts. These statistically significant coefficients are in contrast to those in studies of earlier sample periods (e.g., Fama and French (1987)), and also to those in Hong and Yogo (2010) who examine monthly excess returns over the longer sample period 1987-2008. Additionally, $AVBAS1$ shows small bilateral correlations with the other conditioning variables. For instance, its correlations with $(REPO1, IIP13, MMSPD13, OI13)$ are $(-0.15, -0.05, -0.05, -0.08)$ so the weekly average basis represents distinct information about future returns. Hong and Yogo (2010) interpret a negative correlation between the basis and returns on futures positions as arising out of hedging activities of producers. However, this explanation appears to be based on the "leaning against the wind" view of hedging. Recall from Figure 4 that changes in the shape of the futures curve tended to anticipate changes in inventory positions during my sample period. Moreover, under plausible assumptions about the persistence in aggregate demand for oil, price increases today can lead to increases in inventories in anticipation of further price increases in the future.

An alternative possibility is that the trading strategies of investors– not necessarily producers– led futures prices to move more than spot prices in response to commodity-relevant news. These reactions were then partially reversed in the subsequent week. The impacts of $AVBAS1$ on excess returns decline (in absolute value) with contract maturity, indicating that reversals were largest for the shorter maturity contracts. An interesting question for future research is the relationship during this boom/bust period between the convenience yields on futures contracts and excess returns.

4.3 Robustness of Excess Return Projections to the Inclusion of Other Conditioning Information

The reported findings are robust to inclusion of several other conditioning variables. Specifically, as noted above, the growth rates in flows into index and managed-money accounts over one-week intervals do not add significantly to the forecasts of excess returns.

In preliminary regressions I also included the one-week change in the Cushing, OK inventory of crude oil in millions, as reported on Bloomberg, to check the robustness of the results to the inclusion of inventory information. There is a statistically weak negative effect of inventory information on the excess return for the one-month contract. Beyond one month the coefficients are all small relative to their estimated standard errors.

Additionally, I estimated the predictive regressions with additional lags of excess returns included as predictor variables and the pattern of results in Table 2 remained qualitatively the same. The inclusion of past information about returns does materially affect the predictive content of the investor flow variables.

Finally, some argue that the trading patterns of index and managed-money investors are linked to speculation about global economic growth. A relevant question then is whether measures of global economic growth also had predictive power for excess returns on futures. As a proxy for aggregate demand, I follow Kilian (2009) and Pirrong (2009), as well as many oil-market practitioners, and use shipping rates, namely, the Baltic Exchange Dry Index (BEDI). The growth rate of the BEDI over the previous three months does explain an additional $2 - 3\%$ of the variation in excess returns, and its coefficients are marginally statistically significant. However, BEDI has very little effect on the explanatory power of the other predictors: they continue to explain most of the variation in futures returns.

5 Concluding Remarks

Investing while learning about economic fundamentals, both from public announcements and market prices, may well induce excessive price volatility and drift in commodity prices.

These phenomena are entirely absent, essentially by assumption, from the models of oil price determination that focus on representative suppliers, consumers, and hedgers. An implication of the presence of "forecasting the forecasts" of others is that commodity prices can be more volatile and, from a social welfare perspective, society can be worse off *even though each investor participating in this guesswork is small.* That is, social welfare may be reduced even though equilibrium prices do not depend directly on the degree to which any individual investor incorrectly measures fundamental economic variables.

The welfare costs of trading based on imperfect information are potentially amplified by the fact that the costs to individual investors of near-rational behavior – following slightly suboptimal investment or consumption plans– is negligible and yet this behavior might be quite costly for society as a whole (Lucas (1987) and Cochrane (1989)).[29] When investors make small correlated errors around their optimal investment policies, financial markets amplify these errors and generate volatility in securities prices that is unrelated to fundamental supply/demand information (Hassan and Mertens (2010)).

The particular economic mechanism through which social welfare is reduced in the model of Hassan and Mertens (2010) is that higher volatility in capital markets raises risk premiums and, as a consequence, the cost of capital to firms. This, in turn, affects firms' investment plans and impacts overall output in an economy. The same issues arise, for example, in an economy in which commercial users purchase commodities as intermediate inputs into production. Furthermore, such additional frictions as multi-period contracting over labor and physical capital will likely exacerbate the social costs of excessive volatility.

Much of the recent debate about "excessive" speculation in commodity markets has focused on the flows into index funds. I have found that these flows are positively correlated with *future* changes in commodity prices, and these findings complement the evidence in Tang and Xiong (2009) on the financialization of commodity markets. Assessing the social costs of these price-pressure effects requires additional economic structure. If index investors are just slightly too optimistic (in market rallies) or pessimistic (in market downturns) relative to the true state of the world then their errors, while inconsequential for their own welfare, may be material for society as a whole.[30]

[29]Such suboptimal plans may arise out of misinterpretations of public information say about future economic growth in developing countries, because of small costs to sorting through the complexity of global economic developments and their implications for commodity prices, or because of over-confidence about future economic growth as in Dumas, Kurshev, and Uppal (2006).

[30]Recent research by Qiu and Wang (2010) shows that when market participants have heterogeneous information, and so asset prices depend on the expectations of the expectations of others, prices tend to be more volatile and the overall welfare of society is lowered. Additionally, if index traders impart noise to market prices through their trading activities, then this could also reduce the efficiency with which futures and spot markets perform their roles in price discovery.

More broadly, it is the dynamic interactions of the trading activities of index investors, hedge funds, broker/dealers in commodity markets, and commercial hedgers that ultimately set prices in commodity spot and futures markets. Just as index investors are, in part, adjusting their positions based on their views about global supplies and demands, other market participants are doing likewise and they are positioning based on their views about what index and other classes of investors are doing. This may well explain the significant effects of hedge fund spread positions on excess returns in oil markets documented here.

Finally, much of the literature on commodity pricing abstracts from the impact of the extensive array of derivatives contracts in commodity markets (e.g., commodity swaps) on market-price dynamics. Adding derivatives markets will typically improve price discovery and mitigate some of the informational problems highlighted above. However enhanced price discovery is only one facet of the complex effects of imperfect information and incomplete financial markets on commodity price setting. In addition to their affects on price discovery, derivatives markets alter participants' access to hedging vehicles and, thereby, affect allocational efficiency. Society can be worse off when information is asymmetric and participants are not able to hedge against all of their business or income risks (Huang and Wang (1997)). A key step towards a better understanding of the effects of interactions among various market participants on price behavior is the collection and dissemination of more detailed information about the trading patterns in *OTC* commodity derivatives, as well as exchange traded futures.

Appendix: Construction of Excess Returns

Let $F_t^{T_i(t)}$ denote the futures contract with expiration $T_i(t)$. The futures-price-term-structure consists of points $F_t^{T_1(t)}, ..., F_t^{T_N(t)}$. Let $D(s) > s$ denote the first time after s that the generic futures curve switches contracts. Then, for all $i = 1, ..., N-1$, and all s,

$$T_{i+1}(D(s)-1) = T_i(D(s))$$

The excess rolling return in generic contract i, between s and t is given by

$$\begin{cases} \dfrac{F_t^{T_i(t)}}{F_s^{T_i(s)}} - 1 & if \quad t < D(s) \\[2ex] \dfrac{F_{D(s)-1}^{T_i(D(s)-1)}}{F_s^{T_i(s)}} \cdot \dfrac{F_t^{T_i(t)}}{F_{D(s)-1}^{T_{i+1}(D(s)-1)}} - 1 & if \quad D(s) \leq t < D^{(2)}(s) \\[2ex] \dfrac{F_{D(s)-1}^{T_i(D(s)-1)}}{F_s^{T_i(s)}} \cdot \dfrac{F_{D^{(2)}(s)-1}^{T_i(D^{(2)}(s)-1)}}{F_{D(s)-1}^{T_{i+1}(D(s)-1)}} \cdot \dfrac{F_t^{T_i(t)}}{F_{D^{(2)}(s)-1}^{T_{i+1}(D^{(2)}(s)-1)}} - 1 & if \quad D^{(2)}(s) \leq t < D^{(3)}(s) \end{cases}$$

and so forth.

By construction these are the net returns from holding one long position in the generic i-month contract, liquidating the position the day before the generic curve 'moves the contracts one month down', and going long one unit in the following month $i+1$ (which the day after, by definition will be generic contract i). This strategy is followed from s until t.

The risk free rate does not enter these calculations. The rational is (following, for instance, Etula (2010)) that investing in a futures position, does not require an initial capital injection. In practice, however, the futures trading strategies are met with margin calls. For this reason Hong and Yogo (2010) consider a fully collateralized return of the form (say if $t < D(s)$)

$$\frac{F_t^{T_i(t)}}{F_s^{T_i(s)}} R_{s,t}^f$$

My calculations omit the multiplying factor $R_{s,t}^f$ from the construction of excess returns.

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