

Financial Energy Markets and the Bubble in Energy Prices:

*Does the Increase in Energy Trading By Index
And Hedge Funds Affect Energy Prices?*

Executive Summary

**Testimony Before the Subcommittee on Oversight and Investigations
Of the
Committee on Energy and Commerce
U.S. House of Representatives**

June 23, 2008

By

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Executive Summary

1. Today's crude oil prices are the result of a perfect storm: demand pressures on supply in both physical and financial markets, very inelastic supply and demand in the physical markets, and rapid increases in demand (relative to supply) in the financial markets.
2. Trying to parse how much is physical versus financial (or, how high oil prices would be without the pressure from financial markets) is not a productive exercise – causation is practically impossible to measure with the information at hand.
3. My narrative on the effects on financial markets on oil prices is as follows:
 - a. There are always bubbles in financial markets. Globally, the size of investable funds is so great, and the ability of managers to alter those flows so substantial, that changes in investment preferences have substantial effects on the market prices of the affected assets. This affects all assets, from equities to bonds to real estate to commodities.
 - b. In the commodities sector, in recent years it appears that pension, index and perhaps sovereign fund managers have increased their exposure to financial energy contracts – especially crude oil. That increase in exposure is intended to increase the diversity of the portfolios of these funds. The size of the inflow of money from this sector, however, is extremely large in proportion to the historic size of the energy commodity markets.
 - c. Those who argue this inflow of buying interest does not affect prices (the “there’s a short for every long” argument) have lost sight of the fact that a large and sudden increase in demand for long positions in a financial contract may only be capable of being satisfied by increases in the price of the contract. This is as true in crude oil as it is in any other asset.
 - d. The potential market power of large entities is enhanced by the generous leverage allowed for commodity trading. As of today, the typical margin requirement for a Clearing Member for a 1000 barrel contract of oil (whose notional value is approximately \$130,000) is \$8500.
4. Our ability to analyze these dynamics is extremely limited by several characteristics of the energy markets, regulations of those markets, and government policies:
 - a. Crude oil is traded on one US-regulated exchange (NYMEX), on one UK-regulated exchange (IPE), and on over-the-counter markets, of which the Intercontinental Exchange (ICE) is the most important.
 - b. Collectively, it is difficult for market observers to evaluate the potential for the exercise of market power (whether willful or accidental). The data made available by the US CFTC (the Commitment of Traders report) is extremely valuable but no such data are available for IPE or ICE trades.
5. Congress could materially reduce the ability of financial markets to influence oil prices by (a) requiring much greater disclosure from IPE and ICE, (b) requiring all exchanges and OTC markets to impose and enforce position limits, and (c) reducing the leverage allowed for energy contracts.

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BACKGROUND: THE “FINANCIALIZATION” OF ENERGY MARKETS

Do financial energy markets affect the level and the volatility of oil and gas prices? We use the term “financial energy markets” here to mean the collective of trading arenas in which forward energy prices evolve from trades on (1) formal traditional exchanges (notably the New York Mercantile Exchange), (2) new forms of exchanges that combine traditional and over-the-counter transactions (notably, the Intercontinental Exchange), and (3) bilateral energy contracts whose prices are indexed to those of the exchanges.

Discussions within the oil and finance community reflect various perspectives on this issue. The discussions raise a very important question: did the increase in oil prices to almost \$140/barrel and natural gas prices above \$10 per MMBTU in 2008 reflect classic commodity “bubbles” in which financial markets played a distinct, *sui generis* role¹; or a “new regime” of permanently higher prices brought about by sharp increases in demand and enduring changes in supply, which pushed both crude oil and natural gas into suddenly much higher marginal production costs? As always, the answers are not mutually exclusive. We may be living in a period when there has been a “perfect storm” of conditions conducive to higher energy prices.

This is obviously an enormously complication question. The number of dollars involved in energy futures and over the counter markets (collectively, the energy derivatives markets) is measured in the hundreds of billions. The physical oil market is global in scale, and information about global oil stocks and flows is notoriously incomplete. The flow of investor funds into commodities; into the fuels segment of commodities; into individual fuels; and from the long to the short side of particular markets is also immense and has been growing rapidly in the last five years.

¹ We use *sui generis* here in its legal context: as a unique, distinct, or one-of-a-kind effect.

The questions the House Subcommittee on Oversight and Investigations of the Committee on Energy and Commerce are exploring this week is whether the increase in the volume and open interest in oil and gas derivatives markets has a significant impact on world crude oil and petroleum product prices, and on U.S. natural gas prices.² I believe this is likely to be one of those questions that – to use Gregory Treverton’s useful distinction³ -- is a mystery, rather than merely a puzzle. In their formal capacities, economists are trained to treat problems as puzzles, amenable to rational analysis. That requires enough information to move the problem from the mists of mystery to the brighter lights of puzzles. There are reasons to believe that condition does not exist, yet, in this case.⁴

How do financial energy market activities influence energy prices? In articles I have published on this issue⁵, I have compared the “flow of funds” of the magnitude we are seeing today to a new wave of buyers and sellers interested in oil and gas. Could that flow have created a “bubble” in oil and gas prices in 2005, 2006 and 2007? Examples of such bubbles abound. From Dutch tulip markets in the 1600s to Internet equities in the 2000s and the subprime mortgage crisis today, asset classes routinely go through booms and busts created – not by any change in the costs of production or technological change in the value added by consumption – but purely by virtue of a change in investors’ desire to own the asset.

There were forward and derivative instruments in oil markets as far back as the 1860s, but they were not as ubiquitous and as easy to use as those available today. Before the advent of

² ESAI first called attention to the apparently growing influence of financial markets in a memo we sent to our clients in 1994, which was subsequently published as an article in *Energy Risk* (November 1994)². Subsequent elaborations on our argument have appeared in memos to our clients as well as in later issues of *Energy Risk* and in *Managed Derivatives* (August 1996).

³ Gregory Treverton, “Intelligence – A Funhouse of Reflections,” Commentary on the website of the Rand Corporation; <http://www.rand.org/commentary/0216SFC.html> (January 17, 2007).

⁴ This prepared statement is an update of a similar statement I submitted to a Joint Hearing of the U.S. Senate Permanent Subcommittee on Investigations of the Committee on Homeland Security and The Governmental Affairs and the Subcommittee on Energy of the Committee on Energy and Natural Resources on December 11, 2007.

⁵ For example, Edward N. Krapels, “Hunters or Hunted?” *Managed Derivatives*, May 1996, pp. 14-15.

modern financial markets, the desire to own oil could manifest itself in only limited ways. One could hoard physical barrels of oil, put them in storage, and sell them at a later date (at a profit or a loss). Or, one could buy the equity or debt instruments of oil producing companies.

Beginning in the 1980s, the emergence of a viable and liquid futures market for oil made it much easier for investors and traders to deal in the commodity: they could buy or sell contracts, settled by an Exchange. U.S. natural gas followed suit in the early 1990s. Like any other futures market, the oil and gas futures markets allow one class of participants to hedge, and another class of participants to speculate. Speculators play an important role: they allow hedgers to put aside the risk of commodity price fluctuations to others better able or more willing to live with them. Oil and gas producers and consumers are hedgers, small traders and larger financial institutions, like hedge and private equity funds, some investment banks, and specialized energy trading outfits, are speculators.

Even though many crude oil and natural gas producers, oil refiners, and petroleum product and natural gas consumers do not hedge, the fact remains that New York Mercantile Exchange (NYMEX)-traded West Texas Intermediate (WTI) crude oil and Intercontinental Exchange (ICE) –traded Brent crude oil, American and European heating oil and gasoline, and U.S. natural gas contracts have become benchmarks of both physical commodities and financial assets whose price fluctuations affect the economics of the entire energy industry as well as those buying services from that industry. Thus, even purely commercial participants in oil and gas markets are just as affected by the force of financial energy markets as are the speculators and hedgers that use them every day.

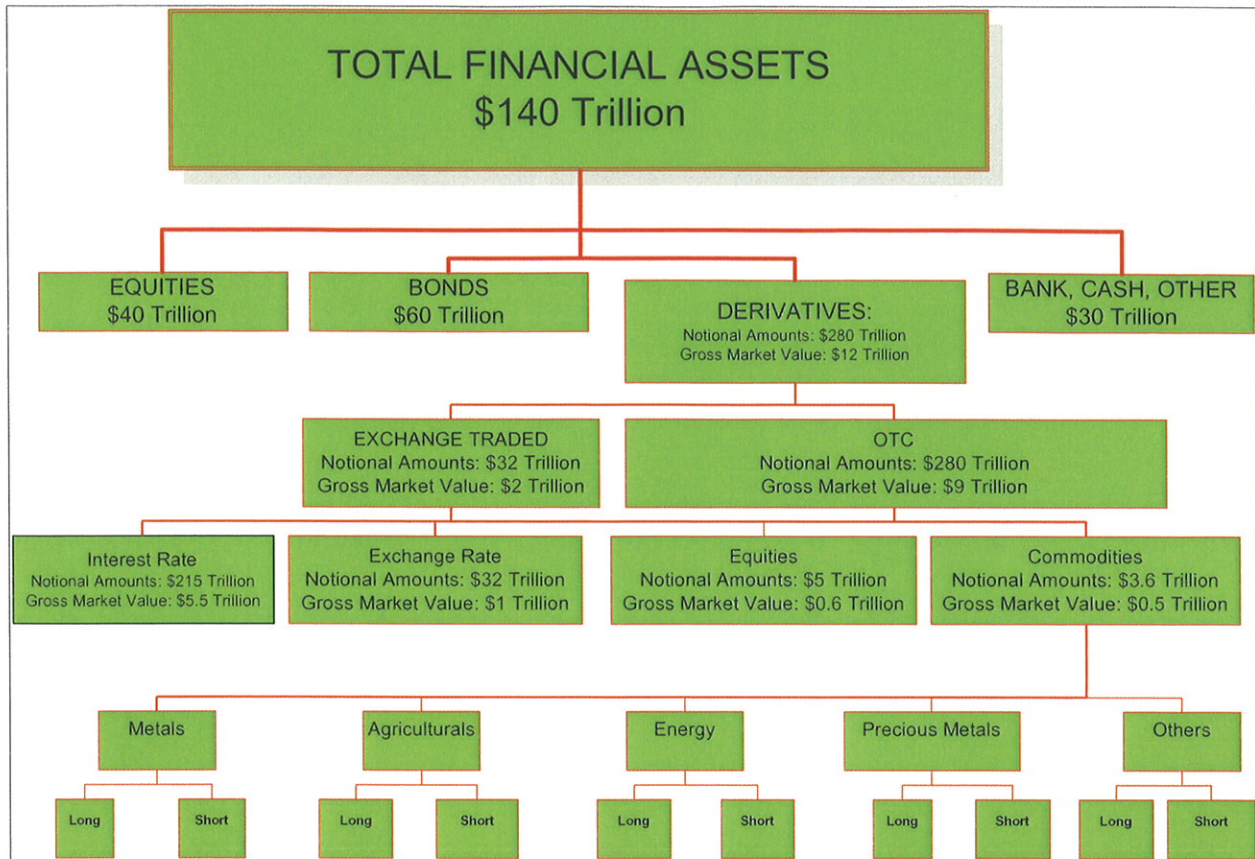
Beginning in the 1990s, some participants in oil and gas markets began to suspect that the trading behavior of institutional speculators was influencing prices. These speculative

organizations had been minor participants in the financial oil markets since the crude oil contract was launched in 1984. By the mid-1990s, however, the number of financial investors trading crude oil contracts began to increase rapidly. The increase was not confined to oil: to the contrary, one can only understand the phenomenon, and how to deal with it, if one understands the larger investment picture in global financial markets.

With the wide array of contracts and assorted rules on leveraging trades, international financial markets have become extremely complicated. In every economy, wealth is held in the form of land, precious metals, goods, and financial instruments like stocks, bonds, currency holdings, and futures contracts. The stock of wealth, on a global scale, has to be tallied in the hundreds of trillions of dollars. The largest shares are in the United States, Japan, and Western Europe.⁶

If the stock of global wealth can be measured in the hundreds of trillions of dollars, the flow of funds – which no single institution measures systematically – amounts to several trillions of dollars over the course of a year. Thus, a Japanese investor may sell his real estate in Tokyo in order to buy stocks in Malaysia, or U.S. Treasury Bills, or crude oil futures contracts, or a trunkful of gold or silver. He may also deposit his funds in a bank, which then makes loans, engages in swaps, and sells futures and options in the over the counter markets.

⁶ For a valuable summary, see *International Capital Markets: Developments, Prospects, and Key Policy Issues*, International Monetary Fund, (a Staff Team led by Charles Adams, Donald J. Mathieson, Garry Schinasi, and Bankim Chadha). Available on the World Wide Web at <http://www.imf.org/external/pubs/ft/icm/icm98/index.htm>



This intricate web of investments, loans, and derivatives has grown exponentially over the last ten years. Parts of this web are always under some pressure. There is almost always a small meltdown or bubble somewhere. In 1998 and 1999, the meltdowns were very large indeed. Asian equity, real estate, and currency markets collapsed. In 2001, the meltdown occurred in U.S. and global equity markets in the spring of 2000.

Meltdowns can happen anywhere. In late September 1998, reports began to circulate of a successful effort by the New York Federal Reserve Bank to orchestrate a \$3.5 billion bailout of a hedge fund (Long Term Capital). According to new reports, “Wall Street’s biggest power brokers agreed to prop up one of their most aggressive offspring, Long-Term Capital Management, L.P., a highflying hedge fund that was on the verge of collapse.”⁷ According to the

⁷ “A Hedge Fund Falters, and Big Banks Agree to Ante Up \$3.5 billion,” *Wall Street Journal*, September 24, 1998, p. A-1.

Wall Street Journal, one of the “hotly debated topics” in the meeting that reached the accord to bail out the Fund was that its failure “would put the entire financial system at risk” because the Long Term Capital had leveraged its several billion dollars of investment capital into a market position that at times exceeded \$100 billion.

FINANCIAL MARKETS AND ENERGY FUNDAMENTALS

Some authoritative observers – like former Federal Reserve Chairman Alan Greenspan and eminent oil economist Robert Mabro -- believe the financial markets have a *sui generis* impact on oil prices. If so, there must be “fundamentals of paper markets” that one must assess along with the fundamentals of the physical markets in order to obtain a complete view of oil pricing dynamics. Others are more skeptical, believing that futures and forward prices reflect entirely information about the fundamentals of the physical market. Some of those who believe the financial markets have a *sui generis* impact on prices are advocating stricter regulation of energy trading activities. Given the ease of international capital movements, however, it is unclear whether regulation in and by the United States would have much effect: squeezing one part of the energy trading balloon may only cause the bubble to appear elsewhere.

Discussions within the oil and finance community reflect various perspectives on the issue: do oil prices above \$50/barrel and natural gas prices above \$5 per MMBTU reflect classic commodity “bubbles” in which financial markets played a distinct, *sui generis* role, or a “new regime” of permanently higher prices brought about by sharp increases in demand, which pushed both crude oil and natural gas into suddenly much higher marginal production costs. Recognizing that both financial and physical dynamics are always at play, the issue nevertheless is whether the financial dynamics have a distinct and measurable role.

The bubble argument suggests that developments in financial energy markets (especially the increase in cash under management of hedge and other funds, and the decisions of index-oriented funds to take long positions in commodities, including energy) may have precipitated a classic period of “too many buyers chasing too few sellers” of financial oil instruments. Such periods of “excess demand” have occurred hundreds of times in competitive markets over the course of centuries. Once oil and gas developed futures and forward market instruments, with all of the fungibility characteristics of such instruments, they too became prey to purely financial bubbles. The potential for such bubbles increased in recent years because of the massive scale of increased involvement of financial institutions that heretofore had not been significant players in the energy space.

For example, Robert Mabro argues that

“Econometric models show that the net position of the so-called ‘non-commercial traders’ is correlated with the subsequent direction of price changes. In other words, when the non-commercial entities hold a net long position (they are betting on a price rise) prices often do rise. And the opposite impact occurs when these entities hold net short position. Is it not odd that the non-commercial players (meaning very broadly the non-oil companies) should lead and the commercial entities (broadly speaking oil or energy companies, oil users and oil-related agents) should follow in what is supposed to be an oil market?”⁸

Others believe in variations of a “new regime” argument that has two dimensions. On the supply side, they would argue that there has been a permanent movement up the oil and gas production cost curve caused by a lack of investment by and in the petroleum extraction industry.

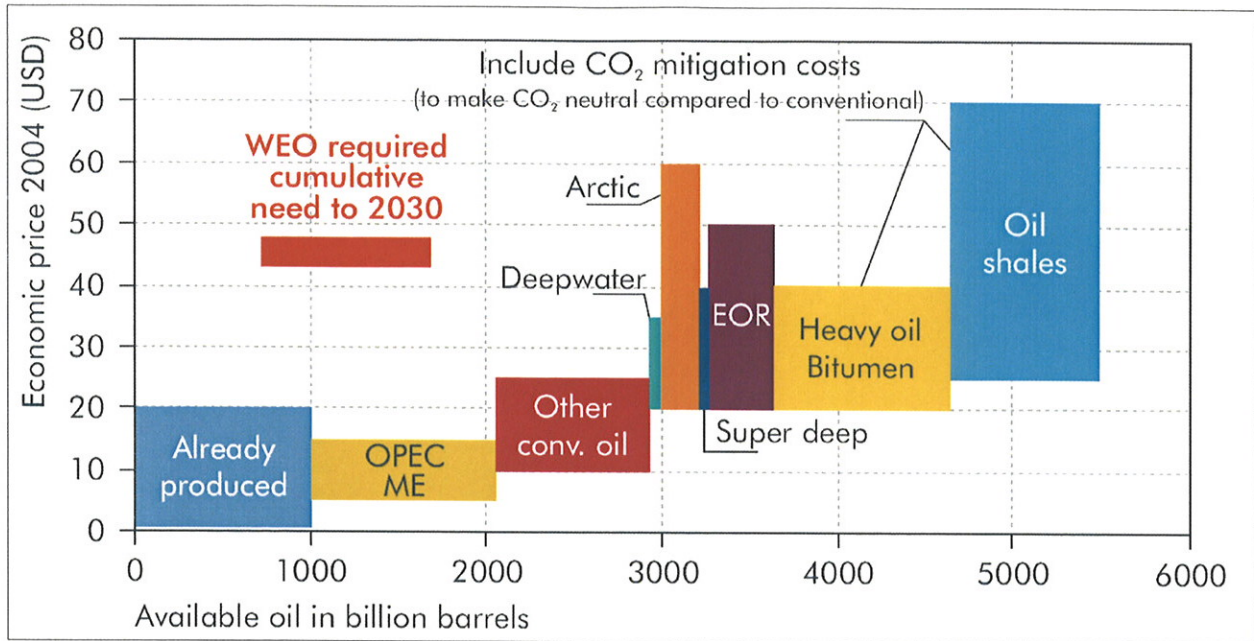
⁸ Robert Mabro, “Robert Mabro Questions the Suitability of the Current Oil Price Regime,” *Oxford Energy Forum*, February 2007, page 15.

On the demand side, there has been an increase in the rate of growth in oil and gas demand (the oil side mostly from Asia; the gas side mostly from increases in the use of combined cycle gas turbines). Taken together, the new regime is characterized by increases in demand for oil and gas that exceed the increase in supply. Thus, the new regime argument indicates it was inadequate investment in production, not excess investment in financial energy markets, that was primarily behind the massive price increases of 2000 – 2006.

In the oil market, many focus on the fact that spare crude oil production capacity has diminished, and there have been additional concerns over supply adequacy caused by the increasingly prominent “peak oil” thesis.⁹ Such long-term concerns can explain why market participants have bid up the price at the back of the forward curve. Sellers at the back end of the curve may believe the peak oil argument is overblown, and that in any event marginal cost does not set the crude oil price.

A third and more nuanced view – in some variations related to Peak Oil – argues that the world has exhausted most of the oil that is available at finding costs of less than \$10/barrel. This leads to a traditional, increasing-marginal-cost explanation for higher oil prices. The chart above presents the relationship between production cost, oil already produced, and the marginal costs of alternatives to “cheap oil” as seen by the International Energy Agency (IEA). The IEA supply curve indicates that there are 5 *trillion* barrels of oil available at “economic prices” of less than \$70/bbl (in 2004 dollars). If this is correct, and the oil extraction business still responds to economic opportunities, then the market prices of \$70/barrel reached in 2006 were unsustainable, and constituted a classic commodity “bubble.” The financial energy markets, by providing such

⁹ Those who adhere to the Peak Oil argument have developed, *inter alia*, regular conferences and journals reviewing the topic. See the Peak Oil web site maintained by Colin Campbell at <http://www.peakoil.net/>.



convenient vehicles for the financial expression of views about oil scarcity, will have contributed to the bubble.

The IEA supply curve is a useful tool for pointing out that the quantity of “OPEC ME” (OPEC Middle East) available oil is curtailed by instability (as with Iraqi oil), failure to maintain fields properly (as some believe is the case with Iranian reserves), and deliberate under-production of available reserves by governments who have decided that their nations’ discount rates are very, very low. The conundrum is that there is still a great deal of oil in the “OPEC ME” category, available for exploitation at less than \$15/bbl, but there are political constraints on its expeditious production. Those who invest in more expensive oil are essentially taking a political gamble that this oil will continue to be held off the market, making it economical to invest in the production of more expensive conventional and unconventional oils. In essence, they are speculating on the assumption that the sub-\$15 barrels are no longer on the margin.

For investors, these arguments are of more than academic interest. Any investment in high-cost conventional oil resources runs the risk that the constraints on producing more of the

sub-\$15 oil pool will be relieved. Such relief could come from resolution of political conflicts in the Middle East, thus releasing the pent-up Iraqi reserves, or from a decision by Saudi Arabia to double its production.

In the absence of liquid financial energy markets, market participants could express their views on these issues in only two “physical” markets: the spot market, and the markets for oil in the ground.¹⁰ The existence of financial energy markets provides a forum for the expression of views in the arena between spot markets and oil in the ground. Financial energy markets are available for the “prompt month” (which should converge with the spot price), and then for months and years into the future.

Concerns About the Impact of Financial Markets

As prices rose from the customary trading range of \$10 to \$30 in the 1990s, to \$30 - \$100 beginning in 2002, the debate about the role of financial markets became more heated, and attracted notable participants, especially in the United States. In the summer of 2006, a number of investigative committees of the U.S. Senate conducted hearings on the issue, and one committee—the Permanent Subcommittee on Investigations – issued an influential report titled *The Role of Market Speculation In Rising Oil and Gas Prices: A Need To Put the Cop Back On the Beat*.

Former Federal Reserve Chairman Alan Greenspan explained to the Senate Foreign Affairs Committee that there had recently been “a major upsurge in over-the-counter trading of oil futures and other commodity derivatives.” Greenspan observed that “increasing numbers of hedge funds and other institutional investors began bidding for oil [and] accumulated it in

¹⁰ While derivative markets for oil have existed in some forms since the 19th century, we will date the emergence of the modern petroleum derivatives markets with the successful launch of the forward markets in the North Sea in the late 1970s and the successful launch of the New York Mercantile Exchange crude oil contract in 1984. We treat investments in oil producing companies as a subset of the market for oil in the ground.

substantial net long positions in crude oil futures, largely in the over-the-counter market,” and that these activities affected oil prices: “These net long futures contracts, in effect, constituted a bet that oil prices would rise... With the demand from the investment community, *oil prices have moved up sooner than they would have otherwise.*”¹¹

Mr. Greenspan also suggested that these price increases have stimulated additional oil production, a large increase in oil inventories, and a partial scale-back of consumption.¹²

The U.S. Senate sub-Committee investigating oil prices in 2006 concluded that

“[T]here is substantial evidence that the large amount of speculation in the current market has significantly increased prices. Several analysts have estimated that speculative purchases of oil futures have added as much as \$20-\$25 per barrel to the current price of crude oil, thereby pushing up the price of oil from \$50 to approximately \$70 per barrel.”¹³

These opinions about the effect of speculation in financial energy markets on oil prices appears to be based on a fairly straightforward proposition: the large and sudden increase in the market position of any subset of oil market participants will tend to move prices up if the increase is in demand (expressed in financial energy markets as an increase in long positions) and down if the increase is in supply (expressed in financial markets as an increase in short positions). Even though there is “a long for every short and a short for every long,” any large market participant can create sudden surges in supply or demand (or sudden shifts in the demand or supply curves of the oil market).

¹¹ Greenspan, Alan. *Statement before the Senate Committee on Foreign Relations, United States Senate*, June 7, 2006.

¹² Coleman, Norm (Chairman). Levin, Carl (Ranking Minority Member). *The Role of Market Speculation In Rising Oil and Gas Prices: A Need To Put the Cop Back On the Beat*, Staff Report, Permanent Subcommittee on Investigations, U.S. Senate, June 27, 2006, page 3. Hereafter, Coleman [2006].

¹³ Coleman, Norm (Chairman). Levin, Carl (Ranking Minority Member). *The Role of Market Speculation In Rising Oil and Gas Prices: A Need To Put the Cop Back On the Beat*, Staff Report, Permanent Subcommittee on Investigations, U.S. Senate, June 27, 2006, page 2.

For example, assume that on a given day an extremely large speculator decides to go short. His brokers will then attempt to purchase 5,000 short contracts. All other things being equal, the effect of such a large increase in the number of shorts demanded is to drive down the price. The order for 5,000 short contracts amounts to a search for 5,000 long contracts, and in the open outcry process on the floor of the NYMEX, the bid price will fall until the necessary number of longs are attracted to take the offsetting positions for the 5,000 shorts.

The nature of any market – financial or physical – is that such a process can feed on itself. If the intra-day price decline forces prices below a technical support level, those who trade on such signals will be attracted into the market, creating further downward price pressure. Market participants can wonder what led to the price decline if nothing of consequence was indicated in the physical supply-demand equation.

For many economists, such effects can be expected only if two conditions exist: a large market participant is exercising market power, or subsets of market participants are (deliberately or coincidentally) acting together, or “herding” and the effect of their acting together is to exercise market power.¹⁴

Trading Entities and Their Trading Styles

While hedge funds have attracted much of the attention of the press, they are only a subset of all of the institutions that trade oil. Even within their own cohort, hedge funds are an extremely variegated herd, each with its own directives and trading strategies. The effects of the oil trades of these participants are unlikely to flow in the same direction.

¹⁴ For a detailed presentation on the difference between these two market characteristics as it applies to financial oil markets, see Robert J. Weiner, *Do Birds of a Feather Flock Together: Speculator Herding in the World Oil Market*, (Washington DC: Resources for the Future Discussion Paper, June 2006).

Quite apart from hedge funds, commercial and investment banks make a variety of offerings to investors that, ultimately, result in a financial institution placing substantial hedge positions in the market. For example, some banks offer structured notes indexed on oil with fixed or guaranteed returns. The buyers of these notes are not oil market participants, and purchase them largely for portfolio diversification.

Of greatest recent interest is the role of yet a third type of trading entity in the energy sector -- index or passive investors, who are looking for portfolio insurance via commodity returns, and are prepared to pay for the portfolio benefit. These funds may buy an index, like the Goldman Sachs Commodity Index, which guarantees them the return of the index. The seller of that index, usually a bank, hedges the index exposure in the energy market by buying the futures that correspond to the index. Some participate as buyers in a Roll Index, which could entail, for example, buying the second month futures. When the prompt month expires, the Roll Index participant holds the prompt, which they sell to buy the second month futures contract again.¹⁵ Others take the opposite view, and are roll sellers.

There is a substantial amount of anecdotal evidence that much of the increase in open interest in commodity contracts was precipitated by a decision of pension funds to increase their exposure to commodities. For example, the *Wall Street Journal* reported on September 9, 2004 that “at the start of the decade, Europe's two biggest pension funds had no commodity investments. Stichting Pensioenfond ABP, the €157 billion (\$190 billion) fund for Dutch government and educational-system employees, got into commodities in 2001 and has reached its target of having 2.5% of its assets, or close to \$5 billion, in commodities. A year earlier,

¹⁵ See, for example, Dizard, John, “Speculators Profit from Commodity Investors,” which notes that speculators “In the pits, physical or electronic, bet against the certainty that commodity index investors' positions are rolled in a mechanistic manner every month, in known patterns on particular days.” *Financial Times*, Jan. 22, 2007.

the €55.7 billion PGGM fund for Holland's health-and-welfare sector waded into commodities. It now has 4.3%, or roughly \$3 billion, invested in them.”

The interest in commodity exposure was not restricted to pension funds: “Harvard University has been investing in commodities for more than a decade, and its internal benchmark calls for allocating 13% of the university's \$19.3 billion endowment to oil, gas and other commodities. That's just two percentage points less than the weighting assigned to U.S. stocks and two points more than the allocation to U.S. bonds. Unlike many pension funds that passively follow a benchmark, Harvard actively manages its commodity investments, and 10 percentage points of the 13 allocated to commodities are invested in timber.”¹⁶

Within the financial community, however, it would be quite unusual for the trading activities of each of these entities to have effects in the same direction. To the contrary, one would expect that the effects of these traders on markets would *usually* be quite dispersed as each trader follows his own objectives. Anecdotal accounts refer to a variety of trading styles:

- *Mean reversion* traders believe that commodity prices tend to return to long-term averages, and thus their trades would tend to help market prices remain within given channels. *Chartists or technical traders* could accentuate trends when their systems indicate they should endure, and bring them to an end to when their systems indicate they should not. Notions of powerful “support” and resistance levels have long held sway over this community, and there is an array of software support available to those who trade in this manner.
- *Macro traders* believe in linkages between energy and other markets. These include incorporating views on macro-economic growth into energy trades (the

¹⁶ Michael R. Sesit, “Commodities Enter Investment Mainstream,” *Wall Street Journal*, September 9, 2004.

“China syndrome”), or specific statistical relationships (dollar – yen – oil pricing dynamics).

- *Fundamental commodity traders* who believe they have superior information about energy supply and demand.
- *Passive investors* who only own energy contracts for their portfolio effects. In recent years, pension funds holding hundreds of billions of dollars began allocating a few percent to energy commodities. This so-called “index investing” is a trickle for this segment of the economy, however, is a torrent of investment for the energy sector. Banks make various offerings to their private banking investors that, ultimately, may result in a financial institution placing substantial hedge positions in the market (whether these are shown as hedges in CFTC reports is unclear). For example, some banks offer structured notes indexed on oil with fixed or guaranteed returns. The buyers of these notes are not oil market participants, and purchase them largely for portfolio diversification.
- *Roll index* investors looking for portfolio insurance via commodity returns are prepared to pay for the portfolio benefit. They may buy an index, like the Goldman Sachs Commodity Index, which guarantees them the return of the index. The seller of that index, usually a bank, hedges the index exposure in the energy market by buying the futures that correspond to the index. Some participate as buyers in the Roll Index, which could entail, for example, buying the second month futures. When the prompt month expires, the Roll Index participant holds the prompt, which they sell to buy the second month futures contract again. Others take the opposite view, and are roll sellers.

Analysis of The Effects of Financial Markets on Oil and Gas Prices

In the past decade, various studies of the behavior of financial market participants have been conducted, and they have shed a considerable amount of light on what is, and is not, happening. In this endeavor, the primary source of data on financial traders' behavior is the "Commitment of Traders" report of the U.S. Commodities Futures Trading Commission (CFTC).

The CFTC divides market participants into "commercial" and "non-commercial" classes:

"A trading entity generally gets classified as a "commercial" by filing a statement with the Commission (on CFTC Form 40) that it is commercially "...engaged in business activities hedged by the use of the futures or option markets." In order to ensure that traders are classified with accuracy and consistency, the Commission staff may exercise judgment in re-classifying a trader if it has additional information about the trader's use of the markets.

A trader may be classified as a commercial in some commodities and as a non-commercial in other commodities. A single trading entity cannot be classified as both a commercial and non-commercial in the same commodity. Nonetheless, a multi-functional organization that has more than one trading entity may have each trading entity classified separately in a commodity. For example, a financial organization trading in financial futures may have a banking entity whose positions are classified as commercial and have a separate money-management entity whose positions are classified as non-commercial.

The long and short open interest shown as "Nonreportable Positions" are derived by subtracting total long and short "Reportable Positions" from the total open interest. Accordingly, for "Nonreportable Positions," the number of traders involved and the commercial/non-commercial classification of each trader are unknown."

Finally, as noted earlier in this report, the CFTC provides an additional level of detail on the behavior of non-commercials with its reports on spreading activities:

"For the futures-only report, spreading measures the extent to which each non-commercial trader holds equal long and short futures positions. For the options-and-futures-combined report, spreading measures the extent to which each non-commercial trader holds equal combined-long and combined-short positions."¹⁷

Published COT data, while interesting and useful, however, are incomplete and sometimes unclear. The most important omission is over-the-counter market transactions. As noted earlier, over the past several years, more and more forward transactions (both energy and non-energy) have moved from organized exchanges like NYMEX to platforms for bilateral and OTC trades, particularly the Intercontinental Exchange. Thus, it is appropriate to consider the volume and open interest data of the NYMEX the tip of energy trading iceberg.

In addition, within the confines of the COT data, it is unclear how bright the line is between the "non-commercial" (a.k.a., speculators) and "commercials" (a.k.a., hedgers). Analysts disagree about the best way to use the data in the analysis of the influence of specific trading cohorts over prices. Some argue in favor of using total (commercial, non-commercial,

¹⁷ See "Backgrounder" on CFTC web site <http://www.cftc.gov/opa/backgrounder/opacot596.htm>.

and non-reporting) open interest, others total non-commercial open interest, and yet others total net non-commercial open interest.

Even though the COT data are incomplete and unclear, they are all the data practitioners have. Thus, given that is information, the analytical community has naturally tried to find relationships between changes in trading positions and prices. After some ten years during which a number of studies – with varying degrees of rigor and focus – have been conducted, it is fair to say that – Robert Mabro’s previous assertion notwithstanding -- there is no consensus on whether financial markets exert a *sui generis* effect on the price of oil and gas.

Generally, formal statistical results on the issue are deemed unimpressive, which is to be expected given the dispersion of trading strategies already reviewed. A 2006 study conducted by the U.S. Commodities Futures Trading Commission concludes that,

“on average, [managed money trader] MMT participants do not change their positions as frequently as other participants, primarily those who are hedgers. We find that there is a significant correlation (negative) between MMT positions and other participant’s positions (including the largest hedgers), and results suggest that it is the MMT traders who are providing liquidity to the large hedgers and not the other way around. We find that most of the MMT position changes in the very short run are triggered by hedging participants changing their positions. That is, the price changes that prompt large hedgers to alter their positions in the very

short run eventually ripple through to MMT participants who will change their positions in response.”¹⁸.

Robert Weiner, in a study published in 2006, obtained access to detailed COT data and conducted an analysis focusing on market power and herding. The study concludes that “the evidence indicates that speculators as a group did not herd during the time period for which data are available (mid-1990s). There is evidence, however, that some subgroups of speculators do tend to act in parallel (‘flock’), notably commodity pool operators. .. Even among subgroups that flock, the extent of parallel trading is modest.”¹⁹

Another study was conducted by analysts from the International Monetary Fund, which compared the behavior of oil spot prices and the non-commercial positions in three commodities: crude oil, copper, and cotton. The IMF study – acknowledging that COT data had numerous characteristics that hindered definitive analysis –concluded that “[crude oil, copper, and cotton] prices appear less volatile than speculative positions across commodities, with no discernible common trend between prices and speculation. For example, in the crude oil market there has been no persistent pickup in net long noncommercial positions in recent years when oil prices have had a strong upward trend. More strikingly, in the copper market, net positions have actually fallen steadily over the past year, during which prices have reached record highs, suggesting that contrary to common perceptions, speculation may not have played a major role in the recent price run-up.”

¹⁸ See Michael S. Haigh, Jana Hranaiova and James A. Overdahl, Office of the Chief Economist, U.S. Commodity Futures Trading Commission, “Price Dynamics, Price Discovery and Large Futures Trader Interactions in the Energy Complex,” April 28, 2005.

¹⁹ Weiner, *Do Birds of a Feather Flock Together: Speculator Herding in the World Oil Market* (Washington, DC: Resources for the Future Discussion paper, June 2006).

The IMF study left open, however, the possibility that – for shorter periods of time – there may be a stronger link between the positions of non-commercials and prices: “while the series do not appear to be correlated over the long run, for most commodities some correlation appears to be present over subperiods, as peaks and turning points seem to occur around the same time across the two series.”²⁰

Some Illustrative Analyses of Financial Market Effects on Oil Prices

If it is unsurprising that simple correlation studies would fail to find a long-term, systematic relationship between oil prices and the changes in trading positions, there remains an apparently large community who appear less impressed with an absence of statistical proof and more impressed with practitioner statements – such as those by Mr. Greenspan and Mr. Mabro – that appear to take for granted that financial markets have a *sui generis* impact on oil prices.

At the most general level, regulators appear to take for granted that “the funds” can affect the markets in which they participate. For example, the U.S. Federal Reserve Board’s Patrick Parkinson testified before Congress that “Although the role of hedge funds in the capital markets cannot be precisely quantified, the growing importance of that role is clear. Total assets under management are usually reported to exceed \$1 trillion. Furthermore, hedge funds can leverage those assets through borrowing money and through their use of derivatives, short positions, and structured securities. Their *market impact* is further magnified by the extremely active trading of some hedge funds. The trading volumes of these funds reportedly account for significant shares of total trading volumes in some segments of fixed income, equity, and derivatives markets.”²¹

²⁰ Sergei Antoshin and Hossein Samiei, “Has Speculation Contributed to Higher Commodity Prices?” in Name of IMF Report, (Washington, DC: International Monetary Fund), pp. 15-18.

²¹ Patrick Parkinson, Deputy Director, Federal Reserve Board, Division of Research and Statistics, “The Role of Hedge Funds in the Capital Markets,” Testimony Before the Subcommittee on Securities and Investment, Committee on Banking, Housing, and Urban Affairs, U.S. Senate May 16, 2006. Emphasis added.

The June 2006 report from the Senate Permanent Subcommittee On Investigations titled “The Role Of Market Speculation In Rising Oil And Gas Prices: A Need To Put The Cop Back On The Beat” cited (in addition to Mr. Greenspan), Citigroup, Goldman Sachs, and eminent energy economist Philip K. Verleger, Jr. as being in the camp of those who believe there is a relationship between financial market activity (specifically, speculation, which is a narrower form of participation than we are reviewing in this paper), and oil prices.²²

Clearly, given the different ways financial institutions participate in financial oil markets, simple regressions of the market positions of any particular cohort of market participants (including “non-commercials”) with price changes are unlikely to be revealing. The trading community is much too variegated to have a simple, measurable effect. The fact is that financial markets offer a variety of participants, each with its own directives and trading strategies. Therefore, the effects of the oil trades of these participants would rarely flow in the same direction. An analysis of the long-term relationships between any particular group of traders and the price of oil or gas, therefore, is unlikely to provide much insight.²³

More fundamentally, it would be naïve to expect any sustained causation between trading strategies and prices. Some trading strategies are based on the belief that markets eventually maintain fundamental relationships, and trades reflecting that belief can act as stabilizers to the market, and slow a market’s adjustment to new developments. Chartists and trend traders, in contrast, can push the market quickly to new levels and can exaggerate price moves. Macro funds provide a linkage between commodity markets and other global investment markets. Fundamental commodity funds may actually enable futures prices to reflect the current expected

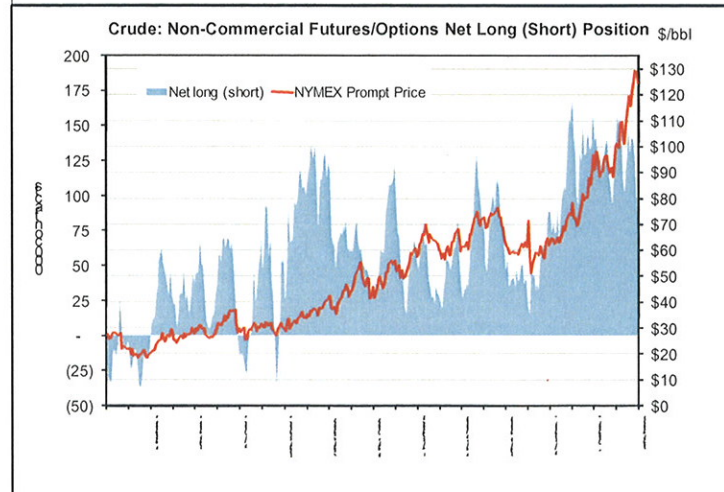
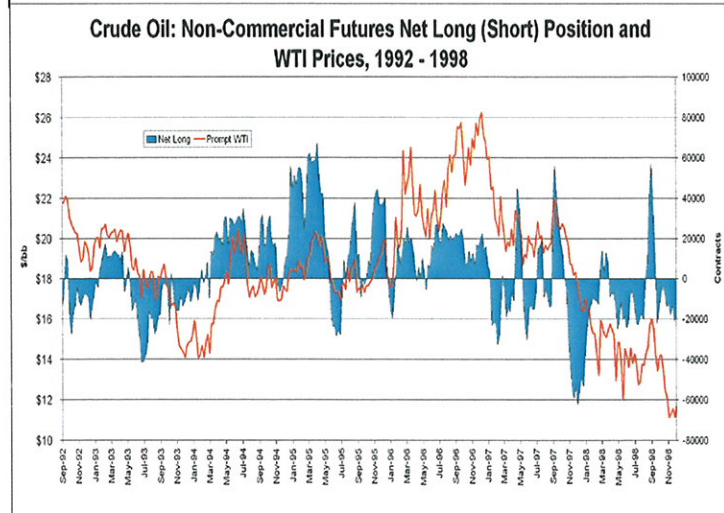
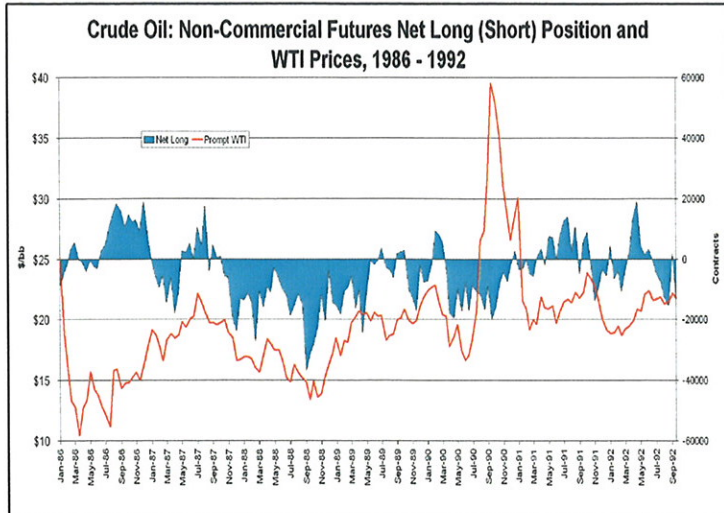
²² Coleman [2006], p. 24-25.

²³ Economists call the tendency of traders to engage in similar strategies “herding.” Robert Weiner has shown that there is little evidence of systematic and prolonged herding in the financial oil markets.

future outcome, where current publicly available information is inadequate or inadequately distributed.

There are, nevertheless, several areas where causation should not be dismissed, all of them consistent with normal economic analysis:

1. *Perfect storm* episodes: there are likely to be periods of time when the condition of the physical energy market and trading strategies of financial market participants are in such good alignment as to produce “herding” and “bubbles” or their opposite, crashes.
2. *Variations on the market power syndrome*: It is possible that the positions of some market participants – index funds as one example – are so large as to constitute witting or unwitting market power. A large-scale infusion or retreat from any of the various positions very large index funds might have price effects. The contract volumes involved in such shifts may -- in the scale of oil trading -- be quite large, but in the scale of money under management by these funds, be quite small. The index funds may be the “elephants in the bathtub” – especially in the long-dated markets.



Analysts have traced developments in total open interest in the WTI futures contract and the price of prompt WTI. At a simple level, the correlation of these two data sets has an R^2 of 0.6 over the entire 1983 to 2006 period. In keeping with a theory that the financial markets occasionally have little impact on oil prices, there are periods (e.g., from 1996 to mid-1999) when there was a very low correlation between them, and other periods (e.g., from January 2001 to October 2006) when the correlation was quite strong (an R^2 of 0.8). These results invite a theory that (1) index funds may be biased to the long side of the WTI contract, perhaps because a long position in oil is used as a hedge against inflation, and (2) they tend to follow trends. That theory holds up

quite well during the bull market for oil and other commodities that was evident from 2001 to 2006.

The analysis of the net positions of non-commercials reveals periods of greater and lesser correlation, *as is to be expected* given the dispersion of trading programs. The charts nearby define a net position as long minus short open interest, and break the 1986-2006 period into three parts:

1. 1986 to 1992, when (except for the period marking the Iraqi invasion of Kuwait and before the onset of the Gulf War that expelled Iraq from Kuwait) WTI was trading in a range of \$10 to \$20/bbl. During this period, non-commercials were usually net short and their swings from net long to net short appeared to coincide with decreases in the price of WTI.
2. 1992 to 2001: Non-commercials' positions oscillated between net long and net short in long trading cycles that tracked a WTI trading pattern between \$14 and \$26/bbl. At the end of that cycle, during the period marked by the Asian financial crisis, WTI prices sank to nearly \$10/bbl.
3. 2002 to 2007: a great and extended bull market, beginning from the depths of the Asian economic crisis, brought oil prices from \$20 to \$100. The non-commercials were usually on the long side of this trend. Open interest in the WTI contract rose rapidly during this period. Anecdotal evidence indicated new money from index and pension funds, pulled into oil markets by financial advisors urging their clients to increase their long exposure to commodities. This inflow would have helped to accelerate the oil price increase. Their high rates of return in 2004 and 2005 fed the impulse of other funds to get on the long side of oil. This trend continued into 2006 and 2007. When it appeared towards the end of the year that the long bull market was over, funds rapidly bailed out of their positions,

accentuating the downward pressure on prices which pushed prices back towards \$80/bbl towards the end of the year.²⁴

In these charts, the visual correlation between the net positions of the non-commercials and the price of WTI occasionally supports a conjecture that sudden changes in the preferences of speculators may be among the causes of changes in the price of oil.

A third approach to the study of the effects of financial energy markets is to evaluate the relationship between the spread positions in the NYMEX WTI contract and the price of WTI. The volume of spread trades has increased enormously, and now outweighs the number of outright trades. It is interesting to observe that there is a high positive correlation (R^2 of 0.86) between the amount of open interest in spread trades (futures and options) and the price of WTI. Without knowing more about the structure of the time spreads (a study that goes beyond the scope of this report but which might yield some interesting results), it is difficult to know exactly what the implication of this correlation is.

Having reviewed these issues, it is important to note that neither hedge funds nor any other cohort of the speculator community are infallible. There are limits to the ability of speculators not only to anticipate but also to influence markets. While WTI is an excellent vessel for holding traders' fears and hopes, the very complex dynamics of global crude oil physical demand and supply exerts itself inexorably, albeit opaquely (because of the highly imperfect state of world crude supply and demand data).

There is an inclination, especially among traders, to assume "the financial market is always right." The record clearly shows, however, that speculators are far from infallible. As the

²⁴ It is important to note that the charts match *weekly* COT data with the price of prompt (first month) WTI. Correlation statistics are highly sensitive to the time period chosen, which is consistent with a theory that the influence of financial markets on oil prices waxes and wanes. The inter-relationship between events in the physical market and financial markets are extremely complex.

example of Amaranth (and its predecessors like Long Term Capital and Metallgesellschaft), they often make mistakes. Their mistakes are visible both in outright and in spread trades.²⁵

ESAI has maintained a proprietary database of crude oil supply and demand (aka, refinery intake of crude oil) since 1984. It has developed several metrics of the condition of global crude oil supply and demand. One of those metrics, ESAI's "Crude Balance," which measures the surplus or deficit of crude supply versus demand, indicated for the winter and spring of 2003 that, while the speculators were aggressively short-selling WTI, the global fundamentals were quite tight. At the same time, there were plenty of political issues (tensions in the Middle East, deteriorating supply conditions in some exporting countries) that were keeping market participants – with the exception of speculators in the WTI market – extremely apprehensive. Thus, the spring of 2003 represents a case where “the non-commercials” had a bearish view of the market, but “the fundamentals” drove the market the other direction.

Regulatory Implications

Our ongoing evaluations of the ebb and flow of demand and supply in financial energy markets has caused us to focus particularly strongly on the activities of professional speculators. Speculators, such as commodity funds, move in and out of the oil markets for reasons that may have nothing to do with oil (e.g., because a trading program has noted an historic propensity for oil to move one way when pork bellies move another). It is possible that a sudden decline in demand for paper barrels – occurring because one or more large players suddenly decides to

²⁵ Amaranth reportedly lost \$3 billion in a period of a few months by trading in the hyper-volatile U.S. natural gas market. For an account, see “Betting the House and Losing Big,” *The New York Times*, Sep, 23, 2006.

abandon oil as a financial instrument – causes a decline in paper oil prices that quickly reduces the value of physical barrels.²⁶

Given this review, it appears to me that – largely because of data quality issues -- the effects of financial markets on energy prices is (to return to Gregory Treverton’s useful distinction) a mystery rather than a puzzle. As such, it is a problem that more amenable to an “intelligence” approach to analysis (as in the Central Intelligence Agency), than to a purely statistical approach. Because of the global complexities of both the physical and financial energy markets, it is unsurprising that purely statistical analysis of the relationship between specific data sets (such as the open interest of non-commercials) and energy prices.

How can energy market participants anticipate large and sudden shifts in the financial energy markets? Not easily. At first glance, COT futures data tell a simple story: there is always a short for every long. As the volume and open interest change, then the long and short positions taken by commercials, non-commercials, and small traders change from day to day and week to week. As with physical market data, the COT data are imperfect at best. They are simply clues in a complex detective story. Why did non-commercials increase their short positions? Why did commercials and/or small traders do the opposite?

We agree with Mr. Greenspan and others who believe organized speculators now affect the value of many of the assets involved in world trade. No one would object to this if only soft drink prices were affected by their activities. But when they drive up the price of the fuels that keep people from freezing, of the equities that hold the store of wealth of savers, and of the

²⁶ Newspaper accounts in January 2007 indicated that “Wall Street commodity funds that have been investing heavily in energy futures are now loading up on agricultural commodities like corn and livestock futures.” See “Wall Street is Betting on the Farm,” *New York Times*, January 19, 2007.

currencies that determine a nation's stature in world affairs, it is no wonder that we hear cries of alarm from government officials.

In the United States, calls for reform of the rules governing speculation tend to focus on two issues: *greater disclosure* and *larger margin requirements*. On the disclosure front, the U.S. Commodities Futures Trading Commission, during the tenure of the Bush Administration, has been disinclined to apply futures-style disclosure requirements on the burgeoning over-the-counter market.

The implosion of Amaranth, however, has rekindled calls for greater disclosure.²⁷ The most prominent specific measure that has surfaced in Washington, DC is the "Oil and Gas Traders Oversight Act of 2006."²⁸ The act – only two pages in length – simply requires that "The [CFTC] Commission shall prescribe rules requiring such regular or continuous reporting of positions in a *reportable contract* in accordance with such requirements regarding size limits for reportable positions and the form, timing, and manner of filing such reports under this paragraph, as the Commission shall determine." A *reportable contract* is defined as "a contract, agreement, or transaction involving an energy commodity, executed on an electronic trading facility, or a contract, agreement, or transaction for future delivery involving an energy commodity for which the underlying energy commodity has a physical delivery point within the United States and that is executed through a domestic terminal."²⁹

Critics of this legislation contend that such disclosure will simply cause the trading activity to migrate away from the United States. This seems disingenuous: one of the

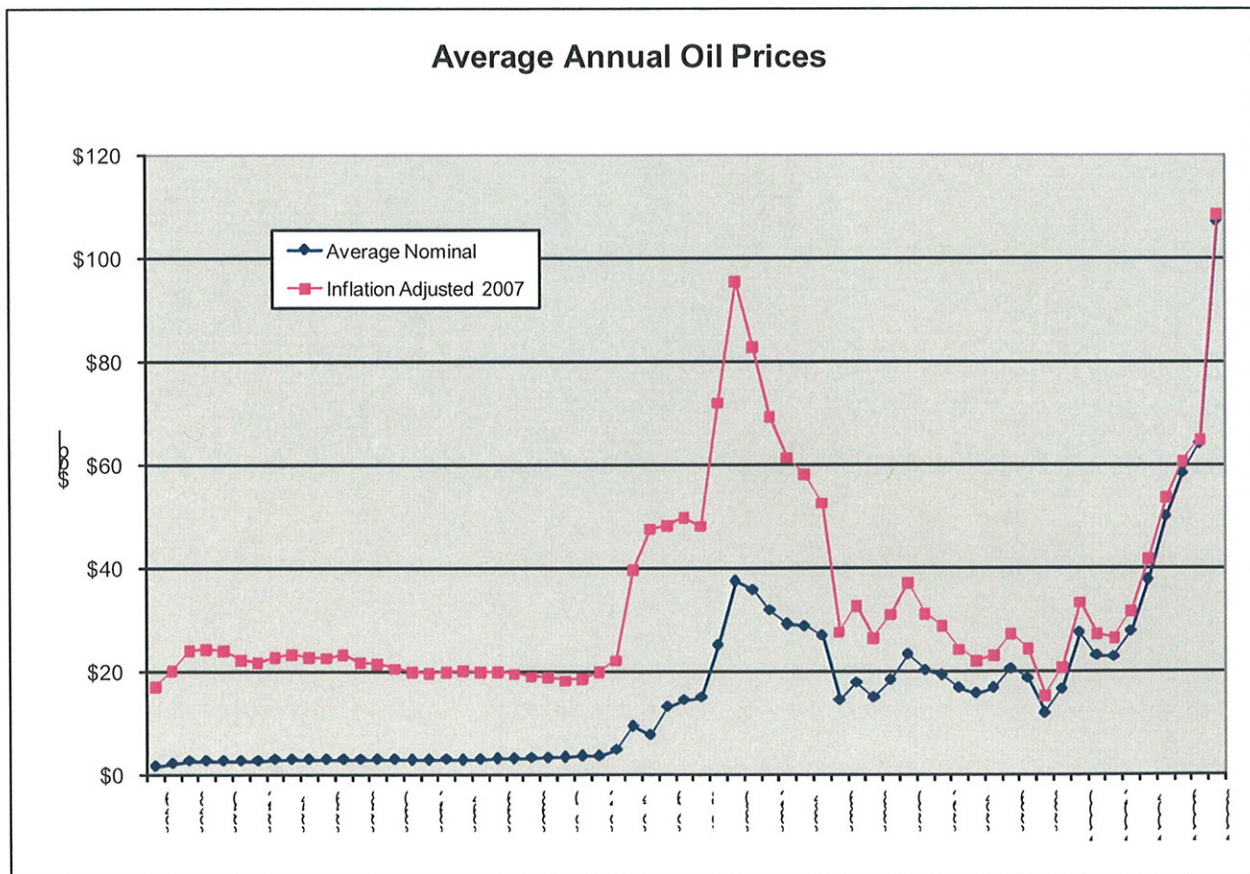
²⁷ See in particular, Coleman and Levin, *The Role of Market Speculation In Rising Oil and Gas Prices: A Need To Put the Cop Back On the Beat*, Staff Report, Permanent Subcommittee on Investigations, U.S. Senate, June 27, 2006, page 3.

²⁸ The influential business journalist of the *New York Times*, Gretchen Morgenson, called for passage of the Act in a September 24, 2006 article titled "Dangers of a World Without Rules."

²⁹ *Oil and Gas Traders Oversight Act of 2006*, available at <http://thomas.loc.gov/cgi-bin/query/z?c109:S.2642>.

reasons these markets use American futures contracts as benchmarks is because they have faith in the underlying integrity of the American financial system, in comparison with the alternatives. There seems to us to be no compelling reason not to require such reporting, at least for US-centered trade, and for European and Asian regulators to implement similar reporting programs.

On the issue of *margin requirements*, we believe the influence of speculators cannot be eliminated without throwing the baby – the efficacy of market forces – out with the bath water. Government officials and most well-informed market participants are aware that markets cannot thrive without the depth and liquidity speculators add to markets, without speculators to embrace the risk that others shun, and without speculators’ restless pursuit of new financial instruments that – in spite of all of the concern about derivatives – still promote financial flexibility and creativity. In short, speculators make markets work better, albeit at a cost.



The cost, as both the academic literature and practitioners recognize, is greater volatility. Markets with higher concentration of professional speculators tend to exhibit greater price volatility. In the short run, say, over a couple of months or at most a few years, this volatility is inconvenient and even painful to those on the wrong side of the price cycle. Thus, the relatively high oil prices of 2002 to 2008 are painful for consumers, the low price of 1998 for producers.

In the long run, however, we find that commodity prices and exchange rates in freely traded markets tend to return to an economically rational level. Thus, oil prices – thought in the late 1970s and early 1980s to be on a constantly rising path – in fact showed a remarkable propensity to return to a very long-term average level of around \$25 per barrel, as shown in the chart above, which depicts oil prices since 1946 in inflation-adjusted terms. After 2000, the price ratcheted up to levels not seen (in real terms) since the 1980 oil crisis. It appears from our analysis that the increase in demand for paper oil barrels over the past several years helped to drive those prices up. But if we have learned one thing about commodity speculators over the years, it is that they are quite willing to trade a commodity down as well as up. Thus, if the fundamentals of oil – the supply curve, the levels of demand, and inventories – conspire to drive short-term prices back down to that long-term \$25/barrel level, speculators will ultimately help to get it there.

If the desire to regulate speculators further cannot be restricted to just additional disclosures, the most direct and effective measure would be to reduce their leverage by *increasing the margin requirements in exchange traded markets*. Funds and exchanges, of course, will resist this suggestion because it would adversely affect the liquidity of their markets. And so it would, but if this segment of the financial community does not regulate itself more

effectively, chances increase that governments will ultimately regulate them, perhaps out of existence.

It behooves the defenders of the new *status quo* – market economists, investment bankers, and Fund managers – to do everything they can to shed maximum light on these markets. There is still an astonishing lack of disclosure of some of the information that helps make market forces explicable. Until January 2007, for example, only the American futures markets were required to collect commitment of traders data. In the future, it is likely that OTC markets will have to do so³⁰. Such vital market information as petroleum inventory levels are still not published in a timely basis by the leading oil producing countries. Saudi Arabia, the world's largest oil producer, fails to publish any timely details of its operations³¹.

Thriving markets have an insatiable appetite for information. It is up to governments – the same ones that have surrendered some of their controls to the market – to ensure that adequate flows of information exist to feed the markets to which they have entrusted their fates. Governments must insist that those who sell critical commodities and associated financial services – whether it be Saudi Arabia or ICE or NYMEX – disclose enough information to ensure that known abuses (like insider trading), and preventable problems (like development of market power by an aberrant single hedge fund or herd of funds) do not fatally undermine the efficacy of the markets. At the end of the day, markets exist because governments allow them to. Support for oil, gas, and electricity markets is ebbing, inside and outside the United States, and advocates of markets as the best way to organize energy activities must do all they can to shore up that support.

³⁰ On January 30, 2007, *Platts Energy Trader* reported that ICE was reporting large gas trading positions to the FTC on a daily basis.

³¹ See, however, www.JODIDATA.org for information about the Joint Oil Data Initiative, which is headquartered in Saudi Arabia.