Prepared Testimony of
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to

U.S. Commodities Futures Trading Commission

on

The Role of Speculators in Setting the Price of Oil

August 5, 2009

Mr. Chairman, members of the Commission, I appreciate the opportunity to appear today to discuss a subject of vital importance to the U.S. economy. For the past 30 years, I have followed the growth of oil commodity markets. During that period, I have prepared many articles and written two academic books on the subject. My views have often been controversial and my conclusions questioned when released or published. I am proud to note, though, that I have been repeatedly vindicated.

Today in my testimony I will offer a number of conclusions that no doubt will once again be questioned. As in the past, I expected to be vindicated.

I will begin with a standard disclosure. The views I express are my own and not endorsed by the University of Calgary or The Brattle Group, the Washington consulting firm that supports me. I will also state at the outset that I have received no financial support from any exchange—they have not even bought me a cup of coffee in 20 years—or any investment bank. My conclusions, for better or worse, are my own.

In this testimony, I will begin by summarizing my conclusions. I then provide analytical support in the subsequent sections.

Conclusions

The increase in crude prices between 2007 and 2008 was caused by the incompatibility of environmental regulations with the then-current global crude supply. Speculation had nothing to do with the price rise. This conclusion was recently validated by the International Energy Agency in its *Medium-Term Oil Market Report*.[1]

[1] *IEA Medium-Term Oil Market Report*, June 30, 2009, Price Section. The report is copyrighted but the IEA has provided a copy of the section for inclusion with this testimony.

The collapse in oil prices from July 2008 to December 31, 2008 can be tied to (a) the decline in demand that accompanied the spreading recession, (b) the increased availability of ultra-low-sulfur diesel fuel, the proximate cause of the price increase, (c) the decision by Congress to stop the Bush administration from filling the Strategic Petroleum Reserve (SPR), (d) the strengthening of the dollar, and (e) the possible liquidation of futures positions.

The price increase from January 2009 to July 2009 has occurred because firms in the energy business—including oil companies, trading firms, and banks—have been able to accumulate inventories without financial risk using the hedging techniques the Commission has overseen for its entire history. Some firms have earned risk-free returns by acquiring inventories, selling futures, and storing the oil. In years past, this near-record accumulation of stocks would have been welcomed by those who worry about energy security.

We will see several large price increases in the coming months and years absent changes in environmental regulations and/or settlement of the low-grade civil war in Nigeria regardless of the steps the Commission takes. As noted above, speculation has had little to do with the price increase and changes in regulations will not eliminate price volatility.

Actions by oil-exporting countries to limit production of low-quality crude oil will exacerbate the price cycle. The members of the Organization of Petroleum Exporting Countries (OPEC) cannot affect prices of light sweet crude but do control sour crude prices. Their actions discourage investment in refinery upgrades and perpetuate price swings.

Changes in crude prices are uncorrelated with flows of money into the two key WTI oil futures contracts offered by the InterContinental Exchange and the New York Mercantile Exchange. In other words, money flows into oil contracts have not affected oil prices.

Changes in crude prices are also uncorrelated with flows of money into or out of commodity funds. Again, the correlation is zero.

Commodity index funds act to stabilize oil price movements. Rebalancing due to changes in oil prices relative to other prices could cause these firms to add or subtract oil futures in a manner that tends to steady prices.

Imposing position limits on passive investors—or even banning passive investment in oil futures—would not affect the spot price of oil but would alter the incentive to hold inventories. If stocks decline, as history suggests they would, the market will become more volatile.

The use of futures markets by banks that do not take physical delivery but rather write financial options to firms producing or consuming oil and natural gas is vital. Any

measure that limits the access of financial firms to these markets would have serious adverse impacts on investment in oil and gas, ultimately causing dependence on imports to rise. Such regulatory proposals should be labeled for what they are, "energy capitulation."

The price increase from $70 per barrel in August 2007 to $147 per barrel in July 2008 was caused by the emergence of a new hydrocarbon.

We customarily describe the traditional energy system as consisting of three hydrocarbons: coal, crude oil, and natural gas. In the last year, however, the crude market has been split. Today, it is more appropriate to speak of sweet crude and sour crude as different types of hydrocarbons. In many instances, sour crude, or crude oil with high sulfur content, is no more useful in meeting consumer demands for petroleum products such as gasoline and distillate fuel oils than, say, coal.

The division of the two crudes can be traced to the introduction of stricter environmental standards by regulators in the United States and Europe. These rules now require that products such as diesel fuel contain almost no sulfur. Although refiners have installed equipment to remove sulfur from crude, the industry's desulfurization capacity has not kept pace with environmental mandates.

Once desulfurization units are filled to capacity, as they were in the first half of 2008, refiners can only produce products meeting specifications set by environmental regulations by processing sweet crudes containing little sulfur. Quite simply, these crudes can be more easily converted into products such as the low-sulfur diesel demanded by environmental regulators.

In 2008, however, the supply of low-sulfur crude oil shrank just as global demand for petroleum products started to increase. One factor that reduced sweet crude supply was the United States Department of Energy's decision to start adding this type of oil to the Strategic Petroleum Reserve in August 2007. Crude prices began to increase as the oil was removed from the market. In December 2007, I testified to the Senate Permanent Subcommittee on Investigations that the DOE action would push prices as high as $120. DOE ignored my warning. However, Congress heeded it and eventually passed legislation to force DOE to stop filling the SPR. Oil prices began to fall when the Bush administration finally complied with the law.

The low-scale civil war in Nigeria added upward pressure on prices. Crude produced from Nigeria contains almost no sulfur. During 2008 and 2009, Nigerian production has been seriously disrupted. Output today is roughly half of capacity. The loss accounts for perhaps eight percent of the global supply of low-sulfur crude.

The price rise from $70 to $147 per barrel can be explained entirely by the loss of sweet crude supply. Full details can be found in the IEA paper attached here and in a paper I prepared at the beginning of the year, which I also submit here for the record.[2]

It is important for the Commission and its staff to understand the role played by limited sweet crude supply in price formation. In the coming years, new environmental rules will require that more sulfur be removed from petroleum products. Because refinery investment in capacity to remove sulfur is still not keeping pace with changes in environmental rules, one can expect to see repeated episodes of dramatic crude price increases.

Pricing policies of oil-exporting countries exacerbate tightness in the sweet crude market.

In a competitive market, one would expect to observe a decline in sour crude prices relative to sweet crude. Our economic models predict that relative prices will change if the demand for one input (sweet crude) rises relative to the demand for a second (sour crude). Our models also predict that the widening spread between sweet and sour crudes would offer the financial incentive for refiners to construct desulfurization equipment.

However, such predictions assume the market is competitive. The sour crude market, which accounts for approximately three-quarters of the oil consumed in the world, is not competitive. Instead, production is controlled by OPEC, particularly Saudi Arabia. For two decades, Saudi Arabia has managed the market using the technique employed by DeBeers in the diamond market for many years. In the latter case, DeBeers held large inventories of various types of diamonds. It was the primary buyer from mining companies and the primary seller to diamond cutters. The firm would assign production quotas to mining companies and countries and inform buyers of the volumes and qualities of stones they would receive. Any organization that violated these instructions would be punished severely. If producers did not hold the line, DeBeers would dump large quantities of the type of stones produced by the miscreant on the market, causing the offender to suffer large losses. Buyers attempting to violate the system were simply cut off from supplies.

The DeBeers program clearly violated all U.S. and European competition laws. However, it was allowed to operate for years outside the United States—and it did stabilize prices.

Today, Saudi Arabia uses a similar system to keep sour crude prices high. At the beginning of each month, Saudi Arabia announces its pricing structure. For example, Saudi Aramco might inform buyers that the price of Arab Heavy delivered to the United States will be the average WTI price less $4 per barrel. European buyers might be informed that the price for Arab Heavy delivered to Europe will be the Brent price less

[2] See the *IEA Medium-Term Oil Market Report* and Philip K. Verleger, Jr., "Anatomy of a 10-Year Cycle in Crude Oil Prices," March 2009.

$3 per barrel, while Asian buyers might be told that the price of Arab Heavy will be the Dubai price plus $1 per barrel. Like DeBeers, Saudi Aramco offers specified volumes of oil that must be taken to specific destinations. This oil may not be resold. After learning of the current pricing structure, buyers tell Saudi Arabia how much oil they want to purchase. Saudi Arabia uses these nominations to set its production levels.

Thus by adjusting its differentials, Saudi Arabia can cause buyers to increase or decrease the volumes of oil they take. Recently, the Saudi differentials have been quite small, effectively eliminating any incentive for a refiner to make plans to invest in desulfurization equipment. Figure 1 traces the discount for Arab Heavy to WTI offered by Saudi Arabia to buyers from January 2002 to March 2009.

Other sour crude producers—such as Iran, Kuwait, and Iraq—follow the price signals emanating from Saudi Arabia. Within days, these countries announce their formula prices. Reviewing these prices reveals how closely they mimic the Saudi differentials. These producers go along for one very simple reason: they do not want Saudi Arabia to dump large volumes of sour crude on the market. Like DeBeers in the diamond market, Saudi Arabia has the power to cause severe economic harm to these other producers. The Kingdom's threat has been successful. Figure 2 compares output of OPEC nations, graphed on the horizontal axis, with the differential offered by Saudi Arabia for heavy crude, graphed on the vertical axis.

As noted, the Saudi strategy makes it unprofitable for refiners to invest in capacity to remove sulfur. Desulfurization capacity is very costly and requires two to three years to construct. Given the low profitability of refining today and the narrow differentials in the market, most refiners will not upgrade. Indeed, I believe the only large refiner making such investments today in the United States is the Motiva venture, jointly owned by Saudi Arabia and Shell.

The absence of investment combined with the desire of environmental regulators in the United States and other countries s to remove sulfur from petroleum products implies that sweet crudes such as WTI will experience larger and large price swings over the next few years. The swings have nothing to do with speculation.

The oil price collapse from July 2008 to December 31, 2008 can be traced to the recession, the weakening euro, and the congressional decision to suspend filling of the SPR.

Three events triggered the oil price decline that began in July 2008. First, the exchange rate of the euro fell versus the dollar. Second, DOE stopped putting crude in the SPR. Third, the spreading global recession reduced demand.

The dollar/euro exchange rate played a significant role in the rise and fall in crude prices during 2008. In the spring, the euro rose against the dollar. At the time, the incremental demand for sweet crude came from Europe as European suppliers switched to ultra-low-sulfur-diesel fuel. Europeans paid for the diesel fuel in euros, not dollars. As

supplies were constrained, prices in Europe had to rise to clear the market. It was the Euro price that rose. The weakening dollar sent the dollar price of diesel and crude even higher.

Evidence of the dominance of European buyers in the market can be found in U.S. export statistics. In 2008, the United States began exporting serious volumes of distillate fuel oil to Europe for the first time in ten years. Diesel fuel manufactured by U.S. refiners was put on ships and sent to Europe because European refiners could not meet indigenous demand. The fact was noted on a web page of the French oil company Total. Figure 3 traces the monthly data on U.S. distillate fuel oil exports from January 1990 to October 2008.

The euro started to decline following Russia's invasion of Georgia. The attack demonstrated the political fragility of the EU and sent buyers to other currencies. The dollar price for diesel sold to Europe decreased as the dollar rose. Sweet crude prices, which followed diesel prices, fell as well.

Simultaneously, diesel supply increased. Much of the boost can be traced to a congressional act that forced DOE to halt its addition of light sweet crude to the SPR. This was followed by the completion of changes at U.S. refineries that boosted production of low-sulfur diesel.

The price decline then accelerated as the global recession spread.

The oil price increase from January 2009 can be traced primarily to the incentive to build inventories offered by high forward prices and cheap money made available to banks by the Federal Reserve Board.

Traders have used forward markets for centuries to facilitate inventory accumulation. This purpose is understood by only a few—and certainly not Charles Gibson, the ABC Evening News anchor.[3] What Mr. Gibson and most other Americans fail to understand is that under the right conditions in futures markets, traders can acquire inventories of a commodity with very little financial risk. Most experts on the subject recognize that in doing so these traders are not "speculating" on higher prices but rather performing the absolutely essential economic function of price stabilization.

The accumulation of such stocks is not speculation because the firms engaging in this act have nothing at risk and *nothing to gain above the margins they have locked in* by acquiring stocks. The transaction is often referred to as a "cash-and-carry transaction." In a cash-and-carry transaction, a firm will buy physical lots of a commodity, place the lots in storage, and sell futures contracts at a higher price, thus locking in a margin. The difference between the forward price and the cost of the commodity, including the storage expense, is all the firm can ever make from the transaction. The firm earns the profit (assuming the lot is delivered) regardless of the spot price movement. That is, *it earns no more and no less*.

[3] See "Over a Barrel: U.S. Oil Addiction," *20/20*, ABC News, July 24, 2009.

In early June, Bloomberg described JPMorgan's use of the cash-and-carry transaction. JPMorgan purchased approximately 2,770,000 tons of gasoil (two million barrels) at a price of roughly $550 per ton. The bank hired a supertanker at a rate of between $35,000 and $41,000 per day to store the oil, according to the article. The piece also indicated that JPMorgan hedged its transaction by selling the oil in the futures market, noting that oil for delivery in August was selling for $583 per ton.[4]

Had JPMorgan sold the oil for delivery in August, it would have earned a profit on the transaction of $24 per ton, or $6.4 million dollars, no matter what happened to the gasoil price. The profit is figured as the difference between the futures price, $583 per ton, and the cash price $550 per ton, less the cost of storage, which would be around $9 per ton. JPMorgan would have earned this profit if gasoil prices collapsed to $2 per ton or rose to $1,000 per ton. The profit was set when JPMorgan entered the transaction.

The International Energy Agency noted that such margins are not earned from speculation, despite what ABC News anchor Gibson asserted in the *20/20* special on oil: "Strictly speaking, however, it is arguable whether the term, speculation, includes an act of arbitrage, which by definition is risk free, while speculation must, again by definition, entail a degree of risk taking and making bets on the future direction of oil prices."[5]

For 30 years, energy policymakers have sought measures to promote inventory accumulation because they believe higher stock levels tend to dampen price fluctuations. The U.S. government has spent billions of tax payer dollars building the Strategic Petroleum Reserve for just this purpose.

In the last ten months, we have observed a very large increase in global inventories thanks to the "cash-and-carry" incentive. During this period, over 700 million barrels of oil have been accumulated. These stocks will eventually serve as a buffer when global demand increases. Figure 4 shows the volume of world inventories by month from January 1990 to April 2009. Note that stocks are climbing toward the record levels set in 1998. The rise is attributable to the ability to hedge.

The stock build has removed surplus oil from the market and lifted prices back to the $60-per-barrel range from $30-per-barrel range observed at the beginning of the year. Some, including prior witnesses at these hearings, have objected to the price rise. These observers are terribly shortsighted because they fail to recognize that persistent low prices, say below $50 per barrel, will discourage private investment in oil and gas exploration. Such critics also fail to recognize that persistent low prices discourage and prevent investment in energy alternatives that hold a long-run promise of reducing harmful greenhouse gas emissions.

The price rise from January through July is explained, then, by the stock accumulation prompted primarily by cash-and-carry transactions. Those accumulating

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[4] Alaric Nightingale, "JP Morgan Hires Supertanker for Storage, Brokers Say," Bloomberg, June 3, 2009.
[5] *IEA Medium-Term Oil Market Report*, June 30, 2009, p. 100.

stocks are not "speculating that prices will rise." Rather they are engaged in transactions on commodity markets that have been recognized for centuries.

Prices could have been stabilized by government intervention.

In July, President Sarkozy of France and Prime Minister Brown of the United Kingdom called for international action to stabilize oil price fluctuations.[6] Their plea is welcome. There is a long history of international efforts to stabilize commodity fluctuations. Some of these have succeeded.

John Maynard Keynes laid out the blueprint for price stabilization more than 50 years ago. At the same time, he lobbied for the creation of international banking institutions. The world accepted his proposals on banking and, as a result, we now have the International Monetary Fund and the World Bank. Commodity stabilization programs, while controversial, have been attempted for commodities such as coffee and tin.

Experts recognize that the successful stabilization of commodity prices does not require intervention in financial markets but rather the use of government-controlled inventories or "buffer stocks." A review of history reveals that stabilization schemes have worked where governments accumulated and used buffer stocks to tame commodity price volatility.

Following the 1973 oil price increases, governments of industrialized countries embarked on a program to build "strategic stocks" of petroleum. These inventories now amount to 1.6 billion barrels, according to the International Energy Agency. The stocks could have—and should have—been used last year to moderate the crude price increase. Prices would never have passed $100 per barrel in 2008 had the United States and other countries released stocks of sweet crude to meet refiner needs. *Such action would have stopped the oil price increase.* ***No other action would have affected the spot price.***

The role of passive investors in the oil market is difficult to measure.

A number of commentators have asserted that the flow of cash into the oil market and other commodity markets affects cash prices. The empirical evidence to support such claims is, at best, very weak.

I can find no evidence that the injection of cash into oil futures has any effect on oil prices. To test the possibility of such an effect, I created a database using data from July 1, 2004, to the present that measures the injection of cash into the light sweet crude oil contracts (WTI contracts) traded on the NYMEX and ICE exchanges. Every day I calculate the total value of outstanding open interest. I also calculate the value of yesterday's open interest at today's prices. Any difference in the sum represents the injection into or removal of money from the two contracts.

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[6] Gordon Brown and Nicolas Sarkozy, "Oil Prices Need Government Supervision," *The Wall Street Journal*, July 8, 2009, p. A15.

From time to time, I conduct correlation tests. The results of the tests can be shown in a graph with the percentage change in price shown on the vertical axis and the percentage change in the amount invested in WTI on the horizontal axis. If there were a perfect relationship, all the points would lie on a diagonal line, as shown in Figure 5. A perfect correlation would reveal that the money injected into WTI by any investor had a relationship to the price change.

Statistical tests reject this hypothesis. The correlation between the price change and the amount invested is 0.00. The correlations remain at these levels even when one applies statistical tests over sub intervals using the approach developed by Professor Gregory Chow.[7] Figure 6 shows a scatter diagram comparing the actual percentage change in investment in NYMEX and ICE WTI futures contracts with the actual percentage change in price.

In short, there is no correlation between the amount invested in oil and oil price movements.

I have conducted a second test using estimates of amounts invested or withdrawn each week derived from information supplied by the CFTC in its *Supplemental Report on Positions of Commodity Index Traders.* Using the data and the formulas published by Goldman Sachs and UBS (formerly AIG), I have constructed estimates of the amount invested in each index by week. Then, again using the formulas, I have calculated the amount invested in WTI.

I have performed the same statistical test between investment flows into the commodity indices and the spot crude oil price as described above. The correlation between the money flowing into or out of the indices is also zero. Thus I conclude that the impact of incremental purchases of futures by investors in commodity indices on the change in prices is zero. Figure 7 shows the relationship between the price change and the change in investment in the S&P GSCI and DG-UBS indices.

Passive investors do, however, influence oil prices. Over time, the rebalancing of futures positions tends to stabilize prices. The stabilizing influence occurs because fund managers rebalance portfolios as prices rise and fall. Thus, when oil prices rise, a manager following the formula for the S&P GSCI or DJ-UBS indices will sell futures to maintain the proper dollar allocation to oil. Conversely, the same managers will sell futures (or buy fewer contracts when positions are rolled) if oil prices rise relative to other commodity prices.

The effect of these actions is captured in Figures 8 and 9. Figure 8 shows the number of WTI futures that managers in the S&P GSCI and DJ-UBS indices would hold if they rebalanced daily. Also shown in Figure 8 is the crude oil price. One can note that

[7] See Gregory C. Chow, "Tests of Equality Between Sets of Coefficients in Two Linear Regressions," *Econometrica* 28, No. 3 (1960), pp. 591–605

the number of contracts owned by these funds declined as prices rose and then increased as prices fell.

Figure 9 compares the percentage change in WTI prices, graphed on the vertical axis, to the percentage change in open interest in light sweet crude contracts, shown on the horizontal axis. Note the strong negative relationship. This indicates that open interest declines as prices rise and increases as prices decrease.

These graphs demonstrate a very important point. *Index investors seem to counteract the role of OPEC. When OPEC nations cut production to raise prices, the empirical evidence shows that index investors liquidate positions, putting downward pressure on prices. On the other hand, when prices fall, index investors buy more futures. They are in, short,* ***a force for price stabilization.***

These findings make intuitive sense. For years economists have noted the tendency of commodity markets to go through prolonged periods of backwardation. At such times, inventories tend to be low, leaving markets vulnerable to sudden supply disruptions. Those of us who have followed oil markets since their creation often bemoan the dearth of longs in the market. For example, one could make a good case that refiners should hedge crude costs and sell gasoline futures. However, refiners cannot implement the program because there is no way of getting consumers to buy gasoline futures. Because the growth of the gasoline futures market has been "stunted," the growth of the crude futures market has been limited. The lack of buyers of crude futures discouraged firms from holding extra inventories. These "missing longs" prevented the market from functioning as well as it could.

The entry of index investors solved this problem. Index investors are the missing long. Their buying has promoted inventory accumulation.

Futures contracts provide an important mechanism for promoting energy independence by reducing the cost of investing in oil and gas exploration.

The Commission seems inclined to impose position limits on banks and financial institutions that use futures markets. This would be a mistake because it would raise the cost of investing in oil and gas development, thus further frustrating the nation's effort to achieve energy independence.

Every U.S. president since Richard Nixon has supported the pursuit of energy independence. President Obama has reaffirmed this goal. It is widely recognized that energy independence can only be achieved through aggressive conservation and increased development of U.S. oil and gas reserves. Most observers would agree that increased development of Canadian resources is also important.

The development of these resources has involved large and small corporations. The ability to hedge using exchange or off-exchange instruments has allowed many good smaller firms to expand rapidly. Newfield Exploration Company, for example, is a small

firm begun in 1990 that today produces 35,000 barrels per day of crude and 180 billion cubic feet of natural gas per year. Newfield's use of financial derivatives is well known.

Many of the firms engaged in oil and gas development purchase puts from financial companies. The puts provide a price floor that guarantees the development firms a cash flow even when market prices fall below the floor. These companies tend to prefer put options to the sale of futures because they can avoid the large margin requirements associated with futures should prices rise.

The financial firms that offer these instruments often transfer their risk to the futures market. The CFTC's special reports on bank participation in futures and options documents their use of these instruments. As can be seen from Tables 1 and 2, banks account for a large share of the open interest in futures and options.

The firms that write options to producers need to sell futures as prices fall in order to remain "delta neutral." Similarly, financial companies selling call options need to buy futures to remain hedged as prices rise. Imposing position limits on financial firms could raise the cost of these services or even make it impossible for financial institutions to offer them. *To repeat, imposing position limits on financial institutions' ability to buy or sell futures to remain balanced when writing options for producers will quite likely cause such services to be curtailed.* The result will be increased costs for exploration and development of oil and gas reserves and hence the continued frustration of efforts to reduce dependence on OPEC.

Imposing higher margin requirements on firms engaged in exploration and production will have the same effect. Today, many E&P firms hedge through their investment banks. Blythe Masters of JPMorgan provided an excellent explanation of how a firm might hedge today in her testimony to the Commission on July 28. Referring to "right-way risk," she explained that JPMorgan may take collateral against the firm's assets to secure a swap. She also noted that if prices rise, the value of the collateral will increase as well, effectively leaving the bank protected.[8]

The ability to hedge in this fashion reduces the cost and risk associated with exploration and production. The result is greater investment in the activity and an increase in non-OPEC output, effects that are clearly consistent with the goal of energy independence.

The benefits described above apply equally to consumers, especially airlines. Banks and financial institutions write calls to airlines seeking to protect their exposure to higher prices. Imposing position limits would limit the ability of the financial institutions to offer such instruments—or would raise their cost. In the long run, adopting such a rule would probably hasten the collapse of some of the financially weak airlines.

Ironically, the chief council of Delta Airlines, Mr. Ben Hirst, speaking for the Air Transportation Association, asked the CFTC to assist in the execution of the financially

[8] Testimony of Ms. Blythe Masters to the Commodity Futures Trading Commission, July 29, 2009.

weak airlines in his testimony on July 28 by calling on the CFTC to impose strict position limits.[9] A cynic might suggest that Mr. Hirst and Delta hope the increased volatility caused by stricter position limits would force one or more of its competitors to close. However, such speculation is unfair. In fact, Delta Airlines and the ATA just fail to understand the consequences of the actions they seek.

Unfortunately, this is not just an issue of misunderstanding. Imposing higher margin requirements and lower position limits on financial firms writing options would almost certainly cause a competitive disaster. The world's dependence on oil exports from OPEC would rise, as almost certainly would prices. The cost of fuel for airlines would increase and some would be forced to close. U.S. and world consumers would be the losers. They would pay more for fuel, see more of their GDP transferred to the oil-exporting countries, and be forced to suffer as competition in air transport declined.

In conclusion, the CFTC should proceed very carefully in imposing position limits on energy markets or making other changes.

I approach this issue as a 30-year veteran of energy policy debates. I have participated in the growth of futures markets but my focus has been on oil markets, the way in which oil prices are set, the operation of the oil cartel, and the drive to achieve energy independence. With this background in mind, I am concerned that some measures that have been suggested would have the unintended effect of increasing dependence on OPEC and boosting the transfer of wealth to the cartel. I note that some EPA actions have inadvertently had such an effect. I would hope the CFTC does not further aid and abet the transfer of wealth to OPEC.

I also note that the 2007/08 increase in oil prices that precipitated this hearing was caused by fundamental factors, not activities on futures markets. The report by the International Energy Agency attached to my testimony supports this conclusion.

With this background, let me briefly address the questions addressed to the witnesses.

> *Should position limits be applied consistently across all markets and participants including index traders, managers of Exchange Traded Funds, and issues of Exchange Traded Notes?*

My answer to this question depends upon the meaning of the phrase "all markets and participants." I can see objection to imposing position limits on index traders, managers of Exchange Traded Funds, and issuers of Exchange Traded Notes, although my research suggests that index traders and others exert a stabilizing influence on markets. On the other hand, I believe that imposing position limits on financial institutions could conflict with the national goal of reducing oil imports.

[9] Testimony of Ben Hirst for the Air Transport Association to the CFTC, July 28, 2009.

Will the imposition of position limits affect the function of markets with regard to integrity and efficiency?

The answer here depends on the limits imposed. I doubt the imposition of limits on index traders, managers of Exchange Traded Funds, and issuers of Exchange Traded Notes would have any impact on the market.

Will position limits have any impact on the risk management of clearing houses?

I am not an expert on the risk management approaches used by clearing houses but I have to believe they have developed the expertise to manage risks. The fact that the profits of ICE and the NYMEX increased in 2008 despite the fact that oil prices moved from $80 to $147 to $30 per barrel and that Bear Stearns, AIG ,and Lehman Brothers collapsed suggests they should have no trouble.

Does the CFTC need additional authority to implement such limits?

I am not a lawyer and thus not qualified to answer this question in detail. However, I was an expert witness in one major dispute regarding oil futures (Metalgesellschaft). I was also an expert witness in the Transnor dispute where Judge Walker ruled that the Brent contract was subject to the CFTC's jurisdiction. Through my work on these disputes, I gained extensive familiarity with CFTC regulations and the authorizing legislation. Based on that experience, I would argue that Congress should (a) repeal the "Enron" exception and (b) give the CFTC the authority to impose the same type of regulations on over-the counter transactions as imposed on exchange-traded instruments. In particular, the CFTC should have the power to impose position limits on a firm or customer-specific basis.

As noted above, I strongly believe the CFTC should not restrict the ability of financial institutions to offer protection to buyers or producers of energy. However, this does not mean the Commission should not have the authority to impose limits should some institution abuse its privileges.

What methodology should the Commission use to determine position limits for each market?

What quantitative measure should be used in setting limits on the size of an individual trader's positions?

Limits on commercial firms involved in the energy business should be set based on their demonstrated use of futures. No limits should be set on financial institutions for the reasons noted above. Limits on noncommercial participants should be based on hard empirical research.

Should the limits be established by percentage or proportion of the open interest of the market or by fixed numbers of allowed contracts?

Limits should be set in fixed numbers of contracts, as has been done historically. Limits should be also specific on a per trader basis as done historically. The limits should be adjusted on an annual or biannual basis. Access to the market should not be rationed by setting a specific number of contracts for one group of traders as suggested by some.

Should limits apply to all months combined or to individual months?

The limits should be specified in terms of total positions and with regard to the last three contracts. Noncommercial firms should not be allowed to accumulate large positions in the spot month as they have in recent years.

How should spread traders be incorporated in the setting of position limits?

Research is required here. It appears that spread traders make it possible for noncommercial traders, including investors, to take positions in long-deferred futures contracts, while allowing commercial firms to hedge production in the next 24 to 36 months. There is little evidence that producers want to hedge production expected for delivery more than two or three years forward, while some investors want to take positions in oil for delivery well into the future. Spread traders seem to facilitate such transactions. Hard data are required to confirm this conjecture.

Should the Commission limit the aggregate positions held by one person across different markets?

The answer here is "it depends" on circumstances. In the Metalgesellschaft matter, MG managed to obtain a large share of the heating oil and gasoline long side positions. Other firms, principally Tosco, were able to gain significant market share on the short side because they were a delivery location for gasoline and heating oil on the NYMEX. The consequent battle between the parties caused a significant decline in crude prices in 1992. The price decrease would not have occurred had such a rule been in effect.[10]

Should exemptions from position limits be permitted for anything other than bona fide hedges for the conduct and management of a commercial enterprise?

The answer here depends on the meaning of the phrase "conduct and management of a commercial enterprise." If the term applies to banks that write hedging contracts for consumers such as airlines and firms building plants to process oil sands, the answer is no. If the term does not encompass banks and those writing such contracts to producers and consumers, the answer is yes. Again, the Commission's goal should be identical to the national goal: reducing dependence on OPEC.

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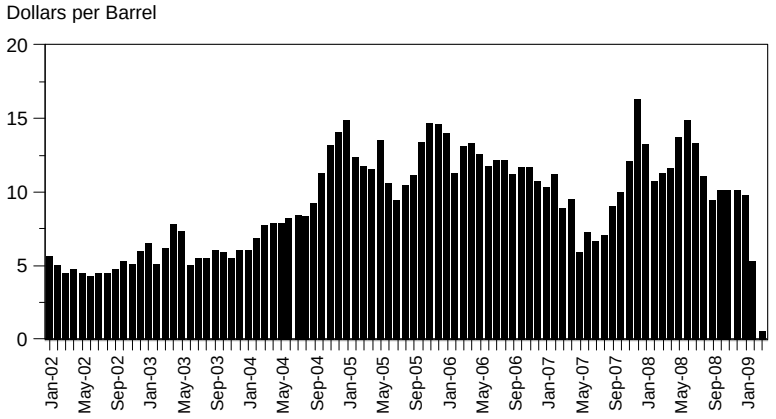
[10] See Philip K. Verleger Jr., "Was Metalgesellschaft's Use of Futures Part of a Rational Corporate Strategy?," *Journal of Energy Finance and Development* 4, No. 1 (1999), pp. 89-115.

Should the Commission use a different approach for other physical commodities such as agricultural commodities?

The report of the Permanent Subcommittee on Investigations reveals that there are significant problems in the wheat contract. The CFTC has also investigated cotton contracts. The investigations suggest that agricultural contracts suffer more severe difficulties than energy contracts. As I have noted elsewhere, I disagree with the proposition that one can construct "equity-like instruments" by buying futures, as suggested by Gorton and Rouwenhorst.[11] Thus I would severely limit—or even prohibit—the purchase of agricultural commodities as part of an investment strategy.

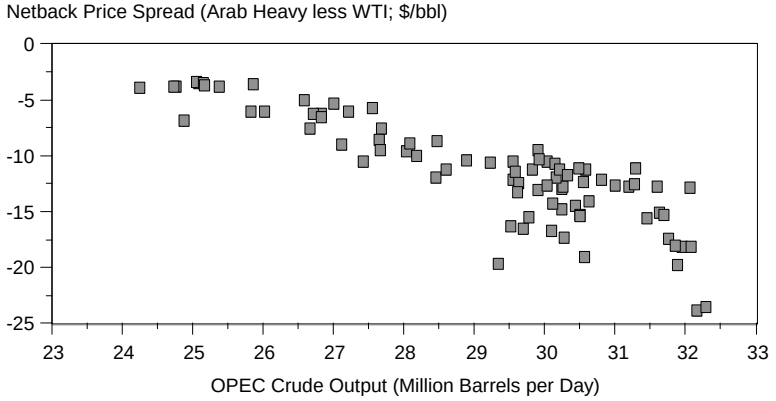
[11] See Gary Gorton and K. Geert Rouwenhorst, "Facts and Fantasies about Commodity Futures," *Financial Analysts Journal* 62, No. 2 (March/April 2006), pp. 47-68.

Figure 1
Discount to WTI for Arab Heavy Crude Delivered to the U.S. Gulf Coast, January 2002-March 2009



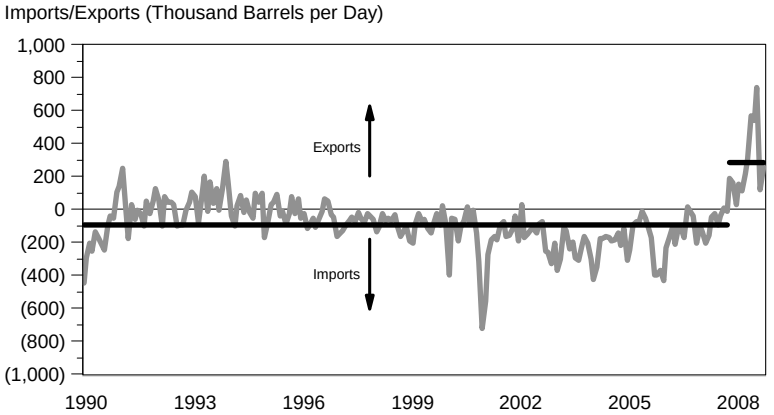
Source: Platts.

Figure 2
WTI/Arab Heavy Netback Spread vs. OPECs Crude Output, January 2006-October 2008



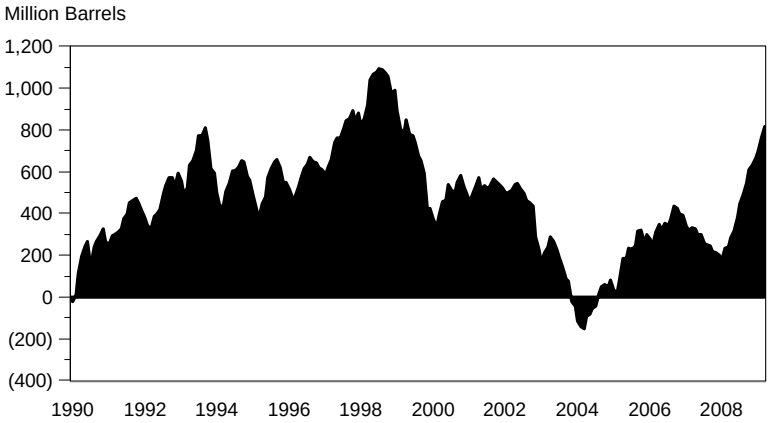
Note: Observations for the first six months of 2008 are labeled separately.
Source: Platts; PIW.

Figure 3
Monthly Net Distillate Imports/Exports to/from U.S., January 1990-October 2008



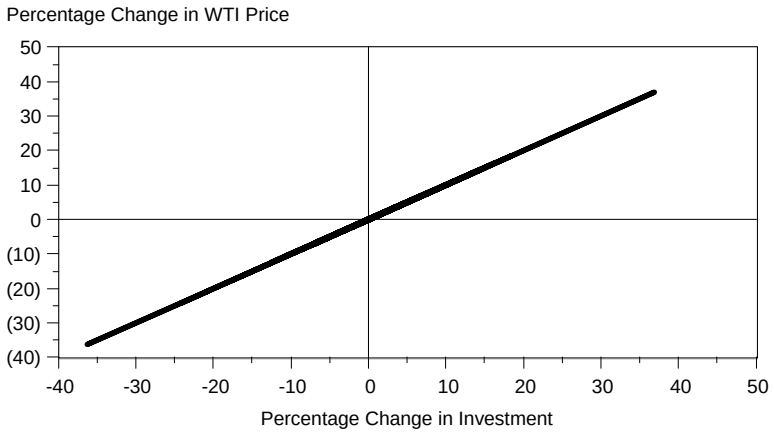
Source: U.S. DOE.

Figure 4
Monthly Cumulative Liquidation and Accumulation of Global Crude and Product Inventories, January 1990-April 2009



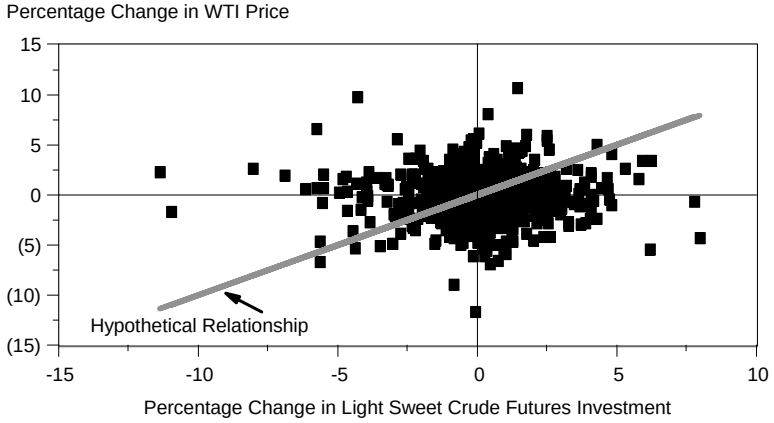
Source: PKVerleger LLC from EIG data.

Figure 5
The Theory: Relationship between Changes in WTI Oil Prices and Changes in Investment that Should Obtain if Flows from Investors Cause Price Change



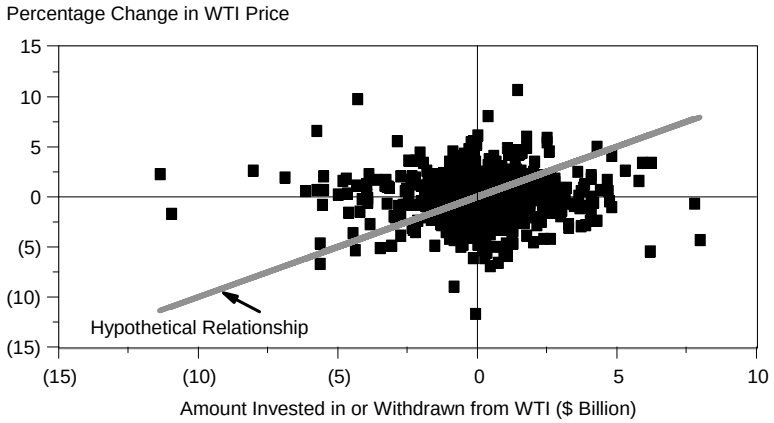
Source: PKVerleger LLC.

Figure 6
Actual Change in WTI Price vs. Actual Change in Total Investment in Light Sweet Crude Futures, January 2006-July 2009



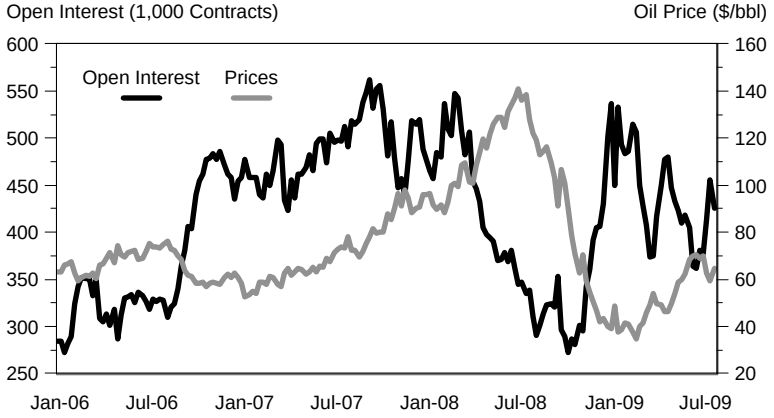
Source: PKVerleger LLC.

Figure 7
Percentage Change in WTI Prices vs. Amount Invested in or Withdrawn from Two Commodity Indices, Weekly Data, 2004-2009



Source: PKVerleger LLC.

Figure 8
Open Interest in Light Sweet Crude Contracts on ICE or NYMEX vs. Spot WTI Price, 2006-2009



Source: PKVerleger LLC.

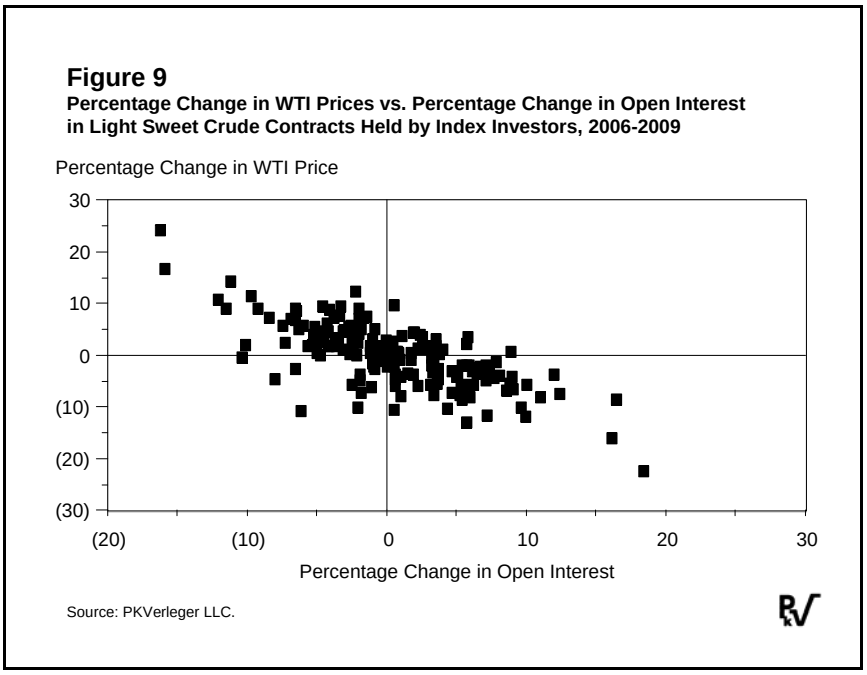


Table 1. Market Share of Key NYMEX Futures Contracts Accounted for by Bank Positions, July 7, 2009

Contract	Open Interest (Contracts)	Number of Banks	Bank Share of Long Open Interest (%)	Bank Share of Short Open Interest (%)
#2 Heating Oil	282,187	7	6.9	0.7
Natural Gas (Henry Hub)	739,142	18	12.1	5.4
Houston Ship Channel Natural Gas Basis Swap	216,886	5	2.5	11.7
Northwest Pipeline Rockies Natural Gas Basis Swap	148,225	6	8.4	22.3
Panhandle Natural Gas Basis Swap	263,784	6	6.1	15.1
SoCal Natural Gas Basis Swap	89,072	7	31.4	11.4
Henry Hub Natural Gas Swap	1,090,445	9	15.3	10.2
Henry Hub Penultimate Natural Gas Swap	1,162,597	28	10.1	10.8
Light Sweet Crude	213,194	10	15.7	18.8
Light Sweet Crude Calendar Swap	173,659	8	22.6	11.1
Light Sweet Crude Brent Calendar Swap	54,993	5	9.5	10.3

Source: CFTC.

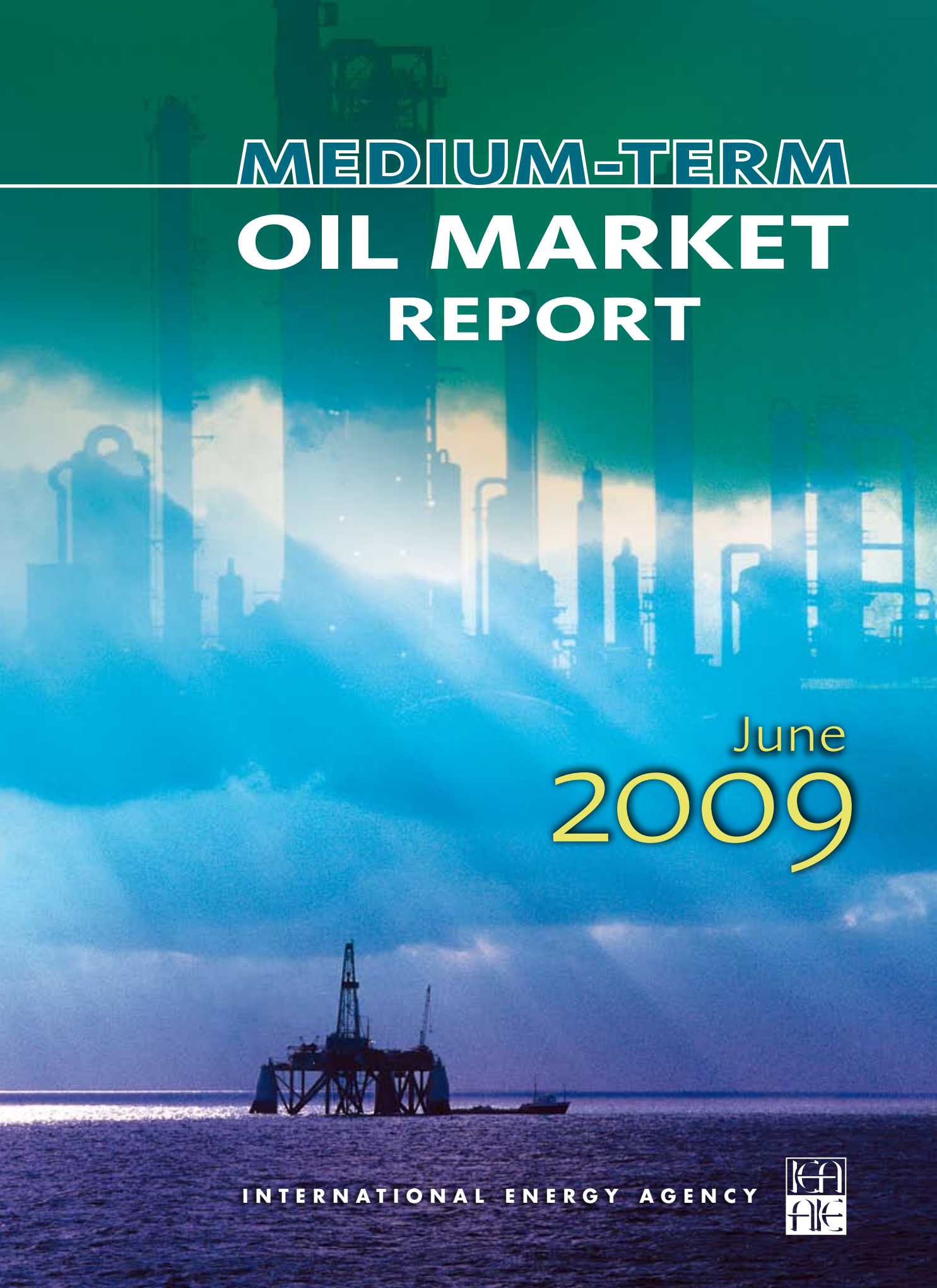
Table 2. Bank Holdings of Exchange-Traded Options Contracts, July 7, 2009

	Heating Oil	Natural Gas	Light Sweet Crude
Calls			
Total Open Interest (Contracts)	113,996	293,057	2,078,425
Number of Banks	5	7	22
Bank Share of Long Open Interest (%)	9.9	4.8	11.0
Bank Share of Short Open Interest (%)	8.0	1.3	13.4
Puts			
Total Open Interest (Contracts)	98,392	278,680	2,114,088
Number of Banks	5	7	22
Bank Share of Long Open Interest (%)	7.4	3.7	12.8
Bank Share of Short Open Interest (%)	8.3	1.2	12.3

Source: CFTC; PKVerleger LLC.

MEDIUM-TERM OIL MARKET REPORT

June 2009



INTERNATIONAL ENERGY AGENCY

MEDIUM-TERM OIL MARKET REPORT

PRICE FORMATION

The following is an extract from the Medium-Term Oil Market Report (MTOMR) produced by the IEA Oil Industry and Markets Division (OIMD) in June 2009.

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June
2009

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- To provide data on other aspects of international energy markets.
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- To promote international collaboration on energy technology.
- To assist in the integration of environmental and energy policies, including relating to climate change.

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PRICE FORMATION

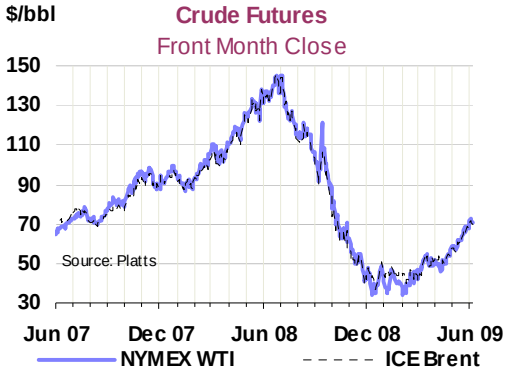
Overview

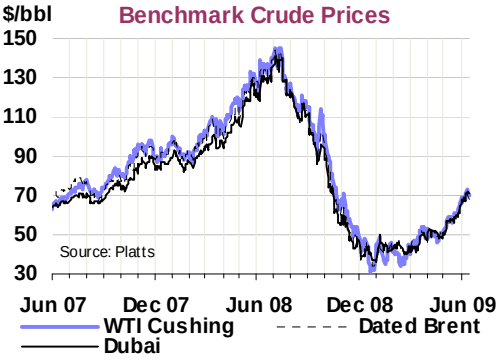
In the 2008 Edition of the *MTOMR*, it was argued that price levels are set primarily by oil market fundamentals, while acknowledging the importance of a myriad of other factors with varying degrees of influence over time. Perceptions about future (as opposed to prompt) supply and demand, geopolitical risks, exchange rate variations and shifts in financial flows can therefore act to augment basic price signals deriving from prompt market fundamentals. Some commentators have expressed views broadly in agreement with this position, while others argue that prices diverged from the levels warranted by fundamentals since financial players brought large sums of money into the oil market. The aim of this section is twofold: first, to provide a brief overview of the current state of arguments on oil price formation; second, with the benefit of recently released data, to revisit some of the fundamental factors examined in the 2008 Edition of the *MTOMR*.

One year on, data capture and coverage unfortunately remain incomplete for both the physical and financial markets. As prices have started to climb again from early-2009 lows, it is all the more important to ensure greater disclosure to allow price changes to be better understood. Identifying and examining today's price drivers is essential to inform views on the future shape of the market and to guide investment decisions accordingly.

The Speculation Versus Fundamentals Debate Persists

Oil prices reached record high levels last July, both in nominal and real terms, with the benchmark Western Texas Intermediate (WTI) futures contract price topping $147/bbl. Oil prices rose steadily from early 2004 but the 18-month period beginning January 2007 saw prices surge by more than 150%. Such a remarkable run-up in oil prices sparked a debate over whether or not oil prices might be driven by factors that are inherently unrelated to oil supply and demand fundamentals. Arguments were put forward that 'speculators', rather than oil market fundamentals, were the main culprit for the high oil price and better regulation to curb speculation was needed to bring down the price level. The Price Formation section in our last *MTOMR* attempted to assess the validity of such arguments. But the situation has subsequently changed dramatically; oil prices had collapsed by more than 75% by year end, from north of $140/bbl to the mid $30s before rallying to $70/bbl in early June, again seemingly often defying oil market fundamentals on their own. In short, the 'speculation' argument has been just as pronounced during the down-cycle and recent uptick as it was when oil prices were breaking record highs. The IEA has continued to monitor market developments both on fundamental and non-fundamentals factors and reiterate our opinion that price rises or falls tend to be multifaceted, rather than driven by a single cause.





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Speculators – Who Are They?

So-called speculators have frequently been blamed for causing distortions in commodity markets, while, simultaneously, they are considered a pivotal constituent of a well-functioning, liquid market that facilitates price discovery. Although studies abound seeking to answer the question of whether or not speculators play a major part in oil price formation, no definitive or compelling conclusion has been reached.

The nature of speculators and the way they enter and interact with the market were examined last year. Yet, speculation, in practice, is very hard to detect in the market place and the precise classification of speculators may indeed be an unachievable task. A broad definition of speculators would be those market participants who have no interest in oil as a physical commodity, while some may distinguish (mostly) long-only, long-term investors and index funds from active speculators engaging in both short and long deals, adjusting and unwinding their positions sometimes instantaneously. According to the US Commodities and Futures Trade Commission (CFTC), participants in exchange-traded commodity markets are classified into two categories – commercials, who are considered to be primarily hedging risk and non-commercials, who could be called speculators. While the CFTC aims to classify participants according to the nature of their trading, practical constraints prevent it from capturing in depth the precise essence of each entity's dealings, especially those of swap dealers, who 'swap' derivative contracts tailored to customer needs and hedge the associated risks on the futures exchange. Notably, a substantial portion of passive investors are now known to gain desired exposures to commodities through swap dealers.

Also important to note is that speculative activity is not confined to those with no natural interest in oil as a physical commodity. Traders at oil companies, refiners or industrial consumers may engage in trades and take positions which could be fully speculative in nature, based on their own views of the market. A refiner could buy, for instance, a three-month futures contract based on a belief that the spot price in three months time will be higher than the current three-month futures price plus the interest cost of the down payment (margin) for the futures contract. This, strictly speaking, is a form of speculation as the purchase of the futures contract is not purely for the hedging of a price risk. Understanding what different observers mean by speculators is therefore important when analysing various arguments on the subject. Generally, when commentators refer to speculators, the kinds of market participants they have in mind consist of index funds and passive investors as well as more apparent speculative players such as hedge funds and traders 'betting' (i.e. taking risk) on rising or falling prices. A stark difference exists, however, between 'passive' and 'active' investors. The former allocate a certain amount of capital from their portfolios to commodity markets, based on a historical correlation of returns on commodities with those of other asset classes such as bonds and equities. This type of investor, therefore, sometimes takes positions which are at odds with what immediate fundamentals suggest. Active investors, on the other hand, tend to act on percieved fundamentals, reading signals from various economic indicators as well as oil market data. In this section, we refer to speculators as being those who do not intrinsically have physical price risks but take on risks by entering the oil market.

The 'Speculation View'

The 'speculation view' of oil price formation holds that a growing participation in the oil futures market of non-commercial, especially financial, players can push the price above the level that should result from purely fundamental factors – speculation causes prices to 'overshoot' or

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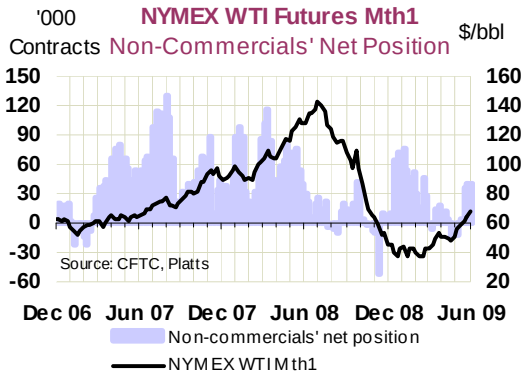
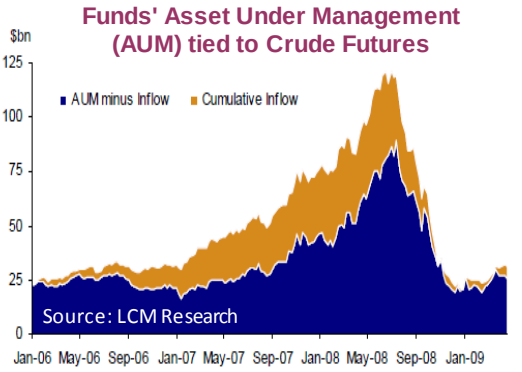
'undershoot'. Most proponents of this view cite the trend of a growing amount of money placed in and out of commodities, oil in particular, by passive investors – index funds, pension funds and university endowments – as well as more active types of investors like hedge funds, which seems to have coincided with price movements. Commodities, indeed, have become a well-recognised asset class within investment portfolios of financial institutions as a means to diversify inherent risks such as inflation, dollar depreciation (for US investors) or equity market weakness. Although there is no officially reported data on the total amount of money invested in commodity indices and different institutions apply different methodologies to derive an estimate, the cumulative amount invested by various funds in commodity indices is said to have quadrupled from around $75 billion in January 2006 to almost $300 billion last July, with crude futures taking a large portion of that amount. As far as the oil market is concerned, LCM Commodities, for instance, estimates that Asset Under Management (AUM) tied to crude futures was close to $125 billion when oil prices reached historical record levels last July, of which some $40 billion was additional inflows since January 2006. The trend and the direction of capital flows, unsurprisingly, reversed in the latter half of 2008 with AUM falling below $20 billion, with a total outflow of almost $50 billion over the same period.

In terms of the number of contracts traded, non-commercials – mostly financials – are also said to outweigh commercial or physical players, buying or selling far more paper barrels than physical players do. However, a look at net positions of non-commercial entities, as reported by the CFTC on a weekly basis, does not reveal any sound correlation with prices.





Although some financial institutions actively engage in physical trading of oil by controlling storage facilities, the conventional path for financials or speculators to enter the oil market is through futures contracts which do not result in physical delivery. Options and other derivatives in the oil market, insofar as it resembles equity markets, can influence physical spot prices of underlying assets through, for example, a phenomenon known as 'stock-pinning'. A case of stock-pinning can be observed when writers of initially-out-of-the-money call options buy the underlying asset as the price of the asset moves closer and closer to the strike price of the options. This can lead to herding among a group of financial players in the market, creating a self-fulfilling prophecy until the price hits the strike price. The oil market, however, is inherently different from equity markets in that it is finite, and the mechanics of how futures and derivative markets without physical delivery affect the spot price of physical oil need careful examination.

When the market is in contango (forward price levels are above prompt prices), futures prices can have a direct impact on spot prices through cash-and-carry, or storage arbitrage, which would favour stockbuilds. Similarly, if the spot price is pulled up by speculation, basic economic concepts tell us

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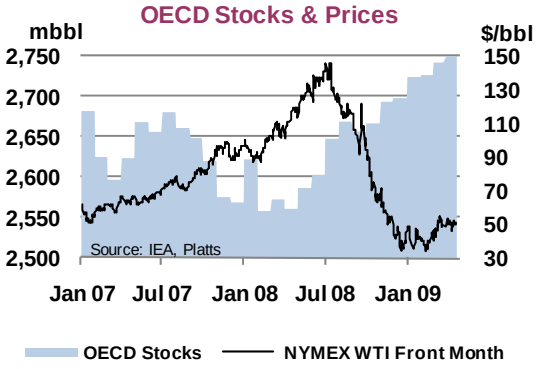
that excess supply needs to be absorbed into storage, or be taken out of the market through hoarding on the part of suppliers. Indeed, any price above (or below) the equilibrium warranted by supply and demand, if caused by speculation, must be explained by an act of hoarding in the form of inventory builds or withholding production. It was suggested in the last *MTOMR* that there was no evience of exceptional stockbuild in the run-up in prices. It is instructive to revisit some of the key fundamental price drivers which were highlighted last year, including stocks, to see if this remains true.

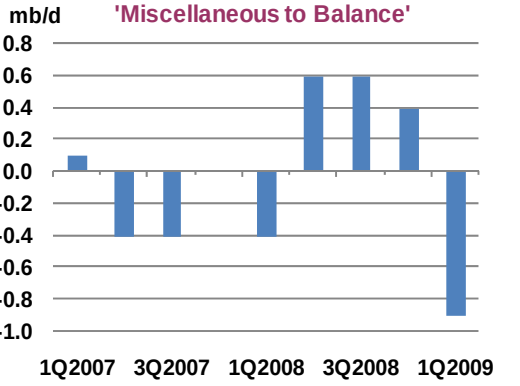
Oil Market Fundamentals Revisited

Stock Levels

Stocks are built up for a variety of reasons. To understand the mechanism through which stocks build, it is helpful to draw a distinction between intentional inventories and unintentional stock-build. The latter may be caused by excess supply, shrinking demand or both. The former is more complicated as it could involve, *inter alia*, mandatory stock holding, planned maintenance, seasonal considerations and speculation about future prices. The *MTOMR* 2008 Edition used a simple model of supply and demand curves to illustrate how an artificially-elevated price should be supported by inventory build-up (or hoarding on the suppliers' part), if such a price level is to be sustained.

Recent data confirm the earlier finding that OECD stocks, although increasing from May onwards, were not exceptionally high in the run-up to $147/bbl. The OECD is of course only around 50% of the global market in consumption terms and there is a lack of data with regards to non-OCED stock levels. The *OMR*, nevertheless, seeks to capture changes in non-OECD stocks in the miscellaneous-to-balance element of its fundamentals estimates. A positive 'miscellaneous-to-balance' could imply a degree of non-OECD stockbuilds, but also potentially overstated supply, understated demand or some combination of the three. The latest *OMR* data for the April-June 2008 period do imply some inventory builds in non-OECD regions – 0.6 mb/d, or 1.6% of non-OECD demand. In addition, recently-released, albeit partial, data on Chinese oil inventories reveal that there were moderate stockbuilds preceeding the Olympic Games.





Global crude inventories started to accumulate in the second quarter 2008, with the pace of build picking up after August as demand and prices began to slide. However, high levels of stockbuilds do not necessarily result from speculation *per se*. Rather, when demand is curbed, it is common to see inventories build up as bottlenecks arise at the existing level of production and refinery runs. Indeed, this is what seems to have happened after August 2008 as global demand for crude oil diminished sharply. Another noticeable phenomenon during the same period was that the market entered heavy contango and there emerged clear opportunities for arbitrageurs to buy spot and sell forward.

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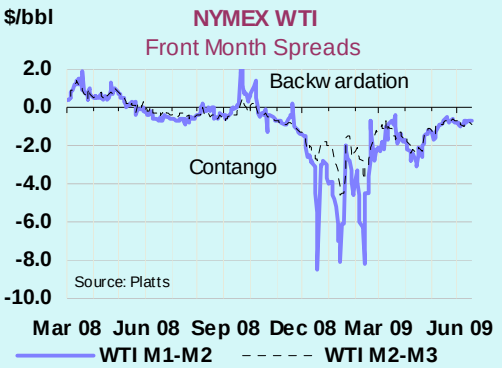
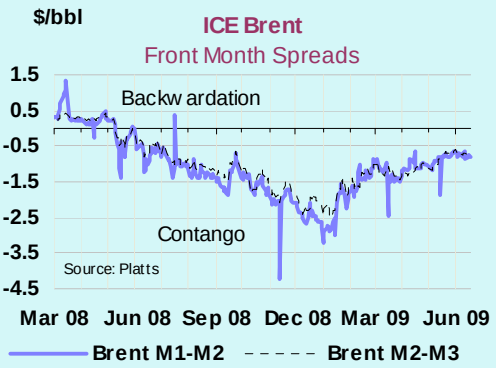
Onland storage facilities were quickly filled and many idle vessels were chartered for floating storage without a predefined destination. Many analysts therefore suggested that there was a clear case of 'speculation', keeping the oil price higher than the levels warranted by the weak fundamentals. Strictly speaking, however, it is arguable whether the term, speculation, includes an act of arbitrage, which by definition is risk-free, while speculation must, again by definition, entail a degree of risk taking and making bets on the future direction of oil prices.

Arbitrage – Cashing in on a Contango

Arbitrage is a common trading strategy in options and derivatives markets where prices for various options or derivatives on the same underlying asset are misaligned. Storage arbitrage in the oil market is one of the most obvious, straightforward trading techniques which arbitrageurs use when the market is in contango to gain profits without taking on price risks. Earlier this year, the contango for a NYMEX WTI three-month forward contract reached around $10/bbl; oil was available on spot at $40/bbl, while, three months later, the same grade of oil was worth $50/bbl.





As long as credit conditions permit, an arbitrageur would exploit this wide spread and buy 1,000 bbl of crude oil at the spot price and sell a 3-month futures at $50/bbl. The arbitrageur has to pay $40,000 for the oil bought, and a refundable $3,000 as a margin to the exchange for the futures contract, as well as storage and insurance costs. Assuming the interest rate of 5.0% p.a., the storage cost of $1.5/bbl per month, and the insurance premium of 0.5% on 110% of the cargo value, this arbitrage strategy yields more than $4,000 of profit, regardless of what the spot price may be in three months time.

Selling Price	$50,000			
		Cost of Oil	*$40,000*	$40/bbl x 1000 bbl
		*Interest**	*$582*	$46572 x 5.0% x 3/12
		Storage	*$4,500*	1000 bbl x $1.5/bbl x 3 months
		Insurance	*$825*	$50,000 x 110% x 0.5% x 3 months
Total Cost	$45,907			
Profit	$4,093			

*(*includes interest on margin at 16.43%, but ignores interest on storage and insurance charges)*

Spare Capacity

Spare supply capacity serves as an important indicator of market tightness because it shows how much supply can theoretically increase within a short time horizon, faced with growing demand or a supply disruption elsewhere. Just as the increase in financial flows into (and the outflows from) the oil market coincided with the price rise (and fall), the tightness implied by OPEC spare capacity can also provide a plausible account of how the fundamentals have changed and provide a clue as to why oil was priced so high in the first half of 2008, fell some 75% in the following six months and is now hovering around $70/bbl.

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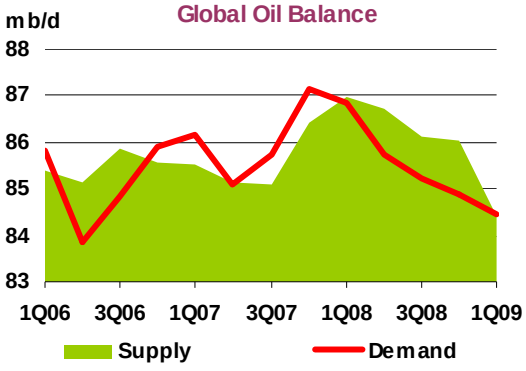

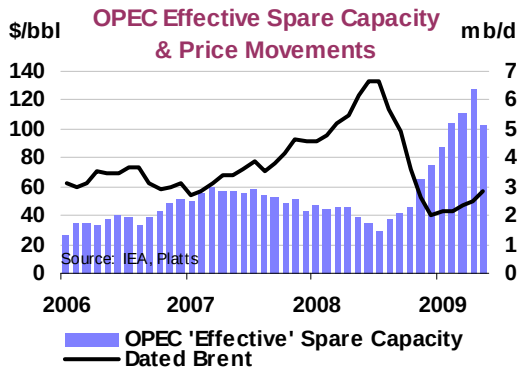

OPEC effective spare capacity was stable at around 2.5 mb/d between January 2007 and April 2008 but the following months witnessed it fall sharply from 2.3 mb/d in April to 1.5 mb/d in July as production increased. During the latter period, the oil price climbed by about $35/bbl to reach the historical high of $147/bbl. In stark contrast to the pre-$147/bbl period, OPEC spare capacity has since continuously risen – it has more than quardrupled by April 2009, due largely to OPEC's decision to curtail production amid the global economic downturn and steadily weaker demand. A look at how OPEC spare capacity evolved over the last 12 months helps to consolidate the fundamentals view that the tight market balance encouraged the run-up in prices, while the economic downturn and demand collapse help explain the sharp fall. Coupled with low price elasticity of both supply and demand, limited spare capacity tends to focus the ability to control production to meet OPEC's price or inventory objectives in the hands of a few suppliers with the capacity to adjust production.

Inelastic Supply and Demand

The price elasticity of demand and supply for oil, at least in the short run, is very low. On the supply side, developing oil fields for commercial operation is inherently a long-term business, often taking five to 10 years to develop and produce oil from a new project. Price volatility and uncertainty about future demand levels can also lead producers to take a cautious approach to investment in new capacity, both upstream and downstream, limiting the supply side response to demand shifts and exaggerating the degree of price movements necessary to choke off demand. Additionally, shortages of specialised labour, equipment and service capacity, rising costs, project slippage and tightening fiscal and access terms all played a role in slowing supply expansion despite rising prices. Sharply higher upstream spending during 2000 to 2008, therefore, did not result in a proportional increase in supply capacity.

Some factors that limit the responsiveness of demand to price changes are more subtle and sometimes policy-driven. A large portion of oil demand, especially in advanced economies, stems from fuel use in the transport sector but modal shifts (away from cars to trains, for example) seem to occur very slowly. The problem is compounded by the fact that a pass-through of increased crude oil prices is often distorted (due to taxation) or prevented (due to government subsidies), further delaying or weakening the demand response. For example, retail diesel prices in China were regulated and kept artificially low despite rising demand prior to the Olympic Games, when the crude price rose to $147/bbl. When the global economy was in a buoyant state with key emerging economies such as China and India experiencing a rapid expansion, rising prices were arguably inevitable on the back of supply tightness and various factors stopping cost feed-through from the wellhead to the end-user. That said, some advanced economies where the cost pass-through was more apparent (the US, for example) did indeed see oil demand weaken sharply due to high prices.

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*Elasticity Matters**

Low elasticity on both the demand and the supply side is a clear recipe for high volatility of market-clearing prices. One common critique by proponents of the speculation perspective is that, during a price jump of over 55%, recorded in seven months from January to July 2008, there was only a slight increase in refinery crude demand, estimated around 1%. It is, indeed, striking that one percentage point demand growth could cause a 55% rise in prices. Yet, the highly inelastic shape of the supply curve could easily warrant a 55% price hike with just a 1% expansion in demand. One can back out an implied price elasticity of crude oil supply based on the given changes in demand and price; a 1% demand expansion and a 55% price increase imply a price elasticity of crude oil supply of 0.0227. So, for the price to move 10%, demand need only fluctuate by a little over 0.02% – a figure not wholly out of line with oil supply elasticity estimates from previous studies, of 0.02 to 0.05.

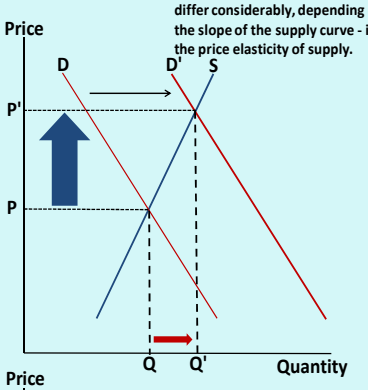
Furthermore, the low price elasticity of supply can also help to explain the sharp fall in the oil price over the four months following the peak of $147/bbl last July. Critics of the fundamentals view argued earlier this year that the 75% price drop by the end of December 2008 could not have been driven solely by fundamentals and instead attributed it to an outflow of money from commodities by index funds, which proponents of the speculation view estimate amounted to some $70 billion, citing that gasoline demand over the same period only fell by 5%.

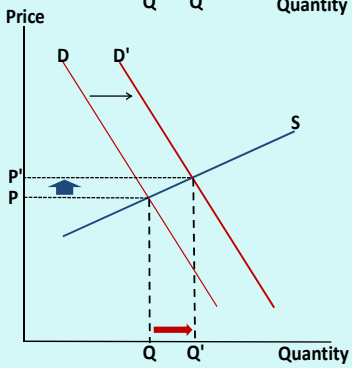
Taking the 5% decline in gasoline demand as a proxy for the crude oil demand change in that period, it is possible to calculate how much the price should change given the price elasticity of supply of 0.02. The calculation shows that the 75% fall was in fact smaller than the low elasticity would warrant; a 5% demand contraction would imply a 90% drop in the price to clear the market.

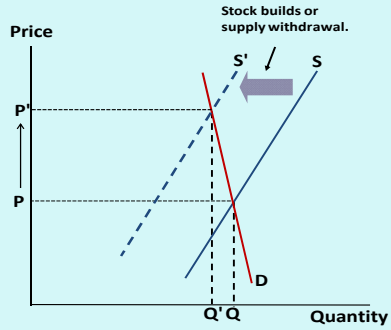
Since initial product demand falls are usually absorbed into inventories and the impact on crude demand is often lagged, the extent of crude oil demand contraction was most likely smaller than 5%, which would bring the change in price necessitated to clear the market closer to the actual price drop of 75%.

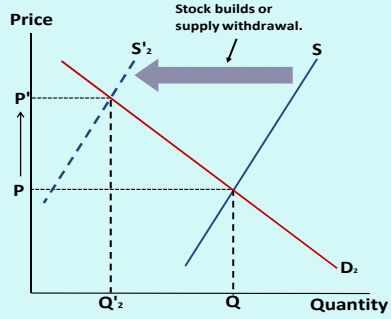
Similarly on the demand side, low price elasticity implies small cuts in supply would warrant a large increase in the price to clear the market. Simultaneously, if the price is elevated out of the market equilibrium, requiring inventory builds or hoarding, the actual amount that needs to exit the market may be very small. Common claims that last summer's oil prices of $140/bbl were some 30-40% above the level warranted by market fundamentals would imply that some 3-4% of global oil supply, or 2.6-3.5 mb/d, was curtailed through stockbuilds or kept in the ground, assuming that the price elasticity of demand is -0.1%. This clearly was not the case.

Demand expansion is illustrated by a rightward shift in in the demand curves (D to D'). In both cases, quantity demanded (and supplied) increased by 3% (from Q to Q'), yet the price increases from P to P' differ considerably, depending on the slope of the supply curve - i.e. the price elasticity of supply.









** Some demand and supply numbers here are based on papers from leading proponents of the speculation view and are not necessarily in line with IEA estimates. These include 'The 2008 Commodities Bubble' (Michael W. Masters and Adam K. White).*

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The 'Peak Oil' Thesis, Geopolitics and Access to Oil

Arguably, perceptions about oil supply in years to come, can also materially affect futures prices and, by arbitrage, sometimes spot prices. A critical dimension to consider in this regard is that the bulk of oil supply and reserves are concentrated in areas and countries that present a degree of geopolitical uncertainty. Uncertainty is a key ingredient of market volatility; various issues – threats of strikes, terrorist attacks, war and political instability in general – in a number of key producing countries such as Nigeria, Iraq, Iran and Venezuela have sparked fears about stable future supplies and likely led to higher levels of stockpiling than might otherwise have taken place, resulting in an upswing in prices. Equally important has been a declining trend in oil production in some of the key non-OPEC countries such as the US, the UK and Mexico. Although the peak oil thesis in itself is much contested, not least in regard to the pessimistic view on global resources it presupposes, and its direct impact on the oil price is probably minimal, an anaemic outlook for non-OPEC supply growth probably strengthens expectation of high price levels in the future. The perception that more and more production capacity and reserves are expected to become consolidated in the hands of a few national oil companies, giving increased control to producers at the expense of importing countries, only reinforces this trend.

Since oil is a limited natural resource, some studies have sought to apply the Hotelling rule of increasing marginal cost of production at the rate equal to the rate of interest over time. The theory basically holds that, with exhaustible resources, producers face a trade-off between selling a unit of oil today and hoarding the same unit until some future date. As a unit sold is a unit lost from the reserve, if produced and sold today, the return for the sale must be greater than the present value of the expected return from a future sale. Hence, there is a perceived long-term future scarcity, which is said to add a degree of premium to future prices. Similarly, Keynes extended the concept of User Cost to illustrate the mechanics of how present and future production decisions interact for exhaustible resources. Any expected upside, net of interest, by withholding supply is therefore considered part of the marginal cost for making decisions on present production. There is scant evidence that the oil price takes the path that the theory suggests, however. It also does not take into account that technological developments can and have influenced perceptions on the size of the reserve base.

A Mismatch: Crude Availability, Refining Capacity and Required Product Mix

Prior to the recent period of high oil prices, there had arguably been years of under-investment not just upstream but also the downstream end of the value chain – refining capacity, in particular – constraining the industry's ability to meet a fast-growing demand for middle distillates that emerged over the last five years. A tight availability of light sweet crude, most notably from Nigeria, and recently-introduced mandates on low-sulphur fuel standards in OECD economies leading to greater interest by refiners to run light sweet crude during 2007 and first half 2008 are a clear case of a tightening supply and demand balance for that segment of the crude market.

Refinery yields are a function of refinery complexity and crude input. Thus, a surge in demand for middle distillates, or any other refined products can only be met by changing configuration of refinery or the type of feedstock or some combination of both. Making changes to refinery configuration or upgrading refining capacity entails capital investment with long lead times, while change of feedstock is an operational, short-term decision. It is not surprising, therefore, that refiners turned to light sweet crude to boost middle distillates yields. Frequent claims by OPEC that there were adequate oil supplies rested upon the fact that some OPEC heavy crudes were struggling to find a market even when benchmark prices kept breaking record highs. In order to assess the validity of the crude-type argument, relevant demand and supply data need to be examined.

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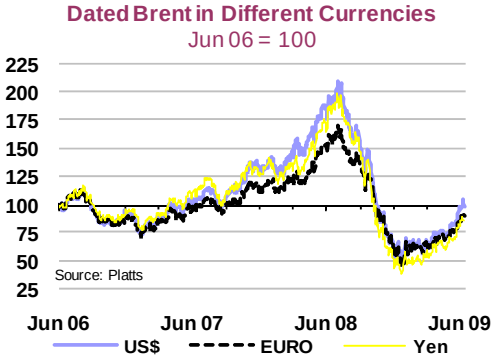
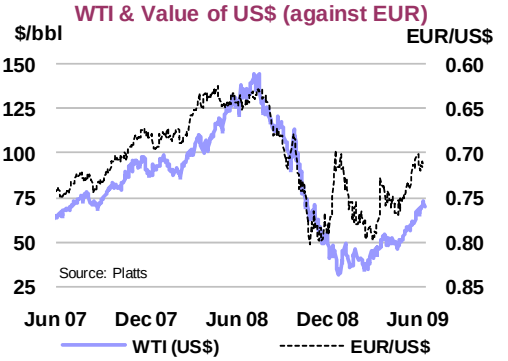
In terms of demand for motor gasoline, diesel and jet fuel, the IEA's demand data since 2006 for both OECD and non OECD countries show that demand for those three products rose from 47.9 mb/d in 2006 to 49.9 mb/d in 2008 – i.e. a 4% or 2 mb/d increase. Although the supply and demand balance was rather tight in 2007, there was no clear evidence of shortage in overall crude supply in 2006 and 2008. But changes in required product specifications affected the type and amount of crude that refiners could process, effectively tightening fundamentals for these grades.

To illustrate this, consider there is currently 500 kb/d of demand for motor gasoline and the maximum sulphur content allowed is 20 ppm. A refiner runs a mix of crudes, namely light crude A with 0.3% sulphur and heavy crude B with 2.0% sulphur to produce, among other products, gasoline which meets the required specifications. If the governing regulations change so that gasoline can only contain 10 ppm of sulphur, even though the absolute level of demand for gasoline in the country does not change, what will the refiner do? The refiner as a going concern can either install a scrubber to desulphurise the product, or change the crude feedstock, running more low-sulphur crude, which naturally yields products with lower sulphur content. Hence, changes in required product quality can tighten the balance for one type of crude, loosening it for another. In short, the distillate market was supply-constrained, rather than facing a demand squeeze; North Sea crude supply, for example, was down by 10.5% in July 2008, compared with the January 2007 level, while Nigerian crude production also declined by 10.6% in the same period, despite rising prices. Readily-available heavy sour crudes were neither a practical nor economically viable substitute for light sweet crudes due to already-stretched refining capacity and the narrow price discount offered by many producers for their heavy/sour grades.

The Dollar Effect

How does the value of US dollar affect oil prices? One clear impact is that with oil prices denominated in the US dollar, the exchange rate for the dollar changes oil prices in other currencies. A weaker dollar means, for example, lower prices in Euros, which should in turn translate into higher oil demand in the euro zone which, all other things being equal, would tighten the global supply/demand balance. Another effect is not directly related to oil market fundamentals. Investors often buy commodities futures contracts as a hedge against inflation. Inflation in the US would imply a weaker dollar, so inflationary trends or fears of inflation encourage buying of futures by financial investors. As the dollar is the world's most widely adpoted reserve currency, perceptions or anticipation of inflation and dollar depreciation can prompt holders of US-based assets to seek exposure to other types of assets normally shielded from the impact of inflation in the US.





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The CFTC and the IMF Find Little Evidence for the Speculation View

One way of assessing the role of speculators in price formation is to apply a statistical testing model to the data on trading activities of different types of traders. Statistical analysis allows for an objective judgment on the significance of changes in independent variable or variables in predicting (not 'driving') how the dependent variable might behave. The CFTC has carried out a series of such analyses, the latest of which was released in December 2008 where the commission ran a recursive co-integration* analysis using the extensive data it collects on daily trading activities on NYMEX. Although the methodology, including classification criteria for traders, is not without its critics and shortcomings, – no data on OTC trading activities were included, for example, – it is the most comprehensive attempt to date that quantifies the effect of speculation on price formation.

The CFTC's December report examined market participants' activities in greater detail and identified three non-commercial 'sub-categories' as 'the most active' players, which together accounted for about 90% of the total non-commercial open interest between 2000 and 2008. These were 'Floor Brokers and Traders', 'Hedge Funds' and 'Non-Registered Participants' (NRP) with the third being predominantly financial traders in nature.

Although commodity swap traders are still classified under the 'commercial' category, the report singled out the significant market position (more than 30% of the market) that this particular group of traders maintained through 'the direct and indirect influx of commodity index money in futures markets' (CFTC, 2008).

The study focused on ascertaining whether or not spot (front-month) contract prices and longer-maturity (1-2 years) futures contract prices exhibit co-integration and if so to what degree. CFTC data confirm the basic trends from 2000 to July 2008 – a tripling of futures open interest (to 1.5 million), a quintupling of futures-equivalent-options positions (to 3 million) and an increasing share of non-commercials involved in 'spread' trading (from 27% to 40% of all open positions), with the notional amount in the oil market reaching $405 billion at the price of $140/bbl last July and the growth accelerating from mid-2003 onwards.

The explanatory powers of crude oil market fundamentals, namely the strength of world demand for industrial commodities and capacity constraints affecting crude oil production, as well as the level of open positions of specific kinds of traders are tested statistically, with market activity and exogenous liquidity shocks held equal. Without delving too deeply into the technical part of the modelling exercise, the final conclusion did not establish a price-making role of the non-commercials in the oil market, even though it did find that market activities of hedge funds and other financial institutions as well as swap dealers help to explain the co-integration of spot and futures prices. Simultaneously, however, market fundamentals were also shown to be strong indicators of price co-integration. It provides, therefore, only inconclusive evidence to suggest that speculative activities had caused the spot price to climb up to the level it did last summer. The International Monetary Fund, in its *World Economic Outlook*, published October 2008 also adhered to the fundamentals view after its statistical analysis revealed no apparent systematic connection between 'financialisation' of commodities – financial flows into commodity markets – and price volatility or fluctuations.

* *Co-integration* implies, put simply, that there is a correlation between variables tested – in the case of the CFTC's December paper, between longer-dated maturity futures and front-month contract prices.

The value of the currency can therefore be a very strong driver of oil price levels. The oil price may rise by 25%, but that does not automatically mean that the price of oil has gone up by 25% everywhere. The Euro or Yen value of crude oil, for instance, could move differently to the dollar value, depending on the relative strength of the currency in question. The real prices of oil in the US,

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Europe and Japan moved largely hand-in-hand until the last quarter of 2007, but they then began to diverge with the US real price sometimes more than 15% higher than that of Europe. As the dollar gained strength over the single currency, the discrepancy between US and European real prices quickly diminished. More recently, a strong yen pushed down the real price of oil in Japan significantly lower than US and European prices. Moreover, the economics of producing oil in different regions can fluctuate depending on the level of local and dollar-denominated costs in the longer time frame.

Other Considerations

Other Commodities

Oil is one commodity where there has been a massive influx of capital and a price surge concurrently. Examining other commodities with or without futures markets may provide further clues as to whether financial forces can drive commodity prices. Critics of the speculation view frequently cite commodity markets without a well-functioning futures market and point out that equivalent price increases in these commodities cannot have been driven by flows of speculative money made possible by the facets of a futures and derivatives market. Iron ore and some rare metals, which are not traded on the London Metal Exchange (LME), are examples of those commodities without futures market which have experienced sharp rises in their prices over the past two to three years. Further, in agricultural crop markets which have a futures market with a longer history than oil, this debate over the role of speculators has persisted since the inception of a futures exchange almost a century ago.

However, even though speculators have frequently been condemned for price rises, studies have found no conclusive evidence that speculation drives agricultural commodity prices and have stressed a more important role played by speculation – providing liquidity and facilitating price discovery. Comparative analysis with other commodities, however, needs handling with caution because minerals like iron ore have completely different market dynamics from oil, with the benchmark price being set annually and almost 70% of global seaborne trade dominated by the top three mining companies. Agricultural crops, meanwhile, are more prone to seasonal fluctuations than oil, and oil is part, albeit small, of production costs. Still, this approach reaffirms that prices can fluctuate widely, regardless of the presence and participation of financial forces in the market.

How Does the Spot Market Work?

The fundamentals view examined so far is really twofold. First, it distinguishes futures from spot, or put differently, non-physical from physical, contracts. Even if speculation did drive the price in a futures market, so the argument runs, it would not force the spot price for physical delivery off the equilibrium determined by physical market fundamentals. Second, as the CFTC study shows, there is no statistically significant relationship between position-taking by speculative or non-commercial players and the futures price, let alone the spot price for physical delivery (though their activities did help explain co-integration between spot and futures prices). Hence, those who argue that the oil price is driven or at least heavily affected by a level of speculation are faced with a two-step refutation exercise, one to show that futures prices are determined, to a certain degree, by speculation and then to identify a connection between the futures price and the spot price for physical delivery.

The speculation view – that the massive inflow of funds in the oil market drove the oil price – has not fully responded to the pivotal question about the relationship between the futures price and the spot price, other than claiming that market participants often see futures prices as a reference point for pricing a spot cargo. This is certainly not self-explanatory and, indeed, it may just be that the spot price is giving indications to futures traders who then decide whether or not to take positions at a

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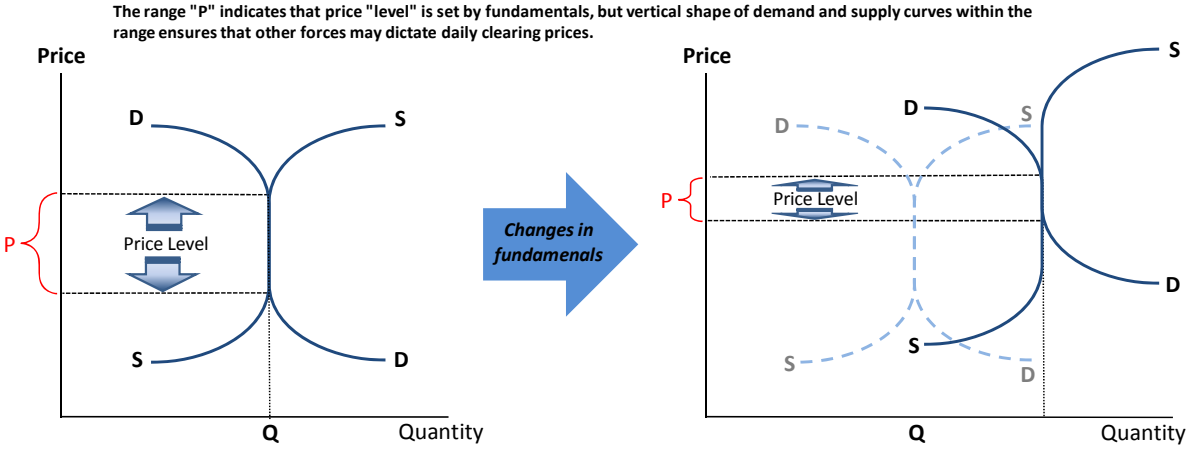
given futures price. To better deal with the issue of linkage between the futures price and the spot price, it is useful to consider the way business functions, i.e. how OTC buying and selling of physical crude oil works, which is one dimension seemingly missing from this debate.

The fundamentals school of thought holds that futures markets merely reflect demand and supply for futures contracts, which generally do not result in physical delivery of crude oil. Hence, when financial investors or speculators put buy orders in futures market, it does not in itself mean the demand for crude oil has increased. While the corresponding future price is likely to increase as a result of the buy orders, price formation for spot crude oil for physical delivery remains a function of physical supply and demand, i.e. the fundamentals. Theoretically, this argument appears sound, but when one looks closely at the predominant process of price formation, or negotiations between sellers and buyers, isolating spot prices from futures prices starts to look rather problematic.

The most common trading practice or pricing mechanism in physical markets worldwide takes the form of premiums over, or discounts against, a certain benchmark. Negotiations for these contracts (of physical supply) usually take place more than one month prior to the actual delivery of the crude, but the prices are hardly ever fixed in absolute terms. Using WTI as an example – the world's most widely-used benchmark crude – a buyer agreeing to buy crude oil next month at the closing WTI price for that month minus x dollars would be a one-line recap of a typical fixture. What number the x takes is a product of negotiations and relative bargaining powers of the seller and the buyer involved, which would be based on fundamental factors. More importantly, however, once the x is fixed, the absolute price of the oil can take any value and this is a moment where both supply and demand curves become completely inelastic – what determines the price then is the futures market and the benchmark price that does not result in physical delivery of crude oil.

A Schematic Illustration of the Short-Term Demand and Supply Curves



There are often 'options' in many OTC contracts for physical oil, which buyers can often choose to exercise or wave in accordance with the price and the strength of demand for their own products; a fixed quantity only holds within a certain range of price levels. Furthermore, completely inelastic, vertical demand and supply curves would only hold in the very short term, perhaps for a few months. Over time demand and supply, however inelastic, should adjust and it is hard to envisage a scenario in which financial and speculative forces alone can sustain an elevated or dampened price away from the levels warranted by fundamentals.

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It is, however, plausible that, for as long as demand and supply have multiple market clearing prices, buying and selling of futures and spot contracts by players of a non-commercial nature drive the settlement price within that range. A $16.37/bbl or 15.7% jump in the price of front-month contracts – the biggest one-day gain in dollar terms since 1984 – recorded on 22 September 2008, has frequently been cited as evidence of how much financial players, or speculators, can affect the price with some proclaiming that fundamentals could not possibly change in just one day to warrant a price increase of that magnitude. So, it is conceivable that financial players and speculators can and do affect the price in the very short term. Under such circumstances, the fact that oil is sold and delivered at a given price does not necessarily mean that the fundamentals would generate the same clearing price in the absence of speculation and financial players in the market. That said, it is questionable whether one can appropriately claim that the oil price is therefore 'driven' by speculation and by how much. Rather, it has more to do with the pricing mechanism in the market, which itself reflects the relative bargaining powers of sellers and buyers, which in turn will be heavily influenced by fundamental factors.

Policing Speculators

The International Organisation of Securities Commissions (IOSCO) set up a Task Force on Commodity Futures Markets in September 2008, following a surge in commodity prices and exploding volatility, which raised concern that speculative activity by non-physical players underpinned the price move. The IOSCO Task Force, co-chaired by the CFTC and the UK's Financial Services Authority, published a report in March 2009, which provides a review of studies done by the IMF, the European Commission, the UK Treasury and the CFTC, and entails a set of recommendations to governments to allocate more resources to enhancing transparency, and monitoring of commodity futures and derivatives trading and markets in general. The Task Force makes a welcome call for more information, which would improve visibility in ascertaining the roles of various types of market participants, thereby enabling a deeper understanding of the impact of speculators in price formation.

In the US, the new administration appears keen to introduce measures to not only increase oversight on futures exchanges but also to regulate over-the-counter trading of commodity futures and derivatives, which are currently not subject to regulatory oversight. During his campaign for the US Presidency, Barack Obama advocated tougher regulation and increasing government oversight of US and international energy markets, accusing speculators of driving energy prices higher and making profits at the expense of consumers. Since Obama has been sworn in as President, a new bill, *The Derivatives Markets Transparency and Accountability Act*, was introduced by the US House Agriculture Committee in February, aimed at, among other things bringing over-the-counter (OTC) derivative deals under government scrutiny. Having passed committee in February, the bill has stalled at the House floor. In the meantime, the Obama Administration proposed legislation to regulate all OTC derivatives by bestowing on the CFTC or the Securities and Exchange Commission (SEC) the power to investigate books and records of all OTC derivative trading as well as establishing a central, regulated clearing system for standardised derivative contracts, which are believed to constitute the bulk of OTC trading. The legislation, if enacted, would amend the *Commodity Exchange Act,* and nullify the controversial *Commodity Futures Modernization Act* of 2000, which, arguably, created the so-called 'Enron loophole' in futures markets.

These new initiatives follow the meltdown in the US financial system, but the initial impetus originates from last year's run-up in commodity prices and wide-spread calls for tighter controls on speculative trading in futures markets. In addition to enhancing transparency by requiring record-keeping and reporting by entities involved in derivatives trading, the creation of a clearinghouse would ensure that more capital would have to be set aside or increased margins would be required for trading derivative contracts. While it would certainly increase the cost of engaging in these trades through futures markets and possibly curtail speculative activity, the precise impact on price levels remains unclear.

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Conclusion

A multitude of factors are at play in oil price formation, although the fundamentals still seem to provide a reasonably plausible account of first the jump and, to a lesser extent, the subsequent fall of the oil price. Speculation, though its long-term impact on the price is neither quantifiable nor conceptually proven, does appear to have an impact on the spot market in the very short term, particularly on a day-to-day basis. Information about market fundamentals is interpreted by various market participants and forms an overall expectation, which is fed into the spot market most swiftly by speculators. Index funds and other passive investors may add pressure to the market from the buy side, leading to claims that future prices are inflated beyond the level warranted by fundamentals, but no hard evidence is present; the fact that they 'roll over' their positions – sell what was bought and use the proceeds to buy further forward – on a regular basis means that the same degree of sell-side pressure originates from these funds, unless they put additional money into oil.

Further, even if they do push futures prices up, the mechanics whereby higher future prices lead to higher spot prices are unclear, except where supply and demand for physical oil is also affected through stockpiling or hoarding behaviour. Perhaps a quote from Daniel Yergin, Chairman of Cambridge Energy Reserch Associates, in his testimony before Joint Economic Committee of the US Congres offers a concise summary on how we should make sense of the oil price fluctuations seen in the last few years: history 'demonstrates that changes of this scale and significance result not from a single cause, but rather from a confluence of factors', acknowledging that speculation may play one role among many in influencing oil prices. Moves which result in greater tranparency in both physical and financial markets are to be welcomed. Legislators, however, need to be aware that searching for a single 'smoking gun' may be fruitless, and should bear in mind that any future legislation needs to avoid the risk of destroying market liquidity and price discovery, something that could exacerbate market volatility rather than remove it.

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June
2009

MEDIUM-TERM OIL MARKET REPORT

This fourth edition of the IEA *Medium-Term Oil Market Report* (*MTOMR*) confronts an economic landscape unrecognisable from that seen at the time of the release of the summer 2008 edition. Crude prices are now 55% lower as financial and economic meltdown have slashed demand, with worldwide contraction in oil use at levels not seen since the early 1980s. But how long will the downturn last, and what is the likely profile of global and regional demand recovery when economic rebound eventually takes root? Has almost a decade of rising prices and costs changed the demand-side blueprint and forced the world onto a lower oil intensity path for the period through 2014?

Equally importantly, the report identifies the impact that weaker demand, low prices and a credit squeeze are having on supply-side investment – in upstream OPEC/non-OPEC supply, biofuels capacity and refining infrastructure alike. The 2009 edition of the *MTOMR* also delves into the issues of diversifying FSU crude exports, evolving crude and product qualities, the importance of petrochemical markets and perceptions on oil price formation in the down-cycle. Two demand scenarios are presented based on differing economic growth assumptions, with a lower non-OPEC supply scenario also accompanying the lower GDP case. Summary oil balances highlight how OPEC spare capacity could develop during 2008-2014. This year, the *MTOMR* also consolidates analysis of future crude availability and trade flows, refining capacity and oil products supply implications under one cover.

The *MTOMR* remains required reading for policy makers, market analysts, industry participants and anyone with an interest in oil market trends. It contains detailed statistical appendices and a wealth of insightful graphics. Alongside its monthly sister publication, the *Oil Market Report*, the *MTOMR* is a cornerstone of the IEA commitment to enhancing oil market transparency.