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Oil Prices: the True Role of Speculation

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Abstract

In US dollar terms, the price of oil rose 525% from the end of 2001 to July 31, 2008. This position paper argues that, despite the appeal of blaming speculators, supply-and-demand imbalances, the fall in the dollar and low spare capacity in the oil-producing countries are the major causes of this sharp rise. It also identifies many of the excessively opaque facets of the world oil markets and argues that greater transparency would enable policymakers to make sound economic decisions. Oil futures markets are shown to contribute to the greater transparency of oil markets in general. However, as the paper shows, futures trading can have short-term effects on commodity prices. In general, it is nearly impossible to pinpoint a single cause for recent oil price movements; indeed, an overview of the geopolitics of the major producing regions underscores the complexity of attempts to do so and points to a multiplicity of structural causes for what this paper—recent falls in oil prices notwithstanding—terms the third oil shock.

About the Authors

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Hilary Till is a co-founder of Chicago-based Premia Capital Management. Premia Capital is a proprietary investment and research firm, which specialises in the natural resources markets. She is also the co-editor of *Intelligent Commodity Investing*. Before co-founding Premia Capital, Ms Till was the Chief of Derivatives Strategies at Putnam Investments and prior to this position was a quantitative analyst at Harvard Management Company. She has a BA with General Honours in Statistics from the University of Chicago and an MSc in Statistics from the London School of Economics (LSE). She studied at the LSE under a private fellowship administered by the Fulbright Commission. Ms Till serves on the North American Advisory Board of the London School of Economics; she is also a member of the Curriculum Committee of the Chartered Alternative Investment Analyst (CAIA) Association. In addition, she is a Research Associate at the EDHEC Risk and Asset Management Research Centre. Ms Till served as a reviewer for the *Journal of Alternative Investments* in 2003, 2007, and 2008; in 2005, she was a referee for the *Financial Analysts Journal*. Ms Till's research for the EDHEC Risk and Asset Management Research Centre has been cited in the *Journal of Finance* and in the *Journal of Structured Finance* as well as by the Bank of Japan, the Banque de France, the European Central Bank, the Bank for International Settlements, the International Monetary Fund, and the US Senate's Permanent Subcommittee on Investigations.

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Noël Amenc

Oil Prices and Speculators

When the Ease of Finding Scapegoats Hides the Reasons for the Rise in the Price of Oil

When oil prices rose sharply in 2007 and the first semester of 2008, many political and economic commentators and opinion-makers argued that this spike was not the result of structural factors but of the activities of financial investors and speculators drawn—the former, in any case—to the prospects for high returns on investments[1] in commodity markets.

This affirmation made it possible to avoid the traditional confrontation between oil-exporting countries and oil-importing countries that justified the past oil shocks, as well as to avoid the no less traditional debate on the deterioration of the terms of trade linked to the dollar and to the countries in the dollar zone.

Debate on this issue has of course fallen off in view of the considerable drop in the price of oil in the second semester of 2008, but we at EDHEC thought it important to examine the real influence of financial investment on movements in the spot price of oil, as this issue is largely representative of the changing practices of political decision-makers. The latter, under media pressure to come up with an immediate response to all economic problems, no longer bother to consult the bodies they have created to analyse these issues, settling instead for sound bites that are immediately seconded by economists, they too obsessed by their presence in the media.

So it is odd to note that, although there are several studies from such respectable international institutions as the IMF[2] or from official task forces linked to the major commodity futures markets,[3] those who have commissioned these studies continue to assert, hastily and without referring to the studies that they themselves have commissioned, that the volatility of the price of oil and the price itself are the result of the activity of the non-commercial parties involved in the futures markets.

Now that a series of statistical tests just published in the October 2008 IMF report[4] on the current crisis in the financial markets concludes clearly that there is no significant correlation between oil prices and non-commercial positions on futures markets and that there is no more a tie of causality between prices and positions than there is between positions and prices, it is to be hoped that, to respond to issues that pose international economic and geopolitical problems that are more complex and less popular than is decrying the greed of evil speculators, politicians and their economic advisors will stop taking the easy way out and put an end to the demagogic search for a scapegoat.

It is in this light that EDHEC wished to study the real reasons for oil price movements. The work of two contributors to the study makes up the present EDHEC position paper.

The first contribution, by Hilary Till, argues that fundamental factors, especially supply and demand, are much more important to the price of oil than are financial transactions on futures markets, which, over the medium term, play no role in movements in the spot price of oil.

Hilary Till highlights the opaque nature of the oil markets (estimates of future production capacity by the major suppliers, statistics on reserves held by the major non-OECD importing countries, data on

1 - Between January 1990 and July 2008 returns on the Goldman Sachs Commodity Index (GSCI) were 9% (in US$); over the same period, by contrast, the stock market returned slightly more than 5%.

2 - In its September 2006 World Economic Outlook, *the IMF found no serious and significant link between speculative positions on commodity futures markets and commodity prices. The October 2008* World Economic Outlook *confirms this finding. The study concludes that the financialisation of commodity markets has led to more highly correlated commodities, but that it is impossible to prove the existence of a link of causation to price volatility or prices themselves.*

3 - The report from the (US) Interagency Task Force on Commodity Markets, published in July 2008, concludes that it is impossible to prove the existence of a link between positions on oil futures markets and movements in the spot price for oil.

4 - IMF, Global Financial Stability Report, *October 2008.*

positions in over-the-counter markets) and, to provide guidance to governments and economists, she argues for greater transparency in underlying markets and in over-the-counter markets.

Till acknowledges that futures markets and market fundamentals are subject to interaction effects that can lead to temporary deviations from long-term averages, and she provides examples of this phenomenon. Nonetheless, she shows that the oil futures markets contribute to the transparency of the oil market and that they make it possible to infer fundamentals when fundamental data are either lacking or opaque. The article illustrates this analysis with several case studies and points to Chinese stockpiling of reserves in advance of the 2008 summer Olympics as a major factor in the spike in the price of oil in 2008. In the presence of active futures markets, an observer need not be privy to information from large oil companies or from cartels to take an accurate reading of the market. The efficiency of the oil market requires active futures markets rather than a reduction of what is pejoratively termed speculation.

Till also points out that the extent of the increase in the price of oil can vary greatly, depending on whether it is gauged in dollars, euros, or ounces of gold—the greatest increase is for the price of oil in dollars. The conclusion is that the fall of the dollar must be viewed as one of the fundamental reasons for the rise in the price of oil.

The second contribution, by Benoît Maffei, complements Hilary Till's comments on the structural causes of the price movements in the spot markets for oil. For Benoît Maffei, the sharp rise in the price of oil is indicative of a new oil shock. This third oil shock has features that differentiate it from its two predecessors. It is emerging, and it should not be confused with a sudden rise in oil prices. Most of all, it cannot be put down to a single overarching cause that would account for a sudden imbalance between supply and demand. It is the result at one and the same time of sustained demand from fast-growing Asian economies, of oil nationalism that is hindering the development of local oil industries in the major exporting regions, of exploitation of high-cost fields, and of the geopolitical strategies of the major oil-producing countries. So the shock is the result of several causes of a structural nature, not of mere cyclical factors amplified by certain financial investors. In Benoît Maffei's view, the intrinsic complexity of price-formation mechanisms in the oil markets attests to the changes that globalisation has brought to international economic relations.

In conclusion, it seems interesting to us to quote the former Saudi oil minister, Sheikh Yamani, founder of the Centre for Global Energy Studies, an advisory firm for investment in the oil industry. This centre publishes well researched analyses of cyclical changes, but these analyses focus on fundamental themes only rarely: they are meant for industry professionals. As Yamani was closely involved in the organisation of the two previous oil shocks, his analysis of the third could be of interest. And this analysis departs from traditional OPEC discourse, which systematically highlights the role of financial speculation and, by relying on the structure of futures prices, the temporary nature of this rise. The reasons mentioned come as no surprise: low reserves, growing demand from non-OECD countries, OPEC's strategy to increase prices, and slow growth in supply from non-OPEC producers. Nonetheless, it turns out that the CGES corroborates the main conclusions to which EDHEC researchers come. The causes of the third oil shock are

multiple, but they must be ranked in order of importance. The main one is the strategy used by the oil monarchies to reassert their dominance.

"At $112 a barrel, Gulf oil today sells for around 56 times the cost of production in this oil-prolific region, an unnatural state of affairs that exists because of an uncompetitive oil market that is dominated by low-cost producers who constrain production, refrain from investing adequately in new capacity and who have erected insurmountable barriers to entry. Based on the fundamental principles of economics, the price of oil should be much lower; that it is not is testimony to the ability of modern states seemingly to defy logic, creating in the process their own reality" (CGES 2008).

Ultimately, EDHEC hopes that these serious analyses of the practices in and the structural factors of the oil market will make possible debate, more well reasoned and less passionate, that involves broader examination of the terms of trade and, in the final instance, of the interdependence of oil-exporting countries and oil-importing countries, because, whether the leaders of these countries like it or not, financial investors and speculators are not to blame for the third oil crisis.

Part 1
The Oil Markets: Let the Data Speak for Itself

Hilary Till

The Oil Markets: Let the Data Speak for Itself

Introduction

In US dollar terms, crude oil prices increased 525% from the end of 2001 through July 31st, 2008. Is this rally yet another *speculative* bubble like the late 1990s technology-stock boom or, more topically, is it going to be like the bubble in US residential real-estate values, which, in turn, is currently deflating in a surprisingly rapid fashion? Specifically, has the oil rally been based on speculative excess rather than fundamental supply-and-demand factors?

In our paper, we will argue that the available evidence suggests that the answer to this question is a *qualified* no, but we acknowledge (1) that there are many areas of data uncertainty in the oil markets, which need to be resolved, given how critical oil is to the global economy; and (2) that in the short-term it is fully plausible for the activity of market participants to have a strong influence on price.[1]

This position paper will be the first of a two-part series. It is introduced by a financial economist. In part 1, we will narrowly examine these issues using the framework of a market professional. In part 2, we will present the perspective of a financial economist on the drivers of the price of oil. Part 2 will focus on the impact of geopolitical issues, which is essential to a complete discussion of this subject.[2]

In the first section of this paper, we will explain how futures traders view the role of price, followed by an examination of data and public statements from the International Energy Agency (IEA) on the present state of the oil market. We will then discuss how useful petroleum-complex futures markets are in their price-discovery function: even when fundamental data on the oil markets are sparse or opaque, large-scale supply-and-demand shifts leave footprints in futures-price relationships, from which one can potentially infer the oil market's fundamentals. In the presence of active futures markets, an observer need not be a member of a cartel or a large corporation to gain insights into the oil market.

We will also discuss how, in the short-term, the actions of traders (and their algorithmic strategies) can impact price, particularly in a commodity that is exhibiting scarcity.

We will conclude the paper's first section by stating that it would be extremely unfortunate if the oil markets were made even more opaque, which could occur if it became public policy, particularly in the United States, to limit oil futures trading (beyond what is needed to prohibit actual or attempted market manipulation).

In the paper's final section, we will note how an analysis of oil-price drivers is made more complicated by trends in currency values; and that, objectively, one should not exclude this factor in policy debates on the causes of the present oil-price rally. We will then conclude with a discussion on the debate surrounding oil as a store-of-value.

1 - This paper was written before the market events of the week of September 29th, 2008. We expect that new lessons will be learned about the short-term interaction effects of trading activity with market fundamentals, noting that on Monday, September 29th, after a financial system bail-out package did not pass the US House of Representatives, all commodities in the Dow Jones AIG Commodity Index declined, except gold, with oil futures witnessing the steepest drop in price. Simultaneously, the S&P 500 equity index declined -8.8% while the VIX (the equity implied volatility indicator) jumped to 46.7%. Essentially, both the equity market and the basket of industrially-useful commodities behaved as one market.

2 - The EDHEC Risk and Asset Management Research Centre (EDHEC-Risk) includes both academically trained financial economists and quantitative market practitioners.

1. The Role of Price and Oil Supply-and-Demand Data

The Role of Price

A sensitive political question currently is: in the oil markets, do the fundamentals justify the price?

For an oil-futures trader, even the premise of this question is perplexing. Instead, a veteran oil-futures trader always asks the opposite question: what is the price telling me about fundamentals? The reason for this difference in outlook is simple: the market imposes sufficient discipline to prevent a trader from ignoring price for anything but a very short space of time. We do not expect that commodity futures traders will ever have the benefit of a term-lending facility, or become the beneficiaries of other large-scale government bail-outs for unwise (or unlucky) financial participants. Commodity futures traders are instead forced to rely on disciplined risk management, which ultimately is based on an in-depth understanding of price and its statistical characteristics.

A futures trader also interprets a commodity's price as part of a dynamic process. A commodity's price moves in whatever direction is needed in order to elicit a supply or demand response that will balance a commodity market. It may be useful to review the technical aspects of this interplay.

For a number of commodities, storage is impossible, prohibitively expensive, or producers decide it is much cheaper to leave the commodity in the ground than store it above ground.

The existence of plentiful, cheap storage can act as a damper on price volatility since it provides an additional lever with which to balance supply and demand. If there is too much of a commodity relative to demand, it can be stored. In that case, one does not need to rely solely on the adjustment of price to encourage the placement of the commodity. If too little of a commodity is produced, one can draw on storage; price does not need to ration demand.

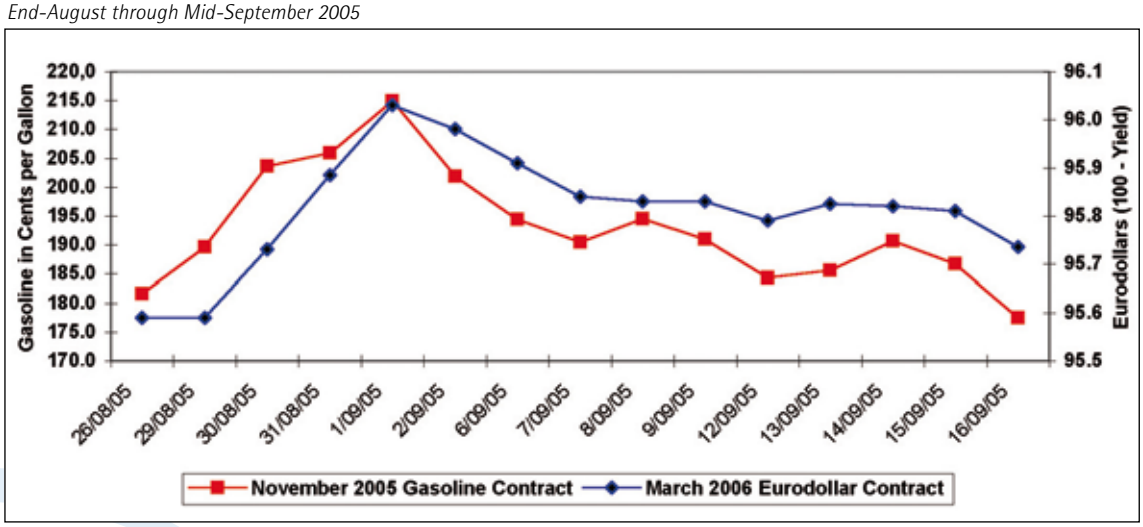
Now, for commodities with difficult storage situations, *price has to do a lot (or all) of the work of equilibrating supply and demand, leading to very volatile spot commodity prices*. A defining feature of a number of commodities is the long lead-time between making a production decision and the actual production of the commodity. It is impossible to foresee exactly what demand will be by the time a commodity is produced. This is why supply and demand will frequently not be in balance, leading to large price volatility for some commodities.

In the case of oil, it is prohibitively expensive to store more than several months worth of global consumption. Rowland (1997) explained the situation as follows:

"From wellheads around the globe to burner tips, the world's oil stocks tie up enormous amounts of oil and capital. The volume of oil has been estimated at some 7-to 8-billion barrels of inventory, which is the equivalent of over 100 days of global oil output or 2½ years of production from Saudi Arabia, the world's largest producer and exporter of crude oil. Even at today's low interest rates, annual financial carrying costs tied up in holding these stocks amount to ... more than the entire net income of the Royal Dutch/Shell Group".

One can look at the aftermath of Hurricane Katrina in the United States in 2005 for a good concrete example of the dynamic interplay between an oil product's price and its supply-and-demand situation. With the onset of Hurricane Katrina, the price of gasoline (petrol) rallied 18% in four days before falling back about the same amount fifteen days later (see figure 1).

Figure 1: Gasoline and Short-Term US Interest Rates Around the Time of Hurricane Katrina
End-August through Mid-September 2005



Source: Till (2006a).

Were the markets irrational in rallying so much in four days, given how short-lived these price increases were?

According to a 2005 Dow Jones Newswire report, "[Hurricane] Katrina shut in nearly all of oil and gas production in the Gulf of Mexico ... The large scale supply disruption and fear of an economic shock triggered a massive government response. The outages prompted the Bush administration to release Strategic Petroleum Reserve oil, waive air-pollution rules on fuels, and ease restrictions on use of foreign-flagged vessels to carry fuel in US waters". Further, "Members of the Organisation for Economic Co-operation and Development agreed ... to [release] 2 million barrels a day of crude oil and petroleum products from their strategic stocks for 30 days".

One could argue that this unprecedented government response caused gasoline prices to decline from their post-Katrina peak. Further, and as also illustrated in figure 1, with that response, fears of an economic slump diminished, which in turn caused deferred interest-rate contracts to decline, as the market resumed pricing in the expectation that the Federal Reserve Board could continue tightening interest rates at the time.

With this brief example, we see how the dynamic change in the price of gasoline induced an international and domestic response to increase supplies; and that once achieved, the price responded by quickly decreasing. Quite simply: price did its job.

The Fundamentals: Oil Supply-and-Demand Data

We admit that the way that an oil-futures trader analyses a commodity market by granting primacy to the role of price may not be satisfactory to those outside the profession. Therefore, let us turn to an objective examination of oil supply-and-demand data.

Surowiecki (2008) succintly summarises the fundamental supply-and-demand reasons for the increase in oil prices this decade: "Between 2000 and 2007, world demand for petroleum rose by nearly nine million barrels a day, but OPEC [the Organization of Petroleum Exporting Countries] has been consistently unable, or unwilling, to significantly increase supply, and production by non-OPEC members has only risen by just four million barrels per day".[3]

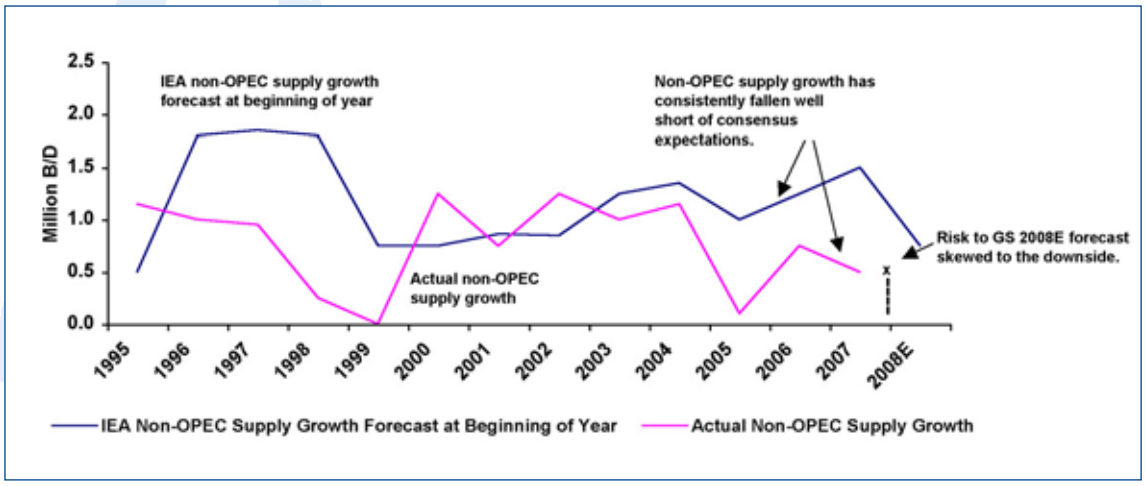
3 - The BP Statistical Review of World Energy June 2008 confirms Surowiecki's factual assertions.

For further fundamental information on the oil markets, we are fortunate to be able to mine the wealth of data provided by the IEA.[4] The IEA,[5] in turn, is an autonomous agency linked to the Organisation for Economic Co-operation and Development (OECD) and based in Paris.

The IEA estimates global oil product demand for 2008 at 86.9 million barrels per day, and global oil supply is estimated at 87.8 million barrels per day, according to its 8/12/08 report. The IEA's table of "world oil supply and demand" is reproduced in appendix A.
The IEA has been unambiguous about how to interpret its data, which is publicly and freely available on its website.

Dr. Fatih Birol, chief economist for the IEA, clearly explained the situation to Pagnamenta of *The Times* [of London]: "The days of the international [Western] oil companies are coming to a glorious end because their reserves are declining and they will have difficulty accessing new reserves. In the future we expect most of the new oil to come from a very small number of national [non-Western, government-owned] oil companies" (2008). Figure 3 illustrates the IEA's expectation of supply decreases in both North America and Europe.
As of July 2008, effective spare capacity[6] in OPEC was only 1.5 million barrels per day, according to the IEA (2008b). Figure 4 puts this excess-capacity cushion in historical context. 1.5 million barrels per

Figure 2: Non-OPEC Growth Struggling



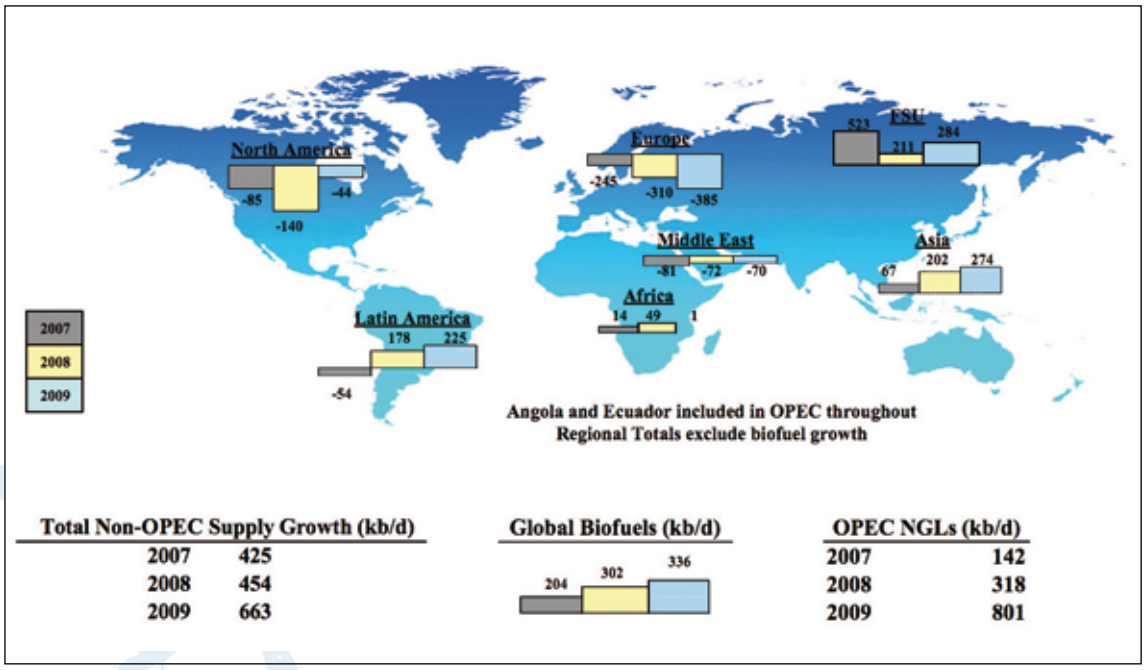
Source: Murti et al. *of Goldman Sachs (2008). - Data Sources: IEA, Goldman Sachs Research Estimates.*

On the supply side, "Oil production in non-OPEC countries is set to peak within the next two years, leaving the world increasingly dependent on supplies from [OPEC]". Figure 2 shows why there may be increased caution in predicting non-OPEC supply growth: this potential source of production growth has consistently failed to meet expectations, as noted and graphically illustrated by Goldman Sachs researchers.

day was an exceptionally small safety cushion, given how finely balanced global oil supply and demand is. Given the risk of supply disruptions due to naturally-occuring weather events as well as to well telegraphed and perhaps well rehearsed geopolitical confrontations, one would have preferred (and would prefer) this spare-capacity cushion to be *much* higher.

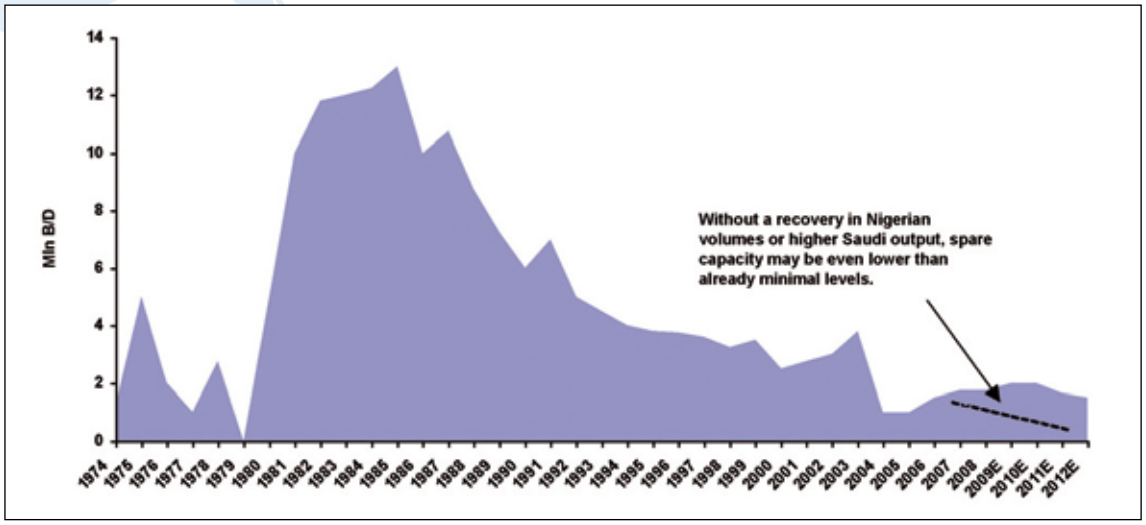
4 - One should note that the IEA does revise its data, even data dating back several years. Market participants tend to focus on the IEA's current and near-term data, and understand that such data are only estimates that may be later revised.
5 - The IEA summarises its history and mission as follows: "The IEA acts as energy policy advisor to ... [28] member countries in their effort to ensure reliable, affordable and clean energy for their citizens. Founded during the oil crisis of 1973-74, the IEA's initial role was to co-ordinate measures in times of oil supply emergencies. As energy markets have changed, so has the IEA. Its mandate has broadened to incorporate ... energy security, economic development and environmental protection. Current work focuses on climate change policies, market reform, energy technology collaboration and outreach to the rest of the world, especially major consumers and producers of energy like China, India, Russia and the OPEC countries."
6 - "Spare capacity refers to production capacity less actual production; it quantifies the possible increase in supply in the short-term", explains Khan (2008).

Figure 3: Non-OPEC Supply Growth 2007/2008/2009 (thousands of barrels per day)



Source: IEA (2008b).

Figure 4: Annual OPEC Immediately Deliverable Spare Capacity 1974 - 2012E

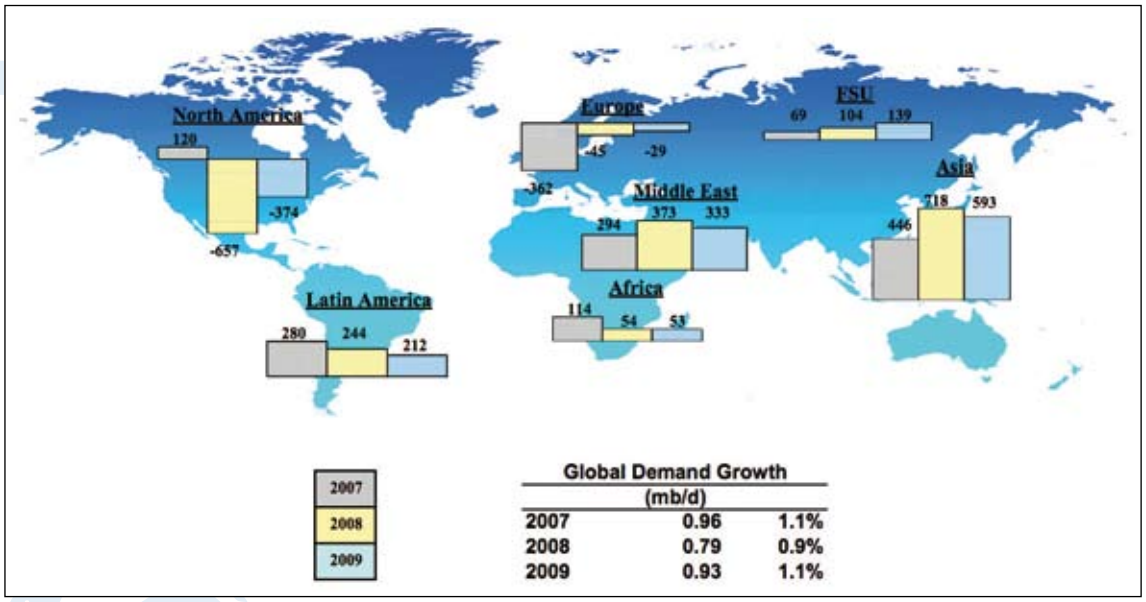


Source: Murti et al. *of Goldman Sachs (2008).*
Data Sources: IEA, Goldman Sachs Research Estimates.

On the demand side, Dr. Birol of the IEA further explained in *The Times*: "Demand growth is no longer coming from the US and Europe but from *China, India and the Middle East* [italics added]. Because their disposable incomes are growing so fast and because of subsidies, high oil prices will not have a major impact on demand growth" (2008).[7] The IEA's current and projected demand growth expectations are illustrated in figure 5.

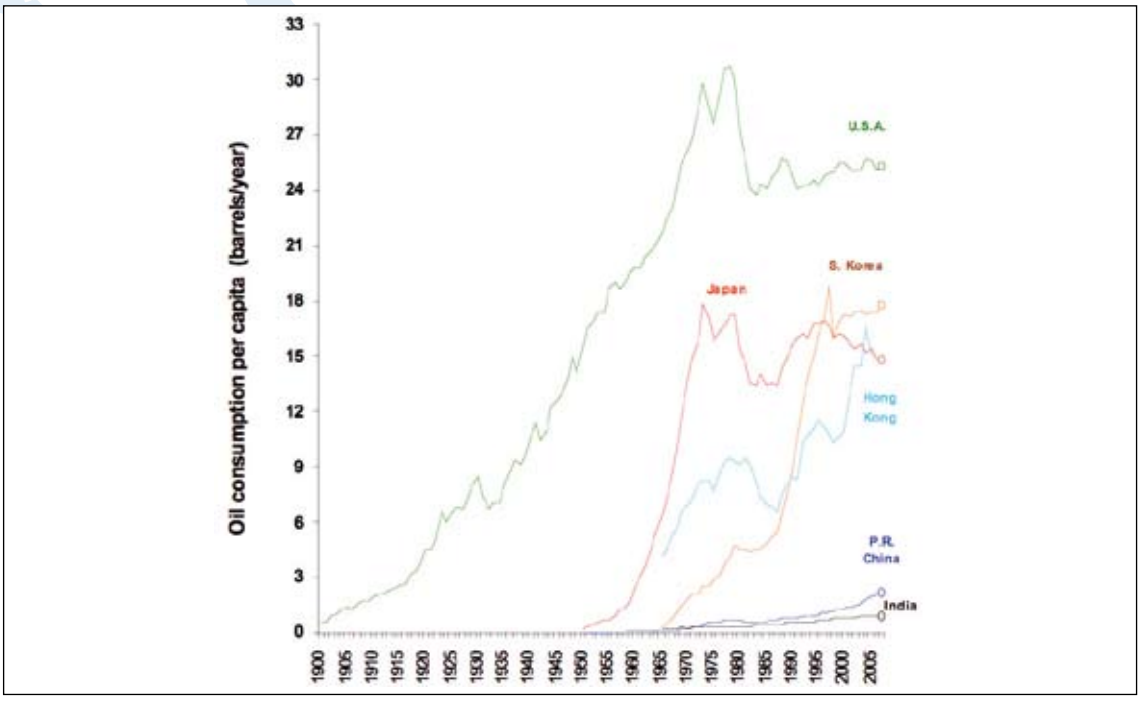
Summarising Dr. Birol's view, *The Times* states: "[T]he fundamental dynamics of the global oil market [are] increasingly ... outside the control of Western countries" (2008). We would add that there is another way of stating this: we are observing the natural consequences of the aspirations of populations outside the OECD to adopt OECD-like standards-of-living.

Figure 5: Global Demand Growth 2007/2008/2009 (thousands of barrels per day)



Source: IEA (2008b).

Figure 6: Oil per capita consumption rises rapidly in response to the GDP growth afforded by inexpensive labor, then levels off in a service economy at saturation



"The two lower lines are the Energy Information Administration's (EIA's) high-growth case for China and India. 2007 estimates are from the EIA." *Source: Bannister (2007).*
(Note: The Energy Information Administration [EIA] is a statistical agency of the U.S. Department of Energy.)

7 - We should add that oil prices are low only in some oil-producing countries. Some countries, including Nigeria, have recently abolished their subsidies.

Putting Dr. Birol's view in historical context, we can see in figure 6 how large the expected future increases in per-capita oil use in Asia are, based on previous episodes of industrialisation.

Taking together the known fundamental data on global oil supply-and-demand, the IEA concluded in its July 10, 2008, report, "Blaming speculation is an easy solution[...] which avoids taking the necessary steps to improve the supply-side access and investment or to implement measures to improve energy efficiency".

Non-OECD Data

One difficulty that the IEA admits to is that it is primarily an OECD organisation in a world where non-OECD countries are now of crucial economic importance, especially in assessing oil demand trends.

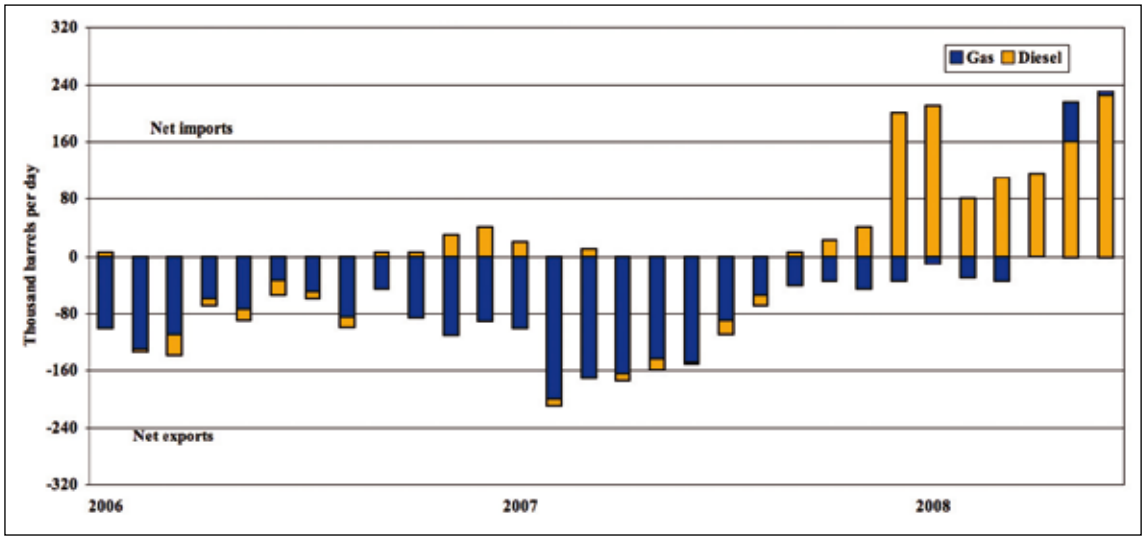
In its of August 12, 2008, report, the IEA wrote that "China's demand remains *remarkably opaque*" (italics added).

As summarised in Winning's Dow Jones Newswire report, "The IEA is forecasting China's oil demand will average 8 million barrels a day this year, and then reach 8.4 million barrels per day in 2009" (2008). In the past, this demand and its projected increase would seem relatively small in absolute terms, but with the fine balance of global supply and demand, these projections take on significance disproportionate to their size.

"Part of the problem is a lack of data on stock levels [in China], which makes it hard for analysts to determine whether there is a big enough inventory build in China to weigh on demand. China's imports of oil products have been surging in recent months, but the IEA said [in its August 12, 2008, report that] it was *unclear* whether these volumes were being stockpiled ahead of the Olympic Games [which began on August 8, 2008] or [were] making up the substantial loss of production from small refiners. [Or] imports may also have been underpinned by buoyant demand growth fueled by economic growth" (italics added). Figure 7, panel A, shows the noteworthy pick-up in diesel imports by China in 2008.

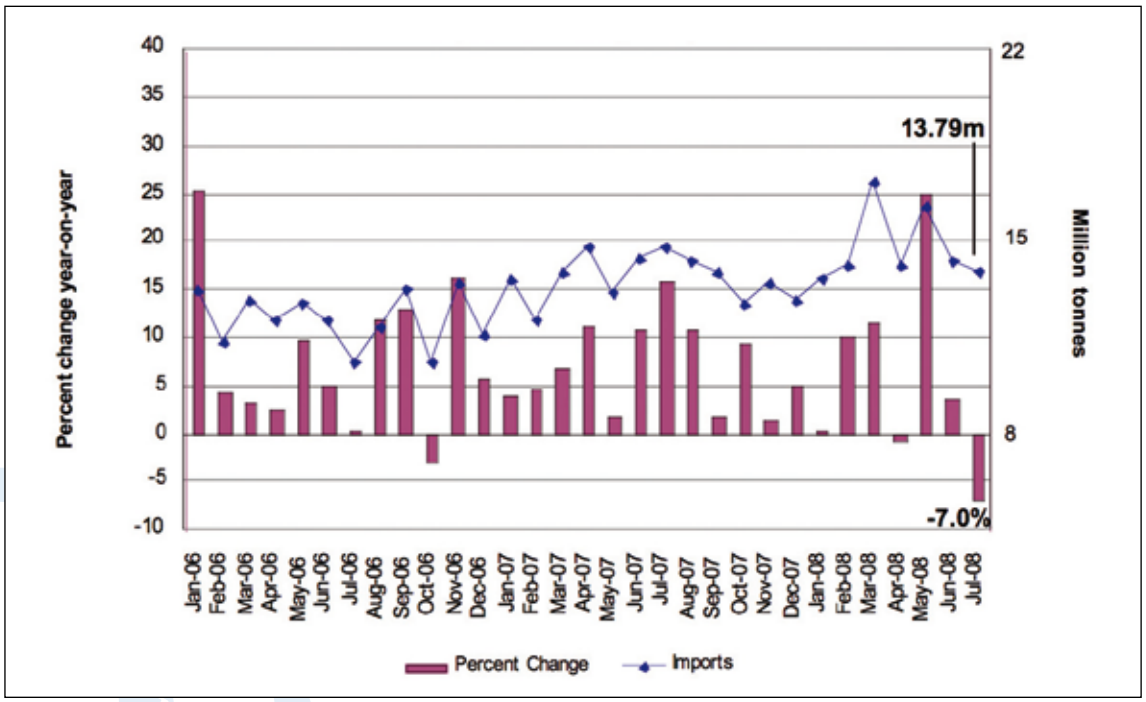
(In order for figure 7, panel A, not to be misleading, we also include panel B of figure 7, which shows China's general pattern of being a net importer of crude oil, even before 2008. Also, in figure 7, panel C, we show that while China's consumption of oil relative to the US is small, it has dominated the US in terms of consumption growth.)

Figure 7: Panel A - China Net Fuel Imports: Monthly Data - January 2006 through June 2008



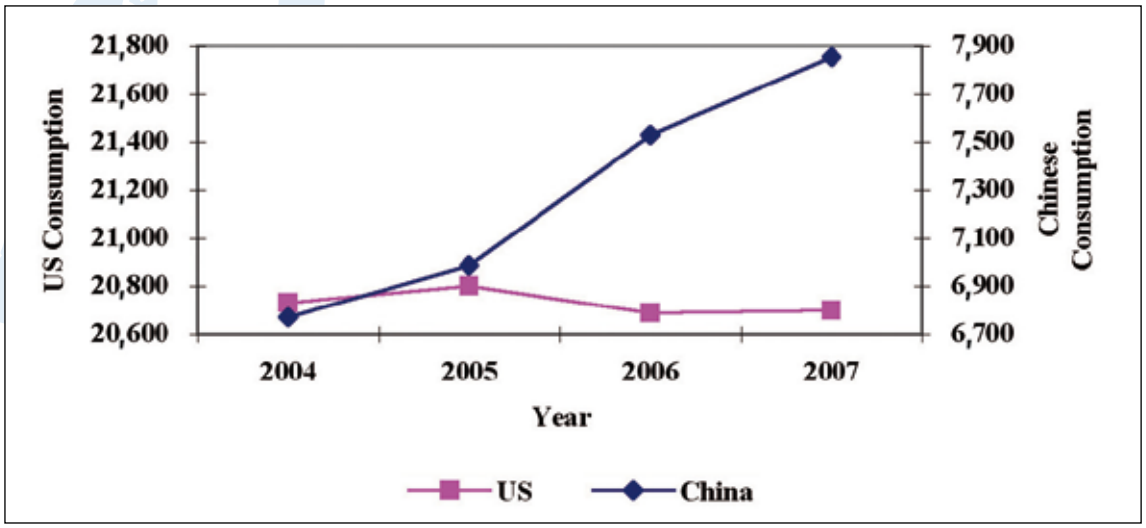
Source: Reuters Calculations Based on Official Data; Graphic Based on Thomson Reuters/Catherine Trevethan.

Figure 7: Panel B - China Crude Oil Imports: Monthly Data - January 2006 through July 2008



Data Source: China General Administration of Customs – Reuters Calculations; Graphic Based on Thomson Reuters/Catherine

Figure 7: Panel C - US and China Oil Consumption in Thousands of Barrels per Day (2004 to 2007)



Data Source: BP Statistical Review of World Energy June 2008.

The IEA's August 12, 2008, report discussed a number of scenarios for the short-term outlook for China's oil demand after the Olympic Games: "On the one hand, the recent strength in crude and oil product imports may diminish after the Olympics, provided that stocks are ample. However, demand will likely rebound as temporary measures to curb pollution are lifted. On the other hand, ongoing power shortages could herald a spike in gasoil [heating oil] use, even though high prices may also deter small-scale power generation. Finally, it is unclear whether the government may adopt policies that could potentially induce further changes to the supply and demand picture, notably regarding import taxes and end-user prices".

Put more directly, the IEA was unable to state whether the surging oil imports were due to political decisions and directives in advance of the Beijing Olympics or to the underlying strength of the Chinese economy.

Inferences from Price Relationships

Oil futures traders first became aware of not solely relying on OECD data to make predictions on the direction of oil-price relationships in 2005. It was at that time that the potential impact of temporarily concentrated Chinese demand started to reveal itself through various futures-price relationships.

Chinese Holiday Calendar

Our first example will, we hope, not seem too trivial, but instead will be seen to provide a preliminary tremor, indicating structural changes to come.

One might expect that the price of crude oil should not be correlated to the prices of either soybeans or copper. But a review of figure 8 from the spring of 2005 might lead to a revision of that expectation.

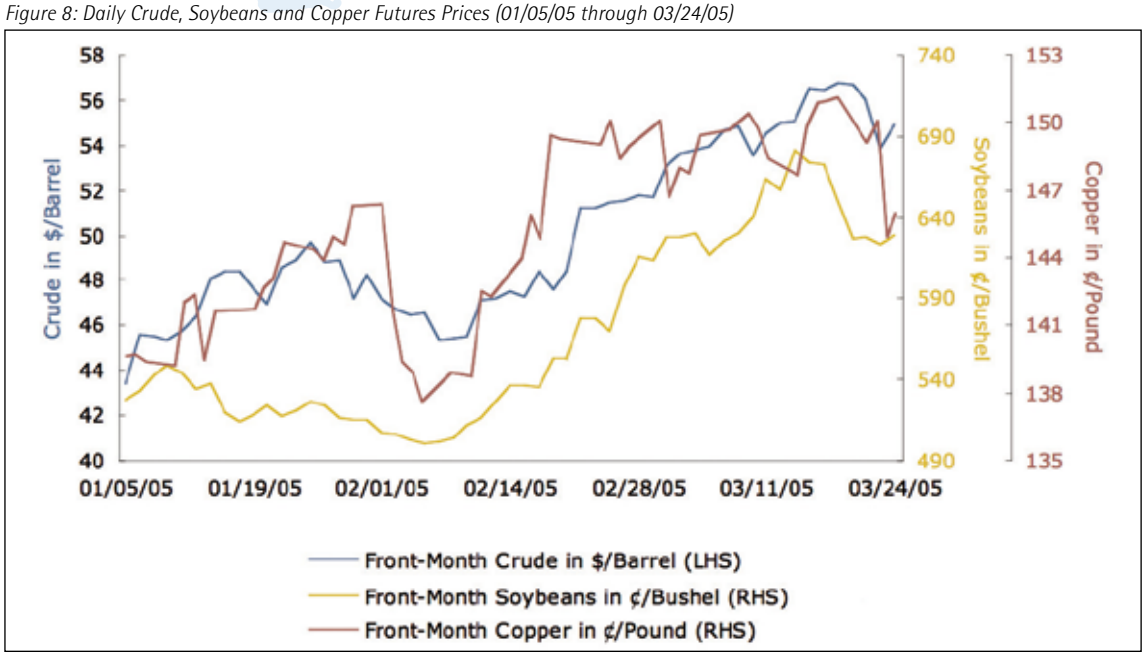
What might explain the common waxing and waning of prices in crude oil, soybeans, and copper in the spring of 2005? As of 2005, China was the largest consumer of copper and soybeans, as well as the second largest consumer of oil, according to Howell (2005). When one re-examines figure 8 in light of the Chinese holiday calendar, one notes that the lulls in each commodity's bull market occurred around the time of the Chinese New Year in February of that year, presumably when Chinese demand fell temporarily.[8] A similar, though less dramatic, pattern occurred during the Chinese holidays of May 2005.

Gasoline versus Heating-Oil Crack Spread in June 2005

Later in the summer of 2005, oil futures traders were further struck by how the petroleum complex was undergoing fundamental structural change.

A historically reliable strategy had been to enter into the gasoline/heating oil spread. Until 2005, traders had expected gasoline to outperform heating oil coming into the US summer driving season. The market historically provided large monetary incentives to refiners to maximise the production of gasoline at the expense of heating oil to meet summer gasoline demand.

Figure 8: Daily Crude, Soybeans and Copper Futures Prices (01/05/05 through 03/24/05)



Source: Based on Till and Eagleeye (2005).

8 - We chose not to include the 2008 Chinese New Year effect on staple commodity prices because the severe snowstorms of the time may have been much more important than, strictly speaking, holiday-related factors. According to Blanch et al., *as of February 1, 2008, "China is experiencing the most severe winter in decades. The recent snowstorms in China have probably been the harshest in 50 years, creating major disruptions across the country. ... In our view, China will have tremendous short-term pressure to deliver food and shelter to millions" (2008).*

2005 was different. Fusaro revealed that in the summer of 2005, "the big Wall Street houses and some other hedge funds lost many ... hundreds of millions [of dollars] on gasoline/heating oil spreads. They could not imagine that heating oil would go higher than gasoline in June. It just never happened before" (2005).

Figure 9 shows the gasoline/heating oil spread differential as of the beginning of June since 1985. Indeed, it had been unprecedented for heating oil to be priced at a premium to gasoline at that time of year.

As Stein noted, "This is the first business cycle where Chinese demand is having a global effect on prices, notably of energy and other raw materials" (2005).

Farivar of Dow Jones Newswire reported that "in China, diesel demand has been rising rapidly, because power shortages have forced many companies to use stand-alone generators. Diesel accounts for a significant portion of the overall rise in Chinese oil demand over the past year" (2005). Both diesel and heating oil are "middle distillates", and in the refining process both "compete for the same part of the barrel". Therefore, a rise in diesel prices tends to lead to a rise in the value of heating oil futures. Accordingly, heating oil futures are frequently used as a proxy hedge for diesel inventories.

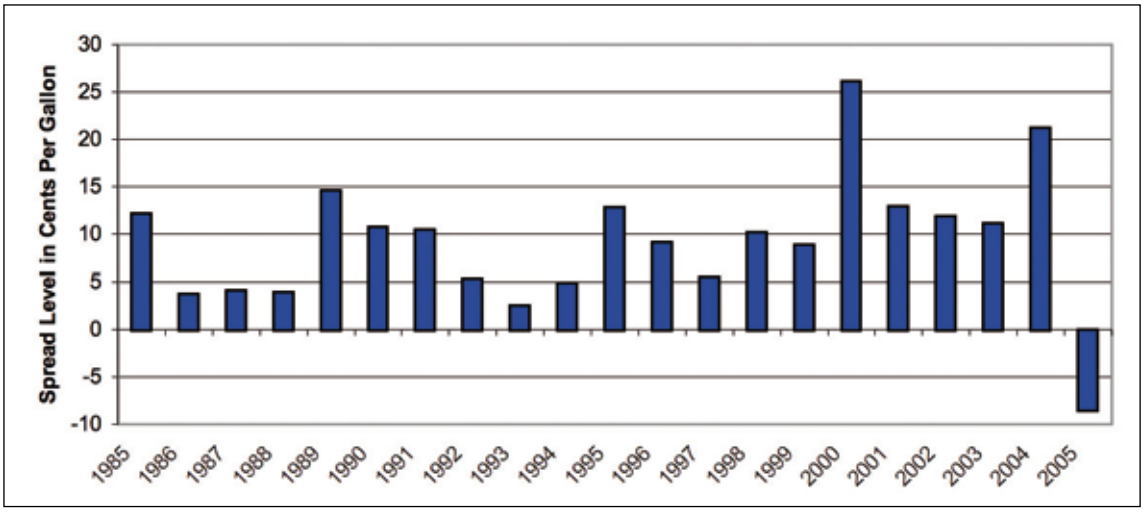
For the first time, Chinese demand for diesel may have trumped the American consumer's demand for gasoline, a scenario that had been historically unprecedented, and which provided alert futures traders with ample warning of the entrée of China as a potentially dominant force in the commodity markets.

Product Crack Spreads in 2008

After 2005, commodity-market participants were conditioned to be alert to the potential of Chinese demand factors to outweigh US demand factors. This is also the clear message of figure 7, panel C. This caution has been reinforced by the market dynamics (thus far) of 2008, as will be discussed below.

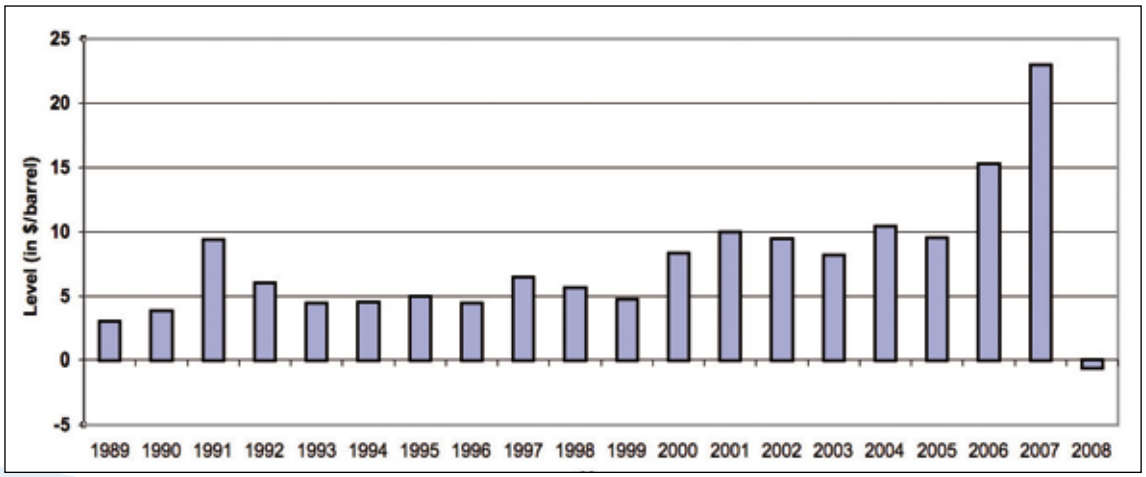
Crude oil in and of itself is not useful. It must first be refined. Prior to this year, the margin of gasoline over crude oil, the gasoline crack spread, would trade at ever higher levels in order to incentivise the sufficient production of gasoline for the summer driving season in the United States. For example, in mid-March 2007, the gasoline crack spread traded at $23 per barrel in order to accomplish this task.

Figure 9: July Gasoline vs. Heating Oil Spread Differential as of the 5th Business Day of June 1985 through 2005



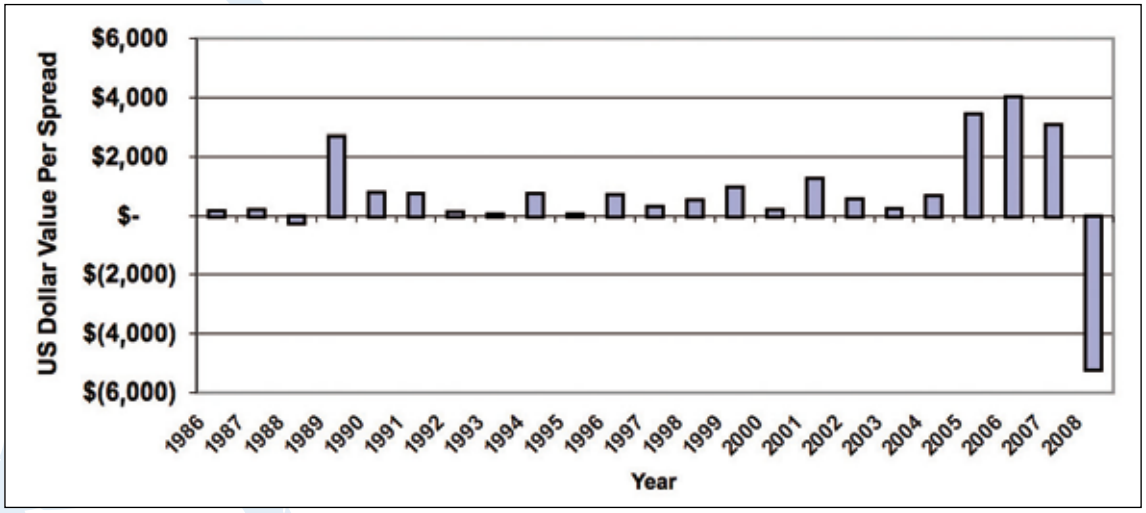
Source: Till (2006a).

Figure 10: Level of Front-Month Gasoline Crack Spread (in $/barrel) on March 17th of Each Year (1989 to 2008)



Data Source: Bloomberg (from NYMEX futures data); symbol: HUCL1.

Figure 11: Change in the value of August Gasoline Crack Spread from 2/13-to-3/31 of Each Year (1986 to 2008)



Data Source: Bloomberg (from NYMEX futures data).

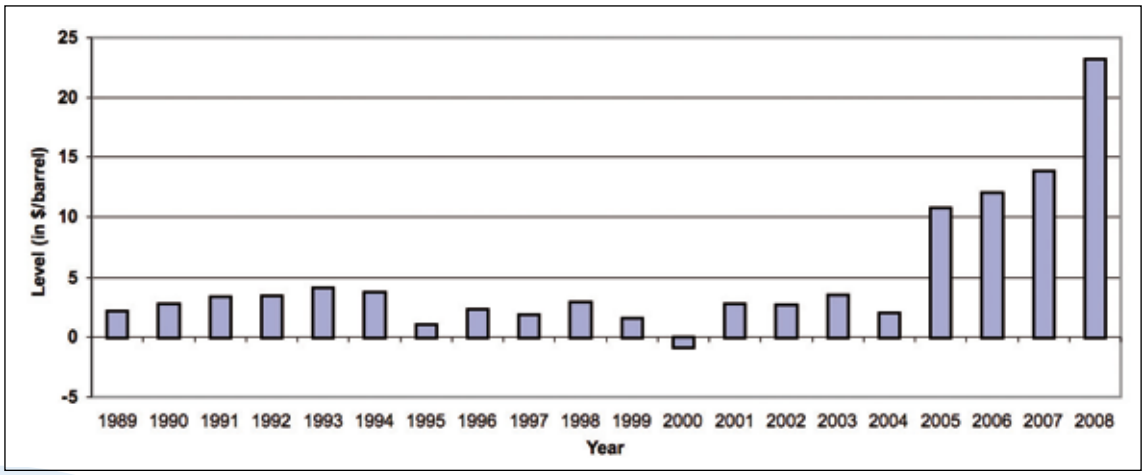
But in mid-March 2008, the gasoline crack spread actually went negative. Crude oil was more valuable than its refined product, gasoline. This is illustrated in figure 10.

Further, the gasoline crack spread for August deliveries had typically increased from mid-February to the end of March, again reflecting the typical need to allow refineries sufficient profitability to create enough gasoline to service US summer demand. Again, this did not occur this year, as illustrated in figure 11.

The story told by the gasoline crack spreads mirrors the fundamental data reported by the IEA: high prices were effective in curbing US (and, for that matter, European) demand. The IEA's report of August 12, 2008, stated that in OECD North America oil product demand had shrunk -2.2% year-over-year, while in OECD Europe oil product demand had fallen -2.3%.

Further, the US Federal Highway Administration reported that the number of vehicle-miles traveled (VMT) had actually declined since 2006. Rural VMT were down -4.1% year-over-year, as of May 2008, suggesting "that US motorists ... sharply reduced leisure driving", as the IEA stated in its of August 12, 2008, report.

Figure 12: Level of Front-Month Heating Oil Crack Spread (in $/barrel) on March 17th of Each Year (1989 to 2008)



Data Source: Bloomberg (from NYMEX futures data); symbol: HOCL1.

In 2008, the heating-oil crack spread told a story different from that of the gasoline crack spread, as shown in figure 12.

This spread indicated extraordinary demand for middle distillates in mid-March.

On May 22, 2008, the front-month heating-oil crack spread traded to $36.12, as shown in figure 13. According to NYMEX futures data available on Bloomberg, the front-month heating-oil crack spread had not traded at such a high level since January 3, 1989. There were no severe weather events, supply disruptions, or large-scale trading blow-ups on this particular date, so it was not immediately apparent why this relationship should spike extraordinarily. That said, on May 12, 2008, a devastating earthquake did occur in Sichuan, China. The heating-oil spread then remained at quite high levels until July 28, 2008.

After the Sichuan earthquake in mid-May, there were a number of Reuters articles that reported that Chinese oil companies were importing diesel for back-up generators in earthquake-hit areas with damaged power supply grids.

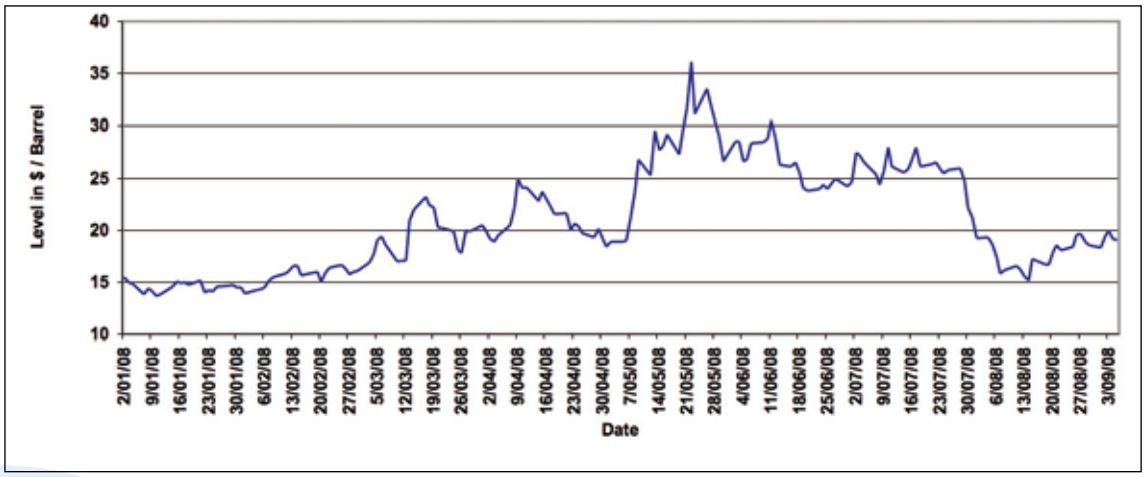
Also, throughout 2008, a number of Reuters articles provided reports of pre-Olympic petroleum-product stocking that was occurring to ensure that there would be *no* shortages during the historic (and very successful) Beijing Olympics, which ran from August 8-24, 2008.

Starting in late August 2008, further financial-press reports on Chinese pre-Olympic and post-Olympic demand began filtering through. Two reports in particular, one in *Forbes* and one from the *Financial Times*, stand out.

According to Wang (2008) in *Forbes*:
"China's nine-month spree importing refined petroleum products is likely to end in the fall, as the close of the Summer Games spells surplus inventories of gasoline and diesel. A slackening of demand in the world's second-biggest oil consumer may help ease upward pressure on global oil prices.

China stepped up refined oil shipments from abroad in May to bolster its stockpile from the Olympics, which ended August 24, and in the process became a net gasoline/diesel importer for the first time. PetroChina is bound to halt imports and revive exports in September, according to traders on Tuesday. It is preparing to ship 60,000 tons of gasoline, likely to Southeast Asia, next month.

Figure 13: Front-Month Heating Oil Crack Spread (1/2/08 to 9/5/08)



Data Source: Bloomberg (from NYMEX futures data); symbol: HOCL1.

Under a strict directive of Beijing to avoid any shortage of fuel during the Olympics, China's state-controlled refiners, PetroChina and China Petroleum and Chemical Corp. (Sinopec), boosted their refined oil imports, which topped 960,000 tons in June. The import frenzy was one of a number of developments that drove global oil prices sky-high ... in July. Oil has fallen sharply since [then] ...; China's revived exporting of refined fuel products could lead to further easing" (italics added).

<u>According to Hille (2008) in the *Financial Times*:</u>

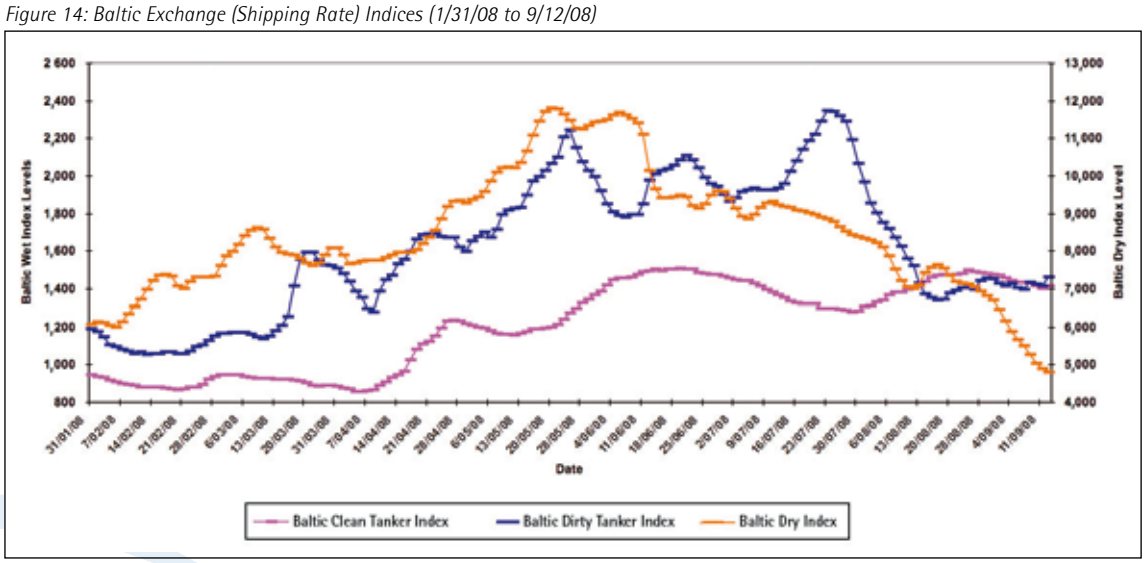
"China's state-owned oil companies are likely to stop imports of refined products such as diesel and petrol next month after a nine-month buying spree that has left stockpiles overflowing, one of Asia's largest refiners said. Industry experts have attributed the buying binge to *political orders* to refiners to avoid shortages during the Olympics. The import wave had been boosted by tax rebates granted to Sinopec and PetroChina for imports of refined products" (2008) (italics added).

Commodity-market participants frequently monitor the levels of the Baltic Exchange[9] indices, which measure the cost of shipping various types of cargo across international routes. The Baltic Dry Index (BDI), for example, is "a measure of the cost of shipping raw materials ... [and can sometimes be a] good yardstick of commodity ... [demand] and, by extension, global economic growth", according to Gongloff (2008) in the *Wall Street Journal*. Figure 14 shows how the BDI reached its peak on May 20,2008, indicating extraordinary demand for shipping dry-bulk commodities up until that point. Examples of dry-bulk commodities include essential raw materials such as coal, iron ore, and grain.

Notes Orton-Jones (2007), "Other indexes supplied by the Baltic Exchange include the Baltic Dirty Tanker Index and the Baltic Clean Tanker Index ('dirty' tankers carry crude oil and fuels that leave a residue, where 'clean' tankers contain diesel, gasoline, and jet fuel.)" In viewing figure 14, we see that thus far this year, the clean-tanker index peaked on June 19, 2008 while the dirty-tanker index peaked on July 23, 2008. These indices are averages of the costs of booking shipping across six and twelve international routes respectively. Geman (2005) has explained, "As more ships go to China, fewer are available to ferry goods between other parts of the world, causing a supply shortage and price rises". Therefore, when there is particular demand for shipping by Chinese industries, one would expect this demand to be reflected in the levels of international indices as well.

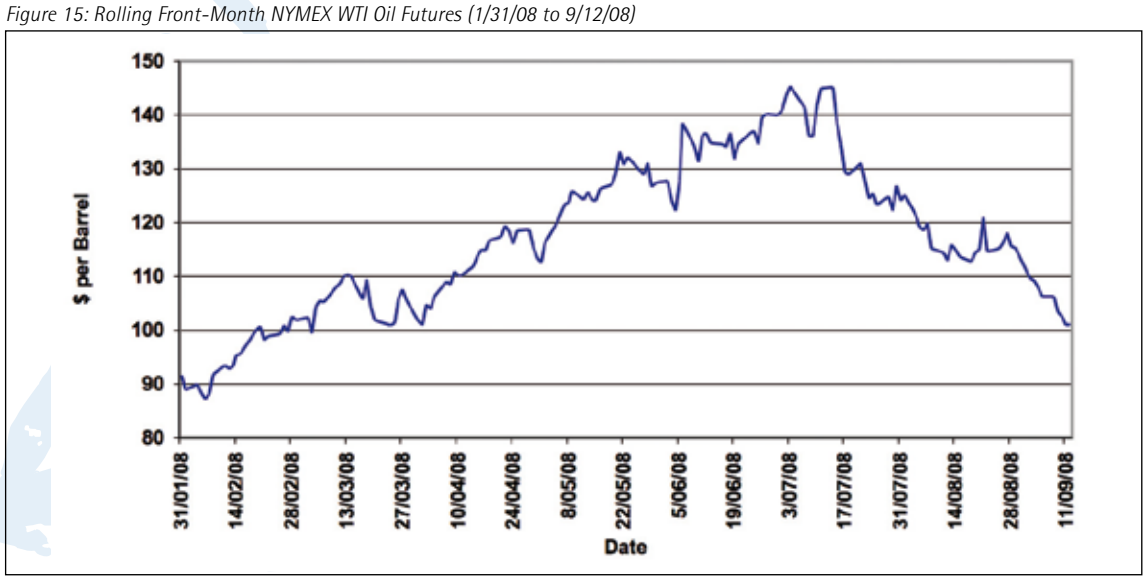
9 - The Baltic indices are managed by the Baltic Exchange in London, which is the global marketplace for brokering shipping contracts.

Figure 14: Baltic Exchange (Shipping Rate) Indices (1/31/08 to 9/12/08)



Data Source: Bloomberg.

Figure 15: Rolling Front-Month NYMEX WTI Oil Futures (1/31/08 to 9/12/08)



Data Source: Bloomberg.

In viewing figures 13 and 14, we see that the peaks in the costs of global shipping occurred at about the same time as the heating-oil crack spread was trading at extraordinary levels. These observations are consistent with the hypothesis that brief intense demand from China during the country's pre-Olympic preparations may have contributed to the petroleum-complex rally of the time.[10,11]

Clearly, we need to be very modest in claiming to have solved the puzzle of what caused the price of oil to peak in July 2008 (see figure 15, which shows the July 2008 price spike).

There is a limit on how much we can infer about market fundamentals from price relationships. What Jacobs and Levy (1989) noted for the stock market is equally true for the oil market:

"The stock market ... is a complex system. The market is permeated by a web of interrelated return effects".

10 - At this point in the paper, we should admit one of the complications with explaining information conveyed by price. The following is intuitively understood by traders, but has arguably not been sufficiently quantified (at least in the practitioner journals) except by Abdulali et al. (2002) and by Weinstein and Abdulali (2002). The price of an investment should not be a "point asset value." Instead, price should be parameterised, according to the volume that needs to be transacted, over what timeframe this needs to occur, and what the investor's risk tolerance is. Perhaps this general framework will become quite important for commodities as well, with "risk tolerance" not only meaning an aversion to losing money, but also an aversion to inadvertently violating a government mandate (or political order).

11 - We need to carefully caveat our analysis here. In this section, we are solely pointing to the pre-Beijing-Olympics stockpiling as a plausible explanation for the acceleration in the price of oil during the first seven months of 2008. A separate analysis is required for explaining the long-term rise in the price of crude, especially from 2004 to 2008; this will be the task of part 2 of this document.

But we would say that alert futures traders, who noted that both the heating-oil crack spread and the Baltic indices were successively peaking in late May to late July, had a number of warning signs that a fundamental source of demand for oil might dry up in short order.

Other Market Fundamentals: Light Sweet Crude Oil and Strict Environmental Mandates

Verleger[12] (2008a) outlines additional fundamental reasons for the oil market's 2008 spike. Crude oil spare capacity is concentrated in heavy sour crude oil with total production of light sweet crude oil at only "12 to 15 million barrels per day out of a worldwide crude production of 81 million barrels per day. Nigeria is the leading producer of light crude with a capacity of 2.6 million barrels per day. However, civil strife has lately reduced output".

Verleger (2008b) noted that in the spring of 2008, light sweet crude markets tightened "as the available supply of this crude was reduced further by US Department of Energy (DOE) ... actions" to top up the US Strategic Petroleum Reserve (SPR), removing "60,000 barrels of light sweet crude from the market".

Why is the availability of light-sweet crude oil (even on the margin) so important? Verleger (2008a) explains that both the European Union (EU) and the United States have "required refiners to cut sulfur content in diesel fuel ... from much higher levels". The rules went into effect in the US in 2006 and will be phased in in the EU by the end of this year. In the absence of sufficient complex refinery capacity to produce the mandated fuels from heavy sour crudes, refineries have been forced to bid up for scarce light crude oil volumes.[13]

Verleger (2008a) continues: "over the last six months, one can observe an extraordinarily tight link between the price of Brent crude (a sweet crude produced in the North Sea that is a key benchmark) and the spot price of low-sulfur gasoil, an indicator of the spot price of diesel fuel in Europe. The linkage is tight and the econometrics are compelling. The conclusion is clear: European demands for very-low-sulfur diesel are driving crude prices up".

To be complete, one should note that Verleger has been even-handed in describing the political causes of the oil rally. The US receives its share of blame, too. On December 11, 2007, Verleger testified before the US Senate, calling for the DOE to cease filling the SPR with light sweet crude oil, regardless of price, and instead, use sour crude oil, which was in relative surplus. His testimony is in Verleger (2007).

Historical Skepticism Regarding Futures Trading

At this point, a reader of this paper may grant all of the above, but still say, "Yes, but what about the speculators?" In reviewing historical studies since 1941, one realises that this topic may *always* be an area of controversy. When one reads the landmark US Department of Agriculture (USDA) study by Hoffman and Duvel (1941) on the impact of futures trading on grain prices, one is struck by how little the terms of the debate on futures trading have changed in sixty-seven years.

12 - Dr. Philip K. Verleger, Jr., is a professor of global strategy and international management at the Haskayne School of Business, University of Calgary, Alberta, Canada.

13 - We should add that Tchilinguirian (2008b) emphasises the need to examine the global supply-and-demand trends over the past four to five years in combination. "Demand-side factors, brought on by the emergence of markets such as China, India or the Middle East as new large consumers of oil have taken the limelight as explanatory variables in the distortion of previously established pricing relations. Yet, it is important to understand that their effect has been magnified by the underlying constraints in productive capacity, be it in the upstream or downstream sectors, in particular during a period that also saw oil-product specifications tighten in the Atlantic Basin." Tchilinguirian (2008a, 2008b) writes that "refining capacity additions in Asia and in the Middle East over Q408-2Q09 could lead to a reversion towards more typical price-spread relations between oil products and crude oil, notably for distillate products like gasoil and jet fuel/kerosene. Reliance in India is bringing online a large and very complex export-oriented refinery at Jamnagar while China is adding refining capacity domestically at Huizou and Qingdao. Reliance's new refinery will boost light product supply on Asian markets, but this 580 kb/d plant is also capable of meeting tighter European and US product standards and supplying those markets as well. By adding domestic capacity, China will be in a better position to address its growing demand for transport fuels and occasional spikes in diesel demand on shortfalls in power generation, moderating its product-import-dependency. All in all, crack spreads for light products in 2009 ... [may therefore] average lower than what we experienced in 2008. (As noted in footnote 11, we will be covering the structural causes of the oil-price rally in part 2 of this paper.) For the purposes of this paper, we note that one can infer the progress of these fundamental developments by monitoring current and forward price-spread differentials, as revealed by the futures markets. This type of analysis is also found in Tchilinguirian (2006).

Moreover when one reads US Congressional testimony from 1892, as cited in Jacks (2007), one realises how during times of intense competitive dislocation, as also occurred during the last great era of globalisation, the social usefulness of futures trading has historically been called into question.[14]

Similarly, Sanders *et al.* (2008) note how the intense price rises of the 1970s also resulted in public pressure to curb futures trading.[15]

A later section of this paper will cover the plausible short-term effects of futures trading on commodity prices. But first we will draw some preliminary conclusions from the fundamental data and price histories that we have presented thus far.

Preliminary Conclusions: Data Transparency

[1] We showed several well-chosen price charts and news reports to indicate that pre-Olympic stocking *may* have contributed to 2008's oil-price spike. Obviously, it is inappropriate for us to say we proved this assertion. That said, we can point to one unambiguous conclusion: given how finely balanced global oil supply and demand is, it would be extremely helpful for China's demand and inventory statistics to become as transparent as those in the OECD, in coordination with the IEA. The IEA is already working cooperatively with non-OECD consumers (such as China) and non-OECD producers (such as Saudi Arabia) through the Joint Oil Data Initiative (JODI) to provide more transparency on oil statistics. In fact, this was one of the key policy statements that emerged from the 6/22/08 Jeddah (Saudi Arabia) Summit on the global energy markets, which included leaders from both oil consuming and producing countries.[16] Appendix B from the JODI shows the progress in signing up countries to provide empirically sound statistics on the oil markets.

We can draw three other subsidiary conclusions as well, all of which are related to the current and future importance of data transparency in the oil market.

[2] In examining futures-market price signals from the spring of this year onwards, we would conclude that the futures markets once again provided alert participants with useful, concurrent information on underlying demand in the opaque oil markets; waiting several months for a coherent, fundamental explanation was unnecessary.

That said, fundamental structural changes occur constantly in the commodity markets, including in the petroleum complex. The interpretation of a price relationship is sometimes conditional on a particular state of the world. A concrete example should make this statement more clear. This example is in appendix C.

[3] It is clearly not a good state of affairs for oil to be in such *tight* balance that (a) an extraordinary (and temporary) demand event could plausibly cause oil prices to increase at such an extraordinary pace; and (b) relatively small supply disruptions in notoriously unstable parts of the world could cause oil prices to spike to over $250 per barrel, as discussed in scenarios by Blanco and Aragonés (2006).

Regarding the latter point, and consistent with the theme of data transparency, it would be extremely helpful if reserve and

14 - Sesit (2005) quotes from Professor Niall Ferguson of Harvard University and George Magnus, senior economic advisor at UBS, on the similarities between the current era of globalisation and the last one, which occurred from the 1880s until the onset of World War I. In each case, both eras resulted in greater global prosperity, but also large economic dislocations. The first era obviously ended disastrously.

15 - To be complete, one should also note that agricultural futures trading was suspended in the US during World Wars One and Two, by degrees, as rationing and prioritising war objectives overrode other economic objectives.

16 - The Kingdom of Saudi Arabia and the Secretariats of the International Energy Agency (IEA), the International Energy Forum (IEF) and the Organisation of Petroleum Exporting Countries (OPEC) each called for the enhancement of the "quality, completeness and timeliness of oil data submitted through the monthly Joint Oil Data Initiative (JODI)." Also, "in order to further improve market transparency and stability, the seven organisations involved in JODI – APEC (Asia Pacific Economic Cooperation), Eurostat, IEA, IEF, OLADE (Latin American Energy Organisation), OPEC and UNSD (United Nations Statistics Division) – are called upon to start work to cover annual data, that includes, among other things, upstream and downstream capacities and expansion plans", noted the Jeddah Joint Statement (2008).

productive capacity information from key oil exporters were not so opaque, as discussed in Khan (2008). For example, is Saudi Arabia incapable of playing its historical role as swing producer?[17]

That said, with oil markets so finely balanced, even marginal additions of supply may have a disproportionately positive impact on price. During the June 22, 2008, Jeddah Oil Summit, Saudi Arabia announced that it would increase production by an additional 255,000 barrels per day in July and by more than 200,000 barrels a day in June, according to Reed (2008).

Promoting openness (*i.e.*, data transparency) is one of the core principals described in the June 2008 paper, "Global Commodities: A Long Term Vision for Stable, Secure and Sustainable Global Markets", by the United Kingdom's Treasury Group.[18]

[4] In the absence of key (timely) fundamental data from non-OECD countries, one can rely on the transparency of commodity futures markets to infer what the concurrent and future expectations are regarding the oil supply-and-demand balance, as noted in point [2]. It would, therefore, be extremely unfortunate if US public policy were to limit oil futures trading, and make these markets even more opaque.

Now, to be fair to critics of futures trading, this activity is arguably *not* sufficiently transparent either, at least by the standards originally established by the US Congress in the Commodity Exchange Act of 1936. This is an area that the US Commodity Futures Trading Commission (CFTC) is in the midst of addressing and whose progress was described in Dunn (2008). The CFTC is presently examining not only the opaque over-the-counter (off-exchange) energy derivatives markets, but also energy futures trading in London, in those specific cases where the contracts are tied to US delivery locations. This energy trading takes place on the ICE Futures Europe exchange. It may be that the CFTC will need additional legislative authority (and funding for staffing) before these monitoring functions become a regular part of the CFTC's responsibilities. Obviously, also, the gathering and publication of data on energy futures trading in London requires cooperation with the UK regulatory body, the Financial Services Authority (FSA).

The legislative and regulatory framework for providing greater transparency in commodity derivatives trading will likely be changing quite soon. Appendix D provides a summary of a bill passed by the US House of Representatives on September 18, 2008, which codifies a number of the CFTC's recommendations. As of the writing of this paper, the bill was not yet law since it also requires the approval of the US Senate and the president.

Also, one should not ignore the broader financial context in discussing derivatives-trading transparency issues. As noted in Dumas (2008), the notional size of the opaque over-the-counter commodity derivatives markets is $8.3 trillion, quoting Bank for International Settlements (BIS) data, which, in turn, excludes precious metals and is current as of the end of 2007. Dumas (2008) notes that this size dwarfs the open interest of the (transparent) exchange-traded futures market, which is calculated at $1.2 trillion by Barclays Capital and includes precious metals and is current as of the end-of the first quarter of 2008.

Therefore, the opaqueness in commodity-derivatives trading is concentrated in the

17 - We need to sound another note of caution here. Presenting the global oil market as a confrontation between a swing producer such as Saudia Arabia and a swing consumer such as China is clearly an oversimplification. That said, it does make sense to focus on China since it is the main importer of oil in Asia; as such, its marginal imports determine the market price (as with soybeans and copper). However, the supply-and-demand imbalance on the global oil market derives from the growing demand from all Asian countries that are registering rapid economic growth.

18 - The UK Treasury summarises its mission as follows: "The Treasury is the United Kingdom's economics and finance ministry. It is responsible for formulating and implementing the Government's financial and economic policy. Its aim is to raise the rate of sustainable growth, and achieve rising prosperity and a better quality of life with economic and employment opportunities for all."

over-the-counter (off-exchange) derivatives markets. Given the ongoing intense difficulties of large US banks (and some European banks) in valuing opaque, over-the-counter credit-derivatives instruments, which is now a crucial issue in determining their solvency, one natural consequence of the current financial situation may be as follows: there may be intense pressure to move *all* derivatives activity to on-exchange, centrally-cleared and transparent forums, as discussed in Whalen (2008). Such a broad-based move would naturally lead to more transparency in commodity trading, assuming this is embraced by all the main financial centers.

The Technicals: the Interaction Effect Between Traders and Price

In this paper, we have not yet directly addressed the role of speculators, other than to say we support greater transparency in the activities of these participants.

To be completely fair to those who see the hand of futures traders in the 2008 oil-price rally, one can say that there has been evidence in the past across a number of commodity markets for an interaction effect between traders and price. This is analysed, for example, in Hoffman and Duvel (1941) for grain trading on the Chicago Board of Trade; in Gilbert (2007) for metals trading on the London Metals Exchange (LME); and in Verleger (2007) for oil trading on the New York Mercantile Exchange (NYMEX).

The Hoffman and Duvel (1941) study finds that neatly ascribing price to either market fundamentals or trading activity is unsatisfactory. The authors of this study conclude that "grain prices reflect not only the forces originating in the production and merchandising of grain, but also those generated in the process of market trading... "This school [of thought] holds that while a long-run average of prices will conform fairly closely to fundamental trade facts, *there is no assurance at any given time that this will be the case due to the uncertain nature of purely market operations*" (italics added).

Extrapolative Behavior in Tight Markets

Gilbert (2007) explains why temporarily large price rises in commodity markets occur. "Commodity markets are characterized by very low short-run elasticities of both production and consumption, although long-run supply elasticities are probably high. ... [I]n a tight market in which only minimum stocks are held, the long-run price becomes irrelevant. With inelastic short-run supply and demand curves, *the market clearing price ceases to be well-defined*, not in the sense that the market does not clear, but in the sense that it will be very difficult to assess in advance at what price market clearing will result. Fundamentals-based analysis may show where the price will finish but this will provide very little guide as to where it will go in the meantime" (italics added).

Gilbert further explains that "when markets become tight, inelastic supply and demand make prices somewhat arbitrary, at least in the short term. There will always be a market clearing price but its level may depend on *incidental, and not fundamental*, features of the market" (italics added).

Gilbert specifically tests the metals markets for "extrapolative behavior". When one regresses today's price on yesterday's price and finds that the coefficient on the previous day's price is greater than 1, this is "extrapolative behavior", where the price process can be called "explosive". If the coefficient is only slightly greater than 1, then the process is "mildly explosive". In examining LME data from January 2003 to September 2007, Gilbert found that "extrapolative behavior has been a feature

of the non-ferrous metals over recent years", as inventories became quite tight across the metals complex.

Dynamic Hedging and Negative Gamma

In the case of oil, Verleger (2007) explained how the activity of traders may have (temporarily) interacted with market fundamentals to magnify the oil-price rally in the fall of 2007. Verleger noted how large-scale industrial consumers, such as airlines, had purchased out-of-the-money call options on oil futures contracts in order to protect against price rises. Obviously, someone had to sell the industrial consumers these options: the money-center banks. As crude oil rose towards the level(s) where there was a concentration of call-option strikes, this might have created a cascade of dynamic-hedging purchases by bank dealers, who in turn were hedging the options they had written. This might have caused the oil price to (temporarily) rise still further.

In the terminology of derivatives traders, the bank dealers likely had maximum "negative gamma:" their exposure to being short crude was rising at an accelerating rate, forcing them to purchase crude oil contracts at an accelerating rate, too.

Once market participants became aware of this interaction effect, it became common to note where the concentrations of option strikes are in the crude-oil futures market. Futures traders do not have access to data in the OTC market, where the large-scale transactions are taking place, but one expects some of this activity to show up in NYMEX option open interest, as bank dealers likely hedge some of their OTC derivatives exposure in the exchange-traded market. Therefore, one of the tools in the arsenal of a short-horizon oil futures trader has become to examine where the concentrations of option strikes are on the NYMEX.

Verleger (2007) noted that the reverse may have happened as well. From August 2006 through January 2007, oil put purchases by producers may have (temporarily) caused oil futures prices to temporarily overshoot to the downside as well.

As the above example should make clear, futures traders are aware that market-microstructure effects may predominate as the driver of price over short timeframes.

Liquidation Pressure

Futures traders are also aware that the effects of traders having to liquidate large positions can also be a temporary, but meaningful, driver of price.

Because there are vigorously enforced laws in the United States regarding actual or attempted manipulation of *physical* energy markets, the accumulation of extremely large derivatives positions in the US energy markets, which in turn do not have a well-defined commercial purpose, is a very risky activity since a trader will not be able to resolve a position in the physical markets without triggering regulatory scrutiny. Till (2008b) describes a CFTC and US Department of Justice action against a major international oil company in which the company was fined $303 million for attempting to manipulate one US delivery location's physical propane market. The firm's positions were initially entered into through the forward OTC markets. This case was particularly striking since the firm had *actually failed* in this attempted manipulation and had lost at least $10 million in attempting to carry out this "market corner".

Therefore, a large holder of energy derivatives contracts will generally not resolve his position in the physical markets, if there is no legitimate commercial reason to do so. If that holder then needs to

liquidate a position, then that participant needs to have another participant take on his (or her) position. As discussed in Till (2006b), the commodity markets, including oil, frequently do not have natural two-sided flow. For experienced traders in the fixed income, equity, and currency markets, this point may not be obvious. The commodity markets have "nodal liquidity". If a commercial market participant needs to initiate or lift hedges, there will be flow, but such transactions do not occur on demand. Before a trader initiates a position, particularly one that is large for the market-place, one needs a clear understanding of what flow or catalyst will allow the trader out of a position.

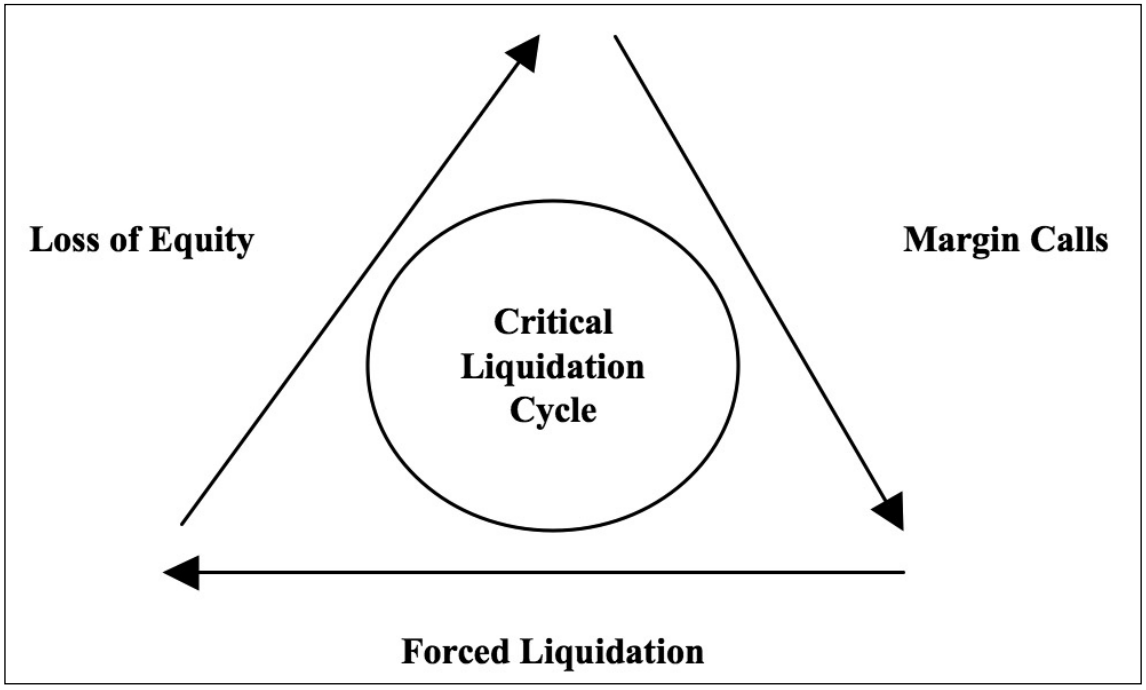
When large holders of energy-derivatives positions have not had an appropriate exit strategy, the outcome has consistently been an unhappy one for speculators, hedge funds, and their investors, with the case of Amaranth in 2006 being only one example. The market tends to extract a large premium from a trader during a distressed liquidation with a consequent (but temporary) impact on price. In De Souza and Smirnov (2004), the authors modeled the price process during a distressed liquidation as a kind of barrier-put option. Once a fund crosses a threshold of losses, a cycle of investor redemptions occur and/or the fund's prime brokers demand the reduction of leverage, and the fund's net asset value thereby declines precipitously as the fund sells off holdings in a distressed fashion. This "critical liquidation cycle" obviously has a (temporary) effect on the price of the fund's holdings, illustrating another interaction effect between traders and price. The cycle is illustrated in figure 16.

De Souza and Smirnov were not specifically addressing liquidations in the commodity markets, but their work definitely has applicability to the energy markets, again as the case of Amaranth demonstrated, and as discussed in Till (2006b, 2008a).

Credit and Risk Environment

In addition to idiosyncratic hedge-fund blow-ups, the commodity markets in general, and the oil markets in particular, have arguably not been immune to the periodic bouts of financial de-risking and deleveraging that occurred from the spring of 2006 through the spring of 2008, again

Figure 16



Source: De Souza and Smirnov (2004).

over short time-horizons. This phenomenon was commented on in November 2007 in the Bank of Japan's report, "Monitoring Commodity Markets From the Perspective of Understanding Global Financial Market Trends".

For example, during the May/June 2006 deleveraging of risky investments, commodities appeared to become the same trade along with other risk assets, as illustrated in figure 17.

Another example of simultaneous de-leveraging is from February 27, 2007. At the end of the trading day, market participants saw algorithmic strategies simultaneously deleverage across numerous risky investments, including in prevalent commodity strategies. In this unusual environment, the normally illiquid platinum market was more liquid than the gold futures market, as leveraged participants rapidly and simultaneously tried to unwind gold positions.

This phenomenon, again, became of concern on August 16, 2007, the day before the Federal Reserve Board cut the discount rate. On that date, *all* commodity markets in the Dow Jones AIG Commodity Index were down, along with *all* other risky assets; this is illustrated in figure 18. The next day, after the announcement of the Fed's action, most risk assets simultaneously rallied, including commodities.

Figures 17 and 18 illustrate how the VIX, the equity-index implied volatility gauge calculated by the Chicago Board Options Exchange, has been a useful early indicator of the market entering into a de-risking environment that, in turn, has had a negative impact on prevalent commodity trades or investments.

During the week of March 17, 2008, market participants appeared to embrace a "preservation-of-capital" stance in the aftermath of the near collapse of Bear Stearns. Not only did three-month US Treasury Bills (T-Bills) hit a nadir of 39 bps in (annualised) yield, but the commodity markets witnessed a weekly sell-off, the scale of which had not been seen since 1956, according to Carpenter and Munshi of *Bloomberg News* (2008). Figure 19 shows how the fortunes of the Dow Jones AIG

Figure 17: Deleveraging of Risky Investments - May 10, 2006 through June 13, 2006

"Risk Indicator"	
VIX (Equity Implied Vol)*	12%
"Risk Assets"	Percent Change
Bovespa (IBX50)	-23.5%
Nasdaq	-10.4%
S&P 500	-7.3%
Nikkei	-10.4%
Silver	-32.4%
Copper	-18.2%
Gasoline (RFG)	-3.6%
"Safe Havens"	Percent Change
Long Bond	1.8%
Dollar vs. Yen (Long Dollars)	4.5%

* The VIX increased from 11.78% on 5/10/06 to 23.81% on 6/13/06.

Source: Till (2008b)

Figure 18: Risky Asset Price Changes on August 16, 2007

Global Unwind	16-08-07
VIX (Equity Implied Vol)*	31%
	Daily
Risk Assets	Percent Change
Bovespa (IBX50)	-2.11%
Nasdaq	-1.01%
Nikkei	-1.99%
Silver	-8.44%
Copper	-7.26%
Gasoline	-1.52%
NZD vs. Yen	-5.32%
"Safe Haven"	Percent Change
Long Bond	0.94%
Crack Spreads (Refinery Margins)	Daily Change
Gasoline Crack	$1.05
Heat Crack	$0.48

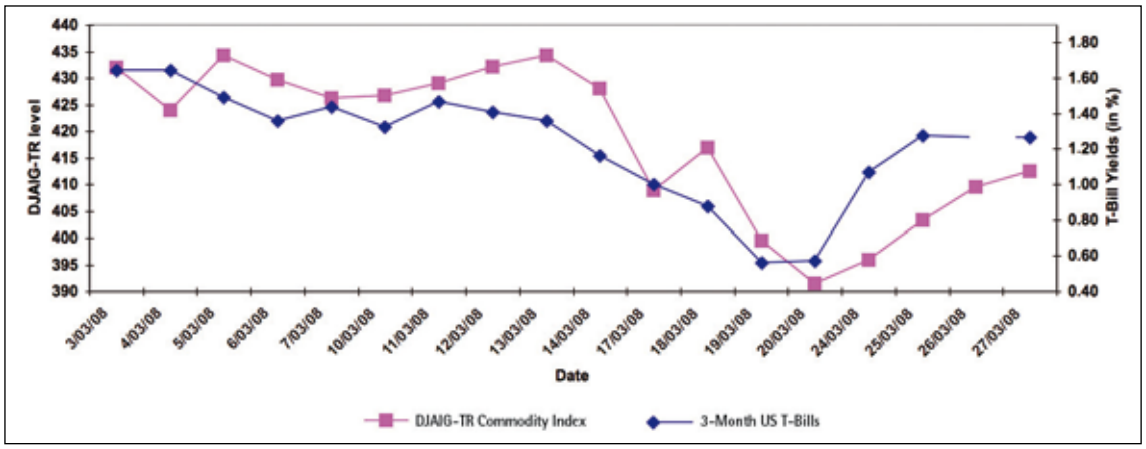
* Absolute level of the VIX (and not change in level as in previous figure.)

Source: Till (2008b).

DJAIG MOVERS 8/16/2007 10:07am CST				
Commodity		Price	Change	% Change
LMAHDS03	Aluminum	2543.00y	-9.00	-0.35
NGX7	Natural Gas	7.791	-0.046	-0.59
W Z7	Wheat	688 3/4	-8 1/4	-1.18
LCV7	Live Cattle	94.600	-1.325	-1.38
LHV7	Lean Hogs	67.550	-1.025	-1.49
LMZSDS03	Zinc	3230.00y	-65.00	-1.97
XBX7	RBOB Gasoline	187.43	-3.95	-2.06
GCZ7	Gold	665.20	-14.50	-2.13
CTZ7	Cotton	58.85	-1.33	-2.21
CLX7	Crude Oil	71.10	-1.73	-2.38
HOX7	Heating Oil	201.55	-4.99	-2.42
C Z7	Corn	336 1/2	-8 3/4	-2.53
LMNIDS03	Nickel	26500.0y	-800.0	-2.93
SBV7	Sugar	9.16	-0.29	-3.07
KCZ7	Coffee	119.30	-3.90	-3.17
BOZ7	Soybean Oil	35.27	-1.25	-3.42
SIZ7	Silver	12.290	-0.445	-3.49
S X7	Soybeans	821	-33 1/2	-3.92
HGZ7	Copper	314.80	-17.40	-5.24

Data Source: Bloomberg

Figure 19



Source: Till (2008b).

Commodity Index fluctuated in March 2008, according to the degree to which investors were embracing T-Bills.

These examples indicate that over the short term it is very plausible that the actions of traders have had (and will have) an impact on the price of commodities, including oil. But what does that mean for public policy? Jacks (2007) examined what happened to commodity-price volatility, across countries and commodities, *before* and *after* specific commodity-contract trading was prohibited in the past. For example, wheat futures trading was banned in Berlin (Germany) from 1897 to 1900; and onion futures trading has been banned in the US since 1958. Jacks (2007) also examined commodity-price volatility before and after the establishment of futures markets, also across time and across countries. He generally (but not always) found that commodity-price volatility was *greater* when there were not futures markets than when there were, over one-year, three-year, and five-year timeframes. Appendix E summarises his findings. In other words, his study showed that price opacity actually (at least historically) made markets more volatile over one-year-plus timeframes, which we would regard as sub-optimal.

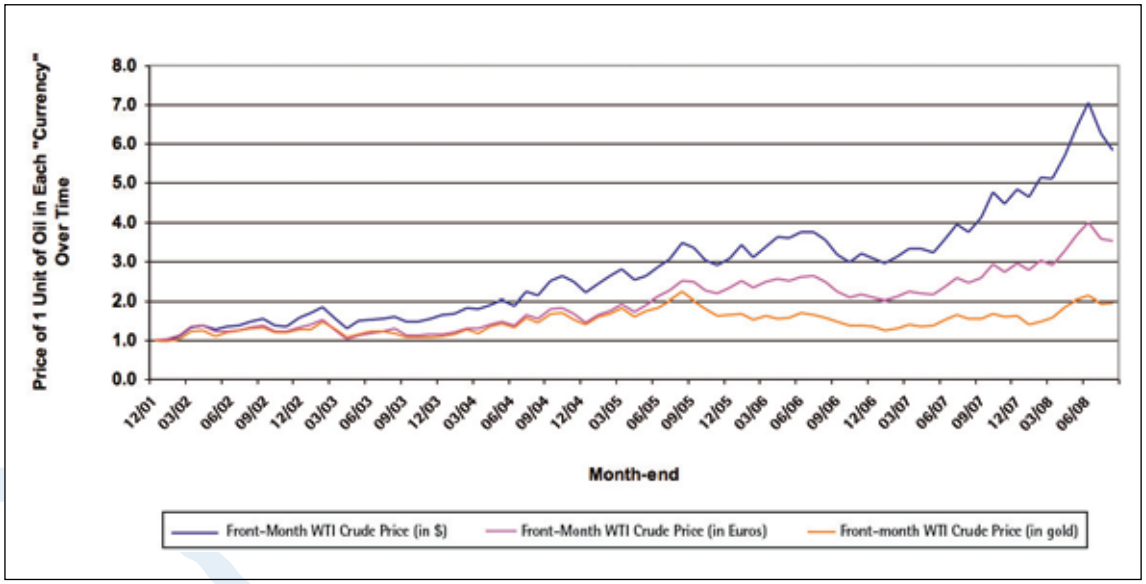
2. Role of Currency and Store-of-Value

In examining the drivers of the oil-price rally, one should not exclude the impact of trends in a currency's value. Figure 20 illustrates how differently the oil-price rally looks, depending on whether oil is denominated in US dollars, euros, or in ounces of gold.

This graph raises all kinds of questions. Is the rise in the price of oil at least partly a currency effect? And then, obviously, to what degree do the price of oil and the value of the dollar interact? Is the cause-and-effect relationship between the two actually two-way?

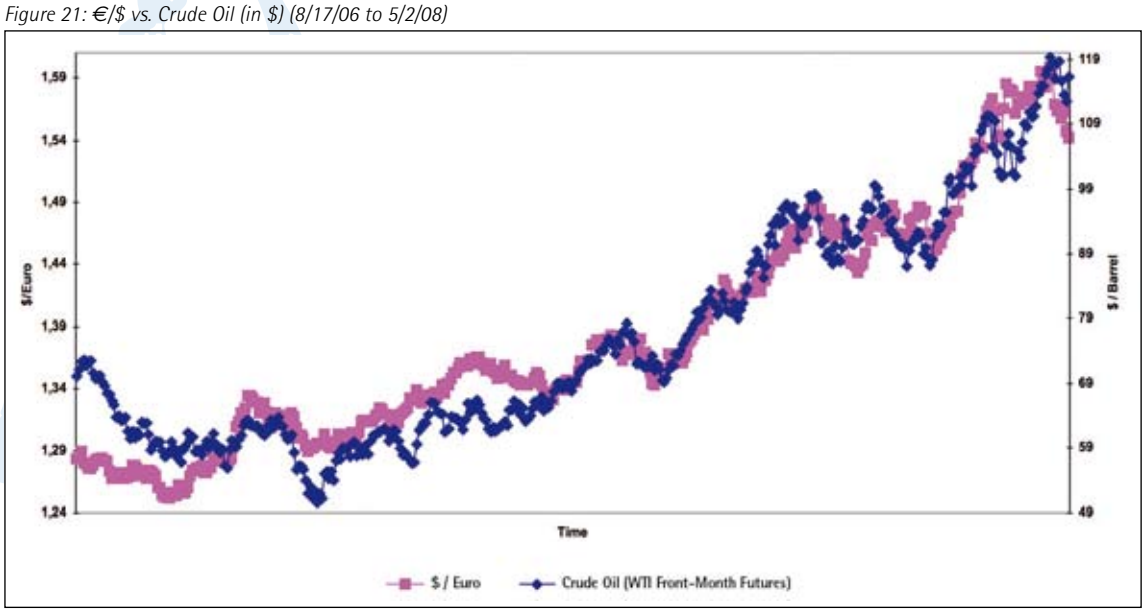
Market participants have surmised that oil exporters may at least partly be diversifying some of their currency exposure in euros, given that the turning points in the price of oil have frequently mirrored the turning points in the euro/dollar exchange-rate over the past two years (see figures 21 and 22).

Figure 20: Oil Prices Depend on "Currency" (12/31/01 through 8/29/08)



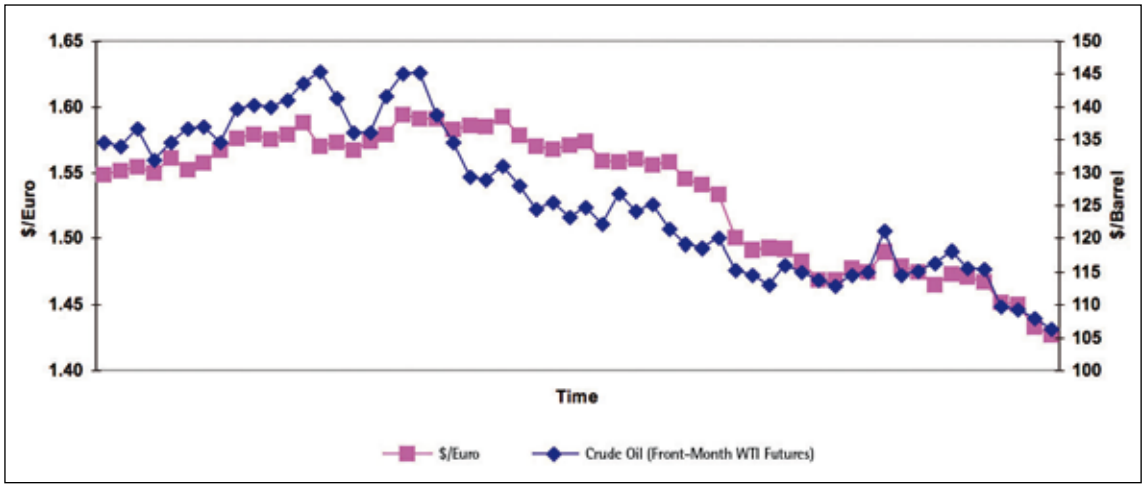
Data Source: Bloomberg.

Figure 21: €/$ vs. Crude Oil (in $) (8/17/06 to 5/2/08)



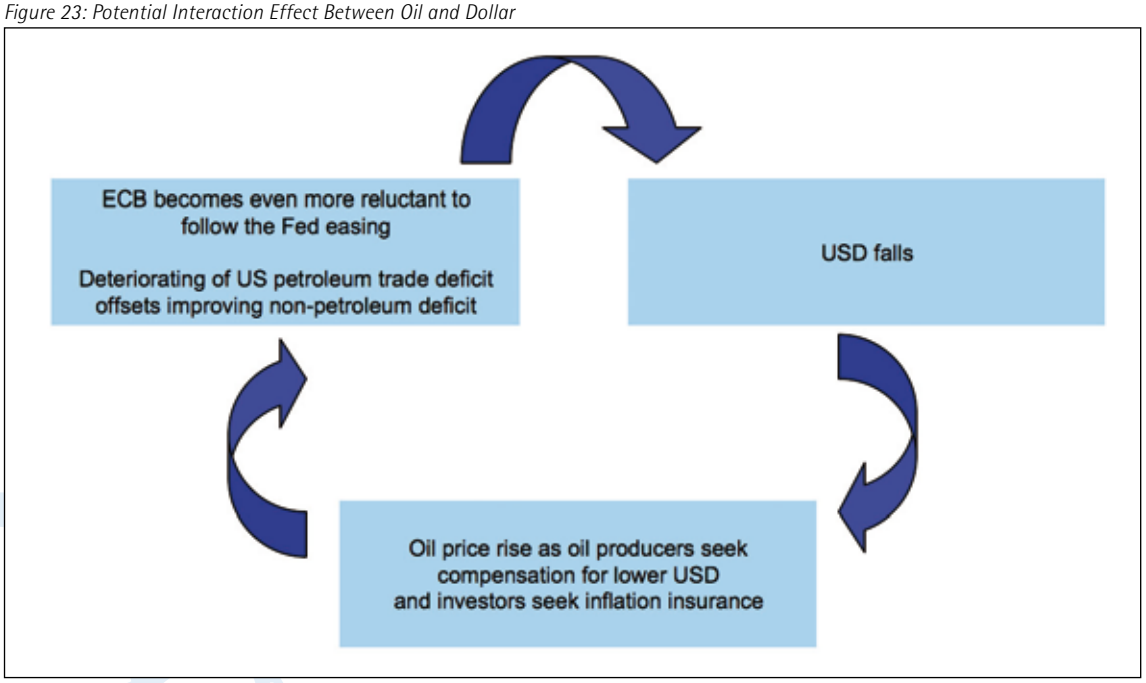
Data Source: Bloomberg.

Figure 22: €/$ vs. Crude Oil (in $) - (6/16/08 to 9/5/08)



Data Source: Bloomberg.

Figure 23: Potential Interaction Effect Between Oil and Dollar



Source: Woo of Barclays Capital (2008). - Note: ECB refers to the European Central Bank.

The potential interaction between the price of oil and the value of the dollar is illustrated in figure 23.

One impact of this observed relationship is for investors to seek store-of-value hedges for their dollar-denominated financial portfolios. This was a key lesson for US fiduciaries from the inflationary experience of the 1970s. Figure 24 illustrates the historical evolution of the asset mix for Harvard University's endowment, which now includes a 33% weighting to real assets, including a 17% allocation to commodities. (The commodity allocation within the policy portfolio includes not only a diversified basket of commodity futures contracts, but also timber and agricultural land.)

Figure 25 illustrates how investors have followed Harvard's example in allocating to commodity futures contracts.

The use of commodity-futures contracts as a store-of-value or as an inflationary hedge has attracted some controversy in a wide variety of contexts. For example, did index investments in 2008 cause the oil-price rally that we have seen thus far? According to data provided in a report released by the CFTC on September 11, 2008, this is an unlikely cause, given that total OTC and on-exchange commodity index investment activity in oil-futures-contract-equivalents actually declined from December 31, 2007, through June 30, 2008 (see figure 26).

The historical writings of Holbrook Working[19] frequently provide insight and a sense of constancy in how to frame the ongoing (tumultuous) debates on futures trading. Working (1970) described how fragile the existence of the futures-trading business in Chicago had been since its inception in the nineteenth century. He also described how the Grain Futures Administration[20] in the 1940s was led by statisticians who were trained in the natural sciences and who therefore allowed the data to provide answers to important policy questions. Judging by the CFTC's exhaustive data-gathering effort that went into the production of its September 11, 2008, report, one can say that this tradition is continuing.

19 - Holbrook Working (1895 to 1985) was a Stanford University professor whose writings on the economic role of futures trading are considered fundamental to our present understanding of these markets.

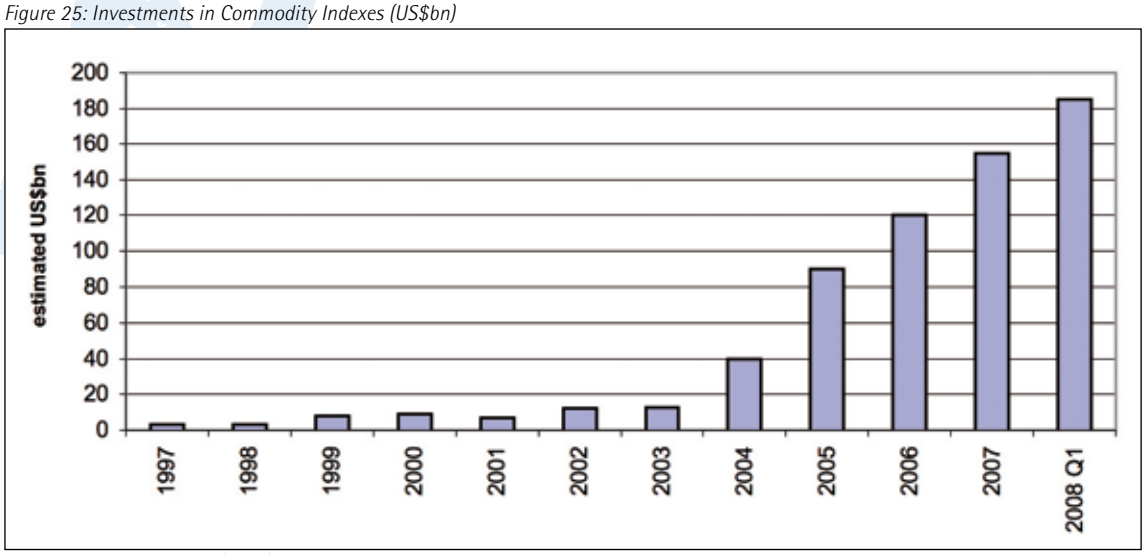
20 - The Grain Futures Administration (1922 to 1936) and the Grain Futures Commission (1922 to 1936) preceded the Commodity Exchange Administration (1936 to 1942), Commodity Exchange Authority (1947-1974), and the Commodity Exchange Commission (1936 to 1974). The Commodity Exchange Commission and the Commodity Exchange Authority merged in 1974 to form the present Commodity Futures Trading Commission.

Figure 24: Historical Evolution of Harvard Management Company's Policy Portfolio

	1980	1991	1996	2000	2007	2008
Equities						
Domestic Equities	66	40	36	22	12	12
Foreign Equities	-	18	15	15	11	12
Emerging Markets	-	-	9	9	8	10
Private Equities	-	12	15	15	13	11
Total Equities	**66**	**70**	**75**	**61**	**44**	**45**
Fixed Income						
Domestic Bonds	27	15	13	10	7	5
Foreign Bonds	8	5	5	4	3	3
High-Yield	-	2	2	3	3	1
Total Fixed Income	**35**	**22**	**20**	**17**	**13**	**9**
Real Assets						
Commodities	-	6	3	6	16	17
Real Estate	-	7	7	7	10	9
Inflation-indexed Bonds	-	-	-	7	5	7
Total Real Assets	**-**	**13**	**10**	**20**	**31**	**33**
Absolute Return and Special Situations	-	-	-	5	17	18
Cash	(1)	(5)	(5)	(3)	(5)	(5)
TOTAL	**100**	**100**	**100**	**100**	**100**	**100**

Source: El-Erian[21] of Harvard Management Company (2007).

Figure 25: Investments in Commodity Indexes (US$bn)



Source: Heap and Tonks (2008).

Several of the principles that guide our current understanding of futures markets date to Working. One is that futures markets need to be considered socially useful for them to thrive and prosper. When, in 1958, onion-futures trading was not seen as socially useful it was banned, for example.

Another Working principle is that a futures contract has to be commercially useful to hedgers. Once hedgers are attracted to a futures market, speculation follows, and not the other way around. Sanders *et al.* (2008) describe how, historically, agricultural researchers found that there was an inadequacy of speculative services provided to offset commercial hedging demand.

21 - Dr. Mohamed A. El-Erian was the President and CEO of Harvard Management Company, the university's endowment management company, as of 8/21/07 when this table was produced. Dr. El-Erian is now the Co-CEO and Co-CIO of PIMCO.

Figure 26: Excerpt From Staff Report on Commodity Swap Dealers & Index Traders With Commission Recommendations
Total OTC and On-Exchange Commodity Index Investment Activity

	12/31/07	3/31/08	6/30/08
Crude Oil Index Values Measured in Futures [Contract] Equivalents	408,000	398,000	363,000

Source: CFTC (2008).

Sanders *et al.* (2008) discuss how there now needs to be a fundamental re-evaluation of futures markets. As of the spring of 2008, they find evidence that increased short hedging has *followed* long-only speculation in the agricultural futures markets (including when one classifies index investors as speculators). That said, it appears that there may have been a period of adjustment in the agricultural futures markets from 2004 to mid-2005 in accommodating the increased flows from index investors.

Sanders *et al.* (2008) also find that because of this increased short hedging, the level of speculative activity is *not* currently high in proportion to hedging activity, when evaluating the 2006 to April 2008 data in the agricultural futures markets. The authors use Holbrook Working's speculative T index to evaluate the proportion of speculators to commercial hedgers. Working's T index is defined in appendix F.

The consistent position of this paper is for there to be increased transparency across all facets of the oil market, so that if over-the-counter oil derivatives data become available in the same format and ease of use as with NYMEX oil futures data, researchers will be able to calculate Working's T index to determine whether speculation is at a particularly high level in relationship to commercial hedging. Also, if index-investor positions in the oil markets are clearly broken out in CFTC reports, one can ensure that index positions are classified as non-commercial hedging in establishing whether indexers are substantially larger than the oil market's commercial-hedging needs.

Drawing from Working (1970) once again, it will be a matter of public policy to decide whether the use of commodity futures contracts for inflation-hedging protection of investor portfolios is economically useful. We would propose that, assuming that there is increased data transparency in the oil derivatives markets, one should employ Working's index to determine objectively whether there is excessive speculation (or inflation-hedging).

Aside from debates on public policy and questions of proper statistical measures, it may at some point be controversial to consider oil as a store-of-value. The June 2008 UK Treasury paper notes that if sufficient measures were universally taken to eventually develop both alternative energy sources and to conserve on energy, the future value of oil in the ground would be markedly lower. On the other hand, Grantham (2008) notes that if there are indeed genuine geological constraints on future production of oil from the Gulf Cooperation Council countries, then it is improper to value oil based on the marginal barrel pulled from the ground, and that its value should instead reflect a large scarcity premium. Regarding this latter point, Khan (2008)'s call for more data transparency on Gulf reserves would seem entirely appropriate.

Conclusion

In our paper we would like to be modest[22] in claiming to having solved the puzzle of what caused the oil-price rally that extended into July 2008 (thus far). What we can say is that there are plausible fundamental explanations that arise from any number of *incidental* factors that can come into play when supply and demand are balanced *so* tightly, especially in light sweet crude oil.

In 2008, these *incidental* factors could be argued to include a temporary spike in diesel imports by China in advance of the Beijing Olympics, purchases of light sweet crude by the US Department of Energy for the Strategic Petroleum Reserve, instability in Nigeria, and tightening environmental requirements in Europe. Then, at least through July 2008, there may have been a self-reinforcing feedback loop between the price of oil and the value of the dollar, which likely occurred as oil exporters attempted to diversify their dollar windfalls into other currencies.

We also fully acknowledge that in the short term it is very plausible for the actions of traders to influence (again temporarily) the price of a commodity, especially one that is exhibiting scarcity.

The natural conclusion to observing that many seemingly inconsequential factors, in combination, could lead to such a large rise in the price of crude oil is that the market is signaling a pressing need for an increase in spare capacity in light-sweet crude oil, however achieved.

We also realise that in both the United States and in continental Europe there is a long history, dating to at least the 1890s—the last great era of globalisation—of scrutiny and scepticism of commodity futures markets. Over the past 120 years, two determinations have prevented futures trading from generally being banned or heavily restricted. The first supportive determination has been a general (although not unanimous) recognition by policymakers that futures markets serve a legitimate social purpose. The second determination has been to base public policy on an objective examination of extensively gathered facts, which are summarised via appropriate statistical measures. In 2008, we believe that public policy governing futures markets should continue to rely on this framework. There are preliminary indications that this will indeed continue to be the case.

Finally, we would emphasise that *all* efforts to make data transparent on the oil markets, whether regarding supply, demand, or market-participant statistics, are extremely important for making informed public-policy decisions about these markets.

22 - We acknowledge that, ultimately, only dynamic *conceptual frameworks will likely be satisfactory in comprehensively explaining the evolution of the price of crude oil during the first seven months of 2008. One can readily understand the decisions of each type of market participant at the* individual level, *as discussed in our paper. But what becomes extremely complicated is taking into consideration (and modeling) "the feedback effects of* collective behavior*" (Williams and Wright 1991) particularly during times of scarcity. This type of modeling is admittedly beyond the scope of this practitioner-oriented paper.*

Endnotes

Research assistance from Katherine Farren, Premia Capital Management, and from Richard Seefeldt, independent consultant, is gratefully acknowledged. The author would also like to note that the interpretation of commodity-price relationships was jointly developed with Joseph Eagleeye of Premia Capital; and that discussions with Kenneth Armstead were very helpful in the development of this article. She would also like to thank Benoît Maffei, Robert Greer, and Hendrik Schwarz for their very insightful comments. That said, the author takes responsibility for the content of the article, including any inadvertent errors or omissions.

In addition, some of this article's ideas were previously discussed in Till (2000, 2006a, 2008a, and 2008b) and in Till and Eagleeye (2005).

Appendix A:
Table of World Oil Supply and Demand

WORLD OIL SUPPLY AND DEMAND
(million barrels per day)

	2005	2006	1Q07	2Q07	3Q07	4Q07	2007	1Q08	2Q08	3Q08	4Q08	2008	1Q09	2Q09	3Q09	4Q09	2009
OECD DEMAND																	
North America	25.6	25.4	25.7	25.4	25.6	25.5	25.5	24.8	24.8	24.9	25.0	24.9	24.5	24.4	24.6	24.6	24.5
Europe	15.7	15.7	15.2	15.0	15.4	15.6	15.3	15.2	14.9	15.4	15.5	15.2	15.2	14.8	15.4	15.5	15.2
Pacific	8.6	8.5	8.9	7.9	7.9	8.7	8.3	8.9	8.0	8.0	8.8	8.4	8.8	7.9	7.9	8.8	8.3
Total OECD	49.8	49.6	49.8	48.2	48.9	49.8	49.2	48.9	47.7	48.3	49.3	48.6	48.4	47.2	47.8	48.8	48.0
NON-OECD DEMAND																	
FSU	3.9	4.1	4.1	3.9	4.2	4.3	4.1	4.1	4.1	4.3	4.4	4.2	4.3	4.2	4.4	4.5	4.4
Europe	0.7	0.7	0.8	0.7	0.7	0.8	0.8	0.8	0.8	0.7	0.8	0.8	0.8	0.8	0.7	0.8	0.8
China	6.7	7.2	7.3	7.7	7.5	7.6	7.5	7.9	7.9	8.0	8.1	8.0	8.3	8.4	8.4	8.6	8.4
Other Asia	8.8	9.0	9.2	9.3	9.1	9.4	9.3	9.6	9.6	9.1	9.5	9.5	9.9	9.9	9.3	9.8	9.7
Latin America	5.1	5.3	5.4	5.6	5.7	5.7	5.6	5.6	5.9	6.0	5.9	5.9	5.9	6.1	6.2	6.2	6.1
Middle East	6.0	6.2	6.4	6.5	6.7	6.4	6.5	6.7	6.9	7.1	6.8	6.9	7.0	7.2	7.5	7.2	7.2
Africa	2.9	3.0	3.1	3.1	3.0	3.1	3.1	3.1	3.2	3.0	3.2	3.1	3.2	3.2	3.1	3.2	3.2
Total Non-OECD	34.2	35.5	36.4	36.9	36.9	37.3	36.9	37.9	38.3	38.2	38.7	38.3	39.4	39.8	39.6	40.2	39.7
Total Demand[1]	84.0	85.1	86.2	85.1	85.8	87.2	86.1	86.8	86.1	86.6	88.0	86.9	87.8	86.9	87.4	89.0	87.8
OECD SUPPLY																	
North America	14.1	14.2	14.3	14.4	14.1	14.1	14.2	14.2	14.1	14.1	14.4	14.2	14.6	14.2	14.1	14.3	14.3
Europe	5.6	5.2	5.2	4.9	4.7	5.0	5.0	4.9	4.7	4.4	4.6	4.7	4.6	4.2	4.1	4.2	4.3
Pacific	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.7	0.7	0.8	0.7	0.8	0.8	0.8	0.8	0.8
Total OECD	20.3	20.0	20.1	19.9	19.5	19.8	19.8	19.7	19.5	19.2	19.9	19.6	20.0	19.2	19.0	19.4	19.4
NON-OECD SUPPLY																	
FSU	11.8	12.2	12.8	12.7	12.8	12.8	12.8	12.8	12.9	12.8	13.5	13.0	13.4	13.4	13.1	13.1	13.3
Europe	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
China	3.6	3.7	3.7	3.8	3.7	3.7	3.7	3.8	3.8	3.9	3.9	3.9	3.9	3.9	3.9	3.9	3.9
Other Asia	2.7	2.7	2.7	2.7	2.6	2.7	2.7	2.7	2.6	2.7	2.7	2.7	2.8	2.8	2.7	2.8	2.8
Latin America[2]	4.3	4.4	4.4	4.4	4.3	4.2	4.3	3.9	3.9	4.1	4.2	4.0	4.3	4.3	4.3	4.3	4.3
Middle East	1.8	1.7	1.7	1.7	1.7	1.6	1.7	1.6	1.6	1.6	1.6	1.6	1.5	1.5	1.5	1.5	1.5
Africa[2]	3.7	3.9	2.5	2.5	2.5	2.5	2.5	2.5	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6
Total NON-OECD	28.0	28.8	27.9	27.8	27.7	27.7	27.8	27.5	27.5	27.7	28.6	27.8	28.6	28.6	28.3	28.3	28.5
Processing Gains[3]	2.0	2.1	2.1	2.2	2.2	2.2	2.2	2.2	2.2	2.3	2.3	2.2	2.3	2.3	2.3	2.3	2.3
Other Biofuels[4]	0.1	0.2	0.3	0.3	0.3	0.3	0.3	0.4	0.5	0.5	0.5	0.5	0.6	0.6	0.6	0.6	0.6
Total NON-OPEC[2]	50.4	51.2	50.5	50.2	49.7	50.0	50.1	49.8	49.7	49.6	51.3	50.1	51.5	50.7	50.2	50.6	50.8
Non-OPEC excl. Angola & Ecuador[2]	48.7	49.2	50.0	49.7	49.2	49.7	49.6	49.8	49.7	49.6	51.3	50.1	51.5	50.7	50.2	50.6	50.8
OPEC																	
Crude[5]	29.7	29.7	30.3	30.2	30.6	31.5	30.7	32.3	32.2								
NGLs	4.5	4.6	4.8	4.8	4.8	4.9	4.8	4.9	5.0	5.2	5.4	5.1	5.6	5.9	6.0	6.2	5.9
Total OPEC[2]	34.2	34.3	35.1	34.9	35.4	36.4	35.5	37.3	37.1								
OPEC incl. Angola & Ecuador[2]	36.0	36.3	35.6	35.5	35.9	36.8	35.9	37.3	37.1								
Total Supply[6]	84.7	85.5	85.5	85.2	85.1	86.5	85.6	87.1	86.8								
STOCK CHANGES AND MISCELLANEOUS																	
Reported OECD																	
Industry	0.1	0.2	-0.8	0.7	0.0	-0.8	-0.2	-0.1	0.0								
Government	0.1	0.0	0.1	0.0	0.1	0.0	0.1	0.1	0.0								
Total	0.2	0.3	-0.7	0.7	0.2	-0.8	-0.2	0.0	0.0								
Floating Storage / Oil in transit	-0.1	-0.1	0.2	-0.2	-0.2	0.2	0.0	0.3	0.0								
Miscellaneous to balance[7]	0.5	0.2	-0.2	-0.5	-0.6	-0.1	-0.4	-0.1	0.7								
Total Stock Ch. & Misc	0.7	0.4	-0.7	0.0	-0.6	-0.7	-0.5	0.3	0.7								
Memo items:																	
Call on OPEC crude + Stock ch.[8]	29.1	29.3	31.0	30.1	31.3	32.2	31.2	32.0	31.4	31.8	31.4	31.6	30.6	30.3	31.2	32.3	31.1
Adjusted Call on OPEC + Stock ch.[9]	29.6	29.5	30.8	29.7	30.7	32.1	30.8	32.0	32.1	31.7	31.3	31.8	30.6	30.3	31.2	32.2	31.1
"Call" incl. Angola & Ecuador[2]	30.8	31.3	31.5	30.7	31.8	32.6	31.6	32.0	31.4	31.8	31.3	31.6	30.6	30.3	31.2	32.3	31.1
"Adjusted Call" incl. Angola & Ecuador[2]	31.4	31.5	31.3	30.2	31.2	32.4	31.3	32.0	32.1	31.7	31.3	31.8	30.6	30.3	31.2	32.2	31.1

1 Measured as deliveries from refineries and primary stocks, comprises inland deliveries, international marine bunkers, refinery fuel, crude for direct burning, oil from non-conventional sources and other sources of supply.
2 Ecuadorean production is reclassified within OPEC and excluded from the Non-OPEC and Latin American totals, for the period December 2007 onwards. Angolan production is classified within OPEC and excluded from the Non-OPEC and Africa totals, for the period January 2007 onwards. Secondary aggregates allow comparison with previous year totals by including Angola and Ecuador within OPEC retroactively.
3 Net volumetric gains and losses in the refining process (excludes net gain/loss in China and non-OECD Europe) and marine transportation losses.
4 Biofuels from sources outside Brazil and US.
5 As of the March 2006 OMR, Venezuelan Orinoco heavy crude production in included within Venezuelan crude estimates. Orimulsion fuel remains within the OPEC NGL & non-conventional category, but Orimulsion production reportedly ceased from January 2007.
6 Comprises crude oil, condensates, NGLs, oil from non-conventional sources and other sources of supply.
7 Includes changes in non-reported stocks in OECD and non-OECD areas.
8 Equals the arithmetic difference between total demand minus total non-OPEC supply minus OPEC NGLs.
9 Equals the "Call on OPEC + Stock Ch" with "Miscellaneous to balance" added for historical periods and with an average of "Miscellaneous to balance" for the most recent 8 quarters added for forecast periods.

Notes: OMR stands for Oil Market Report; and NGL stands for Natural Gas Liquids.
Source: IEA (2008b).

Appendix B

Table on Degree of Satisfaction of Joint Oil Data Initiative (JODI) Partners with International Data

Categories of participation, for the period July-December 2007.

☺😐☹ Submission ☺😐☹ Timeliness ☺😐☹ Completeness

☺ Good 😐 Fair ☹ Poor

Not available (n.a.) when no submission for 12 months.

Algeria	☺	😐	☺
Angola	☹	☹	😐
Argentina	☺	😐	☺
Australia	☺	☺	☺
Austria	☺	☺	☺
Azerbaijan	☺	☺	☺
Bahrain	☺	☺	😐
Barbados	n.a.	n.a	n.a
Belgium	☺	☺	😐
Bolivia	☹	☹	☹
Brazil	😐	☹	😐
Brunei Darussalam	☺	☺	☺
Bulgaria	☺	☺	☺
Canada	☺	☺	☺
Chile	😐	☹	😐
China	☺	☹	😐
Chinese Taipei	☺	☺	☺
Colombia	😐	☹	😐
Costa Rica	☺	☺	☺
Croatia	☺	☺	☺
Cuba	n.a.	n.a	n.a
Cyprus	☺	☺	☺
Czech Republic	☺	☺	☺
Denmark	☺	☺	☺
Dominican Rep.	n.a.	n.a	n.a
Ecuador	☹	☹	☹
Egypt	☹	☹	☹
El Salvador	n.a.	n.a	n.a
Estonia	☺	☹	☺
Finland	☺	☺	😐
France	☺	☺	☺
Gabon	n.a.	n.a	n.a

Germany	☺	☺	☺
Greece	☺	☺	☺
Grenada	n.a.	n.a	n.a
Guatemala	☺	☹	☺
Guyana	n.a.	n.a	n.a
Haiti	n.a.	n.a	n.a
Honduras	☺	☹	☺
Hong Kong, China	☺	☺	☺
Hungary	☺	☺	☺
Iceland	☺	😐	☺
India	☺	☺	😐
Indonesia	☺	☹	😐
Iran	☺	☺	😐
Iraq	☹	☹	☹
Ireland	☺	☺	☺
Italy	☺	☺	☺
Jamaica	😐	☹	😐
Japan	☺	☺	☺
Kazakhstan	☹	☹	☹
Korea	☺	☺	☺
Kuwait	☺	☺	☺
Latvia	☺	☺	☺
Libya	☺	☹	😐
Lithuania	☺	☺	☺
Luxembourg	☺	☺	☺
Malaysia	😐	☹	😐
Malta	n.a.	n.a	n.a
Mexico	☺	☺	☺
Myanmar	☹	☹	☹
Netherlands	☺	☺	☺
New Zealand	☺	☺	☺
Nicaragua	☺	☹	☺
Nigeria	☺	☹	☺

Norway	☺	☺	☺
Oman	n.a.	n.a	n.a
Panama	n.a.	n.a	n.a
Papua New Guinea	☺	☹	☺
Paraguay	☹	☹	☹
Peru	☺	☹	☺
Philippines	☺	☺	☺
Poland	☺	☺	☺
Portugal	☺	☺	☺
Qatar	☺	☺	☺
Romania	☺	☺	☺
Russian Federation	☺	☺	😐
Saudi Arabia	☺	☺	☺
Singapore	☺	☺	☹
Slovak Republic	☺	☺	☺
Slovenia	☺	☺	☺
South Africa	😐	☹	☺
Spain	☺	☺	☺
Surinam	n.a.	n.a	n.a
Sweden	☺	☺	☺
Switzerland	☺	☺	☺
Syria	n.a.	n.a	n.a
Thailand	☺	☺	☺
Trinidad & Tobago	n.a.	n.a	n.a
Turkey	☺	☺	☺
UAE	☺	😐	😐
United Kingdom	☺	☺	☺
United States	☺	☺	☺
Uruguay	☹	☹	☹
Venezuela	☺	☺	☺
Vietnam	😐	☹	☹
Yemen	☹	☹	☹

As a matter of interest, 'submission' criteria are based on the number of monthly questionnaires received; 'timeliness' on the number of monthly questionnaires received on time; and 'completeness' on the average completeness of the questionnaire received. More information is available on the JODI website at www.jodidata.org/DQA.shtm

This table "assesses the degree of JODI partners' satisfaction with data provided by participants with regard to submission, timeliness and completeness for the period from July to December 2007.

Compared to the last exercise (from January to June 2007), progress has been made on the JODI data collection process. The number of participating countries/economies with three smiley faces went up from 39 to 45 (out of 97). However, the percentage of smiley faces decreased from 62% to 60% and 14 countries/economies did not submit any data in 2007.

Appendix B
Table on Degree of Satisfaction of Joint Oil Data Initiative (JODI) Partners with International Data

... [T]imeliness remains a problem for almost half of the participants. ... Eight of them improved the timeliness of their submissions whereas it deteriorated for only five countries.

With respect to completeness, the situation deteriorated for nine participating countries since the last exercise whereas it improved for only seven of them. Lack of information on stock data for non-OECD countries remains a concern.

More than 70 countries/economies are now in a position to report data with only a one-month delay."

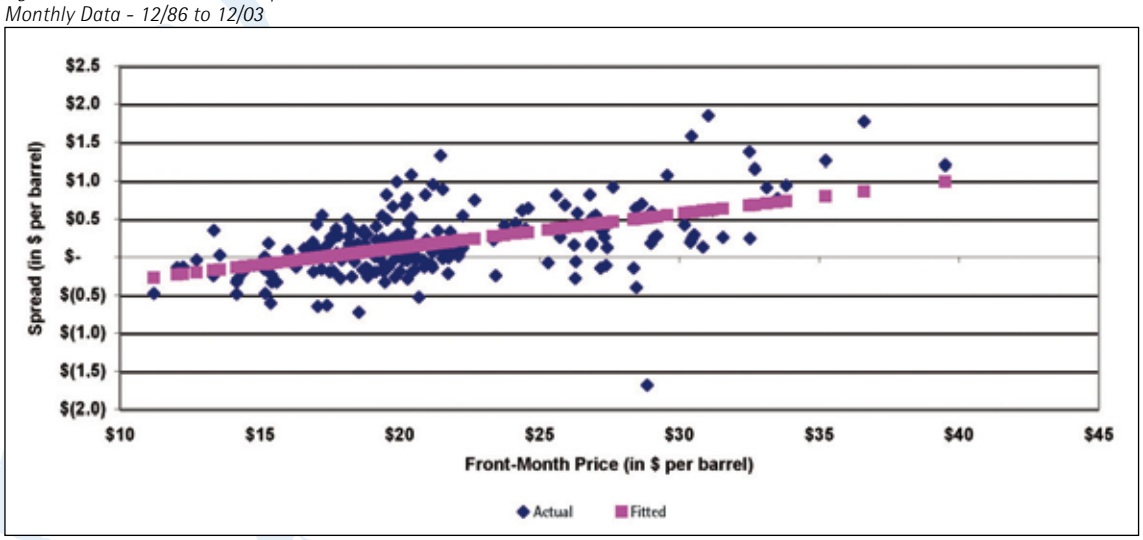
Source: JODI (2008).

Appendix C
An Example of Interpreting Fundamental Information From Price-Relationship Data: The Danger of Structural Breaks

Prior to 2004, if there was scarcity in the crude-oil market, one could expect two outcomes: (1) high prices; and (2) front-month prices that trade at a large premium to deferred-delivery contracts. In the latter case, there would be a negative return to storage: by holding onto the commodity, one would be receiving a lower return in the future. Therefore, in this state of the world, the market would be encouraging immediate use of the commodity (rather than hoarding).

When, by contrast, a futures curve trades in contango, the front-month price trades at a discount to the deferred-delivery contract. In times of surplus, inventory holders receive a return-to-storage, as represented by the size of the contango, since they can buy the crude oil immediately at a lower price and lock in positive returns to storage by simultaneously selling the higher-priced contract for a future delivery. If inventories breach primary storage capacity, the crude curve will trade into deeper contango,

Figure C-1: WTI Front-to-Back Spread vs. Front-Month Crude
Monthly Data - 12/86 to 12/03



Data Source: Bloomberg.

The past structural relationship of crude oil to its curve is illustrated in figure C-1. There had been a +52% correlation between the level of outright crude prices and the level of front-to-back-month calendar spreads.[23]

When the front-month price trades at a premium to the deferred-delivery contracts, this is known as *backwardation*. This has been the historically consistent curve shape[24] for crude oil futures prices, so consistent that a 1995 *Journal of Finance* article discussed why the crude oil futures should trade mainly in structural backwardation.

so as to provide a return for placing the commodity in more expensive, secondary storage (or even tertiary storage).

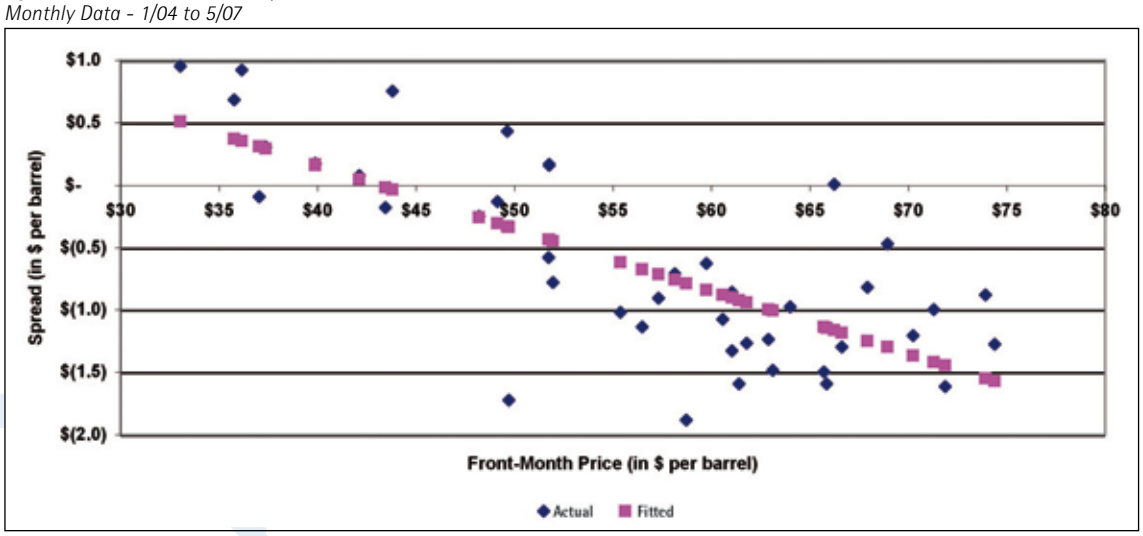
In other words, the more there are crude stocks that need storage, the more the crude curve trades in contango. Correspondingly, the scarcer crude oil is, the more the crude curve trades in backwardation. One would thus normally expect backwardation to be associated with high prices.

23 - A calendar spread is the difference in price between two different delivery months for a futures contract. A front-to-back-month calendar spread is the difference in price between the immediately deliverable futures contract and the next deferred delivery month contract. When the front-month futures price is greater than the back-month price, the spread is positive.

24 - By futures curve shape, we mean whether a futures market is trading in backwardation or contango. Futures traders frequently refer to the term structure of a futures contract as a "curve:" the futures prices for each maturity are on the y-axis while the maturity of each contract is plotted on the x-axis, which thereby traces out a "futures price curve."

Appendix C
An Example of Interpreting Fundamental Information From Price-Relationship Data: The Danger of Structural Breaks

Figure C-2: WTI Front-to-Back Spread vs. Front-Month Crude
Monthly Data - 1/04 to 5/07



Data Source: Bloomberg.

The crude curve's structural relationship changed from 2004 to the summer of 2007. During that time period, the level of crude-oil prices became -75% correlated with its corresponding calendar spread (see figure C-2).

Through the summer of 2007, the structural rigidities in the crude oil market translated into large contangos and high flat prices. This had been extremely unusual in the previous seventeen years (and contrary to many market participants' understanding of the technical features of the crude oil futures markets).

What changed in 2004? Note figure 4 in the body of the paper. 2004 was the year that OPEC's immediately deliverable spare capacity *collapsed*.

Why does this matter? The first item in this explanation is to note that the IEA (2008b) has stated that the OECD presently has inventories to service fifty-three days of demand.

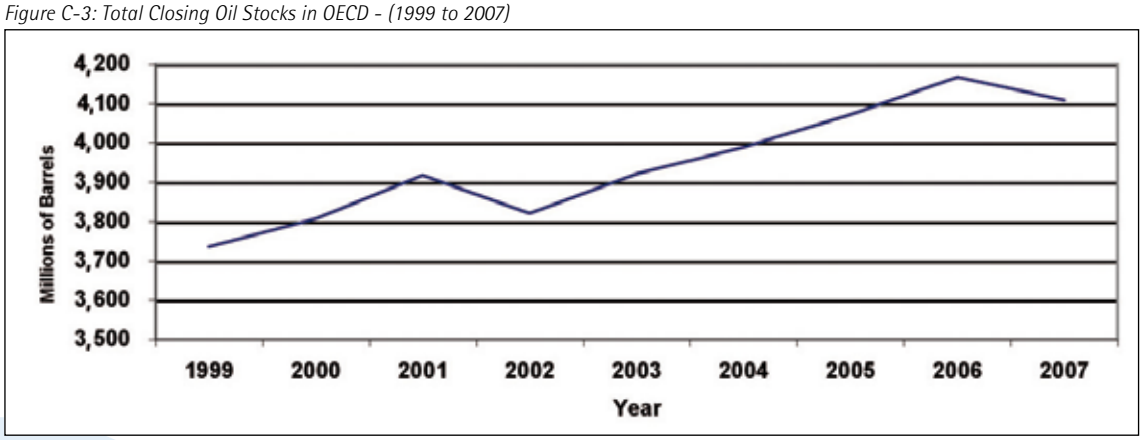
Secondly, as explained in Harrington (2005), the true inventories for crude oil should be represented as above-ground stocks plus excess capacity. Historically, the markets could tolerate relatively low oil inventories (measured in days of demand) because there was sufficient swing capacity that could be brought on stream relatively quickly in the case of any supply disruption. By 2004, this excess supply cushion had dropped to sufficiently low levels that there were two market responses: (1) there were (and are) continuously high spot prices to encourage either consumer conservation or the development of alternative energy supplies, and (2) the market undertook precautionary stock building, which arguably led to the persistent (but not continuous) contangos that the crude oil market began experiencing in late 2004.

The size of the contangos may have been amplified periodically by storage capacity inadequate for the precautionary inventory holdings. Figure C-3 illustrates the growth of yearly inventories (stock-holdings) in OECD countries.

In this concrete example, we see how in one state-of-the-world, high prices are associated with backwardation, while in another, high prices are associated with contango. This example shows how the

Appendix C
An Example of Interpreting Fundamental Information From Price-Relationship Data: The Danger of Structural Breaks

Figure C-3: Total Closing Oil Stocks in OECD - (1999 to 2007)



Data Source: IEA (2008b).

interpretation of fundamental information from transparent futures markets, such as in the oil market, can be quite difficult, particularly during times of surprising structural breaks with the past.

Appendix D

Summary of US House of Representatives Bill on Futures Market Oversight: Press Release from US House of Representatives Committee on Agriculture (9/18/08)

WASHINGTON - Today, the House of Representatives voted to approve a bipartisan bill to increase the transparency, oversight, and anti-manipulation authority over commodity futures and options markets. The House overwhelmingly passed H.R. 6604, the Commodity Markets Transparency and Accountability Act of 2008, a bill sponsored by House Agriculture Committee Chairman Collin C. Peterson of Minnesota, by a vote of 283-133.

H.R. 6604 strengthens trader position limits on oil and other futures markets as a way to prevent potential price distortions caused by excessive speculative trading. It directs the CFTC to get a clearer picture of the over-the-counter (OTC) markets, and it calls for new full-time CFTC staff to improve enforcement, prevent manipulation, and prosecute fraud.

"Commodities markets have seen significant changes in recent years", Chairman Peterson said. Trading volume is at record levels, tradable products are more complex, and an unexplained lack of convergence between futures and cash prices in some contracts has called into question the effectiveness of these markets as a source of price discovery and risk management. I am proud that we could work across party lines today to pass this bill which will bring much-needed transparency to commodities and futures markets for the benefit of producers, processors and consumers."

Provisions included in The Commodity Markets Transparency and Accountability Act would:

- Require foreign boards of trade to share trading data and adopt speculative position limits on contracts that trade US commodities similar to US-regulated exchanges.
- Require the CFTC to set trading limits for all agricultural and energy commodities, in order to prevent excessive speculation.
- Limit eligibility for hedge exemptions to bona-fide hedgers.
- Codify CFTC recommendations to improve transparency in dark markets by disaggregating index fund and other data in energy and agricultural markets as well as requiring detailed reporting from index traders and swap dealers.
- Call for a minimum of 100 full-time CFTC employees to enforce manipulation and prevent fraud. Despite record trading volume in the futures and options markets, CFTC staffing is at its lowest level since the agency was created in 1974.
- Authorize CFTC to take action if it finds disruption in over-the-counter markets for energy and gas.
- Require the CFTC to study the effectiveness of establishing position limits in over-the-counter markets.

Congressional oversight of commodity futures trading is under the jurisdiction of the House Agriculture Committee, chaired by Congressman Peterson. The Committee approved H.R. 6604 by voice vote on July 24, 2008. It was brought to the House floor on July 30 under suspension of House rules, but it did not receive the two-thirds majority needed to pass.

Source: US House of Representatives Committee on Agriculture (2008).

Appendix E
Price Volatility in 16 Markets Before and After the Establishment of Futures

	5 YEARS		3 YEARS		1 YEAR	
CHICAGO Wheat 1854-64 (monthly)	*Without futures*	*With futures*	*Without futures*	*With futures*	*Without futures*	*With futures*
I. Coefficient of variation	0.0591	0.0644	**0.0577**	**0.0361**	**0.0549**	**0.0337**
II. Average monthly change	**0.0895**	**0.0779**	**0.0935**	**0.077**	**0.1036**	**0.085**
III. Likelihood ratio test (all years, k=2)			**2.3335**			
NEW ORLEANS COTTON, 1866-76 (monthly)						
I. Coefficient of variation	**0.0977**	**0.0772**	**0.0837**	**0.0454**	**0.0662**	**0.0292**
II. Average monthly change	**0.0682**	**0.0331**	**0.0655**	**0.035**	**0.0497**	**0.0426**
III. Likelihood ratio test (all years, k=2)			**3.9567**			
WINNIPEG OATS, 1899-1909 (monthly)						
I. Coefficient of variation	**0.0528**	**0.0343**	**0.0486**	**0.0322**	*0.0318*	*0.032*
II. Average monthly change	**0.0815**	**0.0553**	**0.0708**	**0.053**	*0.0383*	*0.0693*
III. Likelihood ratio test (all years, k=2)			**2.1724**			
NYC SUGAR, 1911-21 (monthly)						
I. Coefficient of variation	*0.1361*	*0.1938*	**0.1563**	**0.0882**	**0.0826**	**0.058**
II. Average monthly change	*0.0597*	*0.0732*	**0.0607**	**0.0429**	*0.0524*	*0.0571*
III. Likelihood ratio test (all years, k=2)			**3.636**			
NYC BUTTER, 1920-30 (monthly)						
I. Coefficient of variation	**0.0487**	**0.0325**	**0.0366**	**0.0229**	**0.0295**	**0.0262**
II. Average monthly change	**0.0666**	**0.0473**	**0.0665**	**0.0451**	**0.0665**	**0.0461**
III. Likelihood ratio test (all years, k=2)			**2.1252**			
NYC EGGS, 1920-30 (monthly)						
I. Coefficient of variation	**0.0902**	**0.0634**	**0.0778**	**0.0618**	**0.0797**	**0.0587**
II. Average monthly change	**0.1391**	**0.1015**	**0.1392**	**0.0991**	**0.1328**	**0.11**
III. Likelihood ratio test (all years, k=2)			**2.4587**			
NYC RUBBER, 1921-31 (monthly)						
I. Coefficient of variation	*0.174*	*0.2371*	**0.1365**	**0.1035**	**0.0913**	**0.0195**
II. Average monthly change	**0.1022**	**0.063**	**0.1135**	**0.0616**	**0.1427**	**0.0452**
III. Likelihood ratio test (all years, k=2)			**2.3668**			
NYC SILK, 1923-33 (monthly)						
I. Coefficient of variation	*0.0962*	*0.512*	*0.0619*	*0.2662*	**0.0426**	**0.0206**
II. Average monthly change	*0.051*	*0.0678*	*0.0359*	*0.0478*	**0.0408**	**0.0234**
III. Likelihood ratio test (all years, k=2)			**5.5591**			
NYC COPPER, 1928-38 (monthly)						
I. Coefficient of variation	**0.2099**	**0.086**	**0.1909**	**0.0558**	**0.0852**	**0.0279**
II. Average monthly change	**0.0651**	**0.0564**	**0.0811**	**0.0456**	**0.0857**	**0.0591**
III. Likelihood ratio test (all years, k=2)			**2.7353**			
NYC SILVER, 1928-38 (monthly)						
I. Coefficient of variation	**0.0853**	**0.0415**	*0.0455*	*0.0479*	*0.0278*	*0.0317*
II. Average monthly change	**0.0331**	**0.0238**	**0.044**	**0.0342**	**0.0366**	**0.0329**
III. Likelihood ratio test (all years, k=2)			**2.419**			
NYC LEAD, 1929-39 (monthly)						
I. Coefficient of variation	**0.1852**	**0.1051**	*0.1195*	*0.1279*	**0.1002**	**0.0655**
II. Average monthly change	**0.0387**	**0.0307**	**0.045**	**0.0341**	**0.0342**	**0.0241**
III. Likelihood ratio test (all years, k=2)			**6.0309**			
NYC ZINC, 1929-39 (monthly)						
I. Coefficient of variation	**0.1719**	**0.1017**	**0.1306**	**0.1139**	**0.111**	**0.0598**
II. Average monthly change	**0.048**	**0.0341**	**0.0504**	**0.0323**	**0.0498**	**0.0236**
III. Likelihood ratio test (all years, k=2)			**3.3138**			
CHICAGO SOYBEANS, 1932-9 (monthly)						
I. Coefficient of variation	**0.0907**	**0.0589**	**0.0714**	**0.0607**	**0.0596**	**0.0431**
II. Average monthly change	**0.0856**	**0.0732**	**0.1043**	**0.068**	**0.0722**	**0.067**
III. Likelihood ratio test (all years, k=2)			1.3403			
BOMBAY LINSEED, 1952-60 (monthly)						
I. Coefficient of variation	**0.0261**	**0.0148**	**0.0304**	**0.0157**	**0.0313**	**0.0181**
II. Average monthly change	**0.0456**	**0.0303**	**0.0418**	**0.0329**	**0.0456**	**0.0381**
III. Likelihood ratio test (all years, k=2)			**2.5052**			
CHICAGO LIVE HOGS, 1961-71 (monthly)						
I. Coefficient of variation	0.0637	0.0674	**0.0783**	**0.0638**	**0.066**	**0.0309**
II. Average monthly change	0.0525	0.0598	**0.058**	**0.0514**	**0.0642**	**0.0433**
III. Likelihood ratio test (all years, k=2)			**2.4375**			
JAKARTA RUBBER, 1980-90 (monthly)						
I. Coefficient of variation	**0.0545**	**0.0433**	*0.038*	*0.0503*	**0.0406**	**0.0166**
II. Average monthly change	**0.0384**	**0.0307**	*0.0355*	*0.0358*	**0.0373**	**0.0276**
III. Likelihood ratio test (all years, k=2)			**2.2213**			
Significant at the 10% level	Significant at the 5% level		Significant at the 1% level		Significant at the .1% level	

Note: Figures in bold are those consistent with the hypothesis of dampened price volatility in the presence of futures markets; significance for criteria I-II refers to t-test on differences in means; significance for criterion III refers to an F-test for pooled and non-pooled estimates. This table is directly drawn from Jacks (2007).

Appendix F
Definition of Holbrook Working's Speculative T Index

T = 1+ SS / (HL + HS) if (HS >= HL)
or
T = 1 + SL / (HL + HS) if (HL > HS),

where open interest held by speculators (non-commercials) and hedgers (commercials) is denoted as follows:

SS = Speculation, Short
SL = Speculation, Long
HL = Hedging, Long
HS = Hedging, Short

The data are derived from the classifications contained in the CFTC's Commitment of Traders report.

"Peck (1980, p. 1037) notes that the speculative index, '...reflects the extent by which the level of speculation exceeds the minimum necessary to absorb long and short hedging, recognizing that long and short hedging positions could not always be expected to offset each other even in markets where these positions were of comparable magnitudes.' Working is careful to point out that what may be 'technically an < excess > of speculation is economically necessary' for a well-functioning market (1960, p. 197)."

References:
Peck, A., 1980, "The Role of Economic Analysis in Futures Market Regulation", *American Journal of Agricultural Economics* 62, pp.1037-1043.

Working, H., 1960, "Speculation on Hedging Markets", *Food Research Institute Studies* 1, pp. 185-220.

Source: Sanders et al. *(2008).*

Part 2
The Structural Causes of the Third Oil Shock

Benoît Maffei

Introduction

It should always be kept in mind that analyses of the commodities markets are relevant essentially only for the medium and long term. If the crisis in the international banking system touches off a major global recession, a fall in the price of oil in the coming weeks is not out of the question. But this cyclical crisis should not invalidate analyses of the fundamental trends in the oil markets or of the links between the spot markets and futures markets. On Friday, October 17, for the first time in eight months, the price of oil dropped below $70 a barrel.

Since the record high of $147.27 (NYMEX) on July 11, 2008, prices have fallen more than 50%.

The sustained rise in the price of hydrocarbons over the last four years can perhaps be accounted for by a series of hypotheses, hypotheses both mutually exclusive and complementary.

Nature of hypothesis	Clarification of hypothesis	Countries concerned
Political hypothesis	Limited production as a result of domestic strife or foreign threats	Iraq (civil war) Iran (threat of war) Nigeria (guerrilla insurgency) Venezuela (nationalisation) Russia (reprisals)
Financial hypothesis	Limited production: preservation of reserves preferable to loss-making financial investments (falling dollar, negative real interest rates, rising inflation, falls in securities and real estate markets)	Saudi Arabia, Kuwait, UAE, Brunei, Gabon, Libya
Technological hypothesis	Chronic under-investment in currently producing fields (prices having been too low for too long to encourage exploration): technological progress is improving recovery rates	Saudi Arabia, Kuwait, UAE, Qatar, Venezuela, Nigeria Iraq, Iran, Libya, Algeria, Russia
Geological hypothesis	Inevitable depletion of currently producing fields No discovery of gigantic fields for three decades (technological progress does not make up for the absence of resources), except in Brazil and Kazakhstan	Gigantic fields in Russia, the Persian Gulf, and the North Sea. Discoveries off the coast of Brazil Hypotheses about Alaska and the Arctic.
Strategic hypotheses	Policy to increase prices (supply-side cartel) in OPEC member countries and non-OPEC countries The need to make capacity investments for currently producing fields and transport infrastructure (pipelines) profitable The need to make considerable investments to exploit new fields (heavy and extra-heavy crude, tar sands, pitch, oil shale, deep offshore fields The need to make investments profitable to produce alternative fuels (liquid coal, liquefied petroleum gas, liquefied natural gas, hydrogen) and to make renewable energies (biomass), energy savings programmes, and latest generation nuclear power stations profitable	OPEC countries Russia Saudi Arabia, Kuwait, UAE, Iraq, Iran, Russia, The Caucasus, Central Asia, North Sea, Brazilian and African coasts Arctic Ocean Russia, Canada, Venezuela Member countries of the International Energy Agency Non-producing countries, China

1. Fundamental Imbalances in the Oil Markets

Global oil production fell 0.2% in 2007, as in 2002, although it has increased by one billion tonnes in twenty years. OPEC's share of production was its highest since 1980, during the second oil shock.

Year (millions of tonnes)	Global production	OPEC production	Non-OPEC production	OPEC share	Non-OPEC share	OPEC change	Non-OPEC change
1960	1,056,800	403,044	653,756	38.14%	61.86%	-	-
1961	1,118,900	431,908	686,992	38.60%	61.40%	7.16%	5.08%
1962	1,215,100	502,494	712,606	41.35%	58.65%	16.34%	3.73%
1963	1,303,500	547,951	755,549	42.04%	57.96%	9.05%	6.03%
1964	1,410,500	610,948	799,552	43.31%	56.69%	11.50%	5.82%
1965	1,505,000	663,124	841,876	44.06%	55.94%	8.54%	5.29%
1966	1,641,400	715,069	926,331	43.56%	56.44%	7.83%	10.03%
1967	1,760,100	783,747	976,353	44.53%	55.47%	9.60%	5.40%
1968	1,923,700	885,294	1,038,406	46.02%	53.98%	12.96%	6.36%
1969	2,072,600	1,008,243	1,064,357	48.65%	51.35%	13.89%	2.50%
1970	2,278,400	1,109,787	1,168,613	48.71%	51.29%	10.07%	9.80%
1971	2,470,000	1,254,411	1,215,589	50.79%	49.21%	13.03%	4.02%
1972	2,539,800	1,337,172	1,202,628	52.65%	47.35%	6.60%	-1.07%
1973	2,774 600	1,532,033	1,242,567	55.22%	44.78%	14.57%	3.32%
1974	2,793,330	1,520,965	1,272,365	54.45%	45.55%	-0.72%	2.40%
1975	2,643,463	1,346,342	1,297,121	50.93%	49.07%	-11.48%	1.95%
1976	2,864,000	1,516,561	1,347,439	52.95%	47.05%	12.64%	3.88%
1977	3,044,522	1,556,756	1,487,766	51.13%	48.87%	2.65%	10.41%
1978	3,098,050	1,487,766	1,610 284	48.02%	51.98%	-4.43%	8.24%
1979	3,115,000	1,522,868	1,592,132	48.89%	51.11%	2.36%	-1.13%
1980	3,046,622	1,333,466	1,713,156	43.77%	56.23%	-12.44%	7.60%
1981	2,862,682	1,122,872	1,739,810	39.22%	60.78%	-15.79%	1.56%
1982	2,760,007	960,023	1,799,984	34.78%	65.22%	-14.50%	3.46%
1983	2,750,777	893,180	1,857,597	32.47%	67.53%	-6.96%	3.20%
1984	2,817,120	874,200	1,942,920	31.03%	68.97%	-2.12%	4.59%
1985	2,766,086	814,659	1,951,427	29.45%	70.55%	-6.81%	0.44%
1986	2,922,152	955,432	1,966,720	32.70%	67.30%	17.28%	0.78%
1987	2,906,340	910,544	1,995,796	31.33%	68.67%	-4.70%	1.48%
1988	3,054,122	1,039,535	2,014,587	34.04%	65.96%	14.17%	0.94%
1989	3,108,593	1,137,372	1,971,221	36.59%	63.41%	9.41%	-2.15%
1990	3,130 616	1,205,506	1,925,110	38.51%	61.49%	5.99%	-2.34%
1991	3,128,610	1,207,576	1,921,034	38.60%	61.40%	0.17%	-0.21%
1992	3,143,930	1,268,000	1,875,930	40.33%	59.67%	5.00%	-2.35%
1993	3,147,604	1,304 000	1,843,604	41.43%	58.57%	2.84%	-1.72%
1994	3,182,966	1,318,600	1,864,366	41.43%	58.57%	1.12%	1.13%
1995	3,251,656	1,325,900	1,925,756	40.78%	59.22%	0.55%	3.29%
1996	3,345,161	1,367,700	1,977,461	40.89%	59.11%	3.15%	2.68%
1997	3,479,900	1,447,800	2,032,100	41.60%	58.40%	5.86%	2.76%
1998	3,547,300	1,509,000	2,038,300	42.54%	57.46%	4.23%	0.31%
1999	3,481 100	1,445,500	2,035,600	41.52%	58.48%	-4.21%	-0.13%
2000	3,614,100	1,523,300	2,090,800	42.15%	57.85%	5.38%	2.71%

2001	3,600,300	1,484,000	2,116,300	41.22%	58.78%	-2.58%	1.22%
2002	3,575,300	1,393,400	2,181,900	38.97%	61.03%	-6.11%	3.10%
2003	3,701,100	1,480,900	2,220,200	40.01%	59.99%	6.28%	1.76%
2004	3,866,700	1,596,000	2,270,700	41.28%	58.72%	7.77%	2.27%
2005	3,897,000	1,630,400	2,266 600	41.84%	58.16%	2.16%	-0.18%
2006	3,914,300	1,631,900	2,282,400	41.69%	58.31%	0.09%	0.70%
2007	3,905,900	1,707,800	2,198,100	43.72%	56.28%	4.65%	-3.69%

After a sharp drop in 2001 and 2002, OPEC ramped up production, while production in non-OPEC members fell in 2005 and 2007. The changes can be explained by the fact that OPEC boasts reserves that allow it to increase production when prices are attractive, whereas many producing countries that are not members of OPEC cannot profit from this windfall because of exhausted oilfields (United States, United Kingdom) or because of the obsolescence of their production equipment (Russia). In fact, the increase in OPEC production can be entirely accounted for by Angola's 2007 joining of the cartel. Without Angola's contribution, OPEC production would have stagnated. The increase in consumption is steady, but it is the result of increases in emerging economies

Year	United States	Japan	Canada	Oceania	Latin America	Europe
1980	794.1	237.7	87.6	33.2	211.8	800.4
1981	746.0	223.9	81.7	33.2	223.9	727.6
1982	705.5	207.8	72.9	32.3	231.7	691.3
1983	704.9	207.2	68.2	31.1	209.8	671.7
1984	723.3	217.9	66.7	32.4	208.1	676.4
1985	720.2	206.3	68.5	30.8	206.8	663.4
1986	749.3	208.5	71.0	32.2	214.3	688.6
1987	764.8	209.2	73.1	33.0	222.2	690.8
1988	796.7	224.7	76.8	34.3	227.1	700.1
1989	795.3	232.9	80.3	35.9	232.8	700.4
1990	781.8	247.7	77.7	36.5	234.3	710.2
1991	765.6	252.1	74.8	35.7	238.9	710.5
1992	782.2	257.5	76.8	36.1	246.8	714.6
1993	789.3	251.9	77.1	37.9	249.5	711.9
1994	809.8	267.4	78.4	39.6	264.0	711.0
1995	807.7	267.6	79.8	41.1	266.5	723.4
1996	836.5	268.8	82.1	41.8	277.0	741.8
1997	848.0	265.0	85.2	43.1	291.6	749.6
1998	863.8	253.6	86.7	43.1	309.0	760.9
1999	888.9	257.3	87.2	44.3	309.3	757.5
2000	897.6	255.5	88.1	43.9	311.5	754.7
2001	896.1	247.5	90.5	44.4	315.8	761.7
2002	897.4	243.6	92.2	44.5	310.1	759.3
2003	912.3	248.9	95.9	45.2	305.6	764.3
2004	948.7	241.1	100.6	45.8	313.1	774.8
2005	951.4	244.1	100.3	47.0	323.7	780.4
2006	943.8	237.1	99.6	48.6	326.7	784.5
2007	943.1	228.9	102.3	49.2	341.2	765.6

Year	Africa	Mid-East	Rest of Asia	ex-USSR	China	Global consumption
1980	71.9	82.0	154.6	436.0	88.0	2,998
1981	73.8	104.9	166.1	452.4	84.8	2,918
1982	77.9	107.0	157.6	449.5	82.4	2,816
1983	78.9	132.2	162.4	416.6	84.7	2,768
1984	77.2	140.3	166.9	417.0	86.5	2,813
1985	82.3	144.7	173.1	416.5	90.3	2,803
1986	80.9	146.2	183.3	418.2	100.0	2,893
1987	84.2	151.2	193.2	420.2	105.3	2,947
1988	88.1	150.5	214.8	414.6	110.2	3,038
1989	91.7	156.5	236.2	413.4	112.3	3,088
1990	94.2	164.6	258.4	418.7	110.3	3,135
1991	95.6	169.4	277.0	397.4	117.9	3,134
1992	96.9	173.7	308.7	348.0	129.0	3,170
1993	98.0	178.6	330.4	275.7	140.5	3,141
1994	100.5	187.1	356.0	236.3	149.5	3,199
1995	103.7	193.4	385.9	217.0	160.7	3,246
1996	106.1	198.1	407.5	188.7	174.4	3,329
1997	109.0	213.6	432.4	187.2	196.0	3,421
1998	112.7	216.0	424.9	181.1	197.0	3,449
1999	115.6	218.9	451.7	177.8	209.6	3,518
2000	116.2	225.9	468.5	173.2	223.6	3,559
2001	116.2	230.2	473.3	172.6	227.9	3,576
2002	117.5	238.4	486.7	174.1	247.4	3,611
2003	120.1	248.2	492.7	176.9	271.7	3,682
2004	124.1	261.4	517.5	177.7	318.9	3,824
2005	129.9	271.5	517.5	177.4	327.8	3,871
2006	132.1	281.2	519.5	184.5	353.3	3,911
2007	138.2	293.5	539.0	183.8	368.0	3,953

Breakdown	United States	Japan	Canada	Oceania	Latin America	Europe
1980	26.49%	7.93%	2.92%	1.11%	7.06%	26.70%
1981	25.57%	7.67%	2.80%	1.14%	7.67%	24.93%
1982	25.05%	7.38%	2.59%	1.15%	8.23%	24.55%
1983	25.47%	7.49%	2.46%	1.12%	7.58%	24.27%
1984	25.71%	7.75%	2.37%	1.15%	7.40%	24.05%
1985	25.69%	7.36%	2.44%	1.10%	7.38%	23.67%
1986	25.90%	7.21%	2.45%	1.11%	7.41%	23.80%
1987	25.95%	7.10%	2.48%	1.12%	7.54%	23.44%
1988	26.22%	7.40%	2.53%	1.13%	7.48%	23.04%
1989	25.75%	7.54%	2.60%	1.16%	7.54%	22.68%
1990	24.94%	7.90%	2.48%	1.16%	7.47%	22.65%
1991	24.43%	8.04%	2.39%	1.14%	7.62%	22.67%
1992	24.68%	8.12%	2.42%	1.14%	7.79%	22.54%
1993	25.13%	8.02%	2.45%	1.21%	7.94%	22.66%
1994	25.31%	8.36%	2.45%	1.24%	8.25%	22.23%
1995	24.88%	8.24%	2.46%	1.27%	8.21%	22.29%
1996	25.13%	8.07%	2.47%	1.26%	8.32%	22.28%
1997	24.79%	7.75%	2.49%	1.26%	8.52%	21.91%
1998	25.04%	7.35%	2.51%	1.25%	8.96%	22.06%

1999	25.27%	7.31%	2.48%	1.26%	8.79%	21.53%
2000	25.22%	7.18%	2.48%	1.23%	8.75%	21.21%
2001	25.06%	6.92%	2.53%	1.24%	8.83%	21.30%
2002	24.85%	6.75%	2.55%	1.23%	8.59%	21.03%
2003	24.78%	6.76%	2.60%	1.23%	8.30%	20.76%
2004	24.81%	6.30%	2.63%	1.20%	8.19%	20.26%
2005	24.58%	6.31%	2.59%	1.21%	8.36%	20.16%
2006	24.13%	6.06%	2.55%	1.24%	8.35%	20.06%
2007	23.86%	5.79%	2.59%	1.24%	8.63%	19.37%

Year	Africa	Mid-East	Rest of Asia	ex-USSR	China	Change in global consumption
1980	2.40%	2.74%	5.16%	14.54%	2.94%	-
1981	2.53%	3.59%	5.69%	15.50%	2.91%	-2.67%
1982	2.77%	3.80%	5.60%	15.96%	2.93%	-3.50%
1983	2.85%	4.78%	5.87%	15.05%	3.06%	-1.70%
1984	2.74%	4.99%	5.93%	14.82%	3.08%	1.63%
1985	2.94%	5.16%	6.18%	14.86%	3.22%	-0.36%
1986	2.80%	5.05%	6.34%	14.46%	3.46%	3.21%
1987	2.86%	5.13%	6.56%	14.26%	3.57%	1.87%
1988	2.90%	4.95%	7.07%	13.65%	3.63%	3.09%
1989	2.97%	5.07%	7.65%	13.39%	3.64%	1.65%
1990	3.00%	5.25%	8.24%	13.36%	3.52%	1.52%
1991	3.05%	5.41%	8.84%	12.68%	3.76%	-0.03%
1992	3.06%	5.48%	9.74%	10.98%	4.07%	1.15%
1993	3.12%	5.69%	10.52%	8.78%	4.47%	-0.91%
1994	3.14%	5.85%	11.13%	7.39%	4.67%	1.85%
1995	3.19%	5.96%	11.89%	6.69%	4.95%	1.47%
1996	3.19%	5.95%	12.24%	5.67%	5.24%	2.56%
1997	3.19%	6.24%	12.64%	5.47%	5.73%	2.76%
1998	3.27%	6.26%	12.32%	5.25%	5.71%	0.82%
1999	3.29%	6.22%	12.84%	5.05%	5.96%	2.00%
2000	3.26%	6.35%	13.16%	4.87%	6.28%	1.17%
2001	3.25%	6.44%	13.24%	4.83%	6.37%	0.48%
2002	3.25%	6.60%	13.48%	4.82%	6.85%	0.98%
2003	3.26%	6.74%	13.38%	4.80%	7.38%	1.97%
2004	3.25%	6.84%	13.53%	4.65%	8.34%	3.86%
2005	3.36%	7.01%	13.37%	4.58%	8.47%	1.23%
2006	3.38%	7.19%	13.28%	4.72%	9.03%	1.03%
2007	3.50%	7.42%	13.64%	4.65%	9.31%	1.07%

In more than a quarter of a century, the share of consumption of the United States has dropped by 2.63%, that of Japan by 2.14%, that of Europe by 7.33%, and that of the former Soviet Union by 9.29%. The share of consumption of Latin America has increased by 1.57%, that of Africa by 1.10%, that of the Mid-East by 4.69%, that of China by 6.37%, and that of the rest of Asia by 8.48%. It is clear then that the third oil shock can be put down to the high rates of growth being enjoyed by emerging economies, growth made possible by globalisation. Its energy-greedy character is the result of the low energy efficiency of the systems of production in these countries and of the development of primary industries that consume great quantities of hydrocarbons. In addition, reserves, as officially announced by BP, have remained largely unchanged since the inclusion of the tar sands of western Canada, as Tupi and Carioca, giant oilfields discovered off the coast of Brazil, have not been included in the count.[1]

It is obviously tempting to derive an initial explanation for the third oil shock by comparing longer-term figures for production and consumption.

Year (millions of tonnes)	Production	Consumption	Yearly difference	Cumulative difference
1970	2,278	2,275	-3	
1971	2,470	2,399	-71	-74
1972	2,540	2,572	32	-39
1973	2,775	2,798	23	56
1974	2,793	2,760	-33	-10
1975	2,643	2,725	82	48
1976	2,864	2,895	31	113
1977	3,045	2,986	-59	-28
1978	3,098	3,084	-14	-73
1979	3,115	3,124	9	-5
1980	3,047	2,998	-49	-40
1981	2,863	2,918	55	7
1982	2,760	2,816	56	111
1983	2,751	2,768	17	73
1984	2,817	2,813	-4	13
1985	2,766	2,803	37	33
1986	2,922	2,893	-29	8
1987	2,906	2,947	41	12
1988	3,054	3,038	-16	25
1989	3,109	3,088	-21	-37
1990	3,131	3,135	4	-16
1991	3,129	3,134	5	10
1992	3,144	3,170	26	31
1993	3,148	3,141	-7	19
1994	3,183	3,199	16	9
1995	3,252	3,246	-6	10
1996	3,345	3,329	-16	-22
1997	3,480	3,421	-59	-75
1998	3,547	3,449	-98	-157

1 - If these discoveries are confirmed, Brazil could have the third-largest oil reserves in the world, but they will be exploited only if the price of oil remains high. The exploitation of these resources could loosen the financial constraints to which Brazil is subject—local production would replace costly hydrocarbon imports. But it is unlikely that oil, like exports of agricultural and mining commodities, will generate large surpluses in the balance of payments. Brazil has considerable domestic needs, the reason for which it turned down offers from Venezuela and Iran to join OPEC. Emerging economies tend to use their domestic resources at home, whereas poor countries export them to procure the goods essential to their survival.

1999	3,481	3,518	37	-61
2000	3,614	3,559	-55	-18
2001	3,600	3,576	-24	-79
2002	3,575	3,611	36	11
2003	3,701	3,682	-19	17
2004	3,867	3,824	-43	-62
2005	3,897	3,871	-26	-69
2006	3,914	3,911	-3	-29
2007	3,906	3,953	47	44
Total	**119,529**	**119,429**	**-100**	**-**

This apparent cumulative surplus of 44 million tonnes over twenty-seven years is clearly nonsensical: it cannot be attributed to changes in stocks. It is the result of flaws in the global statistics for production and consumption, both of which are incompletely measured. Of course, at 0.084% of cumulative consumption, this surplus is very low. All the same, it is worth noting that in 2007 consumption exceeded production by 47 million tonnes, a high absolute excess found also in 1975 (82 million tonnes), 1981 (55 million tonnes), and 1982 (56 million tonnes). So the hypothesis of a shock caused by fast-growing demand that suppliers are struggling to meet would seem initially to bear out. These statistics, of course, do not take into account theft, leaks, or any other losses along the production and supply chain.

Attempting to account for the third oil shock are two broad sets of explanations, more complementary than competitive. For its part, OPEC believes that, given the simultaneous fall in production and consumption in OECD countries, supplies are sufficient to meet the growing demand in emerging economies. As a consequence, price increases, and even the formation of a speculative bubble, are primarily the result of speculation on the futures and over-the-counter markets. For their part, the multinational oil companies argue that the supply crisis is the result of geopolitical tensions that account for the drop in production in several major producing countries and of oil nationalism that keeps them out of much of the most promising territory for oil exploration and production (the Arabian Peninsula, Iran, Russia, Venezuela). As it happens, with the exception of the oil monarchies, where American military might ensures that the possible break-out of conflict during dynastic successions will be stamped out and puts a damper on the expansion of Islamist movements (which profit from social tensions), all the major oil-producing countries are experiencing political crises, some more acute than others.

2. Oil Geopolitics—Recent Trends

Some of the principles of the equilibrium of the short- and medium-term oil market should be set out.

• Energy systems are characterised by great short-term inertia and only very rarely are there alternatives. Beyond a certain point, the rise in the price of oil causes a drop in consumption, voluntary (as with the unusual drop in fuel consumption in France this summer[2]) or involuntary (prolonged blackouts in developing countries where electricity is produced by power stations that burn fuel oil or by diesel-run generators). The use of biofuels has clearly had an impact on demand for oil in the United States, but in other countries that have set down this path (Sweden) the impact was relatively minor—Brazil is in a class of its own, as domestic production is largely meeting domestic demand. The very complex matter of the end of a civilisation founded on the mass consumption of oil has very little impact on the oil markets as reflected by futures markets, except when the traders on these markets become suddenly aware of the necessarily finite nature of reserves (which, except for some over-the-counter transactions with very distant settlement dates, has not yet occurred). When that day comes, behaviour comparable to that described in Minsky's theory of the stability paradox cannot be ruled out.[3] For the moment, the reigning paradigms in the oil markets have not undergone major changes.

• The declarations of those involved in the oil markets must always be examined with a critical eye. They are often made simply to steer behaviour in the direction desired by the party making the declaration. The statements from the leaders of OPEC about coming price rises smack of the self-fulfilling prophecies described sixty years ago by Robert Merton in reaction to the somewhat reductive functionalism of Emile Durkheim and Talcott Parsons (which, transposed to economics, postulates that all prices are at any time the result of supply and demand). Only a critical examination of the facts makes it possible to verify the nature of such statements. When the Saudi oil minister announces that he is going to increase production, it is necessary to determine whether the aim of this announcement is to modify the expectations of those active in the oil markets (here, the mere announcement equates to action, which reveals the primacy of performative discourse) or whether it is a decision that will be translated into action in a future whose term must be assessed. It is for that reason that any analysis of the oil markets should first be looked at from the point of view of those who are offering it.

One of the most basic means of evaluating the broad risk presented by each country is to look at the analyses done by organisations that study country-risk. The table below summarises the analyses done by Coface.

In no way, of course, does this synthetic view make it possible to understand the policies actually put in place by the major oil-producing countries.

The countries of the Arabian Peninsula have taken advantage of the windfall of

2 - The Comité Français Professionnel du Pétrole believes that the fall in the consumption of fuel (-13.3% for petrol and -6.4% for diesel) is "somewhat unusual", if the figures for July 2008 and those for July 2007 are compared. This fall attests to the efficiency of price elasticity of demand when prices surpass a certain threshold. Consumption continued to fall in the month of August (-16.9% for gas and -10.6% for petrol on August 2007), indicating a change of behaviour during the driving season.

3 - The theoretical explanations proposed for the anomalies observed in the pricing of assets highlight the inertia of those involved in the markets and their reluctance to make timely changes to their depictions of the economic world and to their assessments in the wake of new economic conditions, or even the necessity, by which they find themselves beset, of coming up with new rationales, some more artificial and arbitrary than others, to legitimise decisions that cannot, in any case, overcome the irreducible uncertainties that make up the frame of the future. All monetary and financial crises have a dual nature. They occur because economic and financial indicators attest to the existence of objective imbalances. But they are triggered when people change their modes of interpreting and understanding these very imbalances, which, considered temporarily acceptable or even likely to go away on their own not long before, are suddenly anathema and thus justify changes in behaviour. Economic and financial crises are not, in themselves, the result of objectively observed imbalances, but of changes in subjective interpretations of these imbalances. The American economist Hyman P. Minsky noted this sudden change to the mechanisms for justifying investor behaviour and made mention of the stability paradox. Investors are naturally inclined toward inferring trends observed on a given market, so they are likely to take positions that, because they are less and less grounded on analyses of the fundamental data that initially justify taking these positions, are intrinsically riskier and riskier.

Oil-exporting country	Rating	Business environment	Medium-term assessment	Hydrocarbons and associated products as share of exports
Algeria	A4	B	fairly good risk	98%
Angola	C	D	very high risk	90%
Azerbaijan	C	C	moderately high risk	85%
Bahrain	A3	A3	good risk	79%
Bolivia	D	C	very high risk	54%
Cameroon	B	C	high risk	54%
Chad	D	D	very high risk	-
Colombia	A4	B	moderately high risk	25%
Congo-Brazzaville	C	D	very high risk	95%
Ecuador	C	C	high risk	59%
Egypt	B	B	high risk	50%
Gabon	B	C	high risk	83%
Indonesia	B	C	moderately high risk	38%
Iran	D	C	very high risk	80%
Iraq	D	D	very high risk	-
Kazakhstan	B	B	moderately high risk	69%
Kuwait	A2	A3	good risk	91%
Libya	C	D	high risk	97%
Malaysia	A2	A3	good risk	14%
Mexico	A3	A4	good risk	15%
Nigeria	D	D	high risk	91%
Norway	A1	A2	-	46%
Oman	A3	A4	good risk	95%
Qatar	A2	A3	good risk	99%
Russia	B	B	fairly good risk	65%
Saudi Arabia	A4	B	fairly good risk	95%
Sudan	D	D	very high risk	-
Syria	C	C	very high risk	68%
Turkmenistan	D	D	very high risk	85%
United Arab Emirates	A2	A3	good risk	50%
Uzbekistan	D	D	very high risk	23%
Venezuela	C	C	high risk	90%
Yemen	C	D	very high risk	78%

growing demand for oil—growth that is almost exclusively the result of demand from the fast-growing economies of Asia—to reverse trends in the global oil markets. As it happens, they are under a dual threat.

- First, the countries of the CIS are flooding the global oil markets, and the countries of the Middle East could have found themselves in a situation comparable to that which prevailed after the oil counter-shock of 1986, when OPEC member countries began competing with non-OPEC member countries. The new producers (Angola, Brazil, Canada, Sudan) are making up for the declining production of older exporters (Nigeria, Venezuela) and for the exhaustion of oilfields in the North Sea: in addition, several long-time producers could ramp up production (Libya, Iraq). The main reason for the venture of the United States into Central Asia in the early 1990s was to spur the production of hydrocarbon resources

there in an attempt to reduce dependence on the Middle East, but the region turned out much less promising than planned, and the attempted expansion of the American sphere of influence has run up against the determination of the Russians to control their "backyard".

• Second, the invasion of Iraq by the United States and the creation of a Shiite crescent have considerably weakened their position; the formation of an alliance to encircle Iran has in part failed (the fall of the Taliban regime in Afghanistan, instability in Pakistan, whose nuclear weapons programme they financed, the determination of Iran to acquire nuclear weapons). As a consequence, they tend to use oil as a weapon with which to undermine US Mid-East policy, which is, at heart, damaging to their interests: there is a link between the drop in production and the installation of a predominantly Shiite government in Baghdad (whereas in 2003, when the United States invaded, they had made up for dropping Iraqi production). The other reasons mentioned are premature (peak oil), unsatisfactory as a result of their isolation (shortage of storage capacity, insecurity of shipping routes, excessive speculation), or specious: it seems that because of the length of the glut that affected the oil industry (1986-2003), under-investment was the rule in all of the traditional oil-producing countries. The real production potential of the countries of the Arabian Peninsula, which are for the most part closed to foreign investment in the oil industry, is little known. The post-2005 drop in production in Saudi Arabia is the result either of the underlying exhaustion of currently producing fields or of reprisals taken against oil-importing countries. As it is assumed that the Middle East has 55% of conventional reserves, the second hypothesis seems more likely.

Iran, Russia, and, to a lesser extent (because of the problems affecting PDVSA), Venezuela have been the beneficiaries of the third oil shock, but it would be a mistake to affirm that they are entirely responsible for it, as Iran and Russia have increased their production. The primary objective of all of these countries is to profit from current conditions on the oil markets to stockpile financial reserves.

2.1. The Ambiguous Strategies of the Oil Monarchies

Saudi Arabia has played its role as a "swing producer" only intermittently. In 2003, production increased greatly to make up for the loss of Iraqi oil in the wake of the US invasion of Iraq (despite the country's official opposition to the war). In 2006 and 2007, by contrast, production fell sharply, when the price of oil rose steeply: for OECD members the average cost of a barrel of oil rose from $54.40 in 2005 to $65.10 in 2006 (+ 19.7%) and to $72.5 in 2007 (+ 10.2%).

Saudi Arabia	Production	/World	/OPEC	Change
1990	334,200	10.68%	27.72%	25.41%
1991	422,800	13.51%	35.01%	26.51%
1992	436,400	13.88%	34.42%	3.22%
1993	433,200	13.76%	33.22%	-0.73%
1994	426,100	13.39%	32.31%	-1.64%
1995	426,700	13.12%	32.18%	0.14%
1996	434,600	12.99%	31.78%	1.85%
1997	454,500	13.06%	31.39%	4.58%
1998	455,700	12.85%	30.20%	0.26%
1999	423,600	12.17%	29.30%	-7.04%
2000	456,300	12.63%	29.95%	7.72%
2001	440,600	12.24%	29.69%	-3.44%
2002	425,300	11.90%	30.52%	-3.47%
2003	485,100	13.11%	32.76%	14.06%
2004	506,000	13.09%	31.70%	4.31%
2005	526,800	13.52%	32.31%	4.11%
2006	514,300	13.14%	31.52%	-2.37%
2007	493,100	12.62%	28.87%	-4.12%

After substantial growth, Kuwaiti production fell by 2.11% in 2007.

Kuwait	Production	/World	/OPEC	Change
1990	59,950	1.91%	4.97%	-36.85%
1991	9,200	0.29%	0.76%	-84.65%
1992	54,100	1.72%	4.27%	488.04%
1993	96,000	3.05%	7.36%	77.45%
1994	104,000	3.27%	7.89%	8.33%
1995	104,400	3.21%	7.87%	0.38%
1996	103,800	3.10%	7.59%	-0.57%
1997	105,100	3.02%	7.26%	1.25%
1998	110,000	3.10%	7.29%	4.66%
1999	102,600	2.95%	7.10%	-6.73%
2000	109,100	3.02%	7.16%	6.34%
2001	105,800	2.94%	7.13%	-3.02%
2002	98,200	2.75%	7.05%	-7.18%
2003	114,800	3.10%	7.75%	16.90%
2004	122,300	3.16%	7.66%	6.53%
2005	129,300	3.32%	7.93%	5.72%
2006	132,400	3.38%	8.11%	2.40%
2007	129,600	3.32%	7.59%	-2.11%

Qatari production has increased constantly since 2003.

Qatar	Production	/World	/OPEC	Change
1990	21,200	0.68%	1.76%	2.70%
1991	20,500	0.66%	1.70%	-3.30%
1992	22,600	0.72%	1.78%	10.24%
1993	21,300	0.68%	1.63%	-5.75%
1994	20,800	0.65%	1.58%	-2.35%
1995	21,300	0.66%	1.61%	2.40%
1996	26,400	0.79%	1.93%	23.94%
1997	33,300	0.96%	2.30%	26.14%
1998	33,600	0.95%	2.23%	0.90%
1999	34,300	0.99%	2.37%	2.08%
2000	36,100	1.00%	2.37%	5.25%
2001	35,700	0.99%	2.41%	-1.11%
2002	35,200	0.98%	2.53%	-1.40%
2003	40,800	1.10%	2.76%	15.91%
2004	46,000	1.19%	2.88%	12.75%
2005	47,300	1.21%	2.90%	2.83%
2006	50,900	1.30%	3.12%	7.61%
2007	53,600	1.37%	3.14%	5.30%

After having increased significantly since 2003, production in Abu Dhabi fell off in 2007.

Abu Dhabi	Production	/World	/OPEC	Change
1990	109,000	3.48%	9.04%	14.68%
1991	123,400	3.94%	10.22%	13.21%
1992	118,300	3.76%	9.33%	-4.13%
1993	111,900	3.56%	8.58%	-5.41%
1994	113,200	3.56%	8.58%	1.16%
1995	113,700	3.50%	8.58%	0.44%
1996	117,800	3.52%	8.61%	3.61%
1997	120,100	3.45%	8.30%	1.95%
1998	123,500	3.48%	8.18%	2.83%
1999	117,400	3.37%	8.12%	-4.94%
2000	123,100	3.41%	8.08%	4.86%
2001	118,200	3.28%	7.96%	-3.98%
2002	108,400	3.03%	7.78%	-8.29%
2003	122,200	3.30%	8.25%	12.73%
2004	124,700	3.22%	7.81%	2.05%
2005	129,000	3.31%	7.91%	3.45%
2006	139,000	3.55%	8.52%	7.75%
2007	135,900	3.48%	7.96%	-2.23%

The four oil monarchies are reported to have idle capacity: according to OPEC, in late August, only Saudi Arabia and Libya had significant potential to increase production. The accuracy of these reports is suspect, however, especially in view of the countries' unceasing assertions that they are maximising production in an attempt to put a stop to the upwards trends in the oil market. In fact, Qatar alone ramped up production in 2007. These countries, in reality, prefer to go it alone and to play both sides in a particularly murky political and social environment. In addition, the social situation in Saudi Arabia remains uncertain as a result of the high unemployment afflicting a young and fast-growing population. Without very efficient police forces, the lot of these monarchies could be similar to that of the ancient kingdoms of the Middle East.

2.2. The Structural Weaknesses of African Producers

Africa is viewed not as an alternative to the Middle East, where more than half of global reserves are found, but as a continent that makes it possible for the United States to diversify its sources of oil. The situation in Nigeria is unclear. The main objective of the distribution of oil wealth is the preservation of the union of a country wracked by profound domestic crises that lead to sporadic inter-ethnic or inter-religious riots. The country is experiencing a demographic explosion (collusion between Islamist and Anglican representatives derailed bills that would have put in place a system of birth control): ethnic and religious rivalries result in emulation (each group attempts to increase its relative weight in the federation), and 90 million Nigerians survive on less than one dollar a day. The federation is largely discredited and the country can remain unified only by distributing oil income to its thirty-six states and 774 local governments. Oil money—whether official transfers allowed for by law or illicit transfers—is in fact the sole tie binding together an entirely artificial federation. The institutionalisation of corruption is necessary, but not always sufficient, to ward off the risk of domestic dissent or even secession. As it happens, however, it is the local governments, especially those of the oil-rich Delta, that have been systematically prejudiced in the

Nigeria	Production	/World	/OPEC	Change
1990	90,736	2.90%	7.53%	14.83%
1991	93,600	2.99%	7.75%	3.16%
1992	91,600	2.91%	7.22%	-2.14%
1993	94,800	3.01%	7.27%	3.49%
1994	93,100	2.92%	7.06%	-1.79%
1995	98,100	3.02%	7.40%	5.37%
1996	105,800	3.16%	7.74%	7.85%
1997	113,200	3.25%	7.82%	6.99%
1998	106,000	2.99%	7.02%	-6.36%
1999	100,800	2.90%	6.97%	-4.91%
2000	105,400	2.92%	6.92%	4.56%
2001	110,800	3.08%	7.47%	5.12%
2002	102,300	2.86%	7.34%	-7.67%
2003	110,300	2.98%	7.45%	7.82%
2004	121,900	3.15%	7.64%	10.52%
2005	125,400	3.22%	7.69%	2.87%
2006	120,000	3.07%	7.35%	-4.31%
2007	114,200	2.92%	6.69%	-4.83%

distribution of this wealth (all the more so as the subsidies they are allotted are often siphoned off, which fans resentment among the local populations). Separatist violence, blamed mostly on the Movement for the Emancipation of the Niger Delta (attacks on pipelines and drilling rigs, an assault with heavy weapons on the Shell terminal at Forcados, hundreds of kidnappings of expatriate personnel) is the result not of ideological antagonism but of the inability of the federal and state governments to share the wealth more equitably, in such a way as to favour the very poor peoples who live in the highly degraded environment of the Delta.[4]

third of the country's production) and is the result of investment by multinationals (deep offshore production).

Despite the growth generated by the third oil shock, Algeria is a society experiencing pauperisation (even its civil servants are opting for exile). Production has stagnated, despite the opening to foreign firms.

Libya has great underused potential that its recent joining of the Western camp should allow it to take better advantage of (the major geopolitical issue is getting the green light from Washington for the son

Angola	Production	/World	/OPEC	Change
1990	24,100	0.77%	-	6.45%
1991	25,600	0.82%	-	6.22%
1992	27,000	0.86%	-	5.47%
1993	25,000	0.79%	-	-7.41%
1994	26,100	0.82%	-	4.40%
1995	30,400	0.93%	-	16.48%
1996	34,100	1.02%	-	12.17%
1997	36,500	1.05%	-	7.04%
1998	36,000	1.01%	-	-1.37%
1999	36,700	1.05%	-	1.94%
2000	36,900	1.02%	-	0.54%
2001	36,600	1.02%	-	-0.81%
2002	44,600	1.25%	-	21.86%
2003	42,500	1.15%	-	-4.71%
2004	48,200	1.25%	-	13.41%
2005	61,200	1.57%	-	26.97%
2006	69,700	1.78%	-	13.89%
2007	84,100	2.15%	4.92%	20.66%

Angola is witnessing a remarkable increase in production, and it is taking place in relatively peaceful political conditions (UNITA was defeated in the legislative elections of 5 and 6 September 2008). But this increase is relatively recent (the Cabinda enclave still accounts for one-

of the current leader to succeed his father, so as to prevent any possible power grab by Islamists). Unlike Algeria and Egypt, this thinly populated country runs a relatively low risk of destabilisation provoked by a latent social crisis.

4 - All in all, the demands of the ethnic groups in the Delta are comparable to those of the rich regions in European countries that aspire to secede. In addition, this divide between oil-rich states and non-oil-producing states is also a religious (the majority Muslim North against the majority Christian South) and ethnic divide (the dominant Yoruba and Hausa and the dominated Ijaw, Igbo, and Ogoni). Though the Biafra war may have been seen as a revival of French and English rivalry for control of the Gulf of Guinea, it was also a result of the perfectly artificial construct that is Nigeria. Broadly, the oil companies want to preserve the production potential of the Delta and are often willing to meet the monetary demands of separatist groups, whereas the federal government seeks to stamp out pockets of insurrection. Meeting these demands is the most efficient means of ensuring the safety of production and distribution infrastructure, but by encouraging the creation of competing guerrilla movements it leads to an escalation of this blackmail: the result is an increase in the premiums paid the guerrillas of the Niger Delta for "insurance" against attacks and kidnappings and a corresponding decrease in the competitiveness of Nigerian oil. It is estimated that the Nigerian government has lost between $10 and $20 billion since 2005.

Libya	Production	/World	/OPEC	Change
1990	64,800	2.07%	5.38%	9.62%
1991	72,200	2.31%	5.98%	11.42%
1992	73,000	2.32%	5.76%	1.11%
1993	67,100	2.13%	5.15%	-8.08%
1994	68,100	2.14%	5.16%	1.49%
1995	69,000	2.12%	5.20%	1.32%
1996	69,100	2.07%	5.05%	0.14%
1997	70,100	2.01%	4.84%	1.45%
1998	69,600	1.96%	4.61%	-0.71%
1999	67,000	1.92%	4.64%	-3.74%
2000	69,500	1.92%	4.56%	3.73%
2001	67,100	1.86%	4.52%	-3.45%
2002	64,600	1.81%	4.64%	-3.73%
2003	69,800	1.89%	4.71%	8.05%
2004	76,600	1.98%	4.80%	9.74%
2005	82,100	2.11%	5.04%	7.18%
2006	85,600	2.19%	5.25%	4.26%
2007	86,000	2.20%	5.04%	0.47%

Production in other African countries is either on the wane (Congo-Brazzaville, Gabon) or increasing fast (Equatorial Guinea, Sudan,[5] Chad). But their production is not great and it is hardly likely to have a great effect on the world oil market.

2.3. Crisis for Latin American producers

There are only two significant exporters in Latin America: Venezuela and Mexico. Bolivia is merely a regional natural-gas power (it produces less than 1.5 million tonnes of oil). As for Ecuador, its production is limited and it is peaking. It withdrew from OPEC in 1992, but rejoined it 2007.

Ecuador	Production	/World	/OPEC	Change
1990	15,000	0.48%	1.24%	2.54%
1991	15,700	0.50%	1.30%	4.67%
1992	16,900	0.54%	-	7.64%
1993	18,000	0.57%	-	6.51%
1994	19,500	0.61%	-	8.33%
1995	20,200	0.62%	-	3.59%
1996	20,100	0.60%	-	-0.50%
1997	20,200	0.58%	-	0.50%
1998	19,600	0.55%	-	-2.97%
1999	19,500	0.56%	-	-0.51%
2000	20,900	0.58%	-	7.18%
2001	21,200	0.59%	-	1.44%
2002	20,400	0.57%	-	-3.77%
2003	21,700	0.59%	-	6.37%
2004	27,300	0.71%	-	25.81%
2005	27,600	0.71%	-	1.10%
2006	27,700	0.71%	-	0.36%
2007	26,500	0.68%	1.55%	-4.33%

5 - It is the growing presence of China on the African oil scene that is the most recent geopolitical development. As the newcomer to drilling in Africa, China finds itself in a tough situation. Its privileged role in Sudan (the only African country where it can control oil production with its own infrastructure) is the result of the particular status of the country, which is subject to American sanctions, wracked by several civil wars, and blamed for the disaster in the Darfur. With the exception of Sudan, China, in the great majority of cases, has acquired only exploration concessions discarded by other oil powers, and those concessions it has acquired are up for review (Angola).

Since its 2004 peak, Mexican production has fallen, the result of the unusual situation of the company that has the monopoly on the exploitation of hydrocarbons. PEMEX, subject to an overriding tax regime, is the source of more than one-third of the federal government's tax revenues. Government ownership of the company is mandated by the Mexican constitution and the government cannot fund it. To finance its investments, PEMEX has taken on considerable debt, using the so-called Pidiregas (productive long-term infrastructure projects), in association with private financial backers. More than four-fifths of PEMEX's investments are thus financed by theoretically repayable funds, a situation that has led to over-indebtedness, similar to that experienced by the company in the late 1970s. But at that time, in compensation for the indebtedness, production potential increased considerably. Unlike the government-owned companies from industrialised countries that were privatised (Elf, ENI), PEMEX is a Mexican institution that, enjoying a monopoly on the exploitation of hydrocarbons, is not subject to similar competition and is subordinate to Mexican political power. Partial (as with Brazil's Petrobras, Colombia's Ecopetrol, or Norway's Statoil) or total privatisation (Argentina's YPF, later merged with Spain's REPSOL) now seems politically feasible (the principle of budgetary autonomy for the company was approved on October 15, 2008). In the early 1970s, its corporate Malthusianism nearly turned Mexico into a net importer of oil (as it is of natural gas). PEMEX needs technologies developed by oil multinationals to continue growing (deep-water reserves in the Gulf of Mexico are promising). It is for this reason that Brazilian authorities agreed to a partial privatisation of Petrobras, which is listed on the NYSE and is well known for its deep offshore production expertise: Brazil's onshore resources are relatively limited and only by reaching agreements for technological cooperation with foreign oil service industries will it be able to exploit its extraordinary offshore resources. Both Mexico and Brazil show then that nationalistic or autarkic oil policies are dead ends.

Mexico	Production	/World	Change
1990	150,811	4.82%	4.04%
1991	157,599	5.04%	4.50%
1992	157,093	5.00%	-0.32%
1993	158,412	5.03%	0.84%
1994	158,910	4.99%	0.31%
1995	155,200	4.77%	-2.33%
1996	166,550	4.98%	7.31%
1997	169,700	4.88%	1.89%
1998	173,500	4.89%	2.24%
1999	165,200	4.75%	-4.78%
2000	171,200	4.74%	3.63%
2001	176,600	4.91%	3.15%
2002	178,400	4.99%	1.02%
2003	188,800	5.10%	5.83%
2004	190,700	4.93%	1.01%
2005	187,100	4.80%	-1.89%
2006	183,100	4.68%	-2.14%
2007	173,000	4.43%	-5.52%

The situation in Venezuela is much more complex. The government of Hugo Chávez has set out to weaken the production potential of PDVSA (chronic under-investment, termination of technological cooperation with North American and British multinationals, firing of qualified personnel, closure of research centres, sale of refineries, service stations, and other strategic assets in the United States). Production has been falling since 1998. But, to secure an inflow of foreign exchange, Venezuela is obliged—the imprecations of its government notwithstanding—to increase exports to the United States. Oil is distributed almost free to the population and to the countries that are members of the Bolivarian Alternative for the Americas (Bolivia, Cuba, Nicaragua), resulting in a great loss of revenue for PDVSA. On its own, the company is incapable of fully exploiting the heavy oils of the Orinoco basin. The share of Venezuelan crude exported to the United States is trending upward: 38.55% in 2000, 42.12% in 2001, 42.56% in 2002, 47.47% in 2003, 45.70% in 2004, 42.97% in 2005, 41.77% in 2006, and 45.26% in 2007.

2.4. The Two Flashpoints: Iraq and Iran

The rebound of Iraqi oil production runs up against a set of obstacles that attest both to the failure of American policy in that country and to the difficulty of building consensus in what, in many respects, is a virtual nation.

- As a result of sectarian conflict and of an inability to reach an agreement on the means of dividing oil wealth between the federal government and the eighteen provinces, the Iraqi parliament has yet vote into law rules for the exploitation of petroleum resources (and thus spelling out the investment conditions imposed on foreign firms). The Kurdish provinces created their own oil law in August 2007 and have already invited in some twenty foreign oil companies. The federal government and Kurdistan are attempting to reach common ground in order to harmonise exploitation conditions throughout the country.
- The oil minister, for his part, decided to call for tender on the basis of laws that were still in force and had not been repealed.
- Despite recent improvements, the conditions for safeguarding foreign investment are far from being met:

Venezuela	Production	/World	/OPEC	Change
1990	115,120	3.68%	9.55%	18.95%
1991	128,776	4.12%	10.66%	11.86%
1992	129,000	4.10%	10.17%	0.17%
1993	134,000	4.26%	10.28%	3.88%
1994	138,000	4.34%	10.47%	2.99%
1995	152,400	4.69%	11.49%	10.43%
1996	162,200	4.85%	11.86%	6.43%
1997	171,400	4.93%	11.84%	5.67%
1998	179,600	5.06%	11.90%	4.78%
1999	160,900	4.62%	11.13%	-10.41%
2000	167,300	4.63%	10.98%	3.98%
2001	161,600	4.49%	10.89%	-3.41%
2002	148,800	4.16%	10.68%	-7.92%
2003	131,400	3.55%	8.87%	-11.69%
2004	150,000	3.88%	9.40%	14.16%
2005	151,000	3.87%	9.26%	0.67%
2006	144,200	3.68%	8.84%	-4.50%
2007	133,900	3.43%	7.84%	-7.14%

corruption, sabotage, and theft are rife. The only solution is to pay the Sunni tribes and the Shiite militias to protect oil infrastructure from terrorist attacks (royalties paid to local warlords).

• The near absence of investment for at least seventeen years (twelve years of which as a result of UN sanctions) accounts for the relatively low production. Two-thirds of the pipeline network is no longer functional and will have to be rebuilt. Investment in repairs and modernisation of the only currently working fields would boost production substantially. Iraq's oil potential is great, but the realisation of this potential is made much less likely by the country's internal politics. It should not be forgotten that the sanctions applied to Iraq after the first Gulf war made it possible for OPEC to counter, in part, the structural overproduction that prevented any sustained rise in the price of oil in the 1990s.

Iran is the flashpoint of the major current geopolitical crisis. The country, profiting to the maximum from the third oil crisis, is stockpiling cash, but its oil industry is in decline. Western multinationals are coming under pressure to terminate earlier cooperation agreements with the NIOC (mainly for the exploitation of the second-largest natural gas reserves in the world).

Iran's economy is in mediocre shape and the country's means are altogether out of line with its geopolitical ambitions. The Iranian economy depends entirely on oil: revenue from oil exports makes up least 60% of the budget and accounts for 80 to 85% of exports. It has all the problems of a rentier economy. But unlike many of the countries of the Arabian Peninsula, Iran is a populated country that should use its oil wealth to create economically viable infrastructure capable of providing work to a young, fast-growing, and more and more well qualified population, the younger generations of which, currently entering the labour market, are especially large. The petroleum industry also requires heavy investment, investment that can be made only in collaboration with industry multinationals. So the country's policy of splendid isolation is altogether at odds with its economic and social needs, and it deprives the domestic oil industry of

Iraq	Production	/World	/OPEC	Change
1990	98,200	3.14%	8.15%	-28.67%
1991	11,600	0.37%	0.96%	-88.19%
1992	23,600	0.75%	1.86%	103.45%
1993	22,100	0.70%	1.69%	-6.36%
1994	25,100	0.79%	1.90%	13.57%
1995	26,300	0.81%	1.98%	4.78%
1996	30,000	0.90%	2.19%	14.07%
1997	57,100	1.64%	3.94%	90.33%
1998	104,200	2.94%	6.91%	82.49%
1999	128,300	3.69%	8.88%	23.13%
2000	128,800	3.56%	8.46%	0.39%
2001	123,900	3.44%	8.35%	-3.80%
2002	104,000	2.91%	7.46%	-16.06%
2003	66,100	1.79%	4.46%	-36.44%
2004	100,000	2.59%	6.27%	51.29%
2005	90,000	2.31%	5.52%	-10.00%
2006	98,100	2.51%	6.01%	9.00%
2007	105,300	2.70%	6.17%	7.34%

access to the latest technology. All the same, the Iranian oil industry[6] is in no way up against the same difficulties as its Venezuelan counterpart. Moreover, the alliance between the United States and Saudi Arabia is no longer in a position to attempt a reprise of its 1986 strategy—that is, sending oil prices plummeting to dry up the former Soviet Union's sources of foreign exchange, a prelude to its ultimate collapse. The third oil shock has shown that the world needs Iranian oil exports to keep prices from going even higher: to all appearances, the countries of the Arabian Peninsula do not have the production capacity to bankrupt Iran.

Iran	Production	/World	/OPEC	Change
1990	155,300	4.96%	12.88%	9.86%
1991	162,000	5.18%	13.42%	4.31%
1992	172,200	5.48%	13.58%	6.30%
1993	177,800	5.65%	13.63%	3.25%
1994	183,100	5.75%	13.89%	2.98%
1995	183,300	5.64%	13.82%	0.11%
1996	183,900	5.50%	13.45%	0.33%
1997	187,000	5.37%	12.92%	1.69%
1998	190,800	5.38%	12.64%	2.03%
1999	178,100	5.12%	12.32%	-6.66%
2000	189,400	5.24%	12.43%	6.34%
2001	186,500	5.18%	12.57%	-1.53%
2002	172,700	4.83%	12.39%	-7.40%
2003	203,700	5.50%	13.76%	17.95%
2004	209,700	5.42%	13.14%	2.95%
2005	210,100	5.39%	12.89%	0.19%
2006	211,300	5.40%	12.95%	0.57%
2007	212,100	5.43%	12.42%	0.38%

2.5. The Hypothesis of the Commonwealth of Independent States

Drilling for oil and gas is done in very unfavourable physical conditions. The fields are isolated, in the middle of great expanses of land: it is for this reason that the network of oil and gas pipelines takes on such importance in the petroleum politics of the CIS. Russia squanders great amounts of energy during transport (perhaps 10 to 15% is lost as a result of leaks or theft), its electricity grid is obsolete, and the insulation techniques used in construction are mediocre. It is for these reasons that energy savings are (to a much greater extent than they are in other industrialised countries) the largest potential source of energy for Russia. In any case, Russia needs Western technology that will allow it to improve its extraction of resources and cut down on waste and on less-than-optimal production. The currently fashionable energy nationalism is depriving Russia of access to the primary resource it lacks: optimisation technologies. It is not currently possible for Russia to diversify the outlets for its production. As Russia lacks the infrastructure to supply the most promising Asian markets (China, India, fast-growing Asian countries), the most accessible market for its production is Europe, even though, from a logistical point of view, it is not always optimal. The reliance of European countries on imports from countries belonging to the

6 - The Iranian petroleum industry is facing a dilemma that, in the current geopolitical situation, will not be easily resolved. The capacity of the country's refineries is insufficient, and Iran is probably dependent on imports for at least 40% of its consumption of refined petroleum products: the large refinery in Madras, India, refines a part of its production, which is then re-exported to Iran. The petrol rationing plan (100 litres per consumer per month) set off violent popular riots in June 2007. Petrol subsidies amount to $10 billion per year.

Commonwealth of Independent States is marked, but so too is the dependence of Russia on these European markets. The oil and gas producing countries of the CIS have not yet managed to diversify the outlets for their production. So the risk of an embargo is low. Control of distribution routes enables control of the countries with oil and gas resources; it is for this reason that Moscow attempts to control the network of oil and gas pipelines and opposes any competing networks that would skirt the territories it controls.[7] In addition, Gazprom's production is stagnating, perhaps even falling, and the company is bedevilled not only by insufficient modernisation of its production capacity but also by Russian nationalism, which is preventing it from taking full advantage of the natural gas fields in the Arctic (such as Shtokman in the Barents Sea) or those in northern Siberia (Yamal, Gydan).

The Russification of the oil and gas industry has resulted in reconsideration of production sharing agreements, unilateral withdrawal of licenses (Shell's license to exploit Sakhalin 2 was revoked—it had awarded the company 100% of the revenue produced by project until the cost of the investment had been recouped), restrictions on the awarding of licenses, and destabilisation strategies (as with BP-TNK). Legal situations are far from being stabilised and law enforcement is arbitrary, which puts foreign investors in a particularly uncomfortable position. This policy is the reason for the decline in exploration: the current production boom can be put down to the use of enhanced oil recovery techniques. Given the deliberate murkiness created by Russian authorities, estimates of the volume of reserves range widely (from forty-eight to 210 billion barrels). Current oil and gas policy discourages investment that can be recouped only over the long term, favouring instead predatory exploitation of long-established fields. The Russian oil industry is being shaken up in such a way as to up the stakes of the Russian government in the companies involved, keeping in mind that the government exercises *de facto*

Russia	Production	/World	Change
1990	570,800	18.23%	-5.96%
1991	515,200	16.47%	-9.74%
1992	448,100	14.25%	-13.02%
1993	358,700	11.40%	-19.95%
1994	315,700	9.92%	-11.99%
1995	306,700	9.43%	-2.85%
1996	301,200	9.00%	-1.79%
1997	307,400	8.83%	2.06%
1998	304,300	8.58%	-1.01%
1999	304,800	8.76%	0.16%
2000	323,300	8.95%	6.07%
2001	348,100	9.67%	7.67%
2002	379,600	10.62%	9.05%
2003	421,400	11.39%	11.01%
2004	458,800	11.87%	8.88%
2005	470,000	12.06%	2.44%
2006	480,500	12.28%	2.23%
2007	491,300	12.58%	2.25%

7 - Around 1% of global oil production passes through Georgian territory via the Baku-Tbilisi-Ceyhan pipeline: it is thus of only relative importance. Hostility between Russia and Georgia has had practically no impact on the price of oil. Russian troops did not destroy any oil infrastructure (with the exception of a railway bridge, used by tank car trains, in the town of Kaspi). This 1,750-kilometer pipeline goes through Baku and Tbilisi (skirting Armenia, politically aligned with Russia and Iran), before reaching its terminus in Ceyhan, a Turkish port on the Mediterranean. It thus crosses the entire Anatolian plateau to avoid terminating on the Black Sea, which allows oil tankers to avoid the Bosporus, a strait in which traffic is very heavy and the risk of collision high. The BTC Pipeline Company was created in 2002 and the first oil pumped through the pipeline reached the terminus in 2006. Previously, most Central Asian oil exported to Europe transited through the Russian Black Sea port of Novorossiysk. As it happens, it is attacks by Kurdish guerrillas that occasionally disrupt the flow of oil in the pipeline.

control over the strategies these companies would be tempted to use. Concentration of the sort common to the members of OPEC, in which a single government-owned company enjoys a monopoly on the exploitation and commercialisation of domestic hydrocarbon resources, cannot be ruled out. In fact, with natural gas, this is already the case, as the Russian government has had a 51% stake in Gazprom, a near monopoly, since 2005 (its earlier stake was 38%): this company has become one of the main Russian petroleum companies. The dispute between BP and the Russian shareholders of TNK-BP (the three oligarchs Len Blavatnik, Mikhail Fridman, and Viktor Vekselberg) is profoundly ambiguous. Caused initially by diverging views on strategy (a desire to internationalise the business in the countries—Cuba, Iran, and Syria—where Russian drillers are already present), it was viewed at the outset as the crowning touch on the policy of Russification of the oil and gas industry. The agreement signed on 4 September 2008 is far from resolving the entire dispute, as the strategy of TNK-BP is at odds with that of BP. It appears that this compromise was reached in an attempt to calm tensions between the United Kingdom and Russia (which would account for the relative moderation of the UK's response to Russia's invasion of Georgia). In view of the great profitability of the joint venture, made possible by the modernisation of the Russian firm's obsolete production equipment, the grievances to which the current leadership of TNK-BP were subject seemed groundless. The three Russian shareholders of TNK-BP may well have attempted to seize majority control of the company (control is currently split 50-50 between BP and the oligarchs), thus responding to an implicit request from the Kremlin, which of course refrained from direct intervention in a dispute between ostensibly private shareholders. In any case, the financial crisis, which is currently making a profound impact on the Russian economy, seems to have forced the oligarchs to bring their strategies into line with their real financial capacities.

Initially, Kazakhstan was favourably disposed toward foreign investment, even though it had obtained a reconsideration of the holdings of KazMunaiGaz, the national energy company. But Gazprom now controls the bulk of its future natural gas production and the Russian government company ARMZ has taken control of its uranium mines. In addition, Gazprom has gained control of the natural gas fields in Turkmenistan and in Uzbekistan. Azerbaijan, for its part, is receptive to Russian interests in the South Caucasus, but Western drillers are still working the reserves of the Caspian Sea.

Azerbaijan	Production	/World	Change
1995	9,200	0.28%	-4.17%
1996	9,100	0.27%	-1.09%
1997	9,000	0.26%	-1.10%
1998	11,400	0.32%	26.67%
1999	13,900	0.40%	21.93%
2000	14,100	0.39%	1.44%
2001	15,000	0.42%	6.38%
2002	15,400	0.43%	2.67%
2003	15,500	0.42%	0.65%
2004	15,600	0.40%	0.65%
2005	22,400	0.57%	43.59%
2006	32,500	0.83%	45.09%
2007	42,800	1.10%	31.69%

Kazakhstan	Production	/World	Change
1995	20,600	0.63%	1.48%
1996	23,000	0.69%	11.65%
1997	25,800	0.74%	12.17%
1998	25,900	0.73%	0.39%
1999	30,100	0.86%	16.22%
2000	35,300	0.98%	17.28%
2001	40,100	1.11%	13.60%
2002	48,200	1.35%	20.20%
2003	52,400	1.42%	8.71%
2004	60,600	1.57%	15.65%
2005	62,600	1.61%	3.30%
2006	66,100	1.69%	5.59%
2007	68,700	1.76%	3.93%

The notion of an "oil curse" is ambiguous, insofar as it does not resolve the dilemma of the origin of conflict (either pre-existing and exacerbated by the discovery of oil or kindled by expectations of rapid and highly inequitable enrichment). In any case, with the exception of Norway and Canada, no large oil-exporting country is a true democracy (the United Kingdom became a net importer in 2006 and the populist regimes of Latin America are not yet authentically democratic).

Conclusion: the Reach of the Third Oil Shock

The third oil shock is a component of the international financial crisis: it is in part the result of the determination of the oil-exporting countries to maintain the purchasing power of their dollar-denominated foreign reserves. By giving certain countries considerable financial resources, the third oil shock has permitted aggressive foreign policy, whether the rapprochement of Venezuela and Russia, the pursuit of a nuclear programme in Iran, or the secession from Georgia, with Russian backing, of two irredentist provinces (Abkhazia and South Ossetia). Although oil is only rarely a direct cause of war, it contributes greatly to the emergence of a multi-polar world. Earnings from the sale of this commodity can be likened to a private income, as a result of which a redistribution of power on a worldwide scale is made possible.

It is necessary, however, to make a clear distinction between the cyclical changes and the structural trends that are affecting the oil market.

- The great expansionary phases corresponded to periods of cheap and plentiful oil, whether "the glorious thirty" for Western Europe and Japan, or the industrial growth of China since 1993. Annual oil production exceeded one billion tonnes in 1960. It surpassed two billion tonnes in 1969 (a gap of nine years). It surpassed three billion tonnes in 1988 (after nineteen years). It peaked in 2006 at 3.91 billion tonnes (3.90 billion in 2007); it will take at least twenty years to increase production by an additional billion tonnes.
- The drop in demand as a result of the global recession will force OPEC to impose production quotas on its member countries; the divide between the rich countries (those of the Arabian Peninsula) and the countries whose political stability rests primarily on their ability to redistribute oil wealth to their populations (Algeria, Iraq, Iran, Venezuela, a group to which Mexico should be added: the redistribution of

oil wealth affects populations in only a marginal fashion) will grow wider.

- The fall in prices may well be as spectacular as was the April-to-August 2008 rise, as overreaction is usually no less pronounced during downswings than it is during upswings (that the futures markets—as of early October—are in backwardation suggests that traders are expecting a fall in prices).

Country	Per capita GDP (PPP in dollars) in 2006	Average annual growth (1995-2005)	Per capita production (tonnes) in 2006
Norway	43,574	2.9	25.74
United States	43,444	3.2	1.05
Denmark	36,549	2.1	3.34
Canada	35,494	3.3	4.79
United Kingdom	35,051	2.8	1.28
Qatar	33,049	9.9	63.63
Australia	32,938	3.7	1.17
United Arab Emirates	29,142	6.3	27.80
Brunei	25,315	1.7	27.00
Equatorial Guinea	23,796	37.3	35.40
Bahrain	23,604	5.2	2.00
Kuwait	19,909	4.9	44.13
Oman	18,841	4.0	14.31
Trinidad & Tobago	17,451	8.1	8.30
Saudi Arabia	16,744	3.3	22.36
Argentina	15,937	2.3	0.92
Libya	12,204	3.5	14.27
Russia	12,096	3.9	3.36
Malaysia	11,858	4.6	1.35
Mexico	11,249	3.6	1.78
Kazakhstan	9,294	6.3	4.41
Brazil	9 ,108	2.4	0.48
Iran	8,624	4.8	3.11
Turkmenistan	8,548	9.5	1.84
Colombia	8,091	2.2	0.60
Algeria	7,827	4.0	2.61
China	7,598	9.1	0.14
Gabon	7,403	1.0	11.70
Venezuela	7,166	1.6	5.34
Azerbaijan	6,171	9.3	4.06
Egypt	4,836	4.8	0.46
Ecuador	4,776	3.0	2.13
Indonesia	4,323	2.8	0.23
India	3,757	6.3	0.03
Angola	3,399	8.2	4.36
Iraq	2,900	-6.7	3.38
Sudan	2,729	5.8	0.45
Uzbekistan	2,283	4.4	0.21
Chad	1,770	8.6	0.40
Congo-Brazzaville	1,457	3.2	3.38
Nigeria	1,213	4.5	0.91
Yemen	759	4.5	0.85

- This reversal of forecasts is likely to lead to a reconsideration of investments in exploration and drilling, in expansion and modernisation of production and transportation infrastructure,[12] and most of all in the development of new energies: the abundance of hydrocarbons hinders the transformation of energy systems, a transformation that, *in fine*, will be imposed only by a rise in the relative price of carbon energy.
- This reversal weakens the rentier states, which must endure a considerable depreciation of their assets (property, capital assets) as a result of the global financial crisis. But the drop in earnings puts the countries (Iran, Venezuela) that have thoughtlessly redistributed oil wealth in a difficult position; it shows that their domestic and foreign policy ambitions are altogether incompatible with their actual economic potential.
- In the end, it seems that the third oil shock is, like its two predecessors, leading to a worldwide economic recession.

References

- Abdulali, A., L. Rahl, and E. Weinstein, 2002, "Phantom Prices, Valuation, and Liquidity: The Nuisance of Translucence", in *A Guide to Fund of Hedge Funds Management and Investment*, (Edited by L. Rahl, Editor), London: Alternative Investment Management Association.
- Bannister, B., 2007, "From BRICs to Bricks: The Fundamental Drivers and Inevitability of an Energy Infrastructure Capital Spending Cycle", Stifel Nicolaus & Co., December 14.
- Blanch, F., S. Schels, G. Soares, M. Haase, and D. Hynes, "Harsh Winter Leaves China Cold and Hungry", *Merrill Lynch Global Energy Weekly*, February 1.
- Blanco, C., and J. Aragonés, 2006, "Funds and Commodities", *Commodities Now*, June, pp. 10-16.
- BP Statistical Review of World Energy, 2008, June.
- Carpenter, C., and M. Munshi, 2008, "Commodity Prices Head for Biggest Weekly Decline Since 1956", *Bloomberg News*, March 20.
- CGES, 2008, *Global Oil Report*, March-April, pp. 2-4.
- Commodity Futures Trading Commission (CFTC), 2008, "Staff Report on Commodity Swap Dealers & Index Traders with Commission Recommendations", September 11.
- De Souza, C., and M. Smirnov, 2004, "Dynamic Leverage", *Journal of Portfolio Management*, Fall, pp. 25-39.
- Dow Jones Newswire, 2005, "Nymex Crude Tumbles as Output Recovers", September 6.
- Dumas, C., 2008, "Oil Bubble Bursting: Metals Soon to Crash", Lombard Street Research, *Monthly Review* 233, September.
- Dunn, M., 2008, "Panel Discussion: Futures Aiding and Abetting Commodity Price Instability", Remarks of Commodity Futures Trading Commission (CFTC) Commissioner Michael V. Dunn Before the Swiss Futures and Options Association's Bürgenstock Meeting, September 5.
- El-Erian, M., 2007, "John Harvard Letter", Harvard Management Company, August 21.
- Farivar, M., 2005, "Diesel Prices Take on Life of Their Own as Demand Surges", Dow Jones Newswire, May 20.
- Fusaro, P., 2005, "Energy: An Immature Financial Market", *Energy Hedge*, October 1, pp. 1.
- Geman, H., 2005, *Commodities and Commodity Derivatives*, Chichester: Wiley Finance.
- Gilbert, C., 2007, "Commodity Speculation and Commodity Investments", University of Trento (Italy) and Birkbeck College (London), Paper for Presentation at "The Globalization of Primary Commodity Markets", Stockholm, October 22-23.
- Gongloff, M., 2008, "Why Baltic Dry Index Demands Attention", *Wall Street Journal*, August 15.
- Grantham, J., 2008, "Letters to the Investment Committee XV; Living beyond Our Means: Entering the Age of Limitations", Special Topic, GMO, July.
- Harrington, K., 2005, "Crude Approximations", Clarium Capital Management, November.
- Heap, A., and A. Tonks, 2008, "Great Bulks of Fire IV", Citigroup Global Markets Equity Research, April 7.

References

- Hille, K., 2008, "China's Diesel and Petrol Buying Spree Poised to End, FPCC Warns", *Financial Times*, August 25.
- HM Treasury [UK], 2008, "Global Commodities: A Long Term Vision for Stable, Secure and Sustainable Global Markets", June.
- Hoffman, G., and J. Duvel, 1941, "Grain Prices and the Futures Markets: a 15-Year Survey, 1923-1938", The United States Department of Agriculture, Technical Bulletin No. 747, January.
- Howell, R., 2005, Investment Seminar, Schroders Alternative Investments Group, Commodities, Gstaad, February.
- International Energy Agency [IEA], 2008a, "Oil Market Report", July 10.
- —, 2008b, "Oil Market Report", August 12.
- Jacks, D., 2007, "Populists Versus Theorists: Futures Markets and the Volatility of Prices", *Explorations in Economic History*, Elsevier, April, pp. 342-362.
- Jacobs, B. and K. Levy, 1989, "The Complexity of the Stock Market", *Journal of Portfolio Management*, fall, pp. 19-27.
- Joint Oil Data Initiative, 2008, *JODI Newsletter*, April.
- Joint Statement by the Kingdom of Saudi Arabia and the Secretariats of the International Energy Agency, the International Energy Forum and the Organization of Petroleum Exporting Countries, 2008, Jeddah Energy Meeting, June 22.
- Khan, M., 2008, "Oil Prices and the GCC: Could the Region Be Stoking Oil Prices?" Citi Economic and Market Analysis, July 4.
- Litzenberger, R., and N. Rabinowitz, 1995, "Backwardation in Oil Futures Markets: Theory and Empirical Evidence", *Journal of Finance*, December, pp. 1517–45.
- Murti, A., B. Singer, K. Koh, and M. della Vigna, 2008, "$100 Oil Reality, Part 2: Has the Super-Spike End Game Begun?" Goldman Sachs, Global: Energy: Oil, May 5.
- Orton-Jones, C., 2007, "Shipping Forecast: As East Asian Factories Multiply and More Ports Worldwide Reach Capacity, Charles Orton-Jones Spots a Storm Brewing", *Financial Management* (UK), November.
- Pagnamenta, R., 2008, "IEA Warns Non-OPEC Oil Could Peak in Two Years", *The Times* [*London*], July 21.
- Reed, S., 2008, "Saudis Try to Cool Off Oil", *Business Week*, June 22.
- Rowland, H., 1997, "How Much Oil Inventory is Enough?" Energy Intelligence Group.
- Sanders, D. R., S. H. Irwin, and R. P. Merrin, 2008, "The Adequacy of Speculation in Agricultural Futures Markets: Too Much of a Good Thing?" Marketing and Outlook Research Report 2008-02, Department of Agricultural and Consumer Economics, University of Illinois at Urbana-Champaign, June.
- Sesit, M., 2005, "Geopolitical Risk: History's Constant", *Wall Street Journal*, August 4, citing Professor Niall Ferguson, Harvard University; and George Magnus, senior economic adviser at UBS.

References

• Stein, G., 2005, "World Oil Demand Revised Down Again", Lombard Street Research, *World Service Daily Note*, September 9.

• Surowiecki, J., 2008, "Oily Speculations", *New Yorker*, July 7.

• Tchilinguirian, H., 2006, "Market Prices: What Do Oil Prices Say about Fundamentals: Presented to the 7th China Oil Traders' Conference", International Energy Agency Presentation, Nanjing, Jiangsu, China, April 18-20.

• –, 2008a, "In Financial Turmoil, What Perspectives for Oil?" Oil Markets Outlook, BNP Paribas Corporate and Investment Banking, September 26.

• –, 2008b, electronic communication, September 30.

• Terada, T., and Shimizu, T., 2007, "Monitoring Commodity Markets: From the Perspective of Understanding Global Financial Market Trends", *Bank of Japan Review*, November.

• Till, H., 2000, "Two Types of Systematic Returns Available in the Commodity Futures Markets", *Commodities Now*, September, pp. 75-79.

• –, 2006a, "Portfolio Risk Measurement in Commodity Futures Investments", in *Portfolio Analysis: Advanced Topics in Performance Measurement, Risk, and Attribution* (Edited by T. Ryan), London: Risk Books, pp. 243-262.

• –, 2006b, "EDHEC Comments on the Amaranth Case: Early Lessons from the Debacle", EDHEC-Risk Publication, October 2.

• –, 2008a, "Amaranth Lessons Thus Far", *Journal of Alternative Investments*, Spring, pp. 82-98.

• –, 2008b, "Case Studies and Risk Management Lessons in Commodity Derivatives Trading", in *Risk Management in Commodity Markets: From Shipping to Agriculturals and Energy* (Edited by H. Geman), Chichester: John Wiley & Sons Ltd., Forthcoming.

• Till, H., and J. Eagleeye, 2005, "Challenges in Commodity Risk Management", *Commodities Now*, September, pp. 45-50.

• US House of Representatives Committee on Agriculture, "House of Representatives Approves Bill to Strengthen Oversight of Futures Markets", Press Release, September 18.

• Verleger, P., 2007, "Prepared Testimony", The Permanent Subcommittee on Investigation of the U.S. Senate, Committee on Homeland Security and Governmental Affairs and The Subcommittee on Energy of the U.S. Senate, Committee on Energy and Natural Resources, December 11.

• –, 2008a, "$200 Oil!" *The International Economy*, Summer 2008, pp. 12-14.

• –, 2008b, "Comments on 'The Accidental Hunt Brothers – Act 2,' A Paper by Michael W. Masters and Adam K. White", September 10.

• Wang, T., 2008, "Olympic Torch Out; PetroChina Left With Pools Of Oil", *Forbes Magazine*, August 27.

• Weinstein, E., and A. Abdulali, 2002, "Hedge Fund Transparency: Quantifying Valuation Bias for Illiquid Assets", *Risk Magazine*, June, pp. S25-S28.

• Whalen, C., 2008, "Yield to Commission: Is an OTC Market Model to Blame for Growing Systemic Risk?" *Journal of Structured Finance*, summer, pp. 8-15.

References

• Williams, J., and B. Wright, 1991, *Storage and Commodity Markets*, Cambridge (UK): Cambridge University Press.

• Winning, D., 2008, "IEA Warns Considerable Risks To China '08 Oil Demand Outlook", Dow Jones Newswire, August 12.

• Woo, D., 2008, "Vicious Circle", Global FX Strategy, Barclays Capital Research, April 17.

• Working, H., 1970, "Economic Functions of Futures Markets", in *Futures Trading in Livestock – Origins and Concepts* (Edited by H. Bakken), Chicago Mercantile Exchange.

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