Energy Special Report

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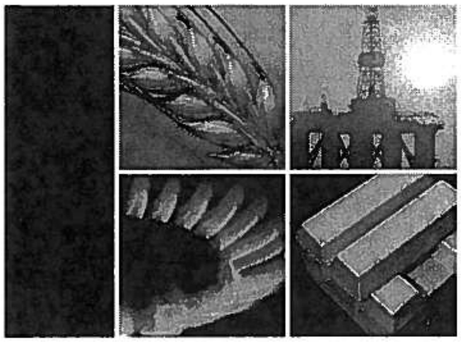

Oil Dot-com

Over the past two weeks, the crude oil forward curve has flattened. Fundamental changes cannot explain sudden, severe price or curve movements. As in the dot-com period, when "new economy" stocks became popular, a growing number of Wall Street analysts have been repeatedly raising their forecasts as oil prices have risen. These revised forecasts have been partially responsible for new investor flows, driving prompt and forward prices to perhaps unsustainable levels (Figures 1 and 2).

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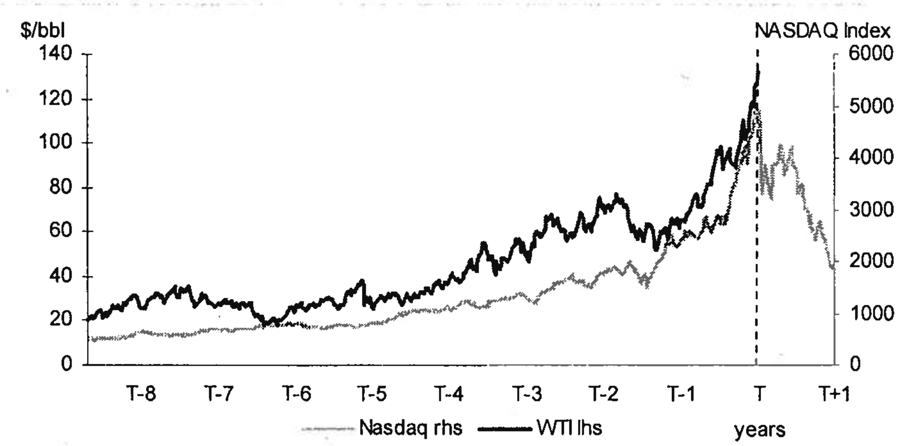
Financial flows and the contango two-step

We have been forecasting that the crude oil forward curve's persistent backwardation since last September would be followed by a move back to contango by the second quarter of this year. We had also projected a weakening of prompt prices at the start of Q2, following by strengthening through Q3. Our view was predicated on the start of a build in crude oil inventories by the end of Q1.

Yet since the start of Q2, crude oil prices (Brent) have rallied from $100.17/bbl to $132.70/bbl. The forward curve has also moved from a $9.71 backwardation extending 67 months on April 25, 2008, to a $12.47 contango going forward 140 months on May 21, 2008. By the end of last week, a one-day precipitous move brought the curve back to backwardation. What has happened to prices and why? (Figure 3)

Figure 1. Crude oil's accelerating ascension recalls 'booms' of yore



Source: Bloomberg

Figure 2. Light sweet crude quarterly oil price forecast ($, period averages)

	1Q08E	2Q08E	3Q08E	4Q08E	1Q09E	2Q09E	3Q09E	4Q09E	2008E	2009E
Brent ($ per barrel) - NEW	96.31	120.00	125.00	110.00	90.00	95.00	100.00	85.00	113.00	93.00
Revision	0.00	10.00	15.00	15.00	10.00	10.00	10.00	10.00	10.00	10.00
WTI-Brent differential	1.51	1.50	1.00	-1.00	1.00	-1.00	1.00	-1.00	0.80	0.00

Source: Actuals – Bloomberg; Estimates - Lehman Brothers.

The deferred crude oil price rise is astronomic

Our forecast of a structural shift to contango was based on expectations of a persistent crude oil inventory build. We still expect this to occur globally in 2008, with demand growing only 885k b/d and global supply up by 2m b/d, making up for last year's 700k b/d global inventory draw and, furthermore, building stocks by 400k b/d. However, last week's rapid flip to contango (and back) was not driven by a perceived inventory build, nor did the front end of the curve fall as the back end rose. Rather, oil prices this past week reached all-time highs above $135/bbl, topping off a $40 run-up since the start of the year, and the back-end (2020) deferred price rose by more than $36 from May 1 to its peak last week. In our judgment, two primal factors drove the market: 1) perceptions of tightness this year and into the indefinite future and 2) momentum.

Perceived market tightness belies reality

Perceived market tightness has come from visible data: crude oil inventories have not built in the most transparent OECD markets, the US and Japan. In the US, imports have fallen by a dramatic 400k b/d on average over the past ten weeks versus the prior YTD average. By comparison, if imports continued at the prior rate of 10.01m b/d, crude stocks would be 26m bbls higher and 4m bbls off of last year's level. Meanwhile, Asian demand, especially Chinese imports and revised Indian data, makes it appear as though emerging market demand will continue relentlessly. On the supply side, non-OPEC production has continued to slide; indeed, last month Mexican output slid by a stunning 13% year-on-year in tandem with a persistent fall in Russian and North Sea flows, and the market continues to discount Saudi production increments and the rise in Saudi surplus capacity.

Projecting past tightness on the future is a pitfall of recent analyst forecast revisions

In an environment in which demand is bumping against capacity constraints, commercial inventories fail to grow, and surplus production capacities are significantly eroded, prices need to grow exponentially to balance the market. This theoretical underpinning of higher prices is graphically demonstrated in Figure 3. The market perceives that this condition, which was prevalent in 2002-2007, still dominates the market, and it provides the basis on which many analysts have increased their price forecasts for this year.

New supply investments can and will be triggered at these price levels

Another factor that has become part of the current analytical consensus is that forward prices have not yet reached a level high enough to trigger new supplies. There is little doubt that some of the increased investor flows into the long dated market stem from this belief, just as a significant share of the flows arise from political uncertainty about a potential flare-up with Iran in the Persian Gulf. A regional military conflict accompanied by a disruption in oil shipments through the Strait of Hormuz would certainly result in a price spike. As we argue below, it is our judgment that forward prices have already reached the point at which new supplies can be triggered, and we believe that it is a double- rather than triple-digit level.

Price buoyancy and passive investor flows

We have argued recently that some of the price buoyancy during Q1 reflected financial flows and investments in oil and other commodities. In our Energy Special Report on May 16, *Is it a Bubble*, we argued that large investor purchases of commodity indices and other structured products had a measurable effect on prices during the period leading up to the beginning of Q2. The motivation of investors—mostly institutional investors from pension, endowment, and sovereign wealth funds—was to take advantage of current commodity fundamentals with the expectation that commodities would outperform equities and bonds in the period ahead.

Inflows have an effect on price: 100m of inflow increases the price of WTI by 1.6%

Using CFTC data and reported cross-commodity weightings, we conservatively estimated index positions. We found that from January 2006 to mid-April 2008, more than $90 billion of incremental investor flows were devoted to total assets under management (AUM) by commodity indices, as opposed to the price appreciation of the underlying assets. Contrary to those who criticized this estimate, the size of the new flows makes a difference. We also estimated that dollar weakness and inflation expectations, along with past index performance, could help predict future index inflows. Our study indicated that for every $100 million in new inflows, WTI prices increase by 1.6%.

Past performance predicts future inflow, leading to the makings of an asset bubble

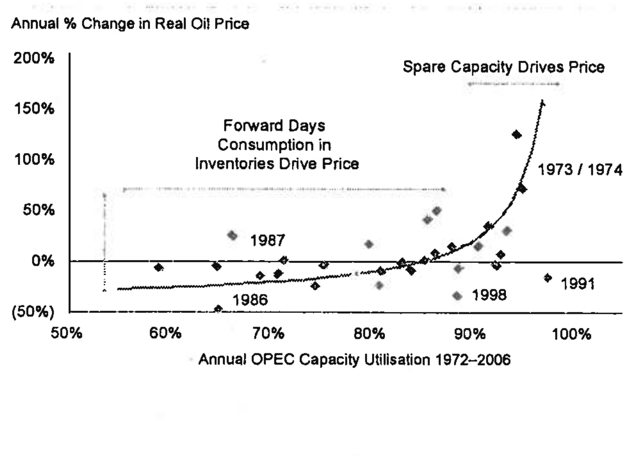
Our conclusion from this study is that we are seeing the classic ingredients of an asset bubble. Financial investors tend to "herd" and chase past performance, comforted by the growing analytical conclusion that markets are tightening, and new inflows, in turn, drive prices higher. Larger allocations by institutional investors, including new sovereign wealth funds desiring to increase their commodity exposure, play a role. So does uncertainty about the true state of market fundamentals, including the level of Saudi spare capacity, the level of Chinese "real demand" versus stockpiling, and other factors that buttress the current bullish consensus.

The anomalous deferred oil price move

Call option interest shows investors' appetite for higher and higher strikes

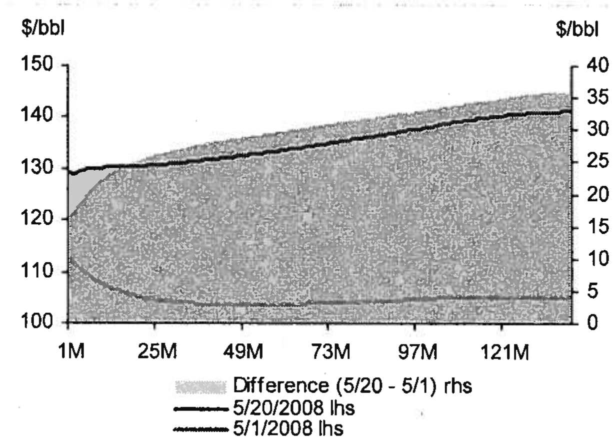
The financial flows responsible for the radical re-pricing of deferred WTI (the back end of the curve) in May are different from the flows into index funds and structured products in Q1. Figure 4 depicts the changing structures of the WTI curve from May 1 to May 20, as well as the difference between the front and deferred parts of the curve

Figure 3. Relationship of spare capacity and price



Source: Lehman Brothers Research.

Figure 4. Changing structure of WTI curve ($/bbl)



Source: Lehman Brothers Estimates.

out more than ten years. Several factors lie behind this change in curve shape. One of these is depicted in Figure 5, which shows the growth in open interest in call options for December 2008 by strike price. Relative interest has been shifting to further out-of-the-money calls, reflecting a growing bullish attitude by short-term investors. This attitude change was particularly acute during the past month, growing with a crescendo along with market sentiment that was becoming increasingly bullish. Starting around May 15, investor interest in $120 strike prices peaked and began to unwind; meanwhile, interest in higher call, particularly at $150 strikes, continued to rise. One indication of that interest is that as the year has progressed, prices of $150 December 2008 calls rose from less than $0.30 to nearly $8.00.

Producers have not been active, allowing "peak oil" and "peak demand" theories to reign

What has been striking about the rise in the back end of the curve over the first three weeks of the month has been – at least until last Friday – nearly a complete lack of interest by producers in selling oil forward. In the past, producer selling would have slowed or impeded the upward price drive. In its absence, retail investors, hearing a growing number of reports about "peak oil," continued to buy at higher and higher strike prices, indicating that there is no necessary physical ceiling to the market. Meanwhile, a number of banks and well-known investors publicized their views that the long run was also going to be tight for oil markets. For some of these analysts/investors, the reason for higher prices had to do with the need to trigger an adequate supply and demand response; for others, it was because they believed peak oil had arrived and, in their opinion, Saudi Arabia could no longer raise its output.

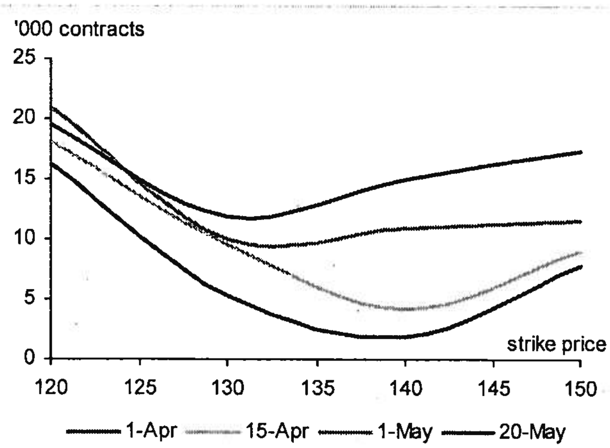
Some also see a window for an attack on Iran lasting until the presidential elections

The investor move was likely also partially motivated by the perception that a window was opening for a military confrontation with Iran. According to some commentators, the window for a US or an Israeli or a joint attack on Iran's scientific and nuclear facilities – if such an attack were to come – opened with the end of President Bush's well-publicized trip to the Middle East (which ended on May 18) and will close a month before the US presidential elections in November.

The radical change in curve shape forced unprofitable spread trades to be reversed

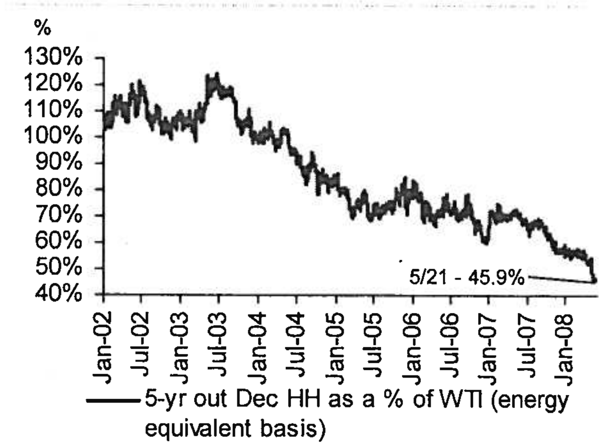
As the back end of the market rose, several other investor triggers reinforced the move upward. These included a rash of new consumer hedges by airlines, locking in prices through 2009, boosting the first 12 months of the forward curve. In addition, numerous investors had "bullish" structures in place, expecting backwardation to strengthen as markets tightened. They were long the front and short the back of the curve, and as the

Figure 5. Call option open interest ('000 contracts)



Source: Bloomberg.

Figure 6. Energy equivalent price of gas to oil (%)



Source: Bloomberg.

back end of the curve moved from backwardation to contango, they had to stop out their positions and unwind them in a fairly illiquid market. Then, as was the case last fall, banks—which were short options at strikes of around $130, which they had written for their investor counterparts—had to buy futures at an accelerating rate to cover their exposure. Finally, a number of small producers that had hedges in place at lower levels also had to reset their positions, and there were concerns that large firms with larger hedges in place to support acquisitions could also unwind their positions.

Some producer-hedging and an end to time-spread position reversals stalled the move

The upward move of the back end of the market stalled and reversed at the end of last week. The triggering event appears to be some combination of an end to the stopping out of positions and, more forcefully, the re-entry of producers to the market to hedge. Doing so, they take advantage of record high deferred prices and arbitrage the difference between current forward prices and their costs structures, which have not inflated at the rate at which deferred prices have risen.

On an energy equivalent basis, the deferred natural gas price is 46% of oil

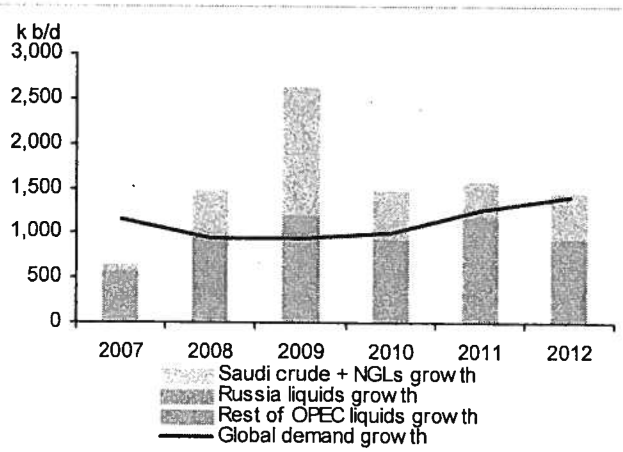
Several other features of the moves of the past three weeks also stand out. What happened to the oil market – at the front end of the market, but even more so at the back end – was unique to petroleum. Unlike other sudden increases in oil prices since last September, the recent move was not reflected in a broad grouping of other commodities. To the contrary, it was not even reflected in natural gas, which arguably should have been more closely tied to oil. Figure 6 depicts 5-year deferred WTI and Henry Hub natural gas prices, in dollars per equivalent thermal units. On an energy-equivalent basis, 5-year deferred natural gas on May 20 was worth only 46% of oil, whereas on May 1, it was 54%. By contrast, the two fuels traded at BTU parity in 2004. While crude oil delivered in 2020 rose by 34%, or $36, natural gas rose only $1/mmbtu, a price increase of less than 10%.

Stealth supply still lurks under the bubble

Indicators point to supply capacity growth outpacing demand growth

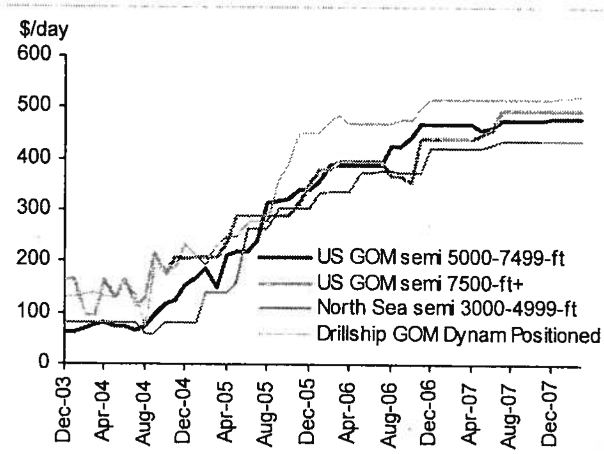
Incremental supply increasingly depends on OPEC's willingness and ability to develop and produce oil. In our 2007 year-end analysis of oil markets, we noted that the declining share of incremental oil from non-OPEC countries in 2008-2010 would test markets. At the same time, we concluded that over the next three years, under almost any demand scenario, incremental OPEC capacity should be sufficient to more than

Figure 7. OPEC + Russia capacity growth vs demand



Source: Lehman estimates

Figure 8. Deepwater rig day rates



Source: ODS Petrodata

balance markets (Figure 7). Through 2009, our analysis indicates that global production capacity should be growing at twice the rate of global demand, and through 2010, any incremental surplus capacities developed through 2009 should carry over. A short-term imbalance between potential supply, including shut-in capacity, and demand should not emerge again until 2011 or beyond.

Three perceptions increase the market's doubts about supply. First, Saudi Aramco officials have re-confirmed that the country will have sustainable capacity to produce 12 million b/d by 2009, excluding the Neutral Zone, which adds another 300-400k b/d to that base. Statements by the Saudi political leadership, including the Saudi king, place doubt on whether this capacity will continue beyond 12.5m b/d. Two critiques revolve around the core position of the kingdom: will it develop this capacity? And will it be willing to use it? We believe that this net new capacity will come on stream, starting with 500+k b/d of 2008 average liquid growth, and that Riyadh will put enough oil on the market for stocks to build.

Rest of OPEC production potential is to upside, not downside

Second, markets doubt the ability of other OPEC countries to add capacity with continuing violence in Iraq and Nigeria. Whereas market reactions to Iraq and Nigeria suggest that oil supply is being undermined, in reality, both countries likely averaged 300k b/d more production in the first five months of this year than in 2007. Violence-related outages have been a structural feature of both countries' production profile since 2003 and will likely continue. But with Northern Iraq exports already up to 600k b/d and Nigeria deepwater capacity expanding almost 500k b/d by the year-end, we believe combined potential additions could tally more than 1m b/d through 2012.

Recent Russian tax changes improve long term production outlook there

Third, doubts about non-OPEC supply, particularly Russian growth, cloud the supply picture. YTD Russian production data have been grim, showing y-o-y declines on the order of 100k b/d, and we now envision no net growth this year. Yet the Russian cabinet's passage this week of tax relief measures for the oil sector makes the longer term picture more sanguine. Rather than Russian production peaking, some industry players now argue that growth could be 10% based on a five-year tax holiday. This sudden change in industry attitude from pessimism to optimism is quite dramatic. Indeed, we believe that some of the prior dour production outlook and data could have partially been a tactic by Russian oil players to improve their negotiating positions. Overall, though, these measures, which take effect in 2009, may not assuage near term production data, but do offer another supply relief valve heretofore underappreciated by the market.

Deepwater response looks robust, as financial factors underpin long dated WTI

Accompanying this development is the debottlenecking of some major obstacles to finding and developing oil, especially in deepwater, an area critical for large new fields. Offshore day rates for deepwater have stabilized, and offshore rig availability looks to increase dramatically – a 650% increase in incremental new rigs available over the past half decade (Figures 8 and 9). And we calculate that much of the divergence between average finding and development costs and 60-month WTI has been due to financial factors, including the slide in the dollar (Figure 10).

Black hole inventories and demand unnerve the market even more

Supply fears can unnerve markets in which US inventories are tight and other data are immeasurable

In the face of declining demand in the US, where we now project that total product use will fall by 430k b/d in 2008 after a -900k b/d 1Q, the bullish forecast for 2008 focuses on a combination of three factors: lack of inventory build in the US and other OECD markets, especially for crude oil; apparently strong demand growth in emerging markets, especially for middle distillates (jet fuel, diesel, and heating oil); and a surge in Chinese demand over the past few months, which is taken to mean that Chinese demand will continue to lead global growth through this year and next. On top of these three signals comes the fear of a disruption from summer weather, domestic instability (e.g., in Nigeria), or geopolitics. Short-term disruptions from Nigeria or southern Iraq are taken to be harbingers of larger disruptions, despite their limited historical context.

Incentives for China to build inventory oppose disincentives for US to build inventory

In our view, these demand signals are misleading, starting with the demand for inventory, but also including the failure of inventory to build in the US during the recent spring maintenance period. We believe the lack of storage builds in the US relates more to weak refinery margins and contracting demand (down more than 900k b/d y-o-y in 1Q08) than lack of available crude supply. Outside of the US, we have little doubt that there is an ongoing build in inventories this quarter. But it appears to be taking place far more in China and the Persian Gulf than in the OECD and, as a result, is less visible and difficult to measure. The Chinese stock build is clear from erratic import data observed so far in 2008, when total imports surged by 14% in February and 25% in March, followed by a 4% decline y-o-y in April. We believe that imports of crude oil and especially products such as gasoline and diesel are growing as a result of mandated pre-Olympic stock building and temporary changes in the tax regime for refiners. Beijing increased mandatory holdings by 5 days for forward demand cover, effect May 1, raising a former 10 day supply rule to 15 days. If this were applicable only to product stocks, China's 8m b/d of consumption implies a stock build of 40 million barrels. If crude inventories are included, China's roughly 7m b/d of refinery throughput would add another 35 million bbls of crude oil inventories.

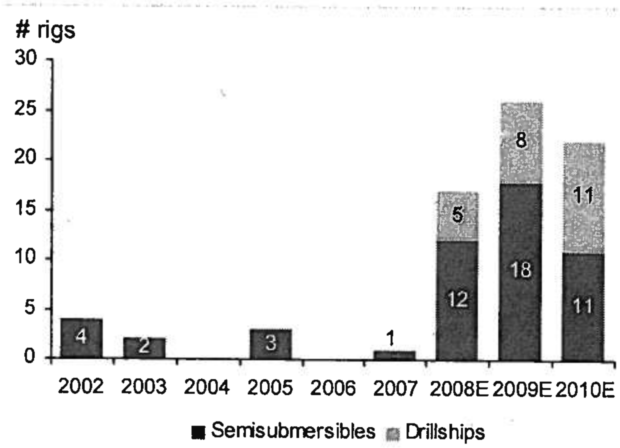
Diesel for coal substitution in power generation is temporary in China

In addition, China appears to be planning to substitute diesel for coal in power generation in Beijing and surrounding provinces starting some 45 days before the Olympics are to begin, or in the third week of June, in order to clear up the environment in the nation's capital.

Middle East power gen and Chinese earthquake reconstruction boost distillates

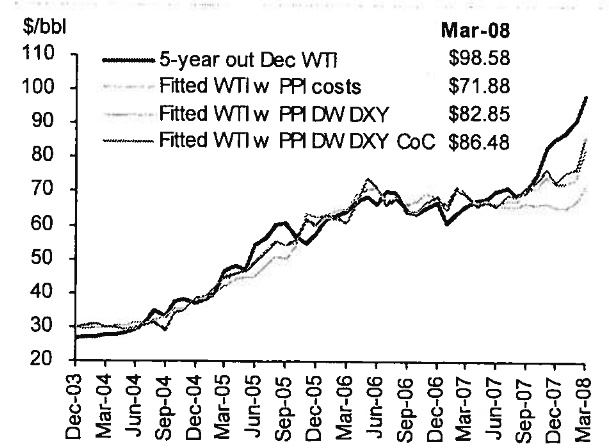
There is little doubt that China and most of the Middle East will have extraordinary demand requirements for distillates in power generation this summer. Distillate markets (and cracks) should therefore remain fairly robust through Q2 and Q3 (Figure 10). The tight situation for distillates and the higher imports to China for inventory build appear to be signs of firm markets through the rest of this year and next. And there is some support for that conclusion, with reconstruction efforts in Sichuan province following the earthquake likely to add 3-4 percentage points per year to Chinese fixed asset investment growth through 2010. That, along with lingering power

Figure 9. Deepwater rigs under construction



Source: Lehman Brothers estimates

Figure 10. Regression of WTI vs PPI, deepwater rigs, DXY, cost of capital



Source: Lehman Brothers estimates

outages since China's countrywide snowstorm crisis earlier this year, could help to mask overcapacities in Chinese heavy industries that would have otherwise become apparent and led to slower trend oil demand growth even by the end of this year.

Figure 11. Distillate margins forecast

$/bbl	1Q08	2Q08	3Q08	4Q08	2007	2008	2009
Nymex Heating Oil	17.16	23.50	30.00	20.00	13.30	22.67	16.00
ICE Gasoil	20.46	30.00	34.00	25.00	12.82	27.37	20.00

Note: Heating oil calculated against Nymex WTI, gasoil calculated against ICE Brent. Source: Actuals – Bloomberg; Estimates - Lehman Brothers.

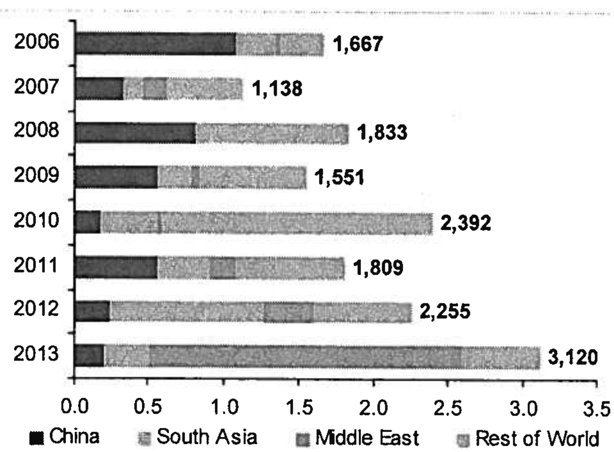
Temporary spurts of strength will likely desert oil markets by the fourth quarter

However, there is a tendency for the market to conflate legitimate reasons for demand growth with what is likely a temporary spurt in recent demand for inventory related to the Olympics. Once these are concluded and economics trump air pollution concerns, many Chinese thermal power plants are likely to switch back from diesel to coal, which is a fraction of the price of diesel on a thermal equivalent basis. Once extra stocking requirements are filled and Middle East summer power demand for diesel has passed, global physical product markets will likely be in for a breather by Q4.

Refining capacity additions should ease product-led strength in distillates

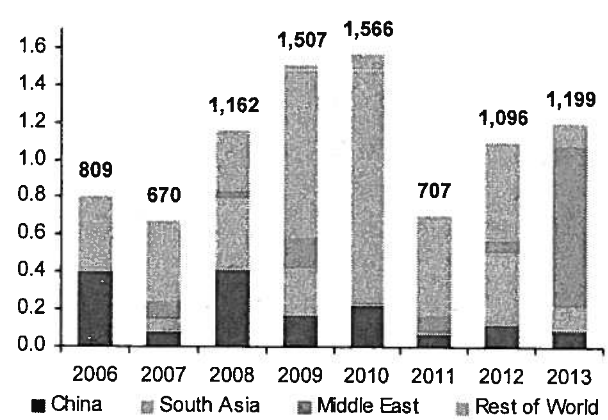
That is especially the case when one adds in a huge spurt of new heavy-sour crude-consuming complex downstream supply capacity coming online in the next year. After a generation during which global demand eroded a persistent surplus refining capacity to the point at which refining was indeed in short supply and margins reached record levels, for the next five years, a growing refining capacity surplus looms. Figures 11 and 12 depict our current view of this emerging refining surplus. From 2008 to 2013, 13m b/d of new refinery capacity should become available, while product demand may grow just 8m b/d. Over the next year alone, about 1.3 m b/d of new refining capacity will become available in just India and China, all capable of consuming heavy crude, a level 1.5x higher than total expected global demand growth. Also competing for end-user markets will be another 3m b/d of NGL production capacity, 1.5m b/d of new biofuel, GTL and CTL capacity, and 1m b/d of new condensate splitting capacity coming on line from 2008 to 2013. This should give rise to greater product competition (as has already appeared in both gasoline and fuel oil markets) and provide a drag on crude oil prices.

Figure 12. Global CDU refinery capacity additions (kb/d)



Source: Lehman Brothers

Figure 13. Global upgrading capacity additions (kb/d)



Source: Lehman Brothers

When things turn…

The history of oil is cyclical: turning points can be sudden, unexpected, and severe

It is difficult to project when market perceptions will turn from the current bullish sentiment. It will almost certainly take a persistent stock build. It might also take a rise in the dollar against the euro and the psychological impact that could have over time, a situation that Lehman Brothers' foreign exchange strategists forecast for the year ahead. In the meantime, market momentum is likely to continue to reinforce the view that even if peak oil is not yet here and even quite far off, there is unlikely to be new supply in the market for at least half a decade. Summer market tightness could, under these circumstances, continue to propel oil prices upward to untested levels. But when peak prices hit, we believe they are also likely to fall precipitously. That's the way cyclical turning points tend to occur—in the midst of a market trend, turning points can be sudden, unexpected, and severe. If history is a guide, the turning point will come. Getting the timing right is the difficult part.

PRICE FORECAST AND FUNDAMENTALS SUMMARY

Light sweet crude quarterly oil price forecast ($, period averages)

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WTI-Brent differential	1.51	1.50	1.00	-1.00	1.00	-1.00	1.00	-1.00	0.80	0.00

Source: Actuals – Bloomberg; Estimates - Lehman Brothers.

Distillate margins forecast

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Note: Heating oil calculated against Nymex WTI, gasoil calculated against ICE Brent. Source: Actuals – Bloomberg; Estimates - Lehman Brothers.

Lehman Brothers global supply-demand balance 2006-09 (m b/d)

	3Q07	4Q07	1Q08	2Q08	3Q08	4Q08	1Q09	2Q09	2006	2007	2008	2009
Global Demand	85.2	86.5	86.8	85.6	86.1	87.4	88.3	86.5	84.4	85.6	86.5	87.4
OECD	48.3	49.5	48.9	47.4	48.0	49.3	49.2	47.2	49.0	48.7	48.4	48.4
USA	20.8	20.8	20.0	20.4	20.4	20.7	19.9	20.3	20.7	20.8	20.4	20.3
Europe	15.3	15.6	15.5	14.9	15.4	15.6	15.8	14.8	15.6	15.3	15.3	15.4
Non-OECD	36.9	37.0	37.9	38.1	38.0	38.1	39.1	39.3	35.5	36.8	38.0	39.0
China	7.4	7.6	7.8	8.1	7.7	8.0	8.1	8.4	7.0	7.5	7.9	8.2
Middle East	7.1	6.6	6.9	7.0	7.4	6.9	7.3	7.4	6.4	6.7	7.1	7.5
Global Supply	84.1	85.7	86.1	86.2	86.7	88.5	88.5	88.2	84.8	84.7	86.9	88.3
Total Non-OPEC	49.2	49.5	49.7	49.4	49.9	50.5	50.9	50.7	49.2	49.6	49.9	50.7
OECD	19.5	19.7	19.6	19.4	19.6	20.0	20.0	19.7	20.0	19.8	19.7	19.8
N. America	14.1	14.1	14.1	14.2	14.2	14.4	14.6	14.6	14.1	14.2	14.2	14.6
Europe	4.8	5.0	4.9	4.5	4.5	4.6	4.5	4.2	5.3	5.0	4.6	4.2
Non-OECD	27.4	27.6	27.7	27.6	27.9	28.1	28.2	28.3	27.0	27.5	27.8	28.2
FSU	12.8	12.8	12.8	12.8	13.0	13.3	13.5	13.6	12.2	12.8	13.0	13.6
Other (1)	2.3	2.3	2.4	2.4	2.4	2.4	2.7	2.7	2.2	2.3	2.4	2.7
OPEC Crude	30.4	31.6	31.8	32.1	31.9	32.7	32.1	31.8	31.6	30.7	32.1	31.8
OPEC NGLs	4.4	4.6	4.6	4.6	4.9	5.3	5.5	5.7	4.1	4.4	4.9	5.8
Inventory Change	-1.1	-0.8	-0.7	0.6	0.6	1.1	0.2	1.7	0.4	-0.9	0.4	0.8
Call on OPEC	31.6	32.4	32.5	31.5	31.3	31.6	31.8	30.1	31.2	31.6	31.7	31.0

(1) Other includes global processing gains, biofuels outside US, Brazil and Europe, GTL, CTL and unaccounted for new projects
Source: Lehman Brothers estimates (including historical numbers).

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