

Oil Prices and Fundamentals

Katherine Spector analyses the market and its players

The most surprising thing about \$50+ per barrel oil prices isn't, arguably, the lofty nominal price per se, but the fact that this two-year rally has coincided with a remarkably flat futures curve or, in other words, remarkably high deferred futures prices (Figure 1). The idea of mean reversion to a \$20–24 per barrel level is effectively debunked.

In recent months, what had been a relatively flat backwardation turned into a steep upward slope, or contango, in the prompt six months of the crude curve. (In energy markets, a downward sloping futures curve – where prompt prices trade above deferred futures – is termed backwardation. Contango refers to an upward sloping futures curve, where deferred futures trade at a premium to spot prices.)

A survey of analysts two years back probably would have generated some scenarios in which outright prices broke old records, but few, if any, rationales for such a severe departure from the old paradigm that contango only occurs when prices are very low (Figure 2).

Expensive Forever?

So what changed? For starters, we have in recent months seen a divergence between short- and longer-term fundamentals. Contango suggests wide availability of prompt supply, and recent inventory levels – particularly crude inventories, and particularly in the USA – tell us more or less the same thing. In fact, the slope near the front of the oil futures curve today is in line with what history would suggest at this inventory level (Figure 3).

Medium- to long-term fundamentals, meanwhile, do support the notion that oil prices will revert to a higher mean level going forward than they have in the past:

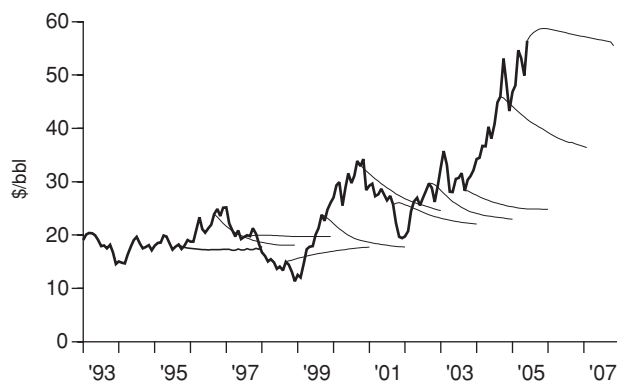
- Underinvestment in refining and distribution infrastructure has introduced bottlenecks to the supply chain that cannot be resolved overnight.
- The industry holds structurally less inventory than it did 10, or certainly 20 years ago, which means that temporary disruptions can have a more acute market impact than they used to.
- The marginal barrel of oil is becoming more expensive to find and produce.
- Oil demand – which grows incre-

mentally even in periods of weak economic growth – is bolstered further now by the emergence of new economic powers that are in a more energy-intensive stage of development than the mature economies of the USA and Western Europe.

But the argument that long-dated futures are high because oil will be expensive forever is a dicey assumption in a historically boom-bust market characterised by periods of over- and under-investment. Financial futures are not a predictor of future price, but rather the price at which a buyer of tomorrow's crude can find a seller of tomorrow's crude in the market today. And more than anything it is the balance of buyers and sellers of financially traded energy that has changed.

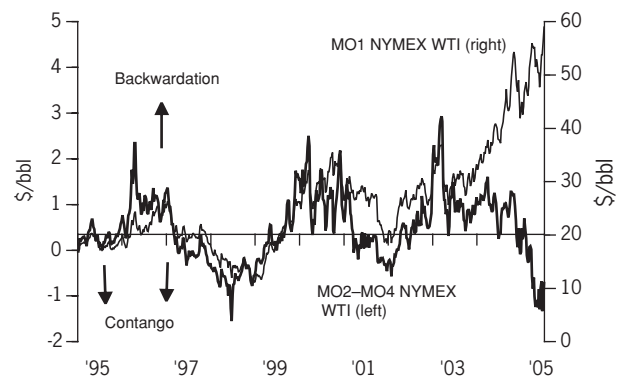
Relative to more mature financial markets – such as interest rate derivatives, bonds, or equities – financial energy markets are young and dynamic. What used to be a market dominated primarily by energy producers and consumers is now increasingly influenced by pure financial players. Physical supply/demand fundamentals still determine price in the long run, but the changing balance of market participation increasingly influences the price path. While new entrants add

Figure 1: Front-Month NYMEX West Texas Intermediate with 'Snapshot in Time' Futures Strips



Source: JP Morgan Energy Strategy

Figure 2: WTI Flat Price versus Forward Spread



Source: JP Morgan Energy Strategy, EIA

liquidity to what are still relatively shallow markets, price distortions and exaggerations feature prominently in this rapidly developing playing field. What could be called the ‘paper supply/demand balance’ – or, in other words, supply of and demand for deferred energy price – is increasingly relevant in this new market.

Who Trades Energy Today and Why

Traditional participants in the financial energy trade – consumers, producers, and market-making financial institutions such as banks – are of course still present in the market, but have evolved since the inception of the energy futures trade. For starters, hedging has, in most circles, shaken off the ‘gambling’ stigma for the risk management label. In the corporate landscape hedging is now not only understood by shareholders but in many cases insisted upon. Derivatives strategies have become more sophisticated, and tenors longer as liquidity in deferred periods improves. A crude oil trade that might have met with decent liquidity 5 years out on the curve 3 to 5 years ago, for example, could expect to find fair liquidity as much as 15 years out on the curve today.

The hedging behaviour of energy producers and consumers is important because it determines, on both a macro and regional basis, the number of ‘natural’ longs or shorts in markets. Typically (as counter-intuitive as it may seem) we see producers hedge

most actively in a weak price environment, and consumers move to lock in forward price in a strong market. Pressure from investors tends to mirror this tendency. In a bullish energy market, investors want reassurance that consumers have some protection from rising costs, but invest in energy producers for proxy exposure to upside energy price risk. Locking in future price eliminates that exposure. We are beginning to see a shift in the producer paradigm, as some investors demand the monetisation of future production at these high price levels, but by and large most of the producer business seen over the past couple of years has been associated with merger or acquisition activity, as opposed to pure strategic hedging. As a result, the natural population of sellers of deferred oil and gas price is automatically reduced.

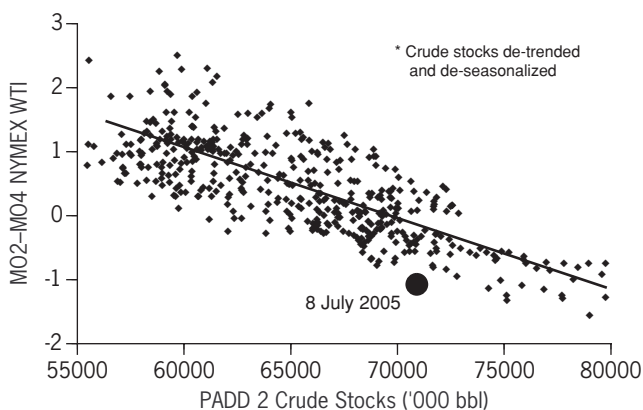
Outside of producer and consumer risk management, there is a temptation to group all ‘speculative’ energy market participants together. In reality, these players are a varied bunch that we would roughly define as financial institutions, commodity trading advisors (CTAs) or ‘black box’ traders, macro hedge funds, and institutional investors.

Banks as a group are not new to the energy space. They have historically been the market makers in the energy trade, and may also warehouse risk in short- or long-term proprietary trading positions. In either of these

roles, banks may be long or short the market depending on client flow and house views. CTAs, too, have been active in the energy trade for some time, and may also be long or short at any given time. CTAs can, however, move in and out of positions very quickly and tend to trade purely technically, or mathematically, as opposed to fundamentally.

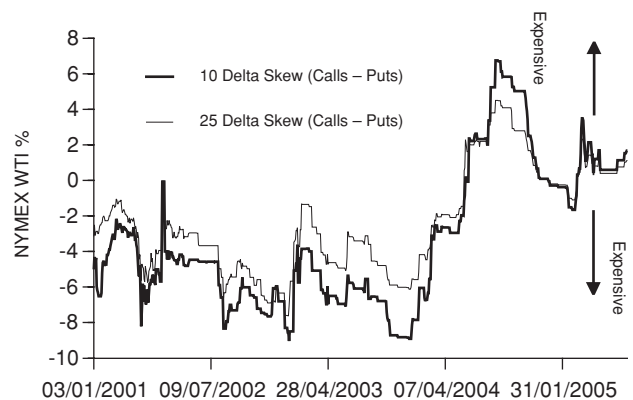
Macro hedge funds are not new to the energy space per se, though their presence has certainly increased and with it the hype surrounding their role in the market. Hedge funds are not only allocating more money to energy now, but as a group have also become significantly more sophisticated in terms of the type of trading they do. By hiring career energy traders in many cases, hedge funds increasingly trade a fundamental view in lieu of or in addition to a technical model. Increasingly sophisticated relative value trading supplements directional strategies, and positions are taken further and further out on the futures curve. While hedge funds may be either long or short depending on their view of opportunities in the market, they have probably been more long than short over the past two years in line with a compelling market trend and broadly supportive fundamental energy story. Virtually all the acute, event-driven shocks that one can imagine waking up to one morning with no advance warning would increase energy prices not lower them, and this has not been lost on the speculative community.

Figure 3: Adjusted* Midwest Crude Stocks versus NYMEX Forward Crude Spread



Source: JP Morgan Energy Strategy

Figure 4: Rolling 12-Month Implied Volatility Skew



Source: JP Morgan Energy Group

Institutional investors – a group distinct from other, more active financial participants – are the newest entrants to the energy space, and possibly the most poorly understood. During a period of low interest rates and relatively few opportunities in traditional investment arenas, the notion of commodities as an asset class and vehicle for portfolio diversification has caught on, aided by a supportive fundamental bull story that has become prominent even in the mainstream media. This group includes pension funds, mutual funds, and even retail investors who may have a broad, macro view of the sector but little expertise in the intricacies of these markets.

Investor products, such as commodity indices and commodity-linked notes give the non-expert an opportunity to add commodity exposure to a diversified portfolio. The indices, such as the Goldman Sachs Commodities Index® and the Dow Jones AIG IndexSM, are long-only baskets of commodities and have been the most popular product for passive participation in the commodities space. The ratio of commodities in the basket is set for branded index products – the DJ-AIG Index, for example, includes roughly equal weightings for energy, metals, and agricultural products, whereas the GSCI weights the energy component more heavily. An investor may express a view on one or more commodity groups by customising a similar structured index-style product that favours or excludes certain commodities.

In any case, length in branded index products is held in the second or third month futures contracts, and rolled every month or every second month as those contracts approach maturity. In this way, an index position could, under the proper circumstances, make money in two ways: a ‘spot return’ is earned when the outright prices of the underlying commodities go up, and a ‘roll return’ is earned when the futures curves of the underlying commodities are downward sloping. In other words, if the second or third month future price – the entry level – is lower than the prompt price – which is effectively sold during roll periods – then an index position earns

a positive yield as length literally rolls up the curve. For this reason, the total return on an index position could be positive even if one of the components of that return – the spot return or the roll return – is flat or negative.

Over the past couple of years, commodity indices have been tremendous performers as spot prices of most major commodities rallied while, until recently at least, several major index components were in steep backwardation.

Institutional investors participate in the energy trade exclusively from the long side, and exclusively over-the-counter, making their influence hard to quantify. Most estimates see as much as \$45–55 billion in passive commodity investment products today, relative to less than \$10 billion 2 to 3 years ago – not a lot of money for deeper and more mature financial markets, but a sizable and sudden influx for energy markets.

It is tough to put a dollar value on the outright contribution of ‘speculation’ to oil or other commodity prices. But certain market distortions do highlight concrete ways in which the change in the balance of energy market participation – in the investor community as well as the traditional consumer/producer community – has influenced the trade.

The volatility skew for West Texas Intermediate – which effectively shows the relative cost of puts and calls struck at equal deltas – also illustrates how the market has changed recently (Figure 4). Typically, crude volatility is skewed towards the put side – i.e. puts are relatively more expensive than calls – reflecting the traditional dominance of producer hedging. In the past 2 years or so, the skew has shifted more often to the call side, reflecting the marked increase in the number of market participants willing to pay a premium to reserve the right to buy oil at a certain price, relative to the number of participants looking to reserve the right to sell. While the skew has on occasion shifted back to the put side during large producer deals, such as M&A related hedging programmes, by and large the buyers have been the dominant presence in

this market.

The front of the oil curve, in particular, has become saturated with index-style investment dollars. With index length held in the second or third month futures contracts, and rolled every month or every other month during a designated and well flagged roll period, we have seen for over a year – even when most of the oil curve was still in consistent backwardation – pressure on the very front of the curve during these periods.

Now that the oil curve is in a more consistent contango – partly attributable to weak short-term fundamentals – the roll yield that had for some time contributed to positive index returns has disappeared. While spot returns, and thus total returns, have still been relatively good on these investor products, the shape of the curve today suggests that passive investors will have to adjust their expectations or find new ways to gain exposure to commodities going forward.

Pointing Fingers

What often follows (or even precedes), any analysis of speculative interest in energy is a value judgment. The negative connotation of ‘speculation’ – often implied to have no grounding in a fundamental view of the market – makes financial participants in the trade easy scapegoats for uncomfortably high prices. But energy speculators are attracted to this market by a perceived opportunity in response to a compelling fundamental story. The story came to the fore in early 2003, when military action in Iraq came hot on the heels of crippling strikes in Nigeria and Venezuela, and has gained significant mainstream traction as refinery capacity constraints, robust Chinese demand growth, and debates over Saudi reserves draw media attention. The proliferation of investor products offered by banks and other financial institutions offers vehicles for passive participation in this story.

‘There were more buyers than sellers out there today,’ traders offer as a tongue-in-cheek explanation for a price rally. Though clearly it is the availability of a seller that makes a

buyer a buyer, the cliché in a sense does help explain the persistent support for deferred futures prices. The increase in the number of would-be buyers of energy over the past few years – including energy consumers, fundamentally-inspired speculators, and passive investors – coincided, as prices rose, with a marked decline in hedging by producers, the market's natural sellers. The result is a sharp increase in the competition for forward price that has changed the way the market responds to supportive energy fundamentals.



David Long sees this as the end of an era

Are high oil prices here to stay? The answer is probably yes. Demand growth remains strong despite a doubling of the oil price over the past 18 months. And supply is constrained by capacity bottlenecks upstream and downstream. After 25 years in which the industry has struggled with the problem of surplus capacity, the oil market is now being driven by the over-riding need for more investment rather than cost minimisation.

The change is profound. Oil is a capital-intensive business with high fixed costs and low variable costs. When there is spare capacity available, supply adjusts quickly and cheaply to changes in demand making it difficult to defend prices or sustain margins. But when capacity is tight, supply becomes much more rigid and prices rise sharply in order to signal the need for new investment and to discourage demand for the scarce commodity.

None of this is surprising. The basic economic principles are well understood by all in the industry. What is surprising is the scale and persistence of the price changes that are taking

place and the slow response of investment to the new price environment. At \$60/bbl, crude oil prices are far above the fully built-up cost of finding and developing even the most expensive source of oil liquids supply. Yet companies remain reluctant to boost upstream expenditure in response to higher oil prices and OPEC seems unwilling to compensate for the shortfall.

The major oil companies still use a hurdle price of around \$20/bbl to test the viability of new upstream investments and are only prepared to relax this rigid constraint (a little) for projects with a quick payback. After being accused by their shareholders of destroying capital when oil prices plummeted to \$10/bbl at the end of the 1990s, directors are unwilling to risk investing in long-term projects that require a higher hurdle price. As a result, there seems little prospect of a strong supply-side response to higher oil prices from the international oil industry.

But the problem is not just a question of attitudes to risk. It also reflects a lack of opportunity. The distribution of global oil reserves is very unequal. Most of the world's oil reserves are contained in a very small number of very large oil fields. Around 94 per cent of the known oil reserves are concentrated in 3 per cent of the known oil fields and most of these very big oil fields are in the Middle East. Even though there are more than 35,000 fields in production, half the world's oil supply comes from around 120 very big oil fields.

If these very large oil fields were allowed to produce to the technical limit of their geological potential the price of oil would only be a few dollars a barrel – which is why the industry and OPEC have always sought to control their development so that the rest of the world's oil industry could remain in business. The history of oil is a succession of agreements to restrict the output of ultra-low cost oil from very large oil fields in order to protect higher-cost investments in smaller fields. Until now this has worked to the benefit of all producers (although consumers

have paid a much higher price as a result). After OPEC member governments nationalised the upstream assets of the major oil companies – sparking the oil price crises of the 1970s – they took on the role of swing producer, allowing their production to fall as demand collapsed in order to slow the decline in oil prices in the 1980s. But this also enabled non-OPEC producers to develop their higher cost oil reserves secure in the knowledge that OPEC was not going to let prices fall too far.

During the 1990s, the cost of developing new non-OPEC oil supplies effectively set a limit on how high oil prices could go as there were plenty of opportunities for companies to boost investment and expand production if oil prices rose. But the scope for additional investment became much more restricted with the start of the new century. Production began to decline in more of the mature non-OPEC provinces as new discoveries failed to replace reserves. Although new fields were still being discovered, the average size was getting smaller and there were only a limited number of new areas where large new fields might be found. Outside the former Soviet Union, non-OPEC conventional oil production has levelled off – leading some to predict a peak in total non-OPEC oil supply by the end of this decade.

Now it is doubtful whether non-OPEC producers can respond in the same way to higher oil prices. Although companies are still investing heavily upstream and there is a long list of new projects set to come on stream during the rest of this decade, it is becoming very difficult to find additional projects or to speed up the pace of development. Most of the big new developments are technically-complex deepwater offshore projects and construction yards and drilling rigs are close to full utilisation already. At the same time output has either passed or is close to a peak in many established provinces, creating a growing capacity deficit that has to be filled by new fields before non-OPEC production can rise. More investment may slow the decline and extend the

life of an individual oil field, but it cannot restore capacity to its former peak.

Looking forward, the balance of power in the oil market appears to have shifted permanently in favour of Middle East producers – as long as global oil demand continues to expand faster than non-OPEC supply. Nearly two-thirds of world known oil reserves are concentrated in the Middle East – primarily Saudi Arabia, Iran and Iraq – in countries that remain largely closed to foreign investment by the international oil industry. In the past, competition between these three countries for market share periodically threatened to undermine oil prices but this threat is greatly diminished because of the continuing unrest in Iraq and the absence of spare capacity in Iran.

For the past 25 years, OPEC countries have had little incentive to invest in expanding upstream capacity. With strong competition from rising non-OPEC supply, OPEC's priority was to agree how to share out the remaining market between its members in order to prevent competition from eroding prices. But stronger demand growth and a slowdown in non-OPEC supply this decade have unexpectedly eliminated most of OPEC's long-standing capacity surplus – forcing members to consider spending more of their oil revenues on expanding upstream capacity. So far the response is muted. Saudi Arabia – which has the greatest potential by virtue of its huge oil reserves – only plans a net increase of 1.5 mb/d by 2009.

Without effective supply-side competition from non-OPEC producers to limit oil prices on the upside, it is no longer clear where oil prices will settle. Although OPEC claims to be concerned about the effect of high oil prices on demand, the Organisation appears to be quite content to earn \$50/bbl rather than \$25/bbl as long as this does not provoke a global economic recession or a collapse in demand. If OPEC expands upstream capacity too fast, it risks undermining these windfall gains if its members start to compete amongst themselves

for market share once a margin of spare capacity opens up again. It makes perfect sense therefore to spend the minimum necessary on upstream investment to expand capacity just enough to prevent a damaging price spike and to let oil prices rise to the highest level that the global economy can stand.

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That price could be very high indeed. Oil remains the most important source of primary energy and still has no effective substitutes as a transport fuel. Unlike the 1980s – when oil demand collapsed as a result of global economic recession and widespread switching away from oil in power generation and household heating – demand (so far) seems much more resilient to rising prices. Although crude oil prices are at record levels in nominal terms, they are still well below the \$80/bbl peak reached in real terms during the 1979 crisis after the Iranian revolution. In addition, the general increase in wealth in the developed world since the 1980s means that cost of oil now represents a much smaller share of both personal and national budgets so it may require a higher price to have the same impact on demand.

Oil also plays a unique role in global economic development. Unlike other fuels it provides a compact and highly portable source of energy that is particularly well suited to a developing economy that lacks the necessary supply infrastructure to distribute natural gas or electricity. Last year, oil demand grew more strongly than it has done for 25 years fuelled by a booming global economy and the accelerating development of the world's most populous countries, China and India. At present, their oil consumption per capita is very low, but – like the United States in the

1920s and Western Europe and Japan in the 1960s – this is rising as China and India become wealthier and more industrialised. Over the past 5 years, oil demand has grown at an annual average rate of 8 per cent in China and nearly 4 per cent in India.

Taken together, the constraints on upstream investment – for both OPEC and non-OPEC – and the renewed potential for strong demand growth as economic development in Asia takes off, paint a very bullish picture for oil prices over the rest of this decade. This does not mean that oil prices will necessarily remain high as there is a huge gap between the price that is required to limit demand growth – possibly as much as \$100/bbl – and the price that is required to justify new upstream investment – probably as little as \$15/bbl. If oil demand slows too rapidly or if a major new source of supply – such as Iraq – suddenly emerges it could be difficult to stop prices falling back towards the bottom end of the range. But there is a rational case that can be made for an extended period of sustained high oil prices if OPEC does not get too greedy and no easy substitute becomes available for oil as a transportation fuel.

Paradoxically this strong medicine may be just what is required. Despite fears to the contrary, the world is not about to run out of oil. But there is a limit to how much oil production capacity can be sustained and there is certainly not enough oil for everybody in the world to use it as intensively as the industrialised world does today. If Chinese consumers were to match US consumption per capita, global oil consumption would almost double from today's levels. Huge gains in energy efficiency will be necessary if the oil industry is to accommodate the needs and aspirations of both the industrialised and the developing world – and high oil prices provide a strong incentive to make those improvements.

Interestingly, consumer governments now appear to accept the inevitability of higher oil prices. Although there are complaints about rising prices and worries about the impact on economic

growth, OPEC has so far escaped strong political pressure to bring prices back down to the consensus levels of the past decade. With growing concerns about global warming and the need to take action to limit carbon emissions, energy efficiency is back on the agenda. And environmental concerns are being reinforced by strategic considerations. Even the United States is worried about its dependence on Middle East oil and seems willing to pay a higher price for oil if this will help to limit imports from what is now seen as a politically unstable region.

The era of cheap oil may well be over. A structural change is underway that will shape the behaviour of oil prices for at least the next decade. The economic development of Asia requires increasing amounts of energy that the oil industry will be hard pressed to supply. Competition between the industrialised world – especially the United States – and the developing world – especially China – for oil supply is already a key factor in driving up and supporting high oil prices. Only the Middle East has the reserves to satisfy both. But if the owners of these reserves choose not to develop them to their full geological potential because they can earn more by restraining development, then oil prices can only remain high.



Paul Horsnell thinks we are moving to a sustainable long-term price level

It used to be so much easier. There was an almost universal belief in a particular theory of the way things fitted together, and that theory seemed

to fit reality well enough. Any deviation from the theory had then to be either, the product of faulty observation, a temporary aberration, or the work of dark forces. On the one hand, a close look would have revealed that the theory used its result as an assumption, and the logic behind it might look a little stretched. However, on the other hand, all the time that the theory remained dominant, questioning the ruling orthodoxy was likely to be somewhat of a career limiting choice.

We are of course talking about the flat earth theory. It fitted reality well enough to survive for a few centuries, and having the Spanish Inquisition behind it certainly helped to improve its degree of persuasiveness. The Flat Earth Society continues to the present day, although perhaps only to demonstrate that you can still, albeit perhaps somewhat quixotically, continue a debate as much as 500 years after the available empirical evidence rather crushed your side of the argument.

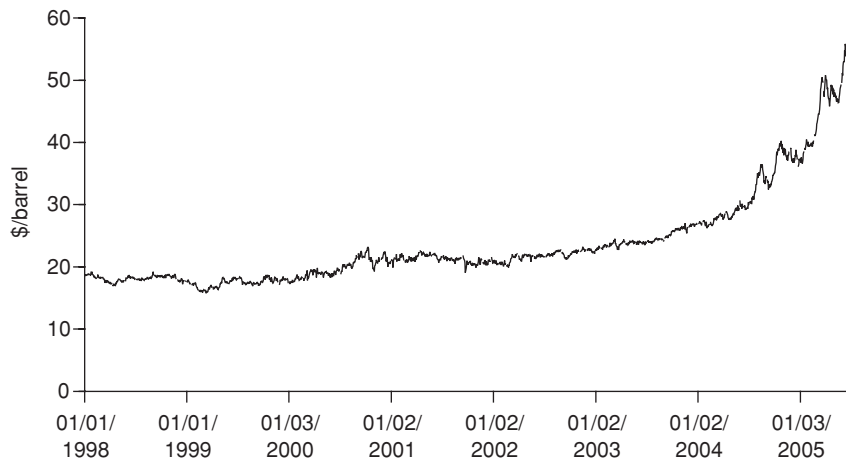
The idea that oil prices had to stay low in nominal terms, and erode even further in real terms, is a little too recent to have had the support of the Spanish Inquisition, and it does not rely on the idea that there is a giant turtle holding everything up. It was, however, taken to be a truth throughout the 1990s, and then well into the current decade, by Wall Street and the capital markets, by energy companies, by most but not all academic observers, and by politicians and planners in consuming countries. The view was very precise, in that the long-term oil price was generally put as being between \$18 and \$21 per barrel. Indeed, the market's perception of where to place the back end of the crude oil futures curve very rarely strayed outside that \$18 to \$21 interval over the whole period from 1986 to 2002.

The \$18 to \$21 range became the touchstone for views of what represented normality, and any hypothesis that suggested prices could be higher than that range was considered heretically abnormal. Governments thought in terms of that range, as did financial markets. Oil companies had to be even more conservative to keep

the equity analysts on side. In the 1990s equity analysts were perhaps the closest we came to having a Spanish Inquisition in the setting of market orthodoxy. After all, it is not that long since a former head of BP found his position being significantly eroded for daring to suggest that \$21 might be a reasonable assumption for an oil company to make in its planning. The dominance of the low price orthodoxy led to the development of an *ex post* rationale for it. This was based mainly along the lines that prices must be set by the marginal cost of non-OPEC supplies, a line of thought that was sometimes referred to as the 'Goldman Sachs consensus'. In short, the theory was that if longer-term prices moved too far above \$20, two things would happen. First, there would be overinvestment in non-OPEC capacity sufficient to lead to a strong supply-side response. Secondly, there would be a sharp truncation of demand growth and then an outright fall in demand. The combination of strongly rising supply and sharply falling demand would mean that prices would have to fall back towards \$20.

Very few would argue today that \$20 is the correct long-term price for oil. However, it should be noted how that change came about. The rejection of the orthodoxy was not the result of any debate or examination that concluded that supply and demand side responses were not as strong as had been assumed. Instead, the rejection came about simply because oil prices rose, and then kept on going. With a few bumps in the road along the way, the front of the oil price curve has now been rising for just over 6 years. More importantly, the back end of the curve started its march up. The 5-year forward price of WTI (as shown in Figure 1) has passed by a series of milestones. It reached \$25 in September 2003, \$30 in June 2004, \$40 in October 2004, \$50 in April 2005 and having reached \$58 in July 2005 it is now threatening \$60.

It has taken a few years, but the forces behind Figure 1 have proved to be strong enough for most not to want to be too dogmatic about a long-term low price for oil. It is significant that

Figure 1: Five-year Forward Price of WTI, \$/b


it was oil price behaviour rather than consensus about assumptions that has produced the change in analyst expectations. It has meant that elements of the 1990s consensus have been recycled and are still in play. There are analysts who would still argue that long-term oil prices are set by the marginal cost of non-OPEC supplies, and hence that prices have gone up because those costs have gone up. For the marginal cost of non-OPEC oil to have followed the path of Figure 1 would be something of a stretch in our view, but that concept is still in the wild. Likewise, political discussion of the oil price still follows some very well worn grooves. Throughout the current year, various politicians have argued that higher prices are either the fault of observation, i.e. if the market had a better understanding and better data it would produce lower prices, or that the rise is temporary, or that it is simply the result of speculators or other dark forces. Even now, among many analysts and consultants there is a belief in a sharp increase in non-OPEC supply growth that will create a sustainable price collapse, i.e. they would say that old theory was perfectly correct but it is just a tad slower to operate than was first believed.

In all, market behaviour this decade has been enough to make it clear what the correct level of oil prices is not, and in particular it has shown that there was nothing magical about the environs of \$20. However, that does not in itself help us to tell what the

sustainable average level might prove to be. Our view is the sustainable level of long-term prices is that which creates enough investment along the entire supply chain to maintain a reasonable degree of spare capacity, while also ensuring that producing countries are able to maintain some growth in employment and in per capita incomes. That would argue for a long-term price of at least \$50, with higher prices needed into the medium term to allow for some catch-up, particularly in the downstream, from the last decade of the 1990s. Prices can of course move to lower levels and indeed in some circumstances to much lower levels. However, they would not be sustainable at those levels into the medium term. Indeed, the real bull case for oil prices would be that we have a period of lower prices and compound the longer-term tightness in the fundamentals of the market.

The view of the sustainable price is of course largely a function of supply and demand responses. Compared to the 1970s, it appears to us that the price elasticities of both supply and demand are significantly lower, that the income elasticity of demand is significantly higher. In addition, the increase in the rate of decline of mature non-OPEC production has become a major force in blunting supply response. Compared to 20 years ago, there is twice as much non-OPEC output and its rate of natural decline is also twice as much. That means that there is now four

times as much that needs replacing each year as before, and that is why non-OPEC production outside of Russia has been flat-lining this decade despite considerable expenditure and the development of a considerable volume of production in new projects. With Russian supply growth now also slowing sharply, it appears to us that non-OPEC production may not increase in the second half of this decade even by as much as it did in the first half of the decade.

On the demand side, the concentration of OECD demand in transportation rather than power generation or industry has limited the downwards pressure on the demand. However, the major change in the demand is that non-OECD consumers are now very much at the margin of the market, and they have far higher income elasticities of demand than OECD consumers. It is a far more general phenomenon than just China and India, but it is certainly salutary to note that those two countries combined represent 2.5 billion people consuming just 40 gallons of oil per capita per year. The average American consumes over 1000 gallons per year, and the average Briton 400 gallons per year. Should the joint Chinese and Indian average to reach just 100 gallons per capita per year, that would be 22.5 mb/d of oil demand. Two-thirds of demand growth in 2004 came from non-OECD countries, and on Barclays Capital projections that proportion should exceed 80 per cent in both 2005 and 2006.

The move up in prices is not a shock, it is an adjustment towards a sustainable long-term price level. It has been in progress for too long, and has been too gradual to be a shock, and indeed that has been the major reason why the macroeconomic impact has been relatively benign. Had prices gone from \$20 to \$60 very quickly there would have been a strong impact effect. As it is, a sustained move up with relatively gentle year-on-year changes has allowed demand growth to continue fairly robustly.