Global Energy Policies: Supply, Demand and the Future of Nuclear Power

Christopher Allsopp

New College, Oxford, and Director, Oxford Institute for Energy Studies

1. Introduction

This paper argues that, despite the strong consensus – or 'dominant story' – that the global economy has moved into an era of high energy prices (especially for oil) due to changes in the 'fundamentals', the situation is fluid and uncertain, both as regards volumes and price. The most important reason for this is that the consensus story 'does not add up' - or, more precisely, appears to be unsustainable. The recent earthquake in Japan, and its repercussions around the world on the prospects for nuclear power has only reinforced the inconsistencies. This means that the industry, finance and all those whose job it is to assess future prospects in energy markets, face intrinsic uncertainty about what the fundamentals are. This leads on to the question of how markets operate and how prices are formed when the fundamentals are unknown.

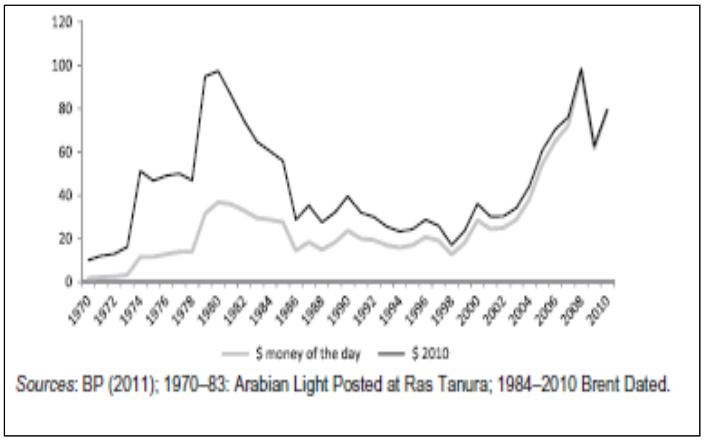
The next section considers the 'dominant consensus' or 'economic realist' position - contrasting it with other approaches that would lead to quite different assessments. (One of these is the climate change perspective – but there are others). Section 3 looks more closely at the tension, or 'disconnect' between the climate change story and the realist position. Section 4 considers aspects of the surge in oil prices in the recent cycle up to 2008, and the adjustments since. The story here is of the lack of anticipated stabilising feedbacks to oil and other markets. Section 3 moves on to pricing issues. Is the market moved by fundamentals or speculation? How does the market coordinate on a particular story. Section 4 concludes with some reflections on the kinds of policy or institutional change that might reduce uncertainty and indeterminacy.

2. The dominant story

The Industry consensus

The dominant consensus that emerged following the 'great recession' starts, as it usually does, in the oil markets. Broadly, with no obvious culprit to blame for the rise in prices to July 2008 (Chart 1), many studies turned their attention to structural transformations in the fundamentals of the oil market. On the demand side, the increase in the oil price has been associated with a shift in global demand towards the non-OECD, driven by rapid growth and industrialisation, with improvements in living standards expected to lead to rising demand for liquids in the transport sector. On the supply side, the cycle was associated with growing concerns about peak oil, rising decline rates in existing fields, increasing costs at the margin, muted non-OPEC supply responses, and greater scepticism about the capability or willingness of national oil companies (especially in OPEC) to develop reserves in a timely manner. Putting these together, it is easy to produce scenarios that, given inelastic

Chart 1. Real and nominal oil prices 1970-2010



Sources: BP (2011); 1970–83: Arabian Light Posted at Ras Tanura; 1984–2010 Brent Dated.

demand and supply responses, lead to high prices into the future. A key part of the story is that oil will continue to be demanded in the transport sector. Producers of oil, so the story goes, can be relatively complacent because oil is 'special'.

With only a brief interruption in the depths of the great recession around the beginning of 2009, the dominant story has shown remarkable powers of recuperation. With oil prices currently at about $110, despite the Arab Spring, the story is essentially the same. Rapid growth in emerging economies combined with high costs on the supply side for 'difficult' oil, support a consensus that prices will remain high. Some believe that prices will rise considerably further.

Forecasts and scenarios

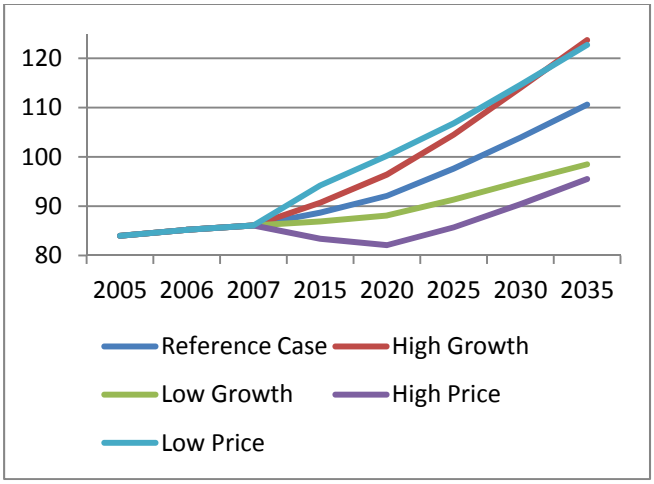
Longer term analyses of the position of oil and other sources of primary energy, usually based on extrapolation and inertia, have frequently turned out to be spectacularly wrong. Extrapolation from the 1950s and 1960s led the Club of Rome to predict unsustainable growth and unaffordable prices. High prices were, indeed a feature of the 1970's and the first half of the 1980s. But two world recessions (often rather simplistically regarded as due to oil, see below), the spectacular substitution of gas for oil in power generation and in space heating, as well as developments on the supply side (the North Sea, Alaska) confounded the conventional wisdom. Instead, oil prices effectively collapsed from 1985 into 1986 (often described as the counter-shock) – ushering in nearly two decades of low oil prices and inadequate investment. The dangers of extrapolation were, again, spectacularly illustrated by the *Economist's* prediction in 1999 that 'the world is awash with the stuff [oil], and it is likely to remain so' and that $10 might actually be too optimistic'. The *Economist* famously went on to suggest that oil prices might be heading for $5 per barrel. Only 9 years later, in 2008, the price of dated Brent reached its historic high of $144.20 in July. As noted, with recovery from the Great Recession, oil is again trading at around $110 per barrel. Some studies have suggested that forecasts for oil and other energy prices are worse than useless. And it is a fact that the industry has missed most of the major turning points.

Official bodies, such as the International Energy Agency (IEA) and the US Energy Information Agency (EIA), usually present their analyses in the form of scenarios. These too have changed reactively with the consensus. (For example, they largely missed the upsurge in demand from Asia). It is sometimes

not appreciated how much uncertainty is built into the analysis. Scenarios depend crucially on assumptions about global growth, about its distribution, and about price. Chart 2, taken from the EIA, illustrates the wide range of outcomes that can arise. It is worth noting that the (assumed) difference between the high and low growth scenarios and base scenario is actually quite small — plus or minus ½ % per annum — and that even the high growth scenario, at 3.7% per annum is lower than growth achieved in the years before the great recession, and is lower than consensus forecasts for global growth (e.g. by the IMF and other official bodies) for the next 5 years.

In any case, the methodology behind such scenarios is very restricted. Often they rely on assessing the 'call on OPEC' – with the assumption that OPEC will simply supply what is needed.

Chart 2. EIA Scenarios (Million barrels per day)



Broadening the picture: substitutions and other sources of primary energy.

The high oil prices of the early 1980s led to spectacular substitution against oil in power generation – mostly by natural gas (the 'dash for gas'). Despite high oil prices, the consensus has it that substitution, now that most oil is used in the transport sector, will be very difficult. There are reasons for caution about this.

- There are substitutes for oil in its main use, such as bio fuels. They are small as yet. But Brazil, perhaps a special case, has substituted around 50% of its gasoline use in transport with ethanol. And it happened quickly. Corn ethanol in the US is highly controversial. Even at present ethanol makes a significant contribution to US fuel supply.
- The possibility of substitution against oil is even more obvious from another direction. Different fossil fuels - coal oil and gas – can be converted into each other, at a price and with costs in terms of thermal losses and carbon emissions. At current prices, both gas-to-liquids (GTL) and coal-to-liquids (CTL) appear to be economic. If fossil fuels are considered together as a potential source of liquids for the transport sector, the problem is not shortage (still less 'peak oil') but, from a climate change point of view, abundance. The operative constraint is not scarcity, but emissions.
- Substitution is possible at the point of use. LNG or CNG can be used in vehicles (c.f. public transport in Delhi, where CNG is competitive with diesel, (Jain and Sen 2011)). Electric vehicles – which are developing rapidly – further threaten to change the mix. The

widespread adoption of heat pumps could have large effects on the demand for electricity in some countries.

There is considerable inertia, not least because these processes are in their infancy, and large-scale change depends on hard-to-predict technical changes. But inertia is not a good basis for prediction beyond the short term. Most importantly, energy markets (prices, investment) are affected by longer term expectations and assessments, which can and do change. (As a thought experiment, imagine what would happen if scientists were to establish, once and for all, that anthropogenic global warming was a myth (unlikely as that may be). Presumably we would all be predicting a large expansion of global coal production (which is already the fastest growing source of primary energy), and the picture of the future, affecting the present, would change).

There are further uncertainties. One, obviously, is the potential for oil supplies – from Iraq, from Iran, from the pre-salt in off-shore Brazil, even from the Arctic. Some believe that the potential for shale oil in the US is very large. I won't labour the point – the consensus can swing about with the news.

Turning to other sources of primary energy, the shale gas revolution in the United States is a cautionary tale. The expansion of natural gas from this source took almost all industry analysts by surprise. The consensus had it that the US would become an increasingly large importer of natural gas – LNG from the Atlantic basin. Instead, the US became self- sufficient. The re-gasification terminals lie idle - and some are already being converted to supply US sourced LNG to European and Asian gas markets. Gas prices in the US at about $4 per MMBTU are about half those in Europe and about 1/3rd of those in Asia, so there is plenty of room for arbitrage in the opposite direction from that previously anticipated. European pricing structures are already being affected (Rogers and Stern, 2011) though the effects on Asia are, so far, small.

A key issue is the extent to which global natural gas supplies will expand. Institutions, such as the IEA have referred to the coming 'Golden Age of Gas' (IEA, 2011). Much of the optimism, or hype, depends on the assumption of the rapid exploitation of shale gas reserves in Europe, China, India, and elsewhere. (On Europe, see Geny (2010); on unconventional gas, more generally, see Rogers (2011)). Many analysts suggest that the US story will not be repeated. The constraints, from environmental concerns, from water availability, and from the lack of technology and infrastructure are obvious. (France has banned exploration and development of shale on environmental grounds – though some cynics see the hand of the French nuclear industry. On the other hand, some company sources are expecting a rapid expansion in China). Helm (2011) puts the case for gas as a transition fuel well – which would also lower oil prices. The argument depends, however, on unconventional gas being a 'game changer', not just in the US but globally as well.

An assumed expansion of nuclear capacity has also been part of the 'censensus' story about how future energy demands will be met, essentially because without a 'nuclear renaissance' it is difficult to make future projections of demand and supply add up. The chequered history includes the remarkable story of the expansion in nuclear capacity in France after oil shocks of the 1970s – a story that is often cited as an example which shows rapid expansion is possible. There was a major retreat from nuclear after the disasters of Three Mile Island (1979) and Chernobyl (1986). The latter coincided, incidentally, with the period of low oil prices and lessened concern about energy security. In recent years there has been a notable swing back towards nuclear energy as part of the solution

to future global energy demands. This has all been threatened by Fukushima which has obviously led to increased fears over safety as well as increased or renewed pressure, against nuclear, from (some) environmental groups.

The ramifications are far from obvious, for Japan and for global energy markets. Clearly, it is likely to lead to more demand for natural gas (and other substitutes) in Asia, but the extent is not yet clear. Germany has reversed recent policy, and is committed to closing existing reactors. Officially, the gap is seen as being closed by renewables, but it may lead to increased reliance on imported gas – or (again cynically) to more imports of nuclear based electricity from France.

At current and expected energy prices, and with not too high a discount rate, nuclear appears economic. The constraints include worries over waste and decommissioning, over proliferation and, especially, fears of the unknown. Statistically, nuclear is the safest form of primary energy. The worst is hydro, followed by coal. But that, as every politician knows, is not the point.

Renewables are expanding fast – but from a very low base. (1.21 % of total primary energy in 2010, according to the BP Statistical Review). Their problem is cost – especially if the implicit costs of intermittency are taken into account. At the moment, there appears to be an alliance between 'peak oilers' and others who think that high energy prices are here to stay, on the one hand, and those pushing for renewable sources such as wind and solar (Marianne Haug 2011). It is easy to understand. Huge subsidies are required, even at current oil and gas prices, to develop renewables at the speed and scale that their proponents deem desirable. At lower prices for conventional energy the subsidy bill would appear unsupportable,

The above sketch suggests that there are plenty of uncertainties within the underlying 'dominant story'. Some of these could be 'game changers' - pointing towards increased supply (e.g. shale gas) or towards even greater difficulties in meeting future energy demands (e.g. if anti-nuclear lobbies prevail). The consensus, it might be argued, is a sort of market average weighing up the various uncertainties and probabilities. Obviously, much of the uncertainty concerns likely policies and politics.

3. The climate change agenda

Within what I have called the 'realist agenda' the big questions are how the system will adapt to ensure balance between the supply and demand sides of the picture, and the implied consequences for developed and developing countries, and for producers and consumers. Clearly, a marked downward revision of anticipations about global growth would change the picture. So would major new discoveries. But such a framework appears increasingly out of date –owing to the developing climate change agendas which now interact with nearly all aspects of international energy policy.

The climate change agenda is of a different kind. It starts with an imperative, essentially to control cumulative GHG emissions (especially CO2) to limit the risk of global temperatures rising about some dangerous or very costly level. The science is subject to considerable uncertainty – there remain climate sceptics – and the uncertainty is an essential part of the problem. Put like this, the issues may seem mainly scientific and technical rather than economic, except in the rather trivial sense that everything that needs to be done should be done in the least costly way.

This methodology is apparent in the widespread use of scenarios, or 'backcasts', illustrating, for example, possible ways of meeting specific targets for emissions at some future date. A good example is the IEA's '450 scenario' designed to limit the long term concentration of GHGs in the atmosphere to 450 parts per million of CO2 (equivalent). The output is usually the delineation of a gap between what is likely (e.g. on a business as usual scenario) and what is required. Not surprisingly, 'realists' are sceptical of the usefulness of these exercises. The typical response has been, however, the widespread adoption of targets for emissions and/or for renewable energy use - some of which have even been enshrined in law (e.g. UK).

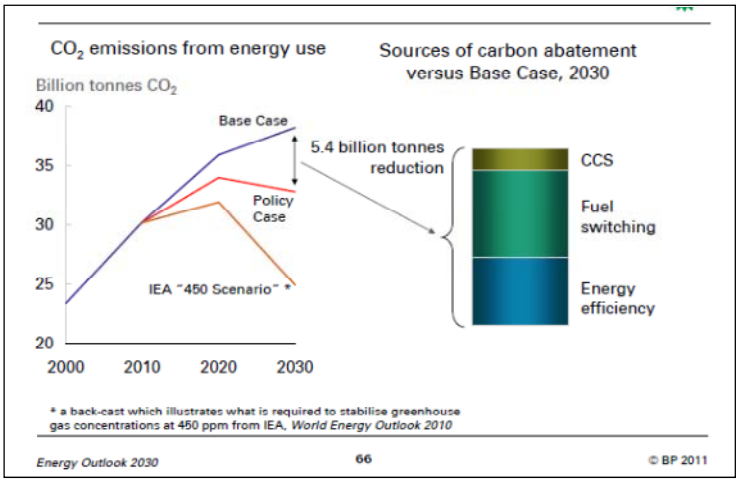
The climate change agenda markedly affects the nature of the debate over international energy. To start with, it directs attention to coal, the fastest growing source of greenhouse gas (GHG) emissions. For a given amount of energy, coal is roughly twice as polluting as natural gas, with oil roughly in between. There are potentially huge benefits from the widespread substitution of gas for coal – unless, that is, carbon capture and storage (CCS) can be developed at industrial scale. To go further, however, would according to the scenarios (such as that of the IEA above) require the almost complete decarbonisation of electricity, and a substantial reduction in the use of fossil fuels in transportation. Moreover, it is obvious that electrification of the vehicle fleet would be of no use at all if the electricity originated from coal (without CCS). (There is an irony in the enthusiasm for electric vehicles in China and the US – the two largest coal burning countries in the world).

Clearly there is a 'disconnect' between the climate change perspective on international energy issues and what I have described as the conventional wisdom among energy industry analysts. At the extremes, different assumptions account for the difference between 'peak oil' worries, on the one hand, and worries about stranded oil (and coal) on the other. (For example, Canadian oil sands might well be 'stranded' if climate change mitigation is given priority). The key differences between views of the future centre on technical and economic assessments (e.g. about efficiency and substitutions) and about the policies that will be adopted and about how effective they will be.

But how should assessments be made given this dissonance? A recent BP study based on the policies they thought 'most likely' (rather than BAU) left a huge gap between their projection and the 450 scenario. For 2030, their base projection suggested nearly 40 billion tons of CO2 per annum – as compared with about 30 billion in 2010. For the same target date the 450 scenario required 25 billion tons. What is more, a strong policy case (putting in strong mitigation measures including a carbon price) reduced emissions by about 5 1/2 billion tons per annum, still leaving a very large gap between that number and the 450 scenario target.

But what if the scientists are right? Then other things are likely to happen. Should these be taken into account? Or should policy be expected to change? Neither of these is easy.

Chart 3. BP Energy 2030



4. Lessons from the last cycle: the case of oil

The rise in oil prices, up to its peak in 2008, took most observers by surprise and its causes are still a source of controversy, with some ascribing the rise to fundamentals, others suggesting a strong influence of speculation. Here, I suggest a somewhat different story – a rise in indeterminacy due to the attenuation of stabilising feedbacks from things that were expected to happen, but failed to materialise. The things that did not happen include anticipated changes of behaviour by OPEC, policy changes by producers and consumer governments as well as demand and supply responses of a more normal kind. I argue that the most important thing that did not happen was the anticipated response of the world economy – involving inflation and recession – to high oil prices.

In the paradigm of supply and demand, prices clear the market. In the case of a market like oil, where there are inventories (above and below ground) and the possibility of financial arbitrage along the futures curve, it is not just spot prices that matter, but the constellation of futures prices as well. Stability, in line with fundamentals, would be characterised by a relatively stable view of the future such that an upward movement in the spot price would lead to the anticipation of a fall over time towards the anticipated longer term price justified by the fundamentals. (And vice versa for a fall in the spot price). Two of the obvious feedbacks that could lead to such behaviour are the anticipated responses of producers on the supply side, and, on the demand side, the anticipated responses consumers to the price changes. But there are others.

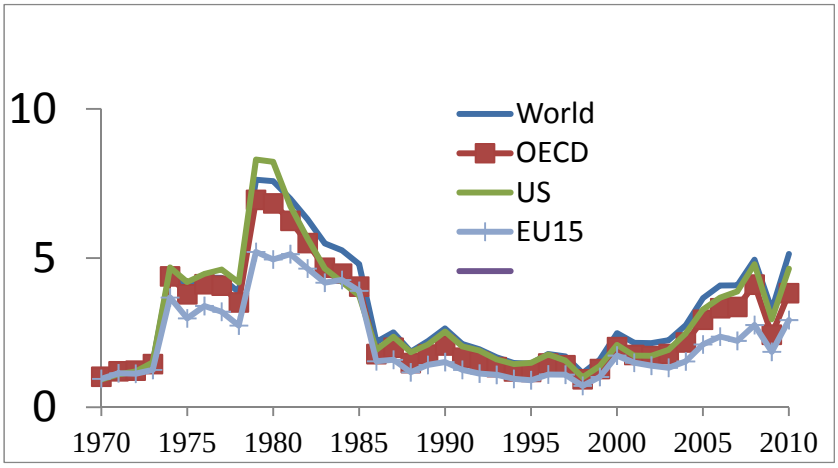
The oil price behaved in this way during the period of the OPEC band around the years 2000-01. Part of the way this worked was that market operators expected OPEC to achieve its objective over the medium term and acted accordingly. Apparently, the OPEC signal was, for a time, credible. (There was a switch in the US attitude at this time, which was apparently supportive of the band). The oil price soon exceeded the band, triggering little or no action – as might, indeed, have been anticipated. And oil prices were on their way up, especially from 2004 – 8. Interestingly, there was a brief period around $60 per barrel, when one of the market stories was that OPEC (or the Saudis) would fear longer term 'demand destruction', either as a response to price, or because of political action (because of energy security concerns) in the US and other countries. This was also short lived.

The story, during the rise and further rise in the price was of actions or policy changes, that might have stabilised the situation, failing to occur. The same was true for some of the more economic stabilisers. Supply responses (e.g. from investment) did not appear to be being stimulated. And rising demand from Asia was more and more apparent. Most importantly, markets appeared to learn that policy and other feedbacks were not likely to happen. (Not long ago, the idea of oil prices above $100 pb seemed unthinkable).

The absence of macroeconomic feedbacks via the world economy

As the oil price rose, a lot of computer time was wasted in simulating the effects of rising oil prices on inflation and on GDP (for individual countries or regions, or for the global economy). Almost invariably, these showed a substantial downward effect on GDP, a rise in inflation and, in most cases, assumed a restrictive monetary policy response - accentuating the downward effect on GDP. This is what appeared to have happened after the two great oil shocks of 1973/4 and of 1979/80. In a word, 'stagflation'. The consequences would be a fall in the demand for oil, limiting or reversing the oil price shock. An extremely important aspect of the run-up in oil prices, from about 2004 to the peak in 2008, was that the anticipated response of the world economy simply failed to happen. It generated a number of articles and explanations of why, over this period, 'oil prices failed to shock' (Walton, 2006, Segal, 2007, 2011, Allsopp and Fattouh, 2011). Despite the fact that the 'shock' was, if anything, larger than the great oil shocks of the 1970s – though less abrupt – the global economy went on growing. (See Chart which indicates the size of the oil shocks, scaled against nominal GDP). The recession, when it came, was not due to oil, but to the financial crisis (especially after Lehman Brothers was allowed to collapse in September 2008). There are still some analysts who continue to ascribe (some of) the great recession to oil (Hamilton, 2009). Essentially, the market learned that a highly stabilising feedback (for oil prices) via the response of the global economy, was not going to happen. The world appeared to be able to live with high oil prices.

Chart 4. Expenditure on oil as percent of nominal GDP. (percent)



Source: Segal, 2011 (updated)

There are two main channels by which a rise in oil (and other commodity) prices would be expected to lower growth – and hence the demand for oil. The first is essentially a fiscal effect. An oil price rise is like a rise in indirect taxes (think of a rise in fuel duty imposed by a consumer government). It is

expenditure reducing in real terms for consumer countries. (The total effect depends on the reactions of consumers, who lose, and producers, who gain. In the 1970s, the absorptive capacity of the producers (OPEC for short) was low, so the impact has a net deflationary effect). For consumers, the 'fiscal' effect raises the *level* of prices and lowers demand. The price level effect may, or may not trigger a continuing wage-price spiral (true inflation).

The second effect arises via policy responses, particularly the monetary policy response to the inflationary pressure. There is much debate about the relative importance of the two effects, especially in accounting for the early 1980s recession after the second oil price shock. Most studies suggest that the monetary policy response was the most important reason for that recession. In the US, interest rates were raised to curb inflation – the 'Volcker shock'.

The key reason for the difference in the period 2004-8 was that inflation and inflationary pressure was low. In the OECD, most countries were experiencing what has come to be called the 'great moderation', and were practising some form of inflation targeting – implicit, rather than explicit in the US. In such a regime, it is the task of the authorities to 'see through' or ignore the level effect on prices whilst standing ready to raise interest rates if there is any sign that second round effects, on inflation expectations and/or wages are coming through. These effects were absent during the recent oil price rise, so there was not reason for monetary policy tightening – which would have slowed world growth. Indeed, one can go further. With inflation under control (i.e. in the absence of second round effects), it is the task of the monetary authorities to offset any downward effects on expenditure and demand arising from the oil price rise. Essentially, monetary policy, far from tightening in response to an oil price shock (the situation in the early 1980s) could actually be offsetting - directed towards maintaining growth and employment.

Macroeconomic policy in the recovery

During the price rise, markets operators appear to have learned that that oil price rises had ceased to 'shock'. But what about the recovery phase, with oil prices again exceeding $100? The same analysis suggests that oil price rises would, under current circumstances have a downward effect on growth. This is not because of inflation – inflationary pressure in the OECD is very low. But the fiscal effect – reducing real incomes as a result of commodity prices - is being felt everywhere. In normal circumstances, this would be offset by monetary ease (lower interest rates) and possibly, by fiscal policy as well. But, in most of the OECD interest rates are at their lower bound. And the fiscal crisis means that fiscal offsets are more or less impossible as well. Offsetting policies are impossible because the authorities have no instruments that they can use.

The situation is very different in emerging countries, such as China, India, and Brazil. With rapid recovery, their problem has been inflation – leading to monetary tightening until recently. The demand lowering effects of commodity price rises should, in principle, mean that monetary policy can be looser. But against this is the very real possibility of second round effects on expectations and nominal wages. Interestingly, some countries, notably Brazil, have lowered interest rates in the face of high oil and other commodity prices – the classic 'offsetting' response.

Could further oil price shocks trigger recession in the OECD? The answer is yes, but for a different reason than in the early 1980s recession. Then, the problem was inflation, and the policy response.

This time it is different - the problem is the lack of policy instruments to offset downward shocks to demand stemming from commodity price rises. And would lower oil and other commodity prices support recovery in the OECD? Again, the answer is yes. Some of the stabilising feedback from the world economy to oil prices is back.

Indeterminacy: what are the 'fundamentals'

During the rise in oil prices up to 2008, the whole futures curve moved up in roughly parallel shifts. In effect, prices in the short and long run became jointly determined. This strongly suggests extreme uncertainty about what the medium or long term fundamental price actually is – leading to a kind of indeterminacy, at least within a broad range. The lack of feedbacks that this paper has pointed to meant that answers to the question 'what would happen if oil prices were (say) $20 pb higher or lower' was essentially 'not much'. This is a situation where drifts, or bubbles and other self-fullfilling processes can easily occur.

The situation changed markedly with the recession (actually, the break was rather late – July 2008). Notably, spot prices tumbled to below $40 pb at the turn of the year 2008 and into 2009. They were supported by anticipated and actual cuts in production by OPEC members. Interestingly, longer term futures prices held up even as the spot price fell, never falling much below $70 pb even in the most gloomy phase of the crisis. The result was a staggering degree of contango during the early part of 2009. One interpretation is that, by this time, the anticipation of high oil prices into the future was already well-established.

5. Pricing and the market

Speculation versus fundamentals

The sharp swing in oil prices, especially during the upswing, have polarised views between those that emphasise changes in the fundamentals, and those that see the volatility and apparent indeterminacy as arising from speculation and the increasing role of financial players. The development of theoretical and empirical models of the effect of financial players in asset price booms and slumps has not helped much in resolving the question of the impact of speculation in the case of oil and other energy markets. Nevertheless concern about the impact of speculation has pushed many governments towards tightening the regulation of commodity derivatives markets. (See Fattouh, 2009, for a review of the literature, and Turner et al, 2011).

Oil price movements and coordination

Given that oil prices in the short run can, as seen recently, clear within a wide band, price changes can be influenced by a wide variety of public signals about fundamentals, or expectations of fundamentals. Equally importantly, prices are influenced by traders' expectations of other players' expectations or beliefs, or more generally by beliefs about how other players will behave. This carries some of the intuition of Keynes' beauty context metaphor (which he applied to stock prices), where traders are motivated to guess other players guesses to benefit from short term movements in price. The price itself may be detached from the fundamentals. Another, related approach is to see oil prices as arising from the outcome of a coordination game. (See Morris and Shin, 2003). Public signals can have a disproportionate effect on outcomes. This heuristic immediately explains

an important feature of oil markets – the tendency to focus on only a few stories at a time. It is impossible to coordinate on a large number of public signals.

Such a framework also helps to explain the marked change in pricing behaviour that occurred during the recovery phase. In line with the stabilisation of expectations about the world recovery (and the dominant story) as well as the developing view that the oil market would be unable to function in a relatively low price environment, the disequilibrium (and contango) was removed by a rise in spot prices towards the longer term futures price. In contrast to the situation during the upward rise in prices, the futures price remained relatively stable. The market appeared to be looking for a focal point. Political statements – eg by Gordon Brown and Nicolas Sarkozy (2009) – called for a target price range 'based on a clearer understanding of the fundamentals … not so high as to destroy the prospects of economic growth but not so low as to lead to a slump in investment, as happened in the 1990'. It even appeared the US, concerned with other agendas such as energy security and climate change would acquiesce, or at least not object, to a relatively high price.

Similar signals came from major exporters. In a rare precedent, King Abdullah of Saudi Arabia indicated in a newspaper interview that he considered $75 to be a fair price, an intervention supported also by the Saudi oil minister. The result was a period of surprising stability, with the oil price remaining within an implicit target band of around $70-80 pb for more than a year. See Chart.

Such a coordination equilibrium is, however, inherently fragile. The price broke out in the upwards direction, before the Arab Spring, The Arab Spring no doubt also reinforced the upward movement. (For the timeline, see Chart). A counterweight, however, has been deteriorating prospect for the world economy (due to disappointing data, and especially the potential effects of the euro crisis. Most recently, the oil price seems to have settled in new band of around $110-120.

Could the price have coordinated on a different price range between October 2009 and October 2010? The answer is probably yes – there was nothing very special about $70-80. And what about the future? Does anybody know what price is justified by the fundamentals?

In all this, it may be objected that the dominant story is a story about the fundamentals – i.e. it is the fundamentals that are determining the price. But this would be to miss the point. The story still does not explain why the price is what it is. It could equally be $30 pb lower, or higher. And the story could change.

> 'But what if stories themselves move markets? What if these stories of over-explanation have real effects? What if they themselves are a real part of how the economy functions? .. The stories no longer merely explain the facts; they are the facts.' (Akerlof and Shiller, *Animal Spirits* (2009) p.54).

The stories that move the oil market are as much political as economic or technical.

Chart 5. The Oil price breaks away the implicit band. (Brent spot, $ per barrel)

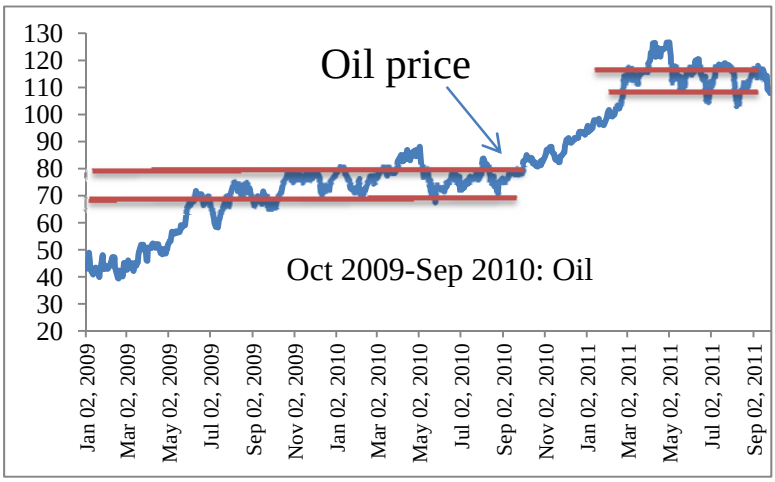
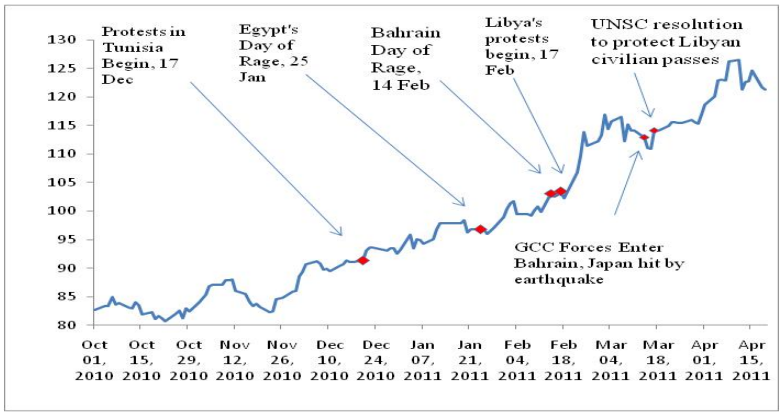


Chart 6. Geopolitical events and the oil price (Brent spot, $ per barrel)



6. Other energies

Much of the above has focussed on oil. In part this is justified since oil is a crucial part of the overall energy system. Outside North America, gas prices are still affected by (i.e. linked to) the oil price – though this is breaking down in Europe (Stern and Rogers, 2011). But even more importantly, many ot the factors that could affect the oil story are more general, such as policy towards the climate change agenda, or security or technology. Political developments are likely to have large effects, across the board. [Develop?]

It is worth returning, briefly, to the apparent dissonance or 'disconnect' between the realist position, and climate change agenda. Essentially the difference between the two positions is about policy – about what policies will be adopted and how effective they will be. If climate change mitigation is

taken as an imperative and policy makers are expected to succeed, the climate change perspective becomes the relist position. The problem at the moment is that appropriate policies are not expected to be introduced, and are not expected to succeed. The dissonance reappears and it is hard to tell a consistent story.

7. Concluding remarks.

This paper has emphasised two, rather different stories of inconsistency or indeterminacy affecting any assessment of future energy trends. On the one hand, there is the divergence between the climate change mitigation perspective and the realist perspective. They cannot both be right – and they have vastly different implications for the future pattern of energy supplies and demands. The tension between them has been heightened by new uncertainties over nuclear. On the other hand, is the story of high oil and other energy prices, backed up by a dominant story of high global growth and an absence of serious policy to curb the use of fossil fuels. This runs into the same inconsistency.

High oil and other energy prices are often 'justified' by the proposition that they encourage the development of renewables. But they could also, via a number of routes, encourage the use of coal. (Unless coal were taxed).

In all this, there is a version of the green paradox (Sinn, 2008). This is the proposition that the successful deployment of renewables could actually encourage the use of fossil fuels. One obvious route would be that such a policy could lower oil prices. Sinn goes further suggesting that producers, faced with the prospect of stringent policy could actually accelerate extraction, making things even worse. Essentially the root of the problem is this. From a climate change perspective, the world needs stranded oil and other hydrocarbons. Producers will obviously resist. And some production is at very low cost.

There are ways round this, but they are not easy. Moreover, as climate change concerns rise, there is almost bound to be a struggle over the vast rents involved in resource extraction between producers and consumers. Not to put too fine a point on it, consumers would much rather maintain high prices (e.g. for oil) by taxation, than by handing the rents to the producers.

Finally, there have been large changes in the price of energy in the last decade and large changes in relative prices. If they persist, the future is quite unlikely to be like the past.

References

Akerlov, G. A. and Shiller, R.J. (2009), *Animal spirits: How HumanPsychology Drives the Economy, and Why it Matters for Global Capitalism,* Princeton University Press, NJ.

Allsopp, C. J., and Fattouh, B. (2011), 'Oil and International Energy', *Oxford Review of Economic Policy.* 27(1), 1 – 31

BP (2011), *BP Statistical Review of World Energy*

EIA (2010), *International Energy Outlook, 2010,* Washington DC. Energy Information Administration.

EIA (2011), Annual *Energy Outlook, 2011 with Projection to 2035,* Washington DC. Energy Information Administration.

Fattouh, B. (2009) 'Oil Market Dynamics through the Lens of the 2002-2009 price Cycle', Oxford Institute for Energy Studies, WPM 39

Geny, F. (2010), Can Unconventional Gas be a game Changer in European Gas Markets?' OIES NG46, Oxford Institute for Energy Studies, available at http://www.oxfordenergy.org/pdfs/NG46.pdf

Hamilton, J.d.(2009) 'Causes and Consequences of the Oil Shock of 2007-2008', NBER Working Paper 15002, May.

Haug, M. (2011, 'Clean Energy and International Oil', *Oxford Review of Economic Policy*, **27** (1) , 92-116.

Helm, D. R. (2011), 'Look to Gas for the Future', *Prospect*, 24 March.

IEA (2010), World Energy Outlook 2010, International Energy Agency, Paris.

Jain A., and Sen, A. (2011), 'Natural Gas in India: An Analysis of Policy' Oxford Institute for Energy Studies, Working Paper NG 50, May.

Rogers, H, (2011), 'Shale Gas – the Unfolding Story', Oxford Review of Economic Policy **27** (1), 117-143.

Segal, P. (2007), 'Why Do Oil Price Shocks No Longer Shock', Oxford Institute for Energy Studies, WP 35.

Segal, P. (2011), 'Oil Price shock and the Macro Economy', *Oxford Review of Economic Policy,* 27(1), 169-85.

Sinn, H. (2008), 'Public Policies Against Global Warming: A Supply Side Approach', *International Tax and Public Finance,* **15,** 360 – 94.

Stern, J., and Rogers, H. (2011), 'The Transition to Hub-based Pricing in Continental Europe', Oxford Insitute for energy studies, Working Paper NG49 March.

Turner, A., Farrimond, J., and Hill, J. (2011), ' The Oil Trading Markets, 2003-10: Analysis of Market Behaviour and Possible Policy Responses', *Oxford Review of Economic Policy*, **27** (1), 33- 67