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The oil shock of 2005

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During the course of 2005, the price of crude oil reached unprecedented high levels, at least in nominal terms. Australian motorists have become used to paying more than a dollar a litre for petrol. Given the past volatility in oil prices, often described in terms of a series of oil 'shocks' (the large price increases in 1973, 1979 and 1999), several questions arise.

First, will current high prices persist, or will prices decline substantially as occurred after previous oil shocks? Second, is the current shortage of oil a temporary phenomenon, caused by inadequate investment in oil exploration, drilling and refining capacity, or is it a signal that the supply of oil available to the world has peaked? Third, will high oil prices lead to broader economic disruption, as is commonly supposed to have happened after previous shocks? Fourth, how painful will an adjustment to lower use of oil be? Finally, how does all this relate to our efforts to deal with the problem of climate change? This article is an effort to answer some of these questions in the light of the knowledge available to us.

MOVEMENTS IN PRICES

The price of oil is typically quoted in $US/barrel, for some specific grade of oil such as West Texas light sweet crude. This need not be an accurate indicator of the cost of oil in general, because of variations in the purchasing power of the US dollar and because the relative prices of different types of oil fluctuate. Figure 1 shows US Crude Oil refiner acquisition costs for 1968–2004, in nominal terms and in real (2000) US dollars. The pattern shown in the graph is broadly descriptive of actual movements in the crude oil market, though the most recent peak is exacerbated by the devaluation of the US dollar between 2002 and 2004.

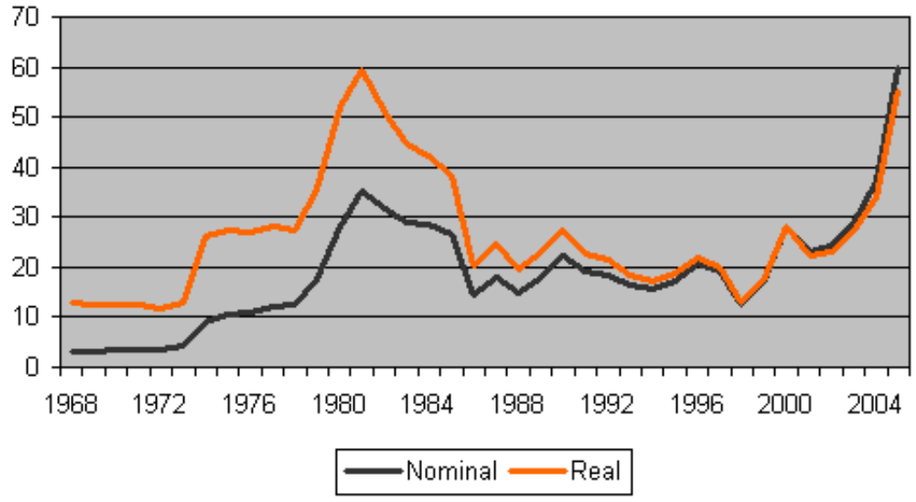
The price of oil has fluctuated widely over the past 50 years. Before 1973, prices were effectively dictated by a buyers' cartel of major global oil companies (the so-called 'Seven Sisters'). The first 'oil shock' occurred when members of the Organisation of Petroleum Exporting Countries (OPEC), acting partly in response to the United States' support for Israel in the 1973 Yom Kippur war, agreed to control oil supplies and raised prices fourfold.

Although this 'shock' was commonly interpreted in geopolitical terms, similar developments were taking place in other commodity markets, reflecting a general upsurge in inflation that had been developing since the late 1960s, and particularly since the breakdown of the Bretton Woods system of fixed exchange rates in 1971 and 1972.

Oil prices stabilised in the late 1970s, before rising to a new peak with the outbreak of war between Iraq and Iran in 1981. The peak was short-lived and prices generally declined in real terms over the next twenty years, with the exception of a brief upturn associated with the 1991 Gulf War. By 1999, the oil price fell as low as $13/barrel, equivalent in real terms to the price prevailing before 1973.

Prices began to recover in 2000, initially responding to cutbacks in OPEC output and then to strong global demand, particularly from the United States and China. The price of $60/barrel currently prevailing, and expected, on the basis of futures prices, to persist through 2006, is well above that observed for most of the period and comparable only to the short-lived peak of 1981.

Figure 1. Crude oil refiner acquisition costs, 1968-2005, Price per barrel*



* Nominal prices in US dollars per barrel. Real prices are in chained 2000 US dollars.
Source: Energy Information Administration (2004, p. 173), with an estimate from the author for 2005.

THE PEAK OIL HYPOTHESIS

Oil is the classic example of an exhaustible resource. Whenever the price of oil rises sharply, then, it is natural to ask whether this is a mere market fluctuation or an indication of the impending exhaustion of the resource.

In general, predictions of resource exhaustion have proved to be baseless or at least premature. Scarcity has been met by new discoveries and by improvements in resource technologies that have made it economic to extract resources from sources that were once considered valueless.

The most notable case was that of the Club of Rome in the 1970s, which presented estimates based on a comparison between existing reserves and extrapolations of growing demand. In the case of oil, the estimate of 'proven' reserves in 1973 was 577 billion barrels. The Club of Rome pointed out that given projections of growing use, reserves would be exhausted by the 1990s.

Obviously, this projection was not realised. In part, the demand projections were overestimates. The economic slowdown from the 1970s onwards meant that the actual rate of growth was slower. Nevertheless, between 1973 and 1996, total usage was around 500 billion barrels, nearly as much as the total 1973 reserve. Yet at the end of the period, estimated reserves had actually grown to over 1,000 billion barrels. This is a pattern that has been repeated for many other commodities, and should give pause to any advocate of the exhaustion hypothesis.

Yet there are good reasons to take the hypothesis of resource exhaustion seriously, a point made by a growing band of geologists and others. Their key exhibit is the Hubbert curve, named for its proponent, geologist King Hubbert, which is supposed to show that oil output from a field should peak about 25 years after discovery. The big success for the Hubbert curve was Hubbert's 1956 prediction of the peak in US oil output around 1970. Hubbert's model, applied to the major world oil fields, implies that world oil output should have passed its peak a year to two ago. This application of the Hubbert curve is commonly referred to as the 'Peak Oil Hypothesis' or the 'Hubbert Peak'.

The Peak Oil Hypothesis is controversial, to put it mildly. On the one hand, its supporters are a vocal group including some prominent geologists, with a large and somewhat cult-like following. On the other hand, most official agencies notably including the US Geological Service, have been dismissive, and arguably complacent. The current period of high prices and short supply is consistent with predictions of the Hubbert Peak.

A central problem in assessing future supplies of oil is the assessment of reserves. Until the 1990s, estimates of reserves were generally conservative to begin with, and were revised over time as knowledge improved. It was this fact, rather than major new discoveries that allowed the combination of growing output and increasing reserves that confounded the Club of Rome projections.

In recent years, however, downward revisions to estimated reserves have become commonplace. The Shell company has been the most notably affected so far, being forced to announce a series of downward revisions in estimated reserves. But there have also been suggestions of similar problems in many other oil-producing countries, either because reserves have been overstated for political reasons, or because fields

have been mismanaged.

Of course, some fields are still expanding. Possible developments in the Timor Gap and deep-water prospects in the Gulf of Mexico are examples. But the very fact that such marginal prospects are being explored is an indicator that oil companies expect high prices to persist.

Then there is the possibility that oil can be economically extracted from sources such as shales and tar sands, which contain vast quantities of oil, but have proved too costly to process. Some promising results have been reported recently from Canadian tar sands. On the other hand, the abandonment of plans to develop the Stuart oil shale deposit near Gladstone in Queensland is an indication of the difficulties with these sources.

THE ECONOMIC IMPACT OF OIL SHOCKS, PAST AND PRESENT

The oil shocks of 1973, 1981 and 1991 all coincided with recessions in the United States. In these circumstances, it is not surprising that the recent increase in the price of oil should raise concerns about the possibility of a new recession In reality, however, the significance of the relationship between oil prices and macroeconomic activity has been overstated.

The importance of oil to the economy was always overstated in popular accounts, and is now quite modest, around three per cent of GDP assuming a price of $50/barrel. Even the energy sector as a whole is of modest importance, accounting for six to eight per cent of GDP. Even a large shock to such a sector is not going to reduce GDP by more than a few percentage points, less than the impact of a moderate recession. More importantly, causality mostly runs from the macroeconomy to oil prices rather than vice versa.

The responsiveness of oil prices to macroeconomic shocks is clear in the case of the original 1973 oil shock. An inflationary upsurge was well under way by the time OPEC oil ministers met in October 1973. Wage and price controls had been imposed in the United States in 1971, but had broken down by early 1973—the oil shock merely administered the *coup de grace*, leading to the final abandonment of controls. Prices of all kinds of commodities were skyrocketing, and monetary policy was being tightened in response, making a decline into recession inevitable. Because of the cartelised nature of the oil market, oil prices responded with a lag, just as the world economy was beginning its downturn.

Similarly the 1981 recession was caused by the Volcker credit squeeze, when interest rates were increased sharply, with the objective of ending an inflationary spiral of which rising oil prices were a symptom rather than a cause. The 1991 shock, only a blip in downward trend, also occurred when a recession was already under way.

A very similar analysis applies to the current period. Although the limits to supplies of oil imply that prices must increase in the medium term, the fivefold increase in prices from $13/barrel to $65/barrel over the past five years cannot be explained in this way. Rather the increase is the product of booming demand in the United States and China, which can in turn be attributed to the expansionary monetary policy adopted by the US Federal Reserve in response to the dotcom crash and recession of 2000 and 2001.

ADJUSTING TO HIGH PRICES

Discussion of the peak oil hypothesis, both favourable and critical, is commonly presented in apocalyptic terms, as if reaching the peak implied that oil supplies will rapidly be exhausted, bringing an end to a technological structure dependent on energy. This is a misinterpretation of the Hubbert curve, which implies that output will gradually decline in the decades following the peak.

In any case, oil will never simply 'run out'. As the supply of any commodity declines, prices increase and, for relatively low-value uses, the costs exceed the benefits. Where they are available, lower-cost substitutes become more attractive.

Before the 1973 increase in prices, oil was commonly used as fuel in electricity generation and home heating. Following the increase in prices, most oil-fired power stations were converted to gas or coal. Where natural gas was readily available, the same was true of home heating. The relevant question then, is not whether oil will run out, but whether it will become so scarce as to be uneconomic in its main uses, the most important of which is as fuel for motor vehicles.

To answer this question, it is necessary to consider how costly it would be to reduce oil usage while maintaining a transport system broadly similar to that we have today. Provided the reduction in usage takes place over a sufficiently long period, say twenty years, the answer is 'surprisingly cheap'. There are many ways in which consumers can adjust to higher fuel prices so as to reduce their usage of oil.

Some of these adjustments may occur rapidly. For example, an increase in petrol prices may cause some

drivers to take fewer trips or switch to public transport. But the full effects will only be felt over a span of decades. Assuming higher prices are sustained, car buyers will switch to more fuel-efficient models (which manufacturers will have an incentive to develop), and homebuyers will seek locations closer to work. The car fleet turns over in about twenty years, and the housing stock takes even longer.

Economists measure such responses in terms of the price elasticity of demand, which measures the proportional change in the quantity demanded in response to a given increase in price. An elasticity of 1 means that a 10 per cent increase in prices will lead to a 10 per cent reduction in the quantity demanded. The higher the elasticity, the bigger the quantity response.

Econometric studies of energy demand tend to show a low elasticity. But the 'long run' in such studies is typically only five years. The important responses to changes in energy prices are slower than this, suggesting that if the long run is measured over decades, energy demand will prove to be elastic.

A standard economic calculation suggests that if carbon-based fuels account for about 8 per cent of GDP at current prices, and the price elasticity of demand is greater than one in the very long term, a doubling of the effective price of oil will eventually produce a reduction in demand of 60 per cent, at a welfare cost of around three per cent of GDP or one year's economic growth. This is consistent with the macroeconomic estimate noted above, and would not be noticeable against the background noise of normal economic fluctuations over a period of twenty years or more.

CLIMATE CHANGE

The present increase in energy prices is occurring against the background of climate change caused primarily by the burning of fossil fuels. To the extent that higher prices cause reductions in energy use, this is all to the good as far as the preservation of the environment is concerned. However, since the current higher prices are themselves the result of increasing demand, the reduction in demand they produce is merely a partial offset to this increase.

On the other hand, our recent experience shows that a substantial increase in energy prices does not have a large macroeconomic impact. The Australian and world economies have continued to grow steadily, and, if growth does come to an end, it will be due to macroeconomic imbalances, such as inadequate saving and the associated current account deficits.

It follows, that we could, if we chose, increase the price of fossil fuels over time, and drastically reduce consumption, without suffering noticeable economic damage. This implication is consistent with the results of economic modelling. It is however, inconsistent both with the fears raised by fossil fuel industry lobbyists and with the hopes of some in the environmental movement who see reductions in energy use as leading to the end of industrial societies as we know them.

CONCLUSION

The HitchHiker's Guide catchphrase DON'T PANIC seems appropriate here. Oil output may well be at or near its peak level, and oil prices are likely to remain high for the foreseeable future. But adjusting to changes in relative prices is what market economies do best, at least when adjustment is supported by coherent and well-designed public policies. There is no reason we cannot adapt to reduced use of oil and other fossil fuels while maintaining and improving our standard of living. Even if the current shock proves temporary, such a reduction is necessary if we are to respond effectively to the challenge of climate change.

REFERENCES

Energy Information Administration 2004, *Annual Energy Review 2004*, United States Department of Energy Report No. DOE/EIA-0384, Washington DC [Online], Available: http://www.eia.doe.gov/emeu/aer/ [2005, Nov 17].

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