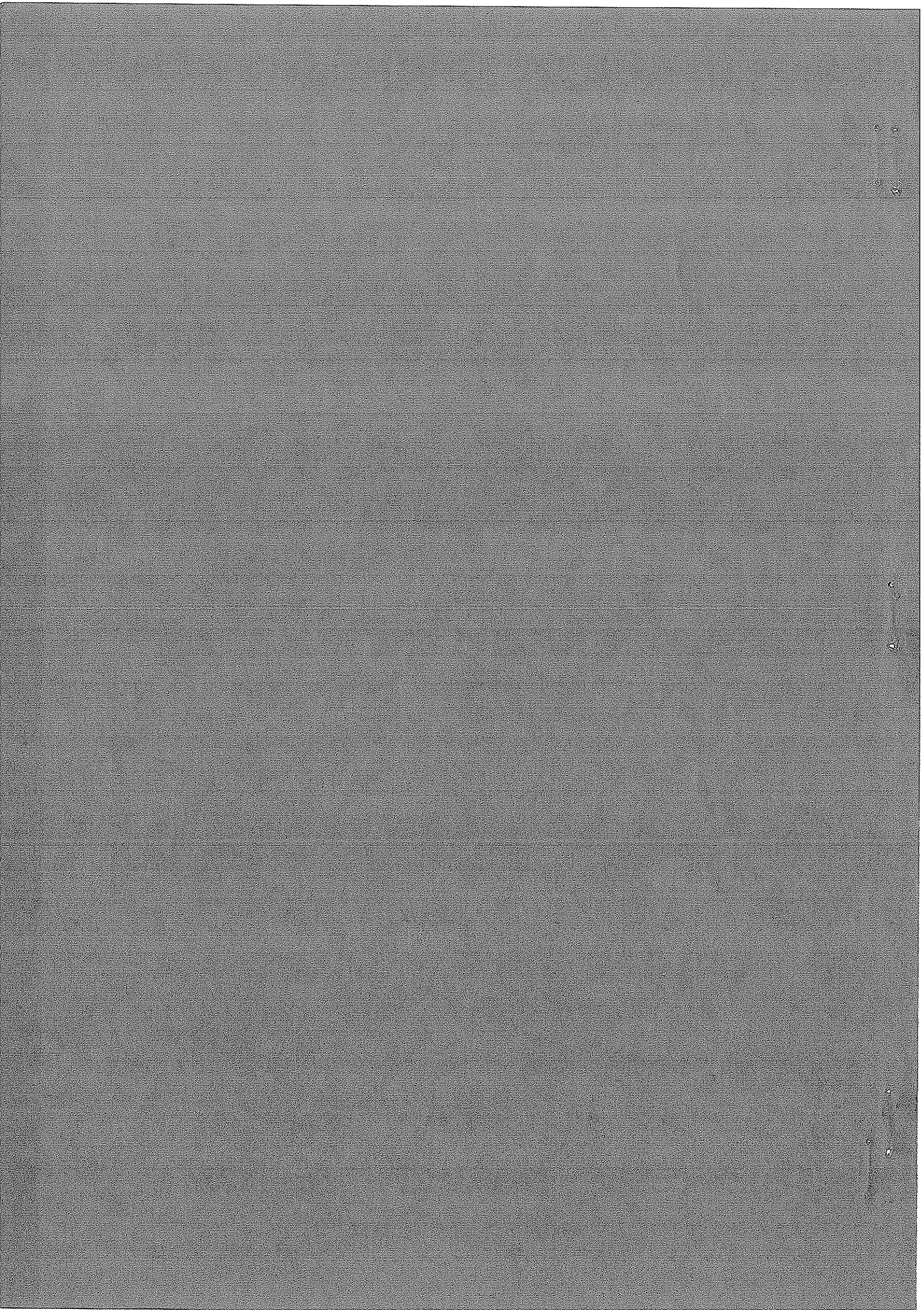


THE FUTURE OF CRUDE OIL PRICES

Colin Robinson

ECONOMICS
DEPARTMENT



THE FUTURE OF CRUDE OIL PRICES

Colin Robinson

Revised version of paper presented

at

BIEE/IAEE Annual Conference

Cambridge, June 1982

THE FUTURE OF CRUDE OIL PRICES

1. Introduction

It never is a good time to try to assess the future trend of crude oil prices, but the present can be regarded as particularly difficult. It is nine months since the official price of light Arabian "marker" crude was fixed at \$34 per barrel f.o.b. Since then, although the official "marker" price has been maintained, differentials in favour of the higher-priced crudes have been reduced and in the spot market light Arabian dropped as low as \$28 in the early months of 1982 before recovering to just below the official price by mid-June and then varying in the \$31 to \$33 range. There is considerable uncertainty not only about what crude oil prices may be in the future but even about what they are now.

In such circumstances, a discussion of possible crude price trends in the 1980s and 1990s might seem a foolish venture. One should also be mindful of how unsuccessful some past efforts at oil price prediction have been. Nevertheless, energy forecasts and plans have to use assumptions about oil prices so it is clearly important to reduce the region of uncertainty as much as one can. Obviously attempts at single line "forecasts" are of no interest in such an uncertain market, and indeed are likely to be more misleading than helpful, but we need to try to define a reasonable plausible range within which crude prices can be expected to lie. Plans to exploit indigenous coal reserves, to construct nuclear power stations and to invest in renewable energy forms are very sensitive to what one assumes about the price of the fuel which still supplies over 40 per cent of the world's energy. Real GNP growth rates may also vary according to the rate of change of real oil prices.

There are two things this paper will not do. It will not set out the results of yet another model of the world oil market; anyone who wishes to

read what results can be obtained from existing models can find them, for example, in a recent Energy Modelling Forum¹ report. The paper will try to use economic analysis to identify key relationships, to indulge in some simple quantification and to demonstrate the uncertainties which abound. Second, the paper will not attempt to deal with oil prices to the consumer. In the 1970s and early 1980s, the export price of crude oil rose much faster than consumer prices: the crude price rise was very considerably damped by depressed tanker freight rates, by comparatively small increases in refining, marketing and distribution costs and by tax increases on oil products which were also small relative to the crude price increase. It may well be that in future consumer prices will continue to move differently from crude prices. Perhaps for a time we shall see product prices to the consumer rising faster than crude prices (as they have been doing in Western Europe recently): the oil companies now seem to have little alternative but to try to make downstream operations profitable in their own right to the extent that competition allows, and governments may increase product taxes in real terms for revenue reasons and to sustain conservation incentives. So crude oil export prices, though clearly very important, are only one of the determinants of the price paid by the oil consumer.

2. Past trends

Since understanding of the past is a necessary (though not sufficient) condition for successful forecasting, we can best begin by examining the history of price changes in the world crude oil market. For this purpose 1950 is a convenient starting point so as to cover the relatively long period of comparatively steady world economic growth from 1950 to 1973 - during which real GWP was rising at an average annual compound rate of some 5 per cent - as well as the more turbulent recent past.

Table 1 gives some estimates of world crude oil price trends from 1950 onwards, using the light Arabian "marker" as an example. The first column shows the "posted" (tax reference) price of light Arabian up to 1974 and the official sales price from 1975 onwards. Column two converts the prices into real terms, using as a deflator the United Nations index of unit values of world exports of manufactures. There were changes in the UN index during the period considered but successive indices have been linked, ignoring the changes, since the intention is merely to give a broad idea of how much a barrel of oil would buy in terms of manufactured imports in any given year. The trend of real oil prices is downwards both in the 1950s and, more strongly, in the 1960s. Then in the 1970s there is the massive jump which raised the 1981 annual average real crude price to over six times the 1970 annual average. Examining the table more closely, we can see that two step increases in real prices occurred, from 1973 to 1974 and from 1979 to 1981. Between the two steps there was little net change in the real price of crude.

Table 1 does not reveal the full story for two reasons. First, in the 1950s and more especially in the 1960s discounts on posted prices tended to increase; thus the true real price trend was more firmly downwards than Table 1 suggests. Second, because in some crucial years the price trend altered, the annual averages given in the table can be a little misleading. In a very imperfect attempt to correct both these failings, Table 2 illustrates some calculated rates of change over what seem to be the relevant periods at which we should look. Estimates of crude discounts in Adelman's "The World Petroleum Market"² have been used to arrive at the figures.

What Table 2 shows is that real crude prices were falling at about 2½ per cent per annum in the 1950s. Then in the 1960s as discounting increased, the rate of decline became steeper at about 4½ per cent per annum. By early 1970, the real price of crude oil was about half what it had been in 1950. However, from the second half of 1970 onwards (after the Libyans had enforced production

cutbacks for most of the companies operating there), real prices began to increase. Over the following eleven years they rose at the remarkable annual average compound rate of about 22 per cent. By late 1981 the real price was nearly ten times what it had been early in 1970. Taking the whole period, 1950 to second half 1981, the annual average compound rate of rise of real crude prices was about 5 per cent so that the real price late in 1981 was about five times its 1950 value.

How can one explain the dramatic change in oil prices? In the 1950s and more especially in the 1960s real oil prices were on a clearly declining trend; from 1970 onwards they rose massively, mainly in two big steps. The popular simple explanation, which regards OPEC as the villain of the piece, is entirely unconvincing since the Organisation was present in both periods. Nor is the view that oil price shocks have resulted simply from political events (such as the Yom Kippur War and the Iranian Revolution) convincing. But if we cannot explain the very different price movements of the 1960s and 1970s we have little hope of being able to discern what may happen in the future. We then need to see if our explanation of the period up to late 1981 can also explain the fall in prices from Autumn 1981 to Spring 1982.

At the risk of over-simplifying some complex issues, it seems that the principal elements of the explanation can be found within the standard economist's theory of resource depletion. This says, in essence, that oil producers will make decisions about producing marginal barrels or holding them back for the future according to whether they think oil in the ground is likely to be more or less valuable than money invested.³ In more technical terms, producers will compare expected rates of price appreciation (net of costs) with their discount rates. Oil companies producing in the Middle East in the 1960s probably had rather limited time horizons, because it is likely they anticipated partial or complete takeover of their producing operations

and thus their discount rates were higher than they would normally have been; they also subscribed to the general expectation of the time that real oil prices would remain approximately constant or decline for many years. The resulting coincidence of high discount rates and low price expectations seems to have resulted in a strong tendency to produce oil sooner rather than later, thus holding prices down. World oil output more than doubled between 1960 and 1970. However, as oil output grew rapidly, fears of future scarcity eventually emerged and price expectations changed from the late 1960s onwards. At the same time "host" countries with relatively long time horizons took over producing decisions and to them money in the bank began to look a poor proposition compared with the apparently excellent prospects of price appreciation if oil was left in the ground. There can have been few better investments than a barrel of oil left in the ground early in 1970, extracted late in 1981 and sold at a price ten times as high in real terms (with only a small increase in production costs). Though ex ante no one anticipated such huge increases, there is no doubt that in the early 1970s expectations of big price increases were formed - a common view was that crude prices would double or treble by the 1980s.⁴ These altered expectations were important determinants of the change from rapidly rising world production to constant or modestly increasing output. Enhanced price expectations coupled with lower discount rates gave a strong incentive to hold marginal barrels of oil in the ground. Thus supply behaviour altered. Producers' supply curves shifted to the left along demand curves which in the short-run, were very inelastic with respect to price and prices therefore rose sharply. Demand curves shifted too, because of reduced real income, but not by enough to avoid price increases induced from the supply side.

OPEC's role in the price increases of the 1970s seems generally to be exaggerated. Clearly, by the early 1970s its members had gained in confidence.

were anxious to lead a Third World crusade against "exploitation" and were both more willing and more able to exploit monopoly power than they had been in the 1960s. The 1973 Arab-Israeli war also provided an occasion for the Arab members of OPEC to take supply-restricting action. But in the 1970s OPEC had no formal output-sharing scheme, as a true cartel would have done. Perceptions of OPEC's power may well have been a significant factor in generating fears of scarcity in the early 1970s but the huge price increases which occurred would hardly have been possible had background economic forces (especially the change in price expectations) not been propitious. To put the matter another way, even with no OPEC, individual oil-producing countries would have had an incentive to cut output in the 1970s, thus raising prices sharply.

In the more recent past, OPEC as such seems to have had little price-increasing influence. Prices increased in 1979-80 mainly because of anticipated shortages and uncertainty - which revived expectations of higher prices in the future - resulting first from the Iranian revolution and subsequently from the Iran-Iraq war. As prices rose, OPEC appears to have done little more than meet ex post, to try to reach agreement on what the crude price actually was and what differentials should be from the light Arabian "marker crude," in somewhat confused market circumstances. Then, in late 1981 and early 1982, OPEC had the novel experience of trying to cope with a falling market which it did first by agreeing to reductions for some of the over-priced crudes and then by output adjustments by some of its members in an effort to stop prices from declining. There is little evidence from the last few years to support the popular view of OPEC as the price-maker in the world oil market. The behaviour of OPEC's dominant producer, Saudi Arabia, has in recent times been more influential than anything done by the Organisation itself. The Saudis clearly decided that, following the 1979-80 price explosion, further big oil price increases in the next few years would not be in their interests.

Political and economic ties with the United States and other industrial countries mean that Saudi Arabia has some interest in avoiding economic instability in the West, and the country's very large crude oil reserves induce caution in raising prices sufficiently to cause accelerated development of substitutes for oil. That is not to say that the Saudis wanted prices to drop quite as much as they did in the early part of 1982. Indeed in the second quarter of 1982 they had to cut output substantially to around 6 million B/D in an effort to maintain the price of their "marker" crude.

3. The Future of Prices

3.1 Discount rates and price expectations

It seems that a change in property rights which altered suppliers' discount rates and a change in price expectations because of anticipated scarcity were two fundamental factors which altered supply behaviour and subsequently demand behaviour and which help to account for the remarkable change in oil price trends between the 1960s and 1970s. If we assume that property rights will not revert to what they were in the 1960s, so that there is unlikely to be a substantial alteration in suppliers' real rates of discount, then we ought, in contemplating future oil prices, to begin by examining what has happened to price expectations. An important message from the experiences of the postwar period seems to be that the oil market is dominated by producer and consumer perceptions of events, rather than necessarily by what is actually happening. Particularly important at any given time is whether perceptions are of future surplus or scarcity since on that basis price expectations will be formed, and the behaviour of producers and of consumers will differ very significantly depending on their expectations of oil price movements. For example, belief in future

scarcity with associated price expectations will, ceteris paribus, cause producers to reduce planned output. Consumers will, in the short run, try to increase stocks because they expect prices to keep increasing and so they will add to the pressure of demand, though in the longer term, they will switch away from oil, thus tending to depress prices.

It is plainly hazardous to generalise about price expectations, but there is surely no doubt that they have been very considerably damped in the last two years or so, which is as one would predict given the second step change in prices from 1979 to 1981 and the subsequent accelerated move away from oil (of which more later). In a 1975 paper⁵ I suggested that the oil market would begin to change as price expectations altered and that the change might come sooner than anticipated by those people who thought large amounts of non OPEC energy had to be available before the market changed. I argued that "Expectations could alter long before new supplies come to market...", that "...the most likely change to expectations in the near future concerns the producers' view of the future rate of price appreciation..." and that "It seems inevitable that the price elasticity of demand for OPEC oil will increase as energy-saving measures and the drive to develop non-OPEC energy forms take hold".

In retrospect we can see that price expectations were beginning to change in the mid 1970s when there was a period (1976-78) of declining real crude oil prices but that two political events - the Iranian Revolution and to a much lesser extent the Gulf War - upset those expectations and revived fears of supply insecurity and future scarcity. As it has become clear that consumers are moving away from oil, as recession has deepened and as the supply reduction has been absorbed, expectations have again altered however. Indeed, they apparently changed very sharply in the early months of 1982 when a number of people argued that oil prices might remain depressed or continue to fall throughout 1982-83

and possibly for longer. Those views may or may not turn out to be correct but they contained elements both of wishful thinking and of attempts to talk the price down so as to institute a change in price expectations. Moreover, they revealed a very common feature of comment on oil market trends - the undue weight placed on very recent experience which sometimes expresses itself in projections for years ahead based on a few weeks' experience. Because prices had been falling it was assumed they would fall further, just as in the 1970s there were incautious statements about prices rising for ever. However, not all statements about oil prices are translated into general price expectations and the rather exaggerated views expressed early in 1982 seemed to have moderated by the middle of the year: to the extent that they were based on projections of recent experience that was bound to happen as prices moved up off their floor in Spring 1982.

3.2 Unlikely change in prices

In contemplating future prices and price expectations there are some kinds of changes we can probably rule out. It is as well to go through this elimination process because it should help to reduce the area of uncertainty about future oil prices. First, a repetition in the 1980s and 1990s of the huge real price increases of the 1970s seems very unlikely. Those increases should probably be regarded as a sharp once-for-all upward movement which the world economy is still attempting to digest by reducing its oil intensity. After the big upward steps in prices in the 1970s and given the development of substitutes for oil, we can probably assume that oil consumption is more elastic with respect to price than it was at the price levels of the early 1970s. Not only has the demand curve shifted leftwards because of income and other changes, it has also flattened. To that extent, consumers are more resistant to price increases than they were. Moreover, as suggested above we no longer have the well-formed expectations of future scarcity and sharply rising oil prices which

existed in the 1970s and were themselves extremely important elements in the large price increases which occurred.

We can also probably rule out any kind of smooth change (upwards or downwards) in crude oil prices. The oil market has in recent times swung from surplus (1977-78) to scarcity (1979-80) and back again (1981-82) and it is probably realistic to anticipate further such swings. Fluctuations in the oil market are reminiscent of the inventory cycle which economists believe helps to magnify changes in real GNP. Let us postulate as a starting point some event in the oil market which causes expectations of scarcity and thus of rising prices. Given the experiences of the 1970s such an event - which might be a revolution in an oil-producing country, a spurt in economic growth, or possibly just a very cold winter - will probably cause a scramble for supplies. Added to the demand from consumers will therefore be a demand for oil for inventory, so that demand on the oil producers increases sharply for a period as storage tanks are filled and tankers steam more slowly. Supply may also be restricted as producers see some advantage from holding off the market to take advantage of higher expected prices. The rate of addition to inventory must, however, decline as physical limits of stock holding come near. Demand on the producers will then fall and price expectations will also tend to come down. At some stage stock holders will then compare the poor prospects for price appreciation with the interest and other costs of holding inventories and decide to reduce those inventories, thus depressing demand on the producers below the level of final consumption. By this time the producers will be concerned about their falling revenues as prices drop, and will start fighting for market share thus depressing prices still more. The price fall will, however, induce those consumers who can at the margin substitute oil for other fuels (such as large electrical utilities) to do so, oil demand will begin to increase, inventories will be re-built and the inventory cycle will eventually go into reverse, producing rising prices once more.

The above description is stylised but nevertheless appears to be consistent with recent experience. After the upswing in 1979-80 came the downswing in 1981-82. Presumably another upswing is somewhere around the corner - indeed it may be under way in the second half of 1982 - but unfortunately we do not see round corners very well so it is hard to anticipate the timing and the extent of the rise. Whether it will cause a relatively small increase in prices, or whether there will be larger rises because a 'natural' increase is augmented by faster economic growth and/or supply restrictions in the producing countries one cannot at present be sure.

Abstracting from the immediate issues, however, and contemplating the 1980s and early 1990s it does seem likely that there will continue to be considerable fluctuations in oil prices, output and consumption rather than the smooth trends which analysts sometimes build into their investment appraisals of energy projects. What trends we shall see is more difficult to determine but we can try to comment on some of the determinants of oil prices and oil price expectations.

3.3 Future oil consumption

The world energy market is now in the midst of the process of adjusting to greatly increased oil prices. Table 3 compares trends in world commercial energy consumption in the eight years before 1973 with corresponding trends in the last eight years. The rate of growth of world energy consumption has fallen from over 5 per cent per annum to less than 2 per cent per annum; oil consumption, which pre-1973 was rising at nearly 8 per cent a year, has hardly increased since 1973; gas consumption has also increased more slowly. Coal consumption, on the other hand, has been growing faster than previously and use of nuclear electricity (though still small on a world scale) has continued to increase rapidly in percentage terms.

There market changes are all consistent with what one would predict from knowledge of the sharp change in oil price trends and the rather less dramatic change in price trends for other fuels which occurred in the early 1970s. There are, of course, significant time lags inherent on the demand side and the supply side of the energy market⁶ which slow the adjustment process and probably result in price elasticities which are considerably greater in the long run than in the short run. It is, therefore, not at all surprising that energy market changes have been greater in the last two or three years than in the mid 1970s. Table 4 concentrates attention on the 1979-81 period to illustrate that world energy consumption fell slightly both in 1980 and 1981 and that in each of those years world oil consumption declined by 3-4 per cent.

In looking to the future we need to form some views on the likely direction of change of world oil consumption and the approximate magnitude of change. Unfortunately, no one can be sure of the relative strengths of the four main determinants of the fall in oil consumption since 1979:

- economic recession
- the structural shift in industrial countries away from energy-intensive activities (such as steel-making), so that the changing mix of activities makes for a less energy-intensive economy.
- the reduction in energy-intensity of any given activity which has reduced the potential market for oil
- within the energy used in any activity the fall in oil's share

Each of these changes is, to a greater or lesser extent, a consequence of the big increase in oil prices and the smaller increases in prices of other fuels. However, the second, third and fourth are likely to have caused some longer-lasting depression of oil consumption (by reducing the energy intensity and

especially the oil-intensity of economic activity) than the presumably more transient effects of recession. Though we do not yet have sufficient experience to do more than guess at the relative sizes of the effects, we can be fairly sure that though oil intensity has been reduced, oil consumption will, ceteris paribus, still be positively correlated with real GNP changes. That is, if one imagines a situation in which oil prices are expected to remain constant relative to prices in general and to other fuel prices, in which the effects of past oil price changes have worked through the system (which could take several years yet), and in which other non-income determinants of oil consumption also remain constant, then a change in real GNP in a given country would probably yield a change of the same sign in oil consumption.

Over the 1980s and 1990s as a whole, if real GNP increases in the industrialised world there may therefore be some tendency for oil consumption to rise, though that tendency will most likely be more than offset for a time by the lagged effects on consumption of past price increases even if real oil prices stay constant. Assuming that economic growth is only modest in the 1980s and 1990s the chances seem to be that we shall see some further fall in oil consumption in the industrial world, though there are circumstances in which the scale of any decline might be quite limited. In a recent analysis of future European energy trends⁷ George Ray and I suggested that oil consumption in Western Europe might fall by 12 to 14 per cent between 1980 and 1990. It was assumed that real oil prices would rise moderately (up to 30 per cent by 1990) though in erratic fashion. We did, however, qualify that assessment by pointing out that there may be even greater difficulties and delays than we had assumed with new fuel supply plans such as nuclear power plants, gas import schemes and coal mining projects; we said that, as a consequence, the fall in oil consumption might be constrained below our most probable estimate.

There is plenty of evidence that oil substitution projects are not going according to plan. Postponements or cancellations of coal liquefaction, coal

gasification, oil from shale and oil from tar sands schemes have recently been announced because of escalating costs, uncertainty about prices and doubts about government policies. A few years ago it seemed that such fuel sources might set an upper limit on oil prices, but the "upper limit" seems to be continually rising. Most of these oil substitution projects are suffering from technical difficulties. Moreover, they are themselves energy-intensive so that oil price rises are a mixed blessing, causing cost increases as well as rising prospective realisations. Nor is nuclear power a very effective competitor for oil in most countries because it has failed to win public acceptability; once plants under construction are (belatedly) completed there may be a period in which little new nuclear capacity is commissioned. Only strip-mined coal from low-cost regions (such as Australia, the United States and South Africa) and to a lesser extent natural gas seem capable of displacing substantial amounts of oil from the market. For all these reasons one needs to be cautious about predicting a further big decline in oil consumption even in an industrialised world where total energy consumption will probably increase only very slowly.

It is also important in considering future oil consumption not to become too obsessed with the Western industrial world. As Table 5 shows, energy consumption in North America, Western Europe and Japan was very little higher in 1981 than in 1973, whereas in the Communist world and especially the developing countries energy demand has continued to rise since 1973. Similarly, Table 6 illustrates that the near-constancy of world oil consumption from 1973 to 1981 is compounded of sharp falls in North America, Western Europe and Japan with continuing growth in the Communist bloc and the developing world. The share of the last two groups in world oil consumption is now over 40 per cent compared with about 30 per cent in 1973. Although one can see reasons why oil demand may rise less rapidly in both groups in the future - for instance, the debt problems which may restrict growth in some developing countries and

the increases in domestic oil prices which a number of oil-producing countries have imposed recently - a continued rise in oil consumption outside the Western industrial world does seem probable.

Estimating the net effect on world oil consumption of these contrary trends is very much guesswork. My own guess would be that some slight rise in world oil consumption is quite probable up to the end of the century, most likely occurring just as erratically as the oil price changes discussed earlier. One might perhaps suggest an area of uncertainty for the late 1990s ranging from a little below present annual world consumption of about 3 billion tonnes up to $3\frac{1}{2}$ or $3\frac{3}{4}$ billion tonnes - a growth rate of $1\frac{1}{2}$ per cent per annum at maximum from the present. Such figures are of course vastly different from the end-century oil consumption levels of about 9 billion tonnes which were being forecast in the early 1970s. The expected life of world oil reserves thus now looks very much longer than the trend-projectors of a few years ago imagined.

3.4 The supply side

On the supply side of the oil market there are some daunting uncertainties; experience in recent years should make us show a due humility in any comments about how oil suppliers may behave.

One factor which might be expected to increase the real price of crude oil in the long run is the rising cost of extraction from the more remote regions (such as the Canadian Arctic) into which exploration has moved. In a sense, such cost increases are "artificial" since there is probably a good deal of lower cost oil still to be found in the Middle East. Nevertheless, political events have moved the oil companies into high-cost areas of production and, unless one foresees a significant revival of exploration and development in the OPEC countries, the consequence is likely to be long run upward cost pressure on prices. Eventually rising costs may price oil out of all but the

uses where close substitutes are lacking (particularly transport) but that day is probably very distant - most likely well into next century.

The strength and cohesion of OPEC are popularly regarded as important supply-side influences on oil prices. For reasons already given (section 2 above), the power of OPEC seems to me to have been exaggerated. There are more fundamental variables we should be concerned about than whether the OPEC members will maintain their present imperfect union or whether the organisation will fall apart. Nevertheless, in looking to the future one might reasonably argue that OPEC, guided by Saudi Arabia, will probably have some supply-restricting influence in the sense that it may well succeed in setting a floor to oil prices when the market is tending to decline because some of its members will agree to cut production. We have seen recently that, when there is an oil surplus at existing prices, even though some members of the Organisation opt out of the cuts, provided Saudi Arabia and the others are willing to reduce output substantially it does seem possible to limit a price decline. Thus Saudi Arabia and some other OPEC members may be able to insert a ratchet effect into the market place: some time after a price increase a consequential surplus may start prices falling but the drop will then be constrained by reduced output. As a result the oil market cycle discussed earlier (section 3.2 above) may continue to be one with a rising floor.

Perhaps the biggest imponderable on the supply side is the extent to which there will be supply interruptions and sharp changes in output in major producing countries. It is quite possible to sketch a scenario which is optimistic (viewed from the oil consuming countries) of a world in which the major supply upsets are behind us. The Iran - Iraq War ends without serious spill over effects in the Gulf. Iran and Iraq both increase oil output, Saudi output rises from its present depressed level and in the longer term the Saudis decide to vary output to keep real oil prices constant or even slightly falling because they are concerned to avoid too quick a development of substitutes for oil. Such an outcome is certainly possible but I would place only a low probability on it. It is much too

close to an accident-free scenario for it to have much plausibility. The difficulty seems to me to be that we can see existing problems in the Middle East and the optimists among us even believe they can see solutions to some of these problems (such as the Gulf War). What we cannot so easily see are those problems which have not yet fully emerged but which may be very important influences on future oil supplies, especially from the Middle East. My own view is that, though we are not sufficiently far-sighted to perceive what the political future of the Middle East will be, there are sufficient sources of unresolved conflict in the area that our most probable expectation for the next ten to fifteen years should be that there will be further wars and revolutions, which are more likely to restrict oil supplies than to increase them. Apart from the continuing Arab-Israeli problem we have to consider what may be the long-run effects of an Iranian victory in the Gulf War. Indeed, there are various possibilities of internal revolutions and takeovers which could significantly reduce output in major producing countries. The oil market seems to me likely to remain sensitive, finely-balanced and very prone to supply uncertainties which in general will tend to promote expectations of rising prices. In other words, for some years yet we may never be far from what Shell have aptly termed "the region of vulnerability".⁸

4. Conclusions

Oil price predictions in the past have not been so strikingly successful that we can say anything with great confidence about how prices may move in the future. The opinion I would venture, however, is that if we try to form a judgment by looking at likely demand and supply influences the most reasonable conclusion we can reach is that expectations will in general be for real oil price increases and that real prices will probably rise in the 1980s and the early 1990s. The plausible scenarios seem to me to be those in which real oil prices fluctuate a good deal, but about a moderately rising trend. It appears likely

that occasional supply shortages (actual or perceived) and spurts of demand about a slightly increasing world demand for oil are likely periodically to drive up real prices in steps; though there will no doubt subsequently be some downward drift caused by inflation and discounting by producers, it would be surprising if the price floor and the price ceiling were not rising. In other words we may in the 1980s and early 1990s see several small-scale repetitions of the events of recent years. The average rate of increase of crude prices in the rest of the 1980s and in the 1990s is a matter about which, in all honesty, we can only speculate: I would take, as a working assumption, real annual average increases in the range 1 to 5 per cent per annum, though the upper end of the range does not at present seem very probable.

Therefore, although I have since 1973 argued that big oil price rises in the 1970s would turn out to be a temporary phenomenon (since the market would adjust and damp down the increases), I do not think we have yet reached the stage when we can reasonably anticipate falling or even constant real prices. In the long run we cannot expect oil prices to continue rising relative to the price level in general - if they were doing so the supply and demand shifts would be so large and the behavioural changes so great that the real price rise would cease. But the time lags in the system are sufficiently lengthy that the long run in this context may mean the late 1990s and early next century rather than the next ten years.

1. Energy Modelling Forum, World Oil: Summary Report, EMF Report 6, Stanford, California, February 1982.
2. M.A. Adelman, The World Petroleum Market, Johns Hopkins University Press, 1972.
3. For further explanation see R.M. Solow, The Economics of Resources or the Resources of Economics, American Economic Review May 1974, and Colin Robinson and Jon Morgan, North Sea Oil in the Future: Economic Analysis and Government Policy, Macmillan for the Trade Policy Research Centre, 1978, Chapter 2.
4. See, for example, James Akins, The Oil Crisis - this time the wolf is here, Foreign Affairs, April 1973.
5. Colin Robinson, Energy Depletion and the Economics of OPEC, Henley Centre for Forecasting, 1975.
6. More details are in Colin Robinson, Ahmed El Mokadem and Paul Stevens, The Future of OPEC Surrey Energy Economics Discussion Paper no.7, August 1981, pp. 6-10.
7. George Ray and Colin Robinson, European Energy Prospects to 1990, Staniland Hall, 1982.
8. J.M. Raisman, Oil-World Supplies and North Sea Development, address to "ANSWER" Conference, Brussels, March 1982.

TABLE 1

CRUDE OIL PRICES

ANNUAL AVERAGE F.O.B. EXPORT PRICE OF LIGHT (34° API)

ARABIAN CRUDE OIL, PERSIAN GULF

\$ PER BARREL

	<u>POSTED OR OFFICAL PRICE*</u>	<u>POSTED OR OFFICAL PRICE IN 1981 DOLLARS⁺</u>
1950	1.71	6.9
1955	1.93	6.9
1960	1.86	6.1
1965	1.80	5.5
1970	1.80	5.0
1971	2.20	5.8
1972	2.48	6.0
1973	3.29	6.8
1974	11.58	19.5
1975	10.72	16.1
1976	11.51	17.3
1977	12.40	17.1
1978	12.70	15.2
1979	17.26	18.1
1980	28.67	27.2
1981	32.50	32.5

* POSTED PRICE FROM 1950 TO 1974, OFFICAL SELLING PRICE FROM 1975 ONWARDS

+ DEFLATED BY UN DOLLAR INDEX OF UNIT VALUES OF WORLD EXPORTS OF MANUFACTURES

SOURCES: M.A. ADELMAN, THE WORLD PETROLEUM MARKET, JOHNS HOPKINS UNIVERSITY PRESS, 1972,
COLIN ROBINSON AND JON MORGAN, NORTH SEA OIL IN THE FUTURE, MACMILLAN 1978.
THE PETROLEUM ECONOMIST (MONTHLY), VARIOUS ISSUES
UN STATISTICAL YEARBOOK (ANNUAL) AND UN MONTHLY BULLETIN OF STATISTICS

TABLE 2

ESTIMATED ANNUAL RATES OF CHANGE
OF MARKET PRICE OF LIGHT ARABIAN CRUDE OIL

	% PER ANNUM, COMPOUND	
	<u>IN NOMINAL TERMS</u>	<u>IN REAL TERMS</u>
1950-1960	- 0.2	- 2.4
1960 - FIRST HALF 1970	- 3.0	- 4.5
FIRST HALF 1970 - SECOND HALF 1981	+33.3	+21.9
1950 - SECOND HALF 1981	10.0	5.2

FOOTNOTE : ASSUMED MARKET PRICES (INCLUDING DISCOUNTS)
IN NOMINAL TERMS ARE AS FOLLOWS (\$ BARREL)

	1950	1.71
	1960	1.67
FIRST HALF	1970	1.25
SECOND HALF	1981	34.00

SOURCES: AS TABLE 1

TABLE 3

WORLD ENERGY CONSUMPTION

	1965 M.T.O.E. OF TOTAL %	1973 M.T.O.E. OF TOTAL %	1981 M.T.O.E. OF TOTAL %	AVERAGE ANNUAL COMPOUND RATES OF INCREASE %
				1965-73 1973-81
OIL	1529 38.7	2798 47.3	2902 47.4	7.8 0.5
SOLID FUELS	1525* 38.6	1668 28.2	2007 29.3	1.1 2.3
NATURAL GAS	647 16.4	1076 18.2	1332 19.4	6.6 2.7
NUCLEAR	6* 0.2	49 0.8	191 2.8	30.0 18.5
HYDRO	242* 6.1	329 5.5	417 6.1	3.9 3.0
TOTAL	3949 100.0	5920 100.0	6849 100.0	5.2 1.8

* PARTLY ESTIMATED

SOURCE: BP STATISTICAL REVIEWS OF THE WORLD OIL INDUSTRY (ANNUAL)
AND BP STATISTICAL REVIEW OF WORLD ENERGY 1981.

TABLE 4
WORLD ENERGY CONSUMPTION

	MILLION TONNES OIL EQUIVALENT		
	<u>1979</u>	<u>1980</u>	<u>1981</u>
OIL	3124	3001	2902
SOLID FUELS	1991	2021	2007
NATURAL GAS	1255	1278	1332
NUCLEAR	155	167	191
HYDRO	<u>408</u>	<u>415</u>	<u>417</u>
TOTAL	6933	6882	6849

SOURCE: BP STATISTICAL REVIEWS OF THE WORLD OIL INDUSTRY
(ANNUAL)

AND BP STATISTICAL REVIEW OF WORLD ENERGY 1981

TABLE 5

PRIMARY ENERGY CONSUMPTION

	<u>1973</u> M.T.O.E.	<u>1981</u> M.T.O.E.	% CHANGE 1981/1973
NORTH AMERICA	2014	2028	+ 0.7
WESTERN EUROPE	1241	1241	0
JAPAN	348	354	+ 1.7
AUSTRALASIA	67	89	+32.8
USSR, EASTERN EUROPE AND CHINA	1590	2138	+34.5
LATIN AMERICA, AFRICA, MIDDLE EAST, SOUTH AND SOUTH EAST ASIA	660	999	+51.4
TOTAL	5920	6849	+15.7

SOURCE: BP STATISTICAL REVIEW OF WORLD ENERGY 1981

TABLE 6
WORLD OIL CONSUMPTION

	<u>1973</u>		<u>1981</u>	
	MILLION TONNES	% OF TOTAL	MILLION TONNES	% OF TOTAL
NORTH AMERICA	902	32.2	825	28.4
WESTERN EUROPE	749	26.8	630	21.8
JAPAN	269	9.6	224	7.7
AUSTRALASIA	35	1.3	36	1.2
USSR, EASTERN EUROPE AND CHINA	455	16.3	631	21.7
LATIN AMERICA, AFRICA MIDDLE EAST, SOUTH AND SOUTH EAST ASIA	389	13.8	556	19.2
TOTAL	2799	100.0	2902	100.0

SOURCE: BP STATISTICAL REVIEW OF WORLD
ENERGY, 1981

