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WHAT ARE THE OPTIONS FOR NON-OPEC PRODUCING COUNTRIES?

By

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ABSTRACT

This paper discuss medium- and long term strategies for non-OPEC oil producing countries highly dependent on petroleum revenues. First a picture of the international oil market of the 1990s is outlined. Then we look at the differences among oil producers and argue that some countries may have common interests in cooperation with OPEC in order to stabilize or increase prices. This may be interpreted as an insurance against a breakdown of OPEC. The benefits of cooperation from a Norwegian point of view is calculated. Finally, we discuss whether a cooperative strategy can be sustained.

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1. Introduction

When OPEC was founded in 1960 the main aim was to secure stability in oil prices. The first half of the life of the new organization took the form of a long battle between the national governments and the multinational oil companies to gain control over the oil resources and thereby the supply side of the oil market. It may seem paradoxical that stability in the oil price and in oil earnings has been much lower after OPEC achieved its supreme position in the world oil market than before. But then it was not only a question of stability, the real issue was the right to acquire the rent value of the vast low cost OPEC oil resources.

Few may in 1960 have had a realistic picture of the enormous growth in the world trade in oil and in the oil price that were to take place over the next 25 years. The ensuing history of the oil market is abundant in examples of how limited the ability to forecast the oil market has been. The future energy shortage depicted after OPEC I and the price scenarios worked out in the immediate aftermath of OPEC II are perhaps the most prominent examples. The price fall in 1986 has caused hardship in several oil producing countries, but it has also had a sobering effect on the future outlook for oil prices, perhaps to the extent of emphasizing a too pessimistic picture. Another prediction that up to now has been proven wrong is that OPEC would break down. OPEC has survived as an organization in spite of external pressure and extreme internal conflict.

The concept of non-OPEC oil exporting countries is of more recent origin than OPEC itself. It gained importance as more than a residual designation around the time when the OPEC oil production culminated reaching a level of 31.5 mbd in 1979 and it was clear that the reduced position of the OPEC in the oil market was due not only to reduced demand but also to sharply increasing non-OPEC oil exports. Among the non-OPEC oil producing countries, which foremost includes USA and USSR, a group of countries has emerged for which oil production is a major industry and oil export the major source of foreign currency, as it is for the OPEC countries. Today this group of countries consists of Mexico, Norway, Egypt, Oman, and

Malaysia. Some of these countries have a long-term interest in the importance of oil as a major source of world energy because their reserves are large relative to current production. This is particularly true for Mexico, Oman and Norway. The path of national economic development for these countries is tied both in the short run and in the long run to the level of oil revenues. In this regard the OPEC countries are themselves a rather inhomogeneous group. Only some of the OPEC countries - foremost Saudi-Arabia, Kuwait, Iran, Iraq, Libya and the UAE - have oil reserves that make it likely that oil will play a major role into the second quarter of the next century.

Mexico and Norway also have other similar aspects of their situation despite all differences in other respects. Both countries have vast natural gas resources and are situated near huge and expanding gas markets. Both countries are furthermore well endowed with the best source of renewable energy - hydro power. But of particular importance in the context of this workshop is the similarity in the relation to OPEC and the international oil market. Mexico and Norway are major oil exporting countries outside OPEC and both countries have pursued a policy of restraint in oil production after the debacle of the oil market in 1986.

The pertinent question is: what are the options in the medium term and the long term for Mexico and Norway as non-OPEC countries highly dependent upon petroleum revenues. This paper does not offer an answer to that question, it aims more at providing a proper background for discussing it. In what follows we first outline a picture of the oil market of the 1990s by means of an oil market model developed by the Central Bureau of Statistics. This picture cannot be drawn without some assumptions about the functioning of OPEC. We approach that by developing in addition to a reference scenario a low-price scenario in which OPEC has been weakened as a controlling force in the market. Then we look at the differences among oil producers and argue that the group of five countries mentioned above may constitute a group that might have a common interest in cooperation with OPEC. Cooperation here does not necessarily presuppose an explicit agreement. A tacit agreement on market behaviour supported by informal contacts might be sufficient. In section 4 we attempt to calculate the benefits of

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cooperation looking at it mostly from a Norwegian angle. Finally, we round off the paper by a discussion of whether a cooperative strategy can be sustained.

2. The oil market of the 1990s.

2.1 Model framework

Over the last 15 years strong fluctuations have taken place in the international market for crude oil, with the two oil price shocks in 1973/74 and 1979/80 and the sharp price fall in the winter 1985/86 as the most noticeable events. These price movements underline the overall uncertainty of this market, caused not only by technological and structural features of supply and demand, but also by institutional and political factors. Few - if any - econometric models have been able to capture the strong price fluctuations that have actually occurred in recent years. Nevertheless, a formal model can be a most useful tool when analyzing and discussing scenarios of the crude oil market, especially in a medium and long term perspective.

We shall for our purpose use an empirical model (Lorentsen and Roland, 1985) as an instrument to develop two scenarios for the international crude oil market. The simulations run to 2010, but the focus will be on the period until the turn of the century. On the demand side the model distinguishes between 3 regions: USA, other OECD countries (ROECD) and less developed countries (LDC). OPEC is singled out as <u>one</u> supplier, while the crude oil supply of non-OPEC producing countries is worked out by means of a separate submodel. No explicit dynamic optimization is undertaken by the various agents, and accordingly no "Hotelling rule" for the evolution of the oil price is obtained in the model solution. This is in line with the commonly held view that the traditional theory of exhaustible resources places too strong restrictions on future price trends. The model does, however, contain some simplified dynamic mechanisms both on the demand side and on the supply side in order to capture lag effects in consumption and exploration and

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extraction of crude oil.

Having discarded the theory of exhaustible resources we hasten to
add that in a sufficiently long run perspective of the oil market,
basic results from the theory cannot be neglected. In a long term
perspective, especially after a period of growth in total demand
for oil, restrictions on the resource base may be regarded as
limiting factors by various agents in the market and thus influence
their behaviour. A price path consistent with the Hotelling rule
will in a competitive market be automatically generated only under
very idealized conditions, one of which is that future and
contingent markets exist to a sufficient degree. However, the
theory is not restricted to competitive behaviour. Both various
forms of imperfect competition and the existence of "back-stop"
technologies may be incorporated in the theory of exhaustible
resources.

2.2 Assumptions underlying the simulations

By running the model under different assumptions we have
constructed two scenarios for the crude oil market. The derived
paths for the oil price should not be regarded as most probable
developments, neither have we explicitly aimed at constructing a
corridor within which the price most probably will oscillate. The
scenarios are, however, constructed within a consistent formal
framework and represent in our opinion reasonable starting points
for discussing trends in the crude oil market and prospects for
non-OPEC producing countries. On the <u>supply side</u> of the model the
most critical assumptions concerns the future cohesion and strategy
of OPEC. Will OPEC continue to exist throughout the time horizon
for these calculations? We have some further remarks on this
crucial question later in the paper, but in the present context we
conduct the simulations with OPEC treated as a homogeneous group
with reactions derived basically from historical behaviour. In the
<u>reference scenario</u> we assume that total OPEC capacity is held
constant throughout the simulation period, while in the alternative
scenario - which we will denote the <u>low price scenario</u> - this
capacity is increased during the 1990s with 10 mbd. The model
determines the actual OPEC production by a <u>reaction function</u>, which

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determines oil price changes from capacity utilization. Obviously,
also with respect to this short term adjustments undertaken by OPEC
great uncertainty exists. In fact, the record since the oil price
fall in 1985/86 seems to indicate that the fit of this reaction
function is rather poor at low and moderate levels of capacity
utilization. The model does not explain the capacity decisions of
the OPEC countries.

As mentioned non-OPEC supply is calculated by means of a
submodel. When calibrating this model our hypothesis has been that
the sharp increase in production observed over the latest ten years
has come to an end, but that the current price level of 18-20
US$/barrel is sufficient to support production at the current
level. -

On the demand side assumptions have to be made concerning income
growth and technological improvements in the years to come, includ-
ing e.g. the development of alternative technologies to oil using
equipment. In the reference scenario we have basically prolonged
the current growth trends, i.e. we assume continued moderate income
growth in the OECD countries (2.5 percent p.a.) and stronger growth
(3-3.5 percent p.a.) in LDCs. In the low price scenario the
estimates of economic growth in developing countries are adjusted
downwards (2 percent p.a.). The demand equations in the model are
of a traditional type in the sense that energy substitution occurs
as a result of changes in relative fuel prices. Linked to a
specific base year the consumption of energy may, however, be out
of equilibrium, and in reality therefore substitution may take
place even with unchanged prices. Furthermore, the model may also
involve a misspecification if consumers actually determine their
composition of energy use to price levels of the different fuels.
In the present model calculations we have implicitly assumed that
the price volatility in the first half of 1986 which ended in a
stabilization at 18-20 US$/barrel, basically restored a price level
for crude oil where it in the long run can compete effectively with
other fuels. Moreover, a back stop price is assumed to come into
full effect when the oil price approaches 50 US$/barrel, and in the
simulations the price path will therefore flatten out around this
level. Admittedly, this is also an assumption surrounded with
considerable uncertainty. For some applications of crude oil the

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back stop price may lie significantly below the 50 US$ ceiling
assumed, and in that case there is in our simulations an element of
overestimation in the rate of increase in the oil price.

2.3 Empirical results

The derived growth path for the oil price until 2010 in the
reference scenario is shown in figure 2.1. The price decreases
slightly towards 1990. This is mainly due to the specified OPEC
reaction function, which can be interpreted in a way that given the
situation in 1986 (the base year) OPEC decides to keep the oil
price stable by increasing production. However, increased capacity
utilization gradually motivates OPEC to loosen the price "anchor",
and combined with continuing income growth this results in rapid
increase in the oil price during the 1990s. This trend continues
until the price approaches the assumed back stop price.

The developments in demand and supply of crude oil simulated in
the reference scenario are presented in figures 2.2 and 2.3

Figure 2.1

Real oil prices
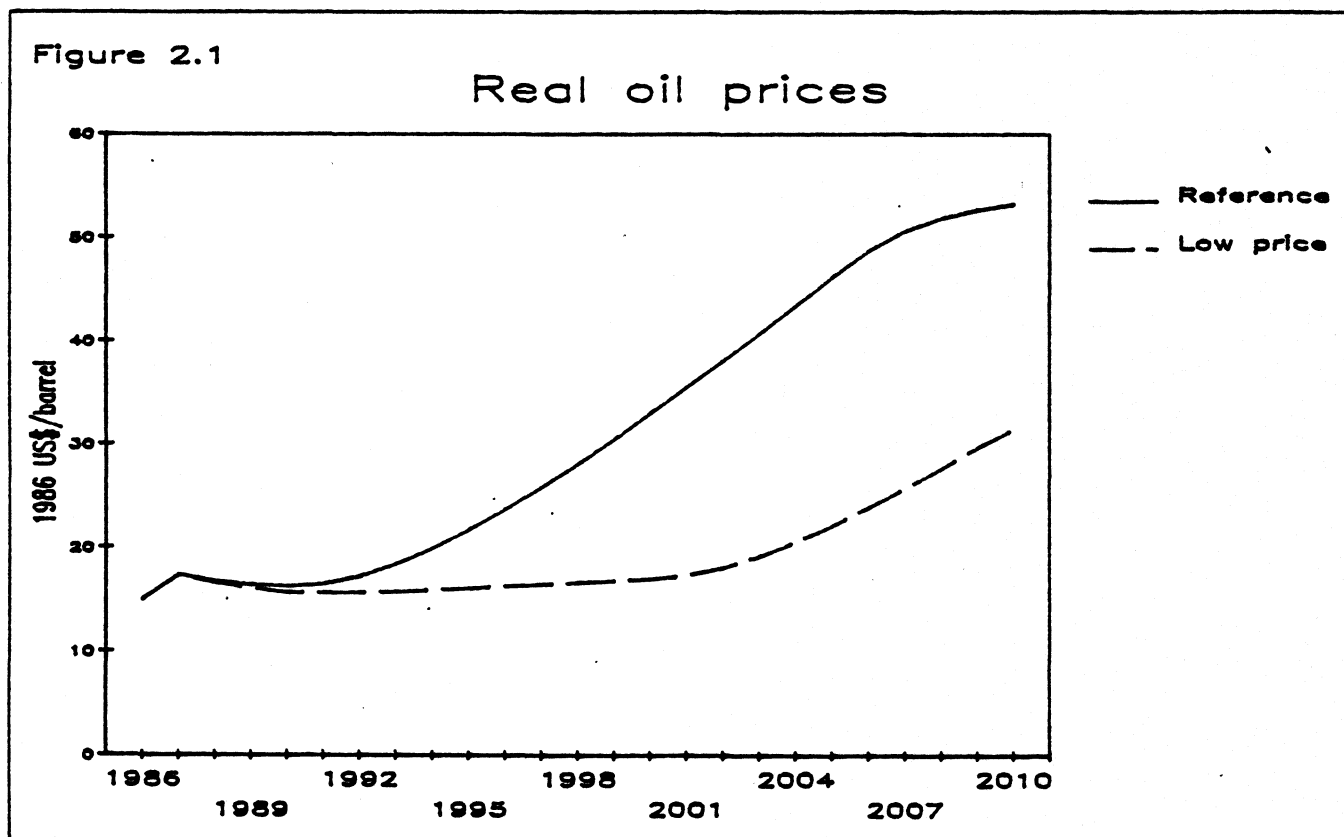
respectively. In all demand regions consumption of oil increases in
the first 6-7 years due to income growth and low prices. From the
mid-1990s, however, the price increases lead to a culmination in
the oil consumption for the OECD area; throughout the rest of the
simulation period the demand in these countries decreases at a rate
of 1 - 1.5 percent per year. In LDCs, on the other hand, due to
stronger income growth and less price responsiveness in the demand
equations, consumption continues to grow another ten years.

As already mentioned, a noticeable feature of the present
simulation is a strong increase in the OPEC supply through the
first ten years of the simulation period. The growth is more
moderate from 1995, and between 2005 and 2010 the production is
reduced somewhat to a level of about 25 mbd. In figure 2.3 we have
also included the estimated production profile for non-OPEC
countries which is slightly decreasing, reflecting that some
countries empty their reserves while prices are too low to motivate
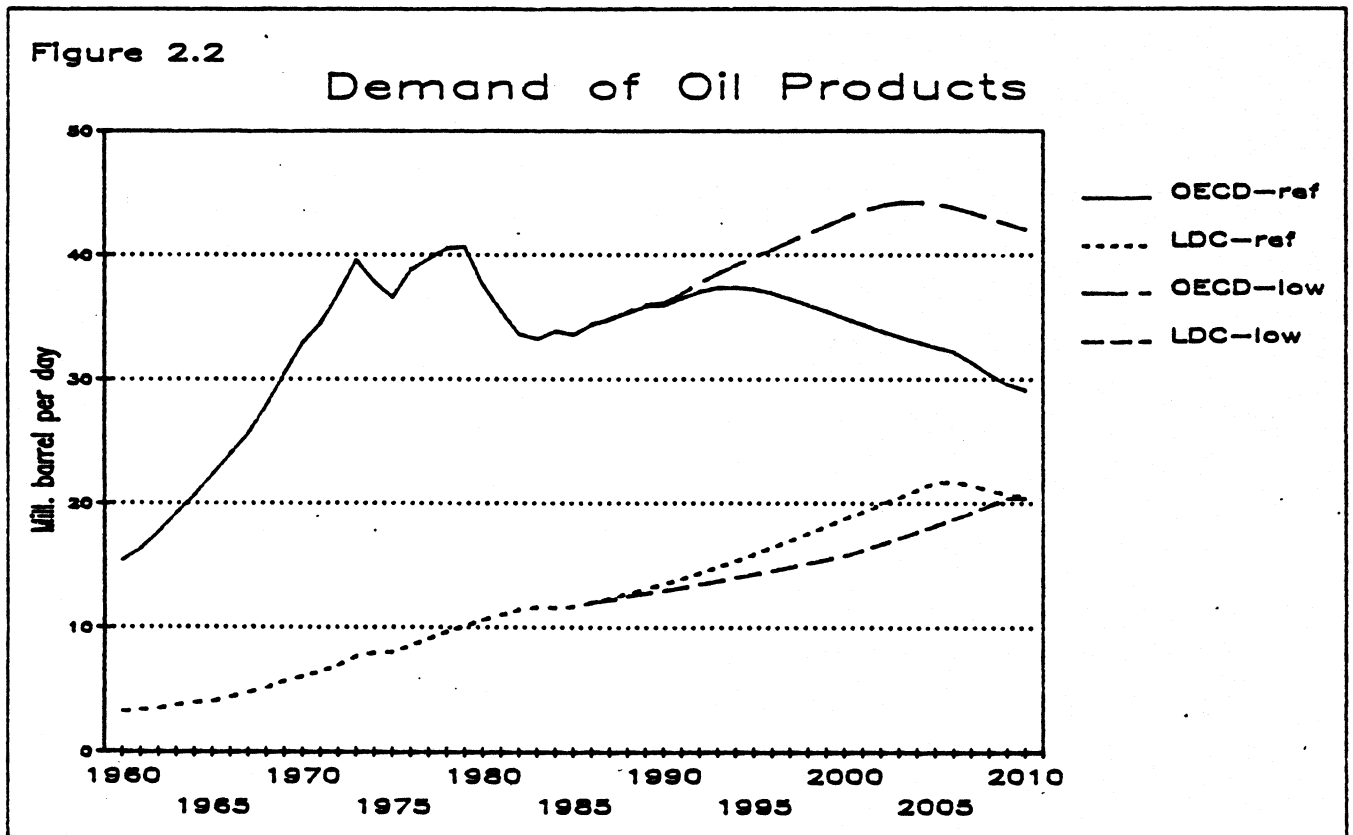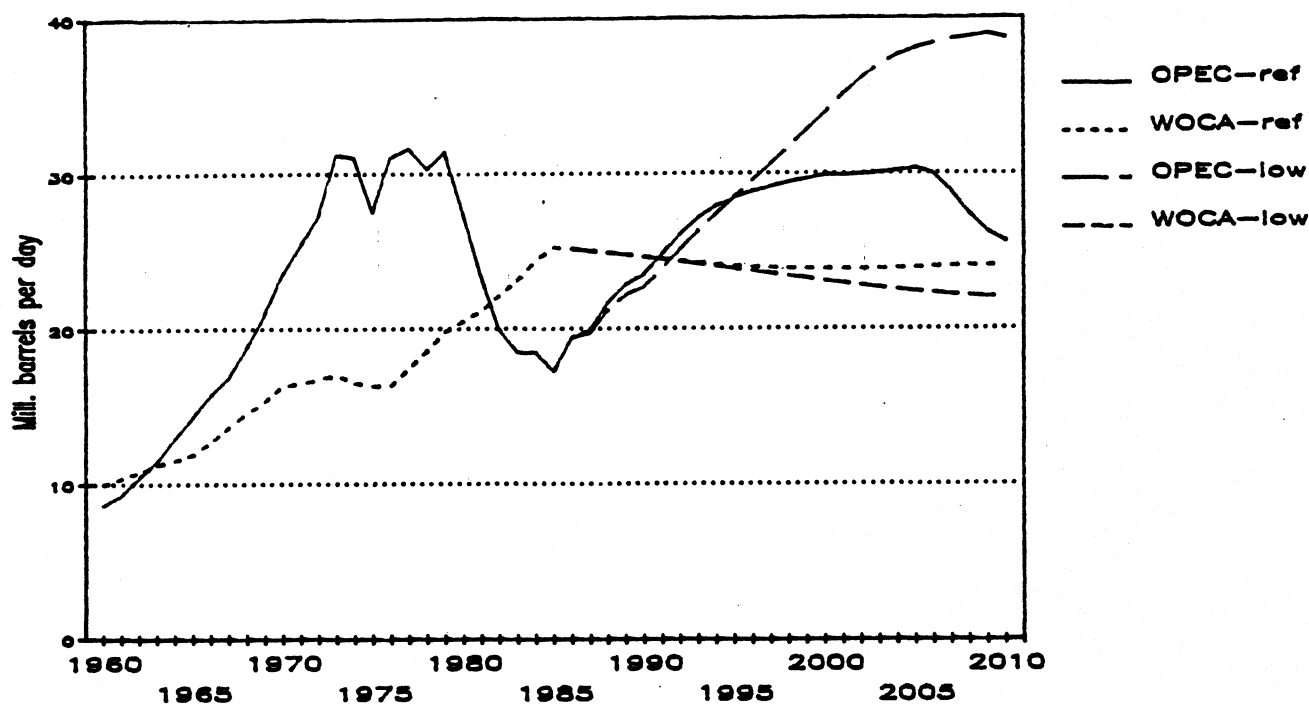sufficient new exploration activities.

Figure 2.2

Demand of Oil Products

Figure 2.3

Supply of Crude Oil

_____ OPEC—ref
..... WOCA—ref
__ _ OPEC—low
___ _ WOCA—low

In the <u>low price scenario</u> the most important changes in assumptions compared to the reference scenario are
- a reduction in the pace of economic growth in developing countries (2 percent per year) until 2000,
- a 10 mbd increase through the 1990s in OPEC capacity.

As shown in figure 2.1 the result is that the price of crude oil remains at the present level until the turn of the century. On the demand side (see figure 2.2) the consumption growth in LDCs is considerably weakened as a result of the reduced GDP growth, while the demand in USA and in the rest of OECD picks up due to a longer period of low oil prices. Due to the expansion of the capacity OPEC production increases markedly, and this is an important precondition for the sluggish price development in the oil market. Outside the OPEC area the lower oil price further restrains the exploration activities and production.

2.4 A brief discussion of the results

The simulations carried out by means of our model have, in our view, corroborated the possibility that the crude oil price can remain at today's level of 18-19 US$/barrel (in real terms) the coming 4-5 years. This result is based on the assumption that this price level is sufficiently close to being an equilibrium price, in the sense that the dramatic price fall in 1985/86 is not counteracted by lagged demand responses. Moreover, expectations held by consumers regarding future price movements are very important for the actual market development. Many consumers probably still have fresh in mind the events of the 1970s when OPEC used its market power to raise prices considerably.

The market development through the 1990s, will to a great extent depend on the rate of growth in the world economy, as indicated by the calculations. In particular, we have by the two simulations demonstrated the significance of the income development in the LDCs. Even the GDP growth rates in the reference scenario may be characterized as relatively moderate compared to historical figures. Given these assumptions the oil price in the reference scenario shows strong growth during the 1990s and reaches 33 US$/barrel in 2000. To modify this picture, one may emphasize the possibility that the technological development will encourage less energy intensive techniques. In view of this the income elasticities in the model may be overestimated. Very important for the relation between economic growth and energy use is also the development of the composition of demand.

In the alternative low price scenario the estimates of growth rates for developing countries were adjusted downwards, and together with increased OPEC supply of oil this resulted in a flat price path for a longer period. On the demand side a possible explanation may be that many LDCs struggle with high levels of foreign debts.

We have not given any explanation yet of the increase in OPEC capacity. It may be interpreted as a weakening, but not a breakdown of the organization as an effective market regulator. For some OPEC countries with large oil reserves, such as Saudi Arabia, a continued low oil price at the indicated level may be seen as

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rather favorable. Such a price path will support growth in world oil demand and may also restrict the evolution of alternative energy sources. At the same time the price can be high enough for other oil producing countries to continue to produce close to their capacity limits. This fits in with the textbook optimal strategy of an oil producing cartel derived within a dynamic exhaustible resources framework. This does not imply, however, that Saudi Arabia consciously pursue such a policy.

3. Differences among oil producers.

In 1986 the total world oil production was just above 60 mbd. Only the superpowers produced more than 10 mbd, the production in USSR and USA accounted for 38 percent of the total supply. 13 other countries produced more than 1 mbd as an average, and together these 15 countries produced 82 percent of the total. The oil production in Mexico was 2.7 mbd, and the Norwegian production averaged 0.9 mbd, although it passed the 1 mbd mark in the fourth quarter of 1986.

There are thus few "large" oil producers and they do not constitute a homogeneous group. The major oil producers of the world differ widely with respect to the size of resources, population, ethnic and political system, income level and the importance of oil in the overall economy.

3.1 OPEC

The heterogeneity between oil producing countries apply also within OPEC. (One of the unsolved problems within OPEC is to work out a formulae to set fair quotas on the basis of the character- istics of each member country.) A common feature for these countries is, however, that they are all very dependent on oil in their total export. In 1985 the oil exports accounted for approx- imately 85 percent of their total export revenues, ranging from 65- 70 percent for Algeria, Ecuador and Gabon to more than 90 percent for the Gulf countries.

Declining oil demand and oil prices since the early 1980s have totally eroded the huge current account surplus of the OPEC countries. In 1985 OPEC as a whole had a deficit of about US$ 20 billion. (However, Saudi Arabia alone had an even bigger deficit, so that the rest of OPEC had in fact a surplus.)

There are also significant differences in income levels between the OPEC countries. On a per capita basis Indonesia and Nigeria, the countries with highest population, have the lowest annual income levels (about 500 US$ per capita). The smaller Gulf countries, Qatar and United Arab Emirates, are at the other extreme and among the worlds richest nations, with GDP per capita close to 20 000 US$[1].

Of the total OPEC production of crude oil of 19.4 mbd (inclusive NGL) in 1986 Saudi Arabia produced 5.1 mbd. Eight other member countries supplied more than 1 mbd. At the lower end was Gabon with 0.16 mbd.

In 1986 OPEC countries possessed 68 percent of the world's proven reserves, and the total R/P ratio was estimated to 69 years. The corresponding figure for the rest of the world was 16 years. However, also with regard to reserves there are wide differences between the OPEC members, from Saudi Arabia with nearly one fourth of the world's total reserves and a R/P ratio of 90 years to Indonesia and Ecuador with R/P ratios of approximately 17 years.

The resource base is a very important factor in consideration of market strategy. Countries with relatively limited reserves may prefer to cut production and increase prices to get higher profits in the short run. Countries with larger proven reserves should put more emphasis on the long term outlook for the oil market.

On the basis of the observed differences between OPEC members the OPEC member countries may be divided into three sub-groups: the low income countries, the price hawks and the long timers. The first group comprise Ecuador, Gabon, Indonesia, Nigeria and Venezuela. The price hawks consist of Algeria, Libya and Iran. The last group then comprises all the Gulf countries except Iran. The main characteristics of the "low income countries" (in addition to the

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[1] These numbers refer to 1985, before the oil price collapse of 1986

fact that they are poor) are modest oil production, high capacity
utilization in the oil activities, low R/P-ratios and deficits on
the current account. (All these features may not necessarily apply
to every country in the group.) For the "price hawks" political
reasons play an important role, and thus generally tend to put
priority on reaping the benefits of high prices. Reserve
considerations and high revenue needs pull in the same direction.
The last group , the long timers, consists of countries with small
population, very oil dependent economies and high R/P-ratios. These
factors make long term market developments vital in their
considerations.

3.2 The other producers.

When discussing strategies and future equilibrium paths in the
oil market, we believe that one should take proper account of the
actions of the producers listed below (they all have production
levels higher than 0.5 mbd). Summary information of crude oil
production and reserves for these countries are collected in table
3.1.

*USSR is the world's largest oil producer, and a significant net
exporter of crude and oil products. Oil export accounts for a
major part of total export revenues. USSR is naturally interested
in high oil prices and they have given positive signals to OPEC's
struggle for high prices, but provided no formal or official
concessions.

*China has increased the oil production with 1 mbd over the last
10 years, and is now a net exporter. One may assume that they are
in favour of high prices, but so far they have given no active
support to OPEC's efforts of stabilizing prices.

*USA is the world's second largest oil producer, and at the same
time importing more crude oil than any other country. Within this
country there is much concern about low oil prices because of
high cost domestic producers and a growing dependence of oil
import. Still, for political reasons any kind of formal negoti-

ations with OPEC is not very likely.

*Canada is a relatively small net exporter, and it is hard to
foresee cooperative efforts with OPEC.

*Brazil has increased oil production more than 200 percent the
last 10 years. This stems from a huge and ambitious development
project which include high cost off shore activities.

*Mexico is Latin America's most important oil producer with a
production capacity of 3 mbd. Mexico is a large net exporter and
the first country to cooperate officially with OPEC. The country
has a self-imposed export quota of 1.36 mbd. As seen from table
3.1 the resource base is significant.

* United Kingdom has the highest oil production in Western
Europe, and is also one of the world's largest producers. Net
export is about 1 mbd. UK's production has increased dramatically
the last 10 years after the first off shore oil activities
started up in 1975. However, the known remaining reserves are
small so that the present production level can only be sustained
for 5-6 years. The production activities are off shore at high
cost. Political signals show no interest in cooperation with
OPEC.

*Norway's present production level is 1 mbd, and there are
prospects for large increases the years to come (to approximately
1.6-2.0 mbd in 1993). As for UK, Norwegian production are run at
relatively high costs. Norwegian oil reserves are significant;
exceeded only by USA and Mexico outside OPEC and the communist
area. Since february 1987 Norway has supported OPEC with a 7.5
percent production cut.

*Oman has for some time openly cooperated with OPEC, and given
its location this may be seen as very natural. The production of
crude oil was 0.6 mbd in 1986.

*Egypt's oil production has increased steadily for some years and

reached 0.8 mbd in 1986. Cooperation with OPEC has taken place.

*<u>Malaysia's</u> oil production was 0.5 mbd in 1986, which is 3 times higher than 10 years earlier. The country has shown interest in cooperation with OPEC.

Table 3.1. Crude oil production and reserves in large non-OPEC countries

	Production	Reserves	R/P-ratio
		(1000 million	
	(mbd)	tonnes)	(years)
Mexico	2.75	7.6	56.3
Norway	0.91	1.4	31.2
Oman	0.56	0.6	43.3
Egypt	0.82	0.5	12.1
Malaysia	0.51	0.4	15.0
Total of above	5.54	10.5	38.4
USSR	12.52	8.0	13.1
China	2.63	2.4	18.5
USA	10.24	4.1	8.5
Canada	1.80	1.0	12.3
Brazil	0.62	0.3	10.1
United Kingdom	2.65	0.7	5.5

Source: (BP 1987)

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What can be deduced from this survey about the prospects for cooperation between OPEC and non-OPEC producers. In the considerations done by a single country both economic, cultural and political factors will have to be taken into account. Most of the countries outside the OPEC area will suffer through marked reductions in incomes by a fall in the oil price as a result of a breakdown of OPEC. In particular, this applies to countries
- where crude oil plays a dominating role in net exports,
- with small or moderate reserves,

- with limited possibilities for postponing the extraction
  activities, due to either institutional factors, low income
  levels, large current account deficits or capital intensive
  technology.

Some producing countries may on this background find it
beneficial to negotiate with OPEC in order to support the organiza-
tion's control over the market. For every country this might be
weighed against the possible benefits of being a "free rider" in
the oil market. The "conditions" demanded by OPEC, e.g. in terms of
production cuts, will obviously also be very important for these
considerations.

Some non-OPEC oil producers may not wish to cooperate with OPEC
for political reasons. Among these countries are United Kingdom.
One may also include Canada and USA among these, but more important
than political considerations is that the former is a minor net
exporter and the latter a net importer of crude oil. Among net
exporting countries outside OPEC, Mexico, Norway, Oman, Egypt and
Malaysia seem to be the countries that have most to lose if there
is a further drop in oil prices, and these countries have also
shown willingness to cooperate with OPEC in order to stabilize the
market. In 1986 this group of countries, in the following nicknamed
NOPEC, produced 5.5 mbd which amounts to nearly 10 percent of the
total world oil production. The group has, however, a much more
dominant position as exporters; they supply more than 40 percent of
world oil exports outside OPEC and about 20 percent of OPEC oil
exports.

4. The benefits of cooperation.[2]

In the previous section we argued that for countries like Mexico
and Norway their best national interest may be to obtain some sort
of agreement with OPEC with the aim of restricting total supply of
oil to the market. Some elements of such cooperative efforts

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[2] This section builds extensively on an earlier paper by Kjell
Berger and Kjell Roland: Norway's relationship to OPEC (in
Norwegian) (Berger and Roland, 1986).

between OPEC and non-OPEC producers have already taken place in the aftermath of the events of the winter 1985/86.

The benefits to be derived by this reasoning depends, of course, heavily upon the point of departure, i.e. the alternative market development in the absence of any accommodation between OPEC and NOPEC. Great uncertainty is attached to the market power of OPEC in the future. A crucial question is whether the organization will be able to agree upon a common strategy, and even if this is the case, one do not know whether this will imply continued efforts to defend prices or whether priority will be given to maintain incomes in the short run. The brief discussion in the preceding section pointed at the danger that the latter aspect may dominate in the future. A "worst case" scenario from many non-OPEC countries' point of view is a complete breakdown of OPEC. After a period of adjustment, this will probably lead to a situation where most oil producing countries produce close to their capacities. This will certainly be followed by a new price crash in the market, one may assume to a level below 10 US$/barrel.

For an oil economy like Norway, with moderate known reserves and with obvious rigidities with respect to changes in the profile of depletion, such a development will be very unfortunate or even disastrous. According to current plans, total oil production will reach a top level in the early 1990s, i.e. in a period where the price after an OPEC breakdown will still be low. Norway will not be able to reap the benefits and net incomes from its oil wealth which current macroeconomic projections are based upon.

It is to avoid this kind of development that Norway and other non-OPEC countries have considered a policy of cooperation with OPEC and thereby restricting total supply. OPEC has also shown clear interest in such contacts and agreements with the aim of stabilizing the oil price at the present level. As mentioned, some temporary steps in this direction have been taken. An important question is however whether these efforts are sufficient to secure a stable oil price for a longer time period. This question is addressed in the following, along with a more detailed discussion of the rationale and possibilities for non-OPEC producers to pursue such a policy. Again, we turn to simulations on our oil market model for carrying out these analyses.

4.1 What happens if OPEC breaks down?

In section 2 two scenarios of the international crude oil market
were presented and briefly discussed. Both were based on the
precondition that OPEC continues to exist, but the implicit
assumption of the strategy and market power of the organization
varied between the two scenarios. For the present discussion we
will take the reference scenario in section 2 as a point of
departure. This growth path for the oil market may be interpreted
as a development where OPEC after a period of consolidation (stable
prices, moderate growth in demand and increase in production)
returns to a strategy of supporting increasing oil prices in the
1990s. Obviously, this development will be very beneficial for non-
OPEC producers like Norway and Mexico. But the development might
easily take a totally different direction, with a much lower oil
price over a period of time. The breakdown of OPEC is simulated in
the model by assuming a gradual increase in OPEC production. In
Indonesia, Nigeria, Gabon, Ecuador and Venezuela which have low
incomes and high debt obligations, production is assumed to
approach rapidly their capacity limits (estimated to a total of 6.5
mbd (PIW(1986)). Other OPEC members - the price hawks Iran, Libya
and Algeria - have indicated more willingness to defend prices. For
these countries we assume a more gradual increase of their
production levels towards 1990. However, the war between Iran and
Iraq implies great uncertainty at this point. If this conflict
comes to an end, this will most likely be followed by a significant
increase in their crude oil supply, and additional pressure on
prices.

For Saudi Arabia one may expect a significant increase in oil
production if the cooperation within OPEC comes to an end. With a
breakdown of OPEC this country with its huge reserves has little
motive for restricting production; on the contrary, it may be
argued that big producers like Saudi Arabia - as a long run
strategy - would find it beneficial with moderate prices through a
number of years. This will encourage some growth in demand, while
at the same time smaller producers empty their reserves. In the
breakdown simulation on our model we assume that Saudi Arabia

doubles its production until 1990. A similar relative growth in production from 1986 to 1990 is assumed for the other Middle East oil producing countries. Altogether, our assumptions imply that for OPEC as a whole actual production increases with 5 mbd from 1988 to 1992. Thereafter, total production for these countries is assumed to be parallel to the growth path in the reference scenario. This implies of course that the corresponding price path will stay permanently below the path of the reference scenario. For countries outside OPEC the breakdown, with a dramatic fall in prices as a result, will put a strain on the oil exploration activities and gradually tend to decrease total production. Total production from the non-OPEC area is thus assumed to be reduced from the level of around 25 mbd to 22 mbd in the mid-1990s.

The detailed assessments of the breakdown scenario is shown in table 4.1 where we have also undertaken a tentative decomposition of the supply figures for OPEC as a whole on its member countries, based on estimates of present production capacities in the various countries. The story told by these assessments is that after the breakdown of OPEC the smaller producers rather immediately increase their production up to their capacities. From then on, the further assumed increase in supply stems mainly from increased production in the Middle-East, and in particular in Saudi Arabia which has significant idle capacity.

Figure 4.1. Oil production in the breakdown scenario. Mbd.

	OPEC	Low income	Price hawks	Long timers	
				Saudi Arabia	Rest
1986	19.4	5.1	3.9	5.1	5.3
1987	19.9	5.5	4.2	4.5	5.7
1988	22.7	6.0	4.5	5.6	6.6
1989	24.9	6.5	4.9	6.3	7.2
1990	26.5	6.5	5.3	7.0	7.7
1991	28.8	6.7	5.3	8.9	7.9
1992	31.1	6.9	5.7	10.2	8.3
1993	32.1	6.9	5.7	11.2	8.3
1994	32.9	6.9	5.7	11.5	8.8
1995	33.4	6.9	5.7	12.0	8.8

Figure 4.1

The Oil Price Scenarios under Cooperation and Breakdown
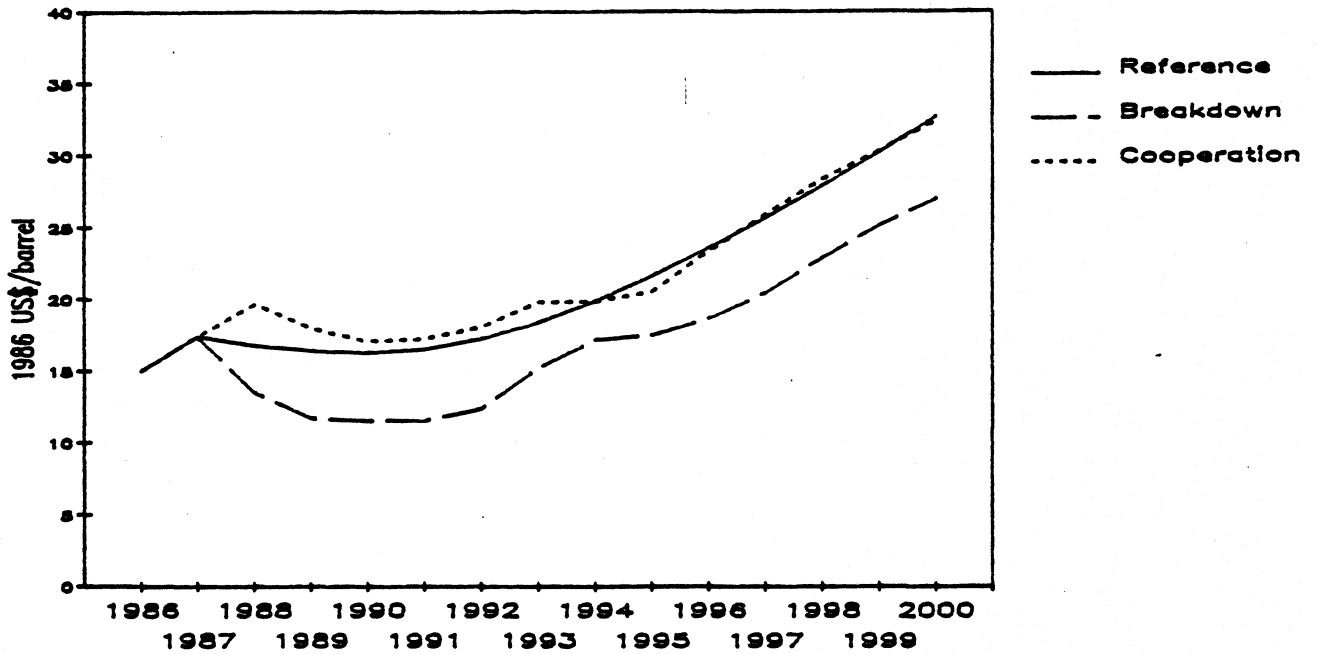
The resulting price path is presented in figure 4.1, where it is compared with the path in the reference scenario. The price decreases sharply towards 1990 and stays around 10 US$/barrel for a couple of years. Thereafter the steadily growing demand pushes prices upwards again. The implication for producing countries with slim possibilities of increasing production is a significant loss of incomes from the oil activities.

4.2 The remedy - cooperation with OPEC.

The breakdown of OPEC and the following decrease in the oil price will imply a significant reduction in total incomes from oil activities compared to the reference scenario for NOPEC producers, including Norway and Mexico. Estimates on the effect on total discounted incomes for Norway are presented below. Recognizing this, NOPEC producers may seem to have a clear incentive to reach an understanding with OPEC and undertake actions that may prevent

the breakdown and the price crash. To study these prospects
analytically we use our model to analyze the equilibrium in the oil
market caused by a self imposed reduction in the supply from NOPEC
countries, assuming that these actions are sufficient to make OPEC
able to maintain its control of the market. More specifically we
assume that the five countries Mexico, Egypt, Malaysia, Oman and
Norway, with separate actions, but with some sort of understanding
with OPEC, reduce their total supply by 0.8 mbd, which means that
current production is restricted by about 15 percent. This agree-
ment is in the simulation assumed to last until 1993-94. The OPEC
supply is kept as in the reference scenario. The equilibrium price
path as calculated by the model is shown in figure 4.1. With a
smaller total supply the oil price in this cooperation scenario
exceeds the price path in the reference scenario during the period
of cooperation. In the mid-1990s the OPEC production and incomes
have reached such high levels that there no longer is need for
production cuts by NOPEC, and the price path thus coincides with
the reference scenario.

4.3 Impacts on Norway's incomes from oil production.

The three price paths outlined earlier in this section obviously
have very different impacts on Norwegian incomes from the oil
activities. We have assumed that without cooperation with OPEC
Norwegian oil production will grow to just above 1.7 mbd in 1994,
and then be reduced somewhat towards the turn of the century when
it is estimated at 1.5 mbd. We assume that the same production path
is sustained by Norway in the breakdown scenario, presupposing that
profitability on the Norwegian continental shelf under the present
tax regime is sufficiently favorable even in this case.

In the cooperation scenario the Norwegian production is reduced
with 15 percent from 1988 to the first half of 1994. During the
rest of the century production is assumed to reach the same level
as in the reference scenario which implies a somewhat lower total
production over the simulation period.

Based on the three price scenarios and the corresponding
assumptions regarding oil production we have calculated the net
present value (NPV) of the Norwegian oil incomes in the three

cases. As shown in table 4.2, not surprisingly the NPV is highest in the reference scenario, where we have obtained an estimate of NPV of 106.6 billion US$. Moreover, the calculations show that there is only a modest reduction in NPV in the cooperation scenario since a part of the reduced volume of production is compensated with higher price. The most striking feature is however the large decrease in incomes in the breakdown scenario, where NPV is reduced with 20 billion US$ compared to the reference scenario.

Table 4.2. Net present value of oil and gas production in the three scenarios. Billion 1986-US$.

	Oil	Gas	Total
Reference scenario	106.6	23.8	130.4
Cooperation scenario	102.5	24.4	126.9
Breakdown scenario	86.4	20.1	106.5

An additional point that should be emphasized is the relation between gas prices and oil prices. For Norway, being a large gas producer and having gas reserves that exceed the known oil reserves, the future development of gas prices is very important. We have computed the NPV of the expected Norwegian gas exports as well, and these figures are also shown in table 4.2. The gas price is assumed to be 65 percent of last years oil price. Norwegian gas export volumes will get a slump to 17.5 bcm in the early 1990s before the Troll/Sleipner contract comes into full effect. The NPV of gas exports is highest in the cooperation scenario because of the higher price in the early years and no change in volumes. There is only a small reduction in the reference scenario, but the NPV in the breakdown scenario is almost 4 billion US$ lower.

For the total value of oil and gas production our estimates indicate that total NPV is 3.4 billion US$ lower in the cooperation scenario than in the reference scenario, while the NPV through cooperation is more than 20 billion US$ higher than in the breakdown case. The difference in NPV between the reference and the cooperation scenario is not significant. The calculations demonstrate, however, that it may be very important for Norway to avoid

the breakdown scenario. The 15 percent reduction of the five countries alone does not significantly influence the oil price, but if this effort is sufficient to keep OPEC stick together it is an important step towards stable higher prices. The reduction in NPV in the cooperation scenario can be seen as an insurance premium against the breakdown scenario, a premium that seems to be of a limited size.

4.4 Some further remarks on the scenarios and possible actions.

The simulations presented above serve to illustrate that the future stability in the oil market is highly important for non-OPEC producing countries. What makes it so difficult to choose strategy for NOPEC is of course that great uncertainty exists with respect to the future strategy and market power of OPEC. Producers outside the organization will reap the highest benefits if market development is not dependent on their active cooperation so that they can continue their journey as free riders. There may be some signs in the market development following the price fall in 1985/86 that may be used as argument for such a choice. After all, OPEC seems to have succeeded well so far in stabilizing the market with rather moderate support from other countries. Moreover, there seems to have been a marked change in the strategy pursued by Saudi Arabia. For many years, this country put lots of efforts to secure high prices. However, it now seems that the Saudis are firmly convinced that the price level in the early 1980s was not sustainable in the long run, and the country has recently expressed the view that the oil price should be stabilized at the present level for some years. Recent developments may be interpreted as a confirmation of this medium term strategy.

On the other hand, we have on several occasions above pointed at the possibility that no agreement of market regulation will be obtained within the organization, with a sharp decrease in the oil price as the likely result. Aversion against this outcome will be the motive for NOPEC producers to enter some sort of cooperation with OPEC. Such an act may be interpreted as an insurance against a breakdown of OPEC. As we saw above, the "risk premium" in terms of income loss, with Norway as an example, may be relatively small.

5. Can a cooperative strategy be sustained

The current balance in the oil market and the stability of the oil price that has lasted since august 1986 seems quite delicate in view of the many uncertain factors in the picture, and it may reasonably be questioned whether OPEC's attempt to stabilize the oil price, even when supported by NOPEC has much chance of success. A key issue in this regard is whether OPEC will be able to keep together as an organization.

5.1 Will OPEC survive in the 1990s?

The collapse of OPEC as an organization able to influence the oil policy of its member countries has been predicted at various times since the birth of the organization in 1960. Especially after OPEC I in 1973/74 and in the post-1981 period when the oil prices have been adjusted downwards, the imminent collapse of OPEC has been a frequently repeated prediction. But OPEC has survived in spite of many difficulties. There are probably no other example of an international economic organization with such extreme internal conflict and still being able to function. Another way of looking at OPEC from the outside has been the modelling of OPEC as a cartel organization in a strict sense and using this assumption to analyze the future development of the oil market. The cartel models flourished in the literature in the late 1970s and early 1980s and to some extent still does.

But is OPEC a cartel exerting a cartel's monopoly control of the market? Most of the modelers have not really put this to an empirical test but rather forced the data to fit this as a prior assumption. OPEC can hardly be described in terms which explains its actions since 1973, not to mention the earlier period, as derivations from underlying rules of behaviour. Game theoretic approaches which allow a dynamic development of the outer setting between OPEC and the rest of the world and the internal structure may theoretically have something to contribute. It may be illuminating though to compare some apparent characteristics of the price cartel as described in theory and OPEC. The aim of the cartel is to extract the maximum benefit for its members by using the

control over the members' production. In a market with various disturbances and uncertainty on the demand side this aim requires <u>external flexibility</u> and <u>internal discipline</u>. The external flexibility is necessary to exploit the market conditions at all times. This presupposes internal discipline: the chairman of the board of the cartel must have the authority to act on behalf of all and everyone of the members.

The president of OPEC has seldom been in this situation. Only for a very short period of its history has OPEC adhered to the cartel model of distributing binding member quotas. OPEC is more like the converse of the theoretical price cartel. The internal discipline has never been strict, after all the members are not merely profit making concerns but national governments. The other side of the coin is that the outward side has not been nearly as flexible and foresighted as expected of an efficient cartel. The power of action has varied from sluggish to determinate, but often exogenous events have run their own course with too little corrections from the organization. Looking back at the history of OPEC the ratchet effects are obvious, especially in 1979/80. Saudi-Arabia expressed at the time a clear conviction that prices had been carried too far above a reasonable level, but had to give up in correcting the mistake.

What about the future of OPEC? The collapse of the organization cannot be ruled out, but from historical experience there seems to be little reason for expecting that in the immediate future. One can for instance point to the strong recovery of the organization when it managed to pull itself together last summer and stabilize prices temporarily.

It seems reasonable to conclude that OPEC will manage to keep together and act as an organization in spite of both internal conflict of non-economic nature and differing views and interests with regard to the pricing policy. When the organization is under pressure from internal or external forces one may expect the actions of the organization to be sluggish and - in view of the low short-run price elasticity - allow wide swings in prices. The cohesion of OPEC may be influenced by the actions of the NOPEC countries and this is a factor that perhaps should be taken into consideration. The question is: how?

5.2 Supporting OPEC: what are the rules of the game?

OPEC has clearly indicated an interest in cooperating with
non-OPEC countries. The group of countries that we have nicknamed
NOPEC have an obvious interest in stable and relatively high
prices. The importance of stability is perhaps not obvious. Is
stability of importance in itself even for a given net present
value of revenues? From Mexican and Norwegian experience the answer
obviously is yes. Falling prices calls for changes in macroeconomic
policies and often in other government policies because of the
direct and strong influence the oil revenues have both on the
current account and on government finances.

The content of the contact between OPEC and NOPEC countries are
only to a limited extent publicly known. The Norwegian government
has announced the reductions relative to full capacity production
that it has enforced to support OPEC for a limited period ahead. It
has furthermore made this agreement conditional on OPEC being able
to keep control over its own production. Mexico on the other hand
practices a selfimposed export ceiling after i.a. extensive
contacts with OPEC countries.

A long-term association of this nature could amount to a virtual
extension of the loosely organized cartel to include non-member
countries, except that the non-members will not take direct part in
the price decisions. It is inconceivable that Norway would enter
into such a relationship which would mean that it would have to get
OPEC approval for capacity extensions.

An important aspect of the OPEC-NOPEC relation is the NOPEC
countries room for manoeuvre in adjusting production. This depends
upon institutional conditions with regard to the government control
over current production and capacity utilization as well as
technical and cost conditions. The Norwegian offshore production
may be quite constrained in this respect. The same may be the case
for other NOPEC countries. Considering the NOPEC countries as a
group should theoretically open up possibilities of greater room
for manoeuvre in addition to the greater influence to be exerted by
working together. But there are two qualifying comments on this.
First, to exploit the possibilities of "working together" with

regard to adjusting production and capacities would imply swapping of production in time between countries, side payments etc, i.e. arrangements that are very unlikely between countries that are far apart politically and having very weak economic links in other respects. In fact, working together so closely would imply a more intimate relationship than the OPEC countries have achieved between themselves. The second comment is with regard to the relation to OPEC. It is not at all obvious that a joint NOPEC stance toward OPEC would achieve more than individual arrangement, as a "united" NOPEC would be considered as a threat while the present shuttle diplomacy practiced by OPEC vis-à-vis the NOPEC countries, and also toward China and the USSR, is at the same time a support to the central role of OPEC even when its percentage share is shrinking.

The group within OPEC nicknamed the long timers earlier in the paper will probably in most cases control a majority within the organization by the influence they will have over the low income group. The long timers will be interested in establishing relations toward the NOPEC and other non-OPEC countries that may extend the current rapport to last a longer period than the current commitments. For this purpose they would need some fairly simple rules on which to base the OPEC-NOPEC respective commitments. An example of such a rule could be a common statement of intent to keep the oil price within a certain "corridor" over a certain length of time and if price exceeds the ceiling it is free for all to increase the volume marketed while if the price tends to fall through the floor it would be counteracted by proportional downwards adjustment by OPEC and by the other countries involved. Many other rules could be conceived, however, and no rules may be a more likely outcome than any rules at all. For rules to be operative, whatever their legal status, they need to be simple, easy to control and generally considered to represent fair and equal treatment.

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