

## Working Paper

No.: 80, April 2, 2007

Author: Dr. Ingrid Angermann

---

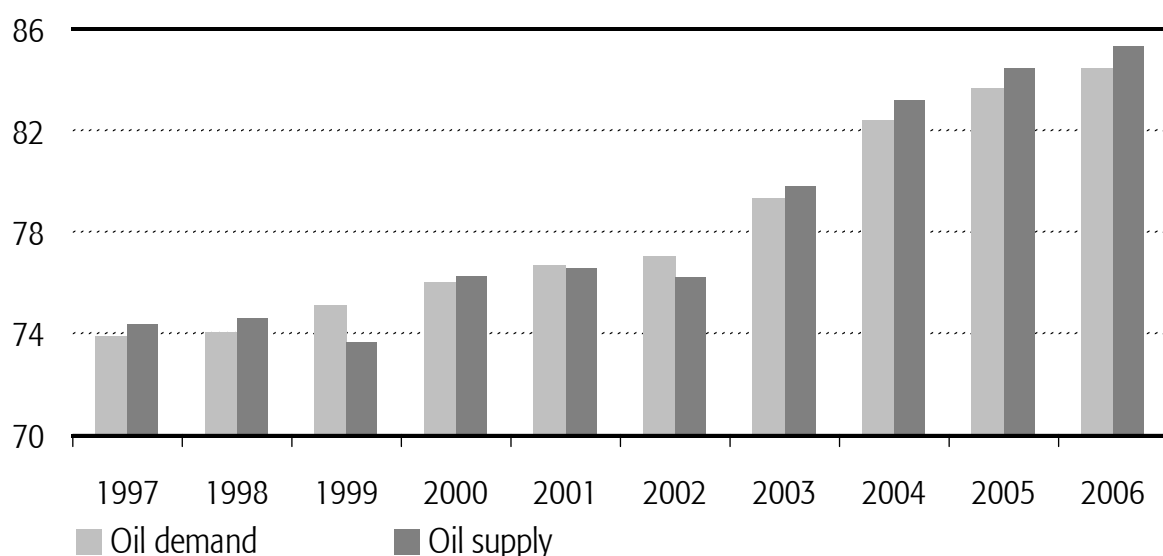
### Medium-term trends on the oil market

Last year's escapades on the oil market, with prices peaking at USD 80 a barrel, appear to be past history. Since their August 2006 high, oil quotations have at times been as much as 35 % lower. At present, benchmark-grade Brent crude is still holding up within spitting distance of the USD 60 mark. What are the factors nourishing such volatility and what is the outlook?

#### Varying trends in oil consumption

Global demand for oil depends largely on the world economic situation. **Business activity has flourished** in recent years. However, whereas in 2004 demand for oil still grew by 3.9 %, statistics from the International Energy Agency IEA show oil consumption in 2005 und 2006 up by only 1.6 % and 1.0 % respectively. That said, energy consumption trends differ between the industrial countries and the emerging markets.

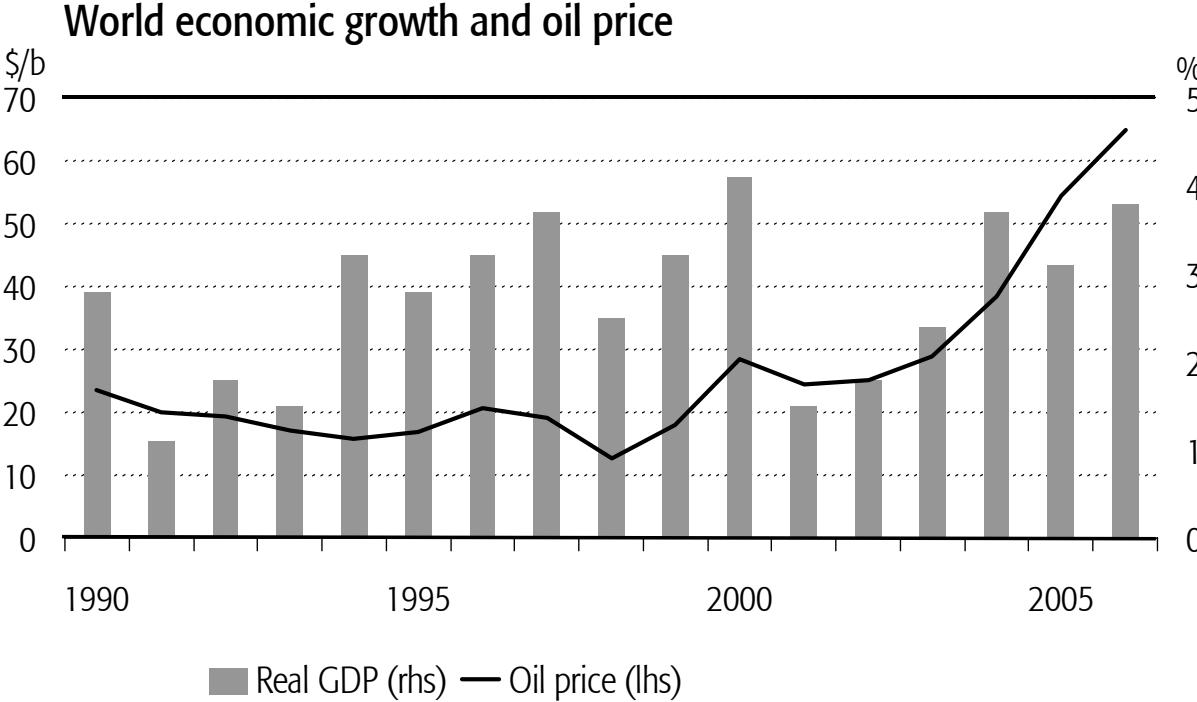
#### World oil demand and supply mb/d



Source: International Energy Agency, Allianz Dresdner Economic Research.

The **industrial countries** consume by far the largest chunk of global oil production, around 60 %, but **their energy-intensity is declining**. According to an OECD study the US has seen one of the strongest reductions of all industrialized nations in dependence on oil. Even so, America's oil consumption, as a percentage of gross domestic product, is still higher than in Japan and most European countries. The relatively low oil consumption in Germany can be ascribed to heavy energy taxation. Amid rather slacker economic growth demand for oil has, anyway, been nudging down for years there. The overall improvement in energy efficiency is due mainly to the increased use of energy-saving technologies in industry and transportation. People have grown more aware of environmental issues and the need to seek alternatives to fossil fuels.

Added to this is a much **higher oil price level**. Price increases in recent years have encouraged **energy-saving behavior** and more widespread use of the relevant technologies. This is reflected in the 0.8 % drop in oil consumption – notwithstanding strong economic growth – in the OECD countries in 2006, when soaring oil prices hit their absolute peak.

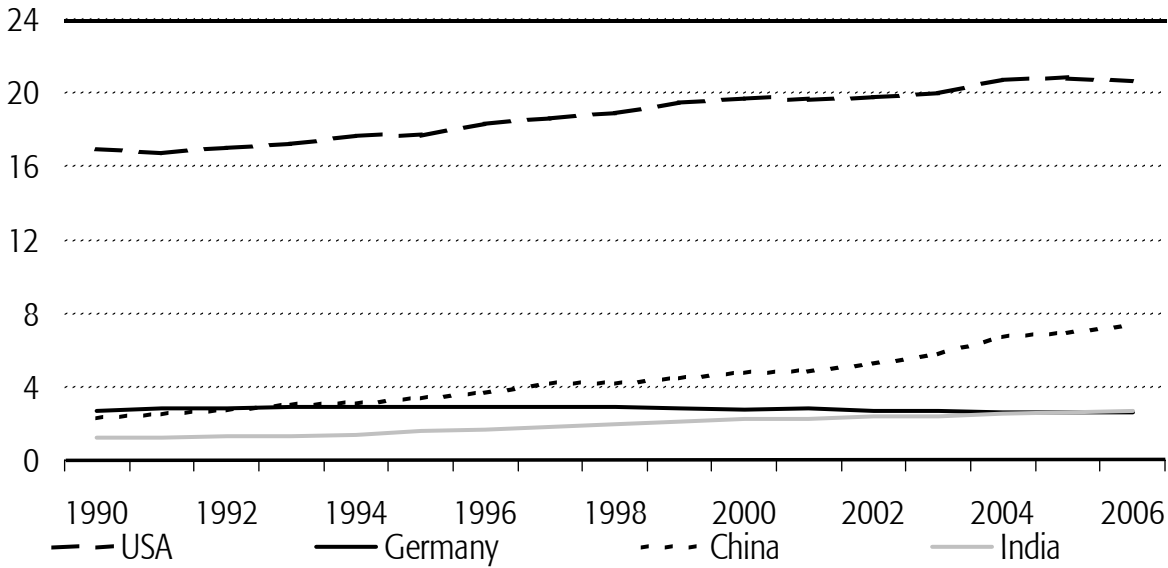


2007 likewise began with unusually low seasonal oil consumption. The extremely **mild temperatures** across the entire northern hemisphere have dampened demand for heating oil, causing a sharp drop in oil prices.

In contrast to the industrialized world, the **emerging markets**, particularly in Asia, **are exceptionally energy-hungry** in terms of growth. As the leader of the pack, **China** has embarked on a catch-up race for its economy with annual growth rates in the region of ten percent. Over the past ten years its oil consumption has doubled! China has now risen to the second largest oil consumer after the US, gobbling up 8 % of global oil output. Although **India** has also taken huge economic strides forward, its oil consumption is rising much more slowly than in China as growth on the sub-continent concentrates

on the services sector, such as software. China, on the other hand, is geared far more heavily to manufacturing, particularly heavy industry. It must be said, though, that many emerging markets subsidize oil consumption to cushion their economies against the effects of high oil prices. However, several Southeast Asian countries, among them Indonesia or Malaysia, have been forced to scale down their subsidization to a lesser or greater extent by the escalating fiscal costs of these policies.

### Trend in oil demand in selected countries mb/d



Source: BP, International Energy Agency.

### Crude oil consumption forecast

World economic expansion in **2007** will fall slightly short of last year, although remaining robust. We are predicting real growth of 3.2 % this year, against 3.8 % in 2006. America and Germany will bear the brunt of **economic slowdown**. While we also expect the emerging markets to suffer a slight dent in growth, they will continue to expand at a high rate of 5.8 %. But these demand-dampening effects contrast with lower oil prices, so on balance we will probably see global oil consumption climb by around 1.4 % to almost 86 mb/d. Given its rip-roaring economic growth, China will account for more than one-third of the extra consumption. On the back of high oil revenues, the Gulf economies are also likely to ratchet up their oil consumption significantly. Some Gulf States, for example, have invested in the energy-intensive aluminium industry and in petrochemicals. But in most industrial countries demand for oil will either continue to shrink or remain flat.

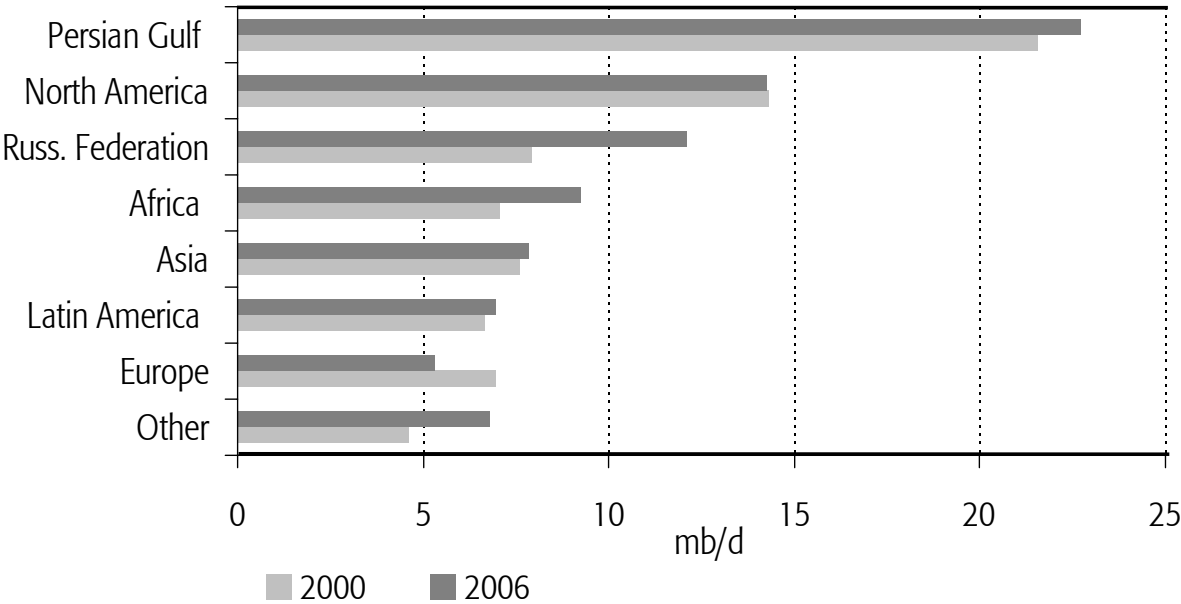
**Medium-term** demand for oil will be increasingly determined by **developments in Asia**. In the course of economic catch-up, growth in China, although slowing a little, will still be in the region of a hefty 8 %. This will presumably continue to whet China’s large appetite for oil, pushing up consumption by around 5 % p.a. The industrial countries, and also the emerging markets, will focus increasingly on

using energy-saving technologies and alternative sources of energy. Lately, policy-makers in Europe, the US – and China, too – have moved more actively to curb energy consumption. More energy-conscious behavior will check the use of oil. Amid robust economic growth, average oil consumption should climb by 1.3 to 1.5 % p.a. up to 2010, reaching around 90 mb/d.

**Oil supplies from volatile regions**

What is now important is how oil output can keep pace with this, particularly since most “black gold” comes from comparatively volatile parts of the world, giving rise to certain imponderables in energy supply. On the **Persian Gulf**, the main oil-producing region accounting for around 30 % of output, capacity has barely been stepped up in recent years. Production has been lifted to 23 mb/d essentially by running down spare capacities. As a result spare production capacities have fallen to historically low levels. However, some **African countries** such as Algeria, Libya and Angola have increased their production facilities. But it is precisely in the Middle East and Africa that the political hotspots lie which in the past have repeatedly driven oil prices to ever-new highs. An issue that refuses to go away is Iran’s nuclear program. Peace has still not been restored in Iraq, while oil companies in Nigeria are hampered by attacks on their oil platforms and pipelines.

**Development of world oil supply**



Source: International Energy Agency.

**Russia** has delivered the most dynamic expansion in recent years. Its output of 9.9 mb/d currently outstrips production by oil heavyweight Saudi Arabia, at 8.6 mb/d. However, Russia’s energy diplomacy has upset the markets on various occasions, raising doubts about the reliability of its oil supplies. **Asia** and Latin America have increased their oil output only marginally. **Latin America** in particular has seen repeated nationalization moves, with Venezuela as the most prominent example. During President Chávez’s almost eight-year term production capacities in the country have shrunk by a

third. Brazil at least has managed a significant increase in oil output. Ultimately this leaves **North America** and **Europe** as politically stable regions. But the important oil production facilities in the Gulf of Mexico are very prone to disruption in the hurricane season. What is more, oil sources in the US and North Sea are yielding less. On balance, since 2000 the supply of oil has expanded by an average of 1.6 % p.a.

### **OPEC in a quandary**

After the risk scenarios were brought to a head in the summer of 2006 and soaring oil prices subsequently lost some of their steam, oil producers have had to contend with lower prices again. This set the alarm bells ringing at OPEC, which announced **production cuts** of 1.2 mb/d in October 2006 and a further 0.5 mb/d in December. However, **reduction discipline within OPEC is shaky**, given the incentives members have to exceed their production limits and maximize their revenues. This is also apparent in the present situation. So far it is the wealthy Gulf States, foremost among them swing producer Saudi Arabia, that have been making the cutbacks. The OPEC members that operate largely outdated production facilities or cannot fully meet their old production quotas anyway, such as Indonesia, Nigeria and Venezuela, are not likely to make any notable reductions. That means a third of the measures planned are unlikely to be seen through.

What is more, the Gulf States themselves have a large number of big projects for **capacity expansion in the pipeline**. The investment costs run into many tens of billions of dollars and will obviously not begin generating returns until the production plant goes onstream. OPEC is therefore in a quandary, particularly since the oil producers outside the cartel, instead of playing along, are increasing their output unchecked.

The question is how long the OPEC members, notably the Gulf States, are prepared to bring influence to bear on oil prices through production cuts and where “**wallet-ache**” sets in. Even with an oil price of USD 30, the Gulf States can still generate current account surpluses. On the other hand, extremely high oil prices would make dearer biofuels more competitive. So some OPEC members could conceivably nudge up their output this year in a bid to secure market share.

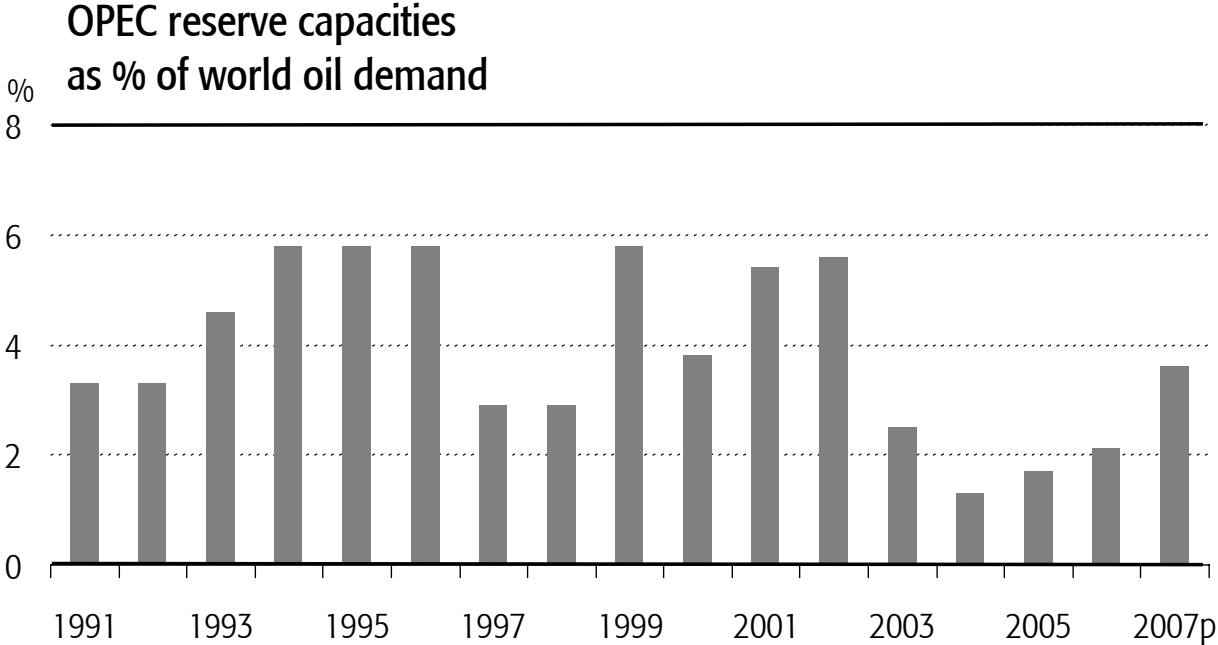
### **Oil supply forecast**

This year the cuts announced by OPEC will therefore probably be implemented only half-heartedly. Outside OPEC oil output will rise by an estimated 1.2 mb/d. Growth will come mainly from the Caspian Sea, West Africa, the US and biofuels. In this base scenario **supply** is estimated at around 86 mb/d, meaning it would be **adequate**.

### **Rising spare capacities and lower risk premiums**

However, the geopolitical risks have not disappeared. In the past increases in supply from the OPEC countries entailed a drop in spare capacities to historically low levels. With spare capacities at rock bottom, latent political risks and fears of hurricanes gave rise to very high risk premiums. Meanwhile, however, the market situation has changed somewhat. Although the recent OPEC cutbacks are lower-

ing current output, they are also automatically boosting spare capacities. Swing producer Saudi Arabia possesses the most slack at present, 2 mb/d. **Spare capacities** in OPEC have **risen** to about 3 – 5 % of global demand for oil. With spare capacities higher, possible production losses and attacks can be offset.



Source: International Energy Agency, Allianz Dresdner Economic Research.

In March Iran arrested 15 British navy personnel and the UN Security Council imposed new sanctions, putting upward pressure on the oil price. Could a further deterioration of the situation in Iran be cushioned with the help of the higher spare capacities? Iran itself currently exports around 2.7 mb/d. In purely arithmetical terms, the loss of its output could be made up for by mobilizing the spare capacities. Saudi Arabia has already signified that it could come to the rescue if production in Iran were interrupted.

### High stocks

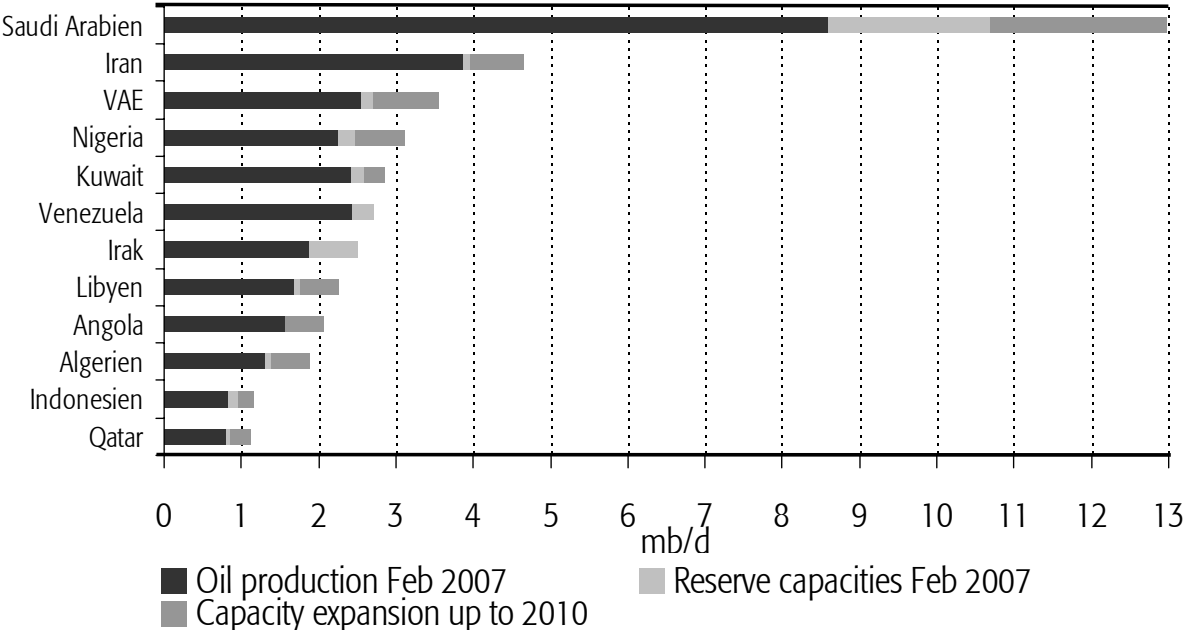
The ample supply situation is further underpinned by high industrial stocks in the OECD countries. Industry stockpiles in the **OECD** are well above the average for the last five years, with sufficient reserves held in 2006 to meet industrial consumption for 54 days, against only 51 days in 2004, according to International Energy Agency figures. This **massive stockpiling** was motivated by the fear of supply shortages and price surges. Industrial stocks will therefore exert downward pressure on the oil price.

### Major investment projects in the pipeline up to 2010

In the medium term, however, the supply situation depends on the expansion of production capacities. High prices have spurred **considerable investment in the Gulf States**, unleashing a veritable drilling boom. Throughout the Gulf region capacity upgrades of some 4 mb/d are in the pipeline. Saudi Arabia

accounts for the lion's share, planning to step up production capacities from 10.8 to around 13 mb/d. **Several projects** are also planned in **Africa**. Besides Algeria and Libya, OPEC newcomer Angola is also eyeing expansion. The pace of growth in Russian oil production is likely to slow on previous years. To achieve any notable increase in output, the Russians would have to move into regions more difficult to exploit, which would be much more costly. No specific investment projects have yet been launched for this. **Asia, North America and Europe** are facing lower yields from conventional oil production, but high oil prices make extraction from oil sands in Canada attractive. This unconventional method is profitable from an oil price of USD 30 per barrel. Production from oil sands is set to climb from 1.1 to 2 mb/d by 2010. All told, global production capacity is likely to rise to around 95 mb/d by 2010.

### Supply outlook for crude oil



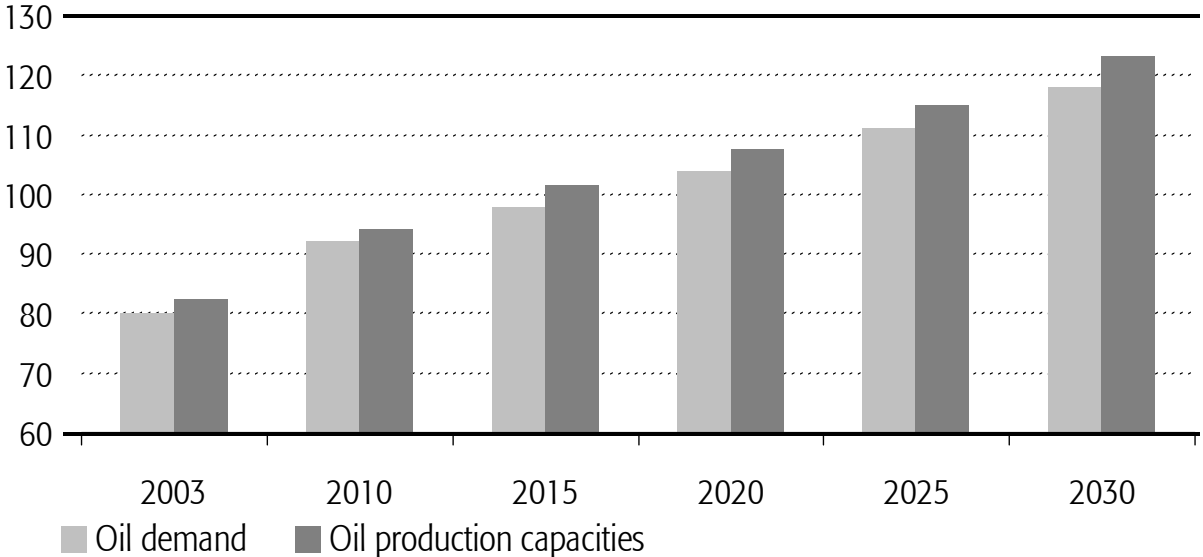
Source: OPEC, Allianz Dresdner Economic Research.

### Long-term supply security?

At this point it is justified to ask how much oil production can grow in the long term and when it will reach its maximum. Skeptics deploy the “peak oil” theory which suggests that global oil output will peak as early as this decade. However, according to figures from the US Energy Information Administration (EIA) conventional oil resources stand at 3 trillion barrels. The bulk of this is accounted for by the Persian Gulf. In addition, with the help of modern technologies, the life of oil fields can be extended using “enhanced oil recovery” procedures, adding another trillion barrels. Going forward, this procedure will be of interest for the mature oil fields in the USA and the North Sea. In addition, immense non-conventional reserves of very heavy oil still exist in the Orinoco Basin in Venezuela and bitumen in Canada, adding another 3.7 trillion barrels. Setting this overall figure of 7.6 trillion barrels against today's output, the resource pool would correspond to 240 years' energy supply. In its long-term outlook up to 2030 the EIA assumes that over the review horizon enough oil will be produced to

cover global demand. New exploration projects and production technologies, cost-cutting programs and the increasing processing of oil sands and very heavy oil will help boost production growth. Global oil output is thus not expected to peak before 2030.

## Global oil consumption and production capacities 2003 - 2030 mb/d



Source: Energy Information Administration.

### Alternatives

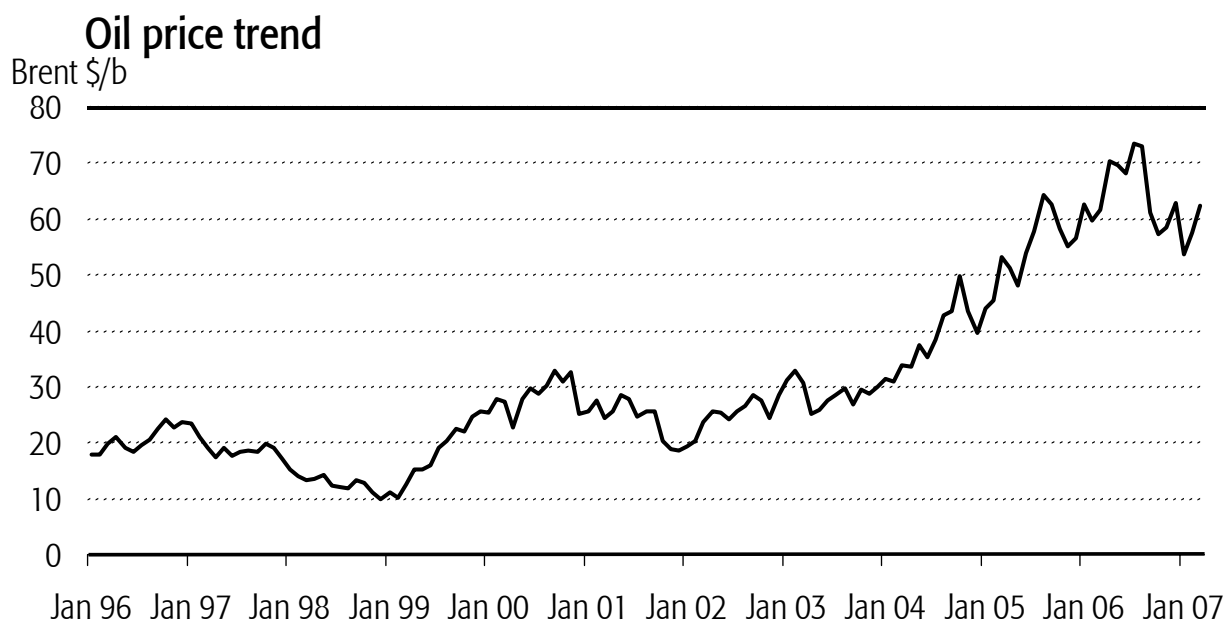
**Competition from the gas sector and renewable energies** will also intensify. Since 2000 the share of oil in world primary energy consumption has fallen from 38 % to 36 %. Oil consumption in Germany is in line with the world average, gas accounts for 23 % and renewables reach 4 – 4.5 %. As a heating fuel, oil will face increasing competition from gas, as well as biomass, solar energy etc. The higher the oil price, the more its market share will shrink. This is partly because oil and gas are becoming increasingly interchangeable and the gas sector has also embarked on various major projects. Moreover, the process of gas liquefaction has now made it easier to transport consignments from the Middle East to other parts of the world. India, for instance, is increasingly turning to gas.

To reduce their reliance on commodity exporters and crisis regions, Western countries are stepping up the search for alternatives, which essentially lie in **more cost-intensive biofuels**. The most important biofuel in the world is bioethanol sourced from sugar cane in Brazil. Its production is commercially viable from an oil price of USD 30 to 40. The second largest producer of bioethanol is the US, although production there from grain is far more expensive. Tax relief is now helping to make it more competitive. In Malaysia and Indonesia heavy investment is being made in producing palm oil-based biodiesel, on which Chinese investors in particular are focusing. According to the IEA the biofuel share in road traffic consumption stood at a mere 1 % in 2004, but energy policy targets in the industrialized countries, and also in China, could cause this to treble by 2010 on a rising trend.



## Oil price outlook

Against this backdrop, given **weaker business activity oil consumption will be moderate** this year. On the supply side, the production cutbacks trumpeted by OPEC are unlikely to be implemented in full. In addition, spare capacities are on the rise again. In this market environment, the average price of oil in **2007** should therefore be around **USD 55**.



**In the medium term the large investment projects will boost production capacity.** Moreover, the search for alternative energy sources will receive fresh momentum. However, oil consumption will also pick up more strongly again. The biggest push to demand will stem from the emerging markets, especially China. However, the expansion in supply will suffice to cover the extra demand. **An oil price crisis is not on the cards.** Rather, we will again see phases where the oil price can ease substantially.

However, the days of extremely low oil prices as seen in the late 1990s are over. Expanding oil production now involves higher marginal costs. Extracting oil from oil sands, biofuel processes and the like are relatively cost-intensive. Arguing against a too hefty decline in the oil price is the fact that these cost-intensive production processes would otherwise lose their charm and, in the worst case, disappear from the market altogether. The related oil supply would be missing, preventing too steep a drop in the oil price.

In view of the geopolitical risks, the **oil market will remain volatile**, although broadly speaking gains in spare capacities should keep risk premiums in check. The **risk of the oil price exceeding** the base scenario lies chiefly in an unexpectedly **powerful upswing in the world economy** or an **escalation**

**of the situation in the Middle East.** Should the row over Iran's nuclear power program come to a head and Iran make the narrow Strait of Hormuz on the Persian Gulf impassable for oil tankers, the oil price could jump well above USD 100 a barrel, at least in the short term. But on a medium-term timeline the many investment projects and the greater incentives to tap alternative sources of energy would still come into play.