The oil price and monetary policy – a new paradigm

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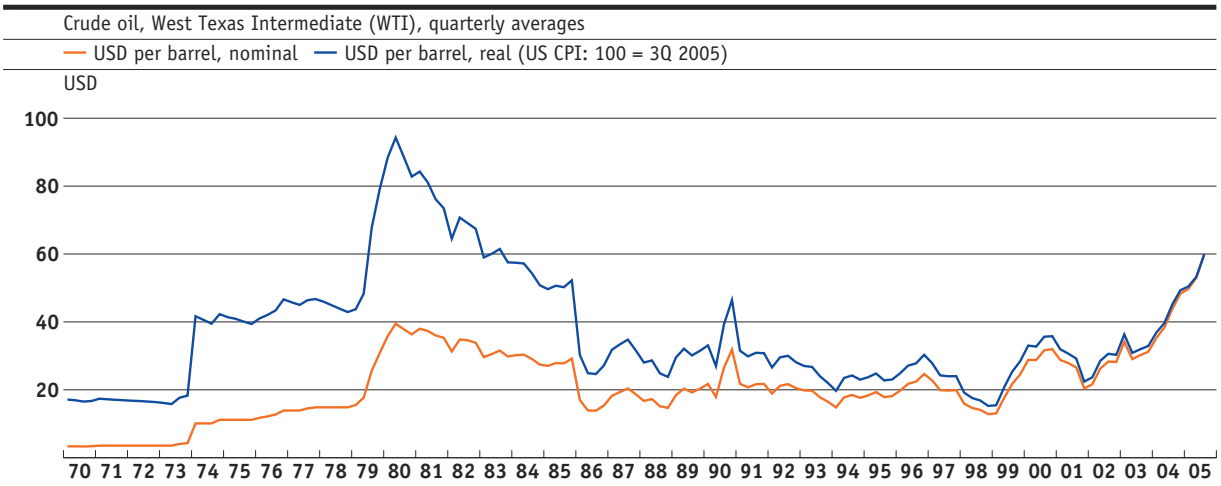
1 Introduction

The oil price hit a low of around USD 10 at the end of 1999. Since then it has moved upwards in a series of steps. In recent years it has been one of the most closely monitored components of the Consumer Price Index (CPI), which is a leading inflation indicator. When it topped the USD 50 mark in October 2004 and in March 2005 and, even more clearly, when it passed USD 60 in mid-2005, it brought back painful memories of the severe economic consequences of the 1970s oil crisis. However, in real terms – after adjusting for inflation – the oil price is still lower now than it was then. In today's dollars, the oil price was over USD 90 in 1980 (Graph 1).

Another striking factor is that between the mid 1980s and the turn of the millennium the oil price fluctuated around an average of about USD 20. Since then, the average price level and volatility have greatly increased.

Although a few years do not provide sufficient evidence to validate a trend, they do raise questions about the background to the oil price hike and its implications for monetary policy. This paper looks at the fundamental factors which suggest that oil prices are likely to remain both high and volatile. It also discusses the implications for monetary policy. Since maintaining price stability is the principal objective of monetary policy, this paper focuses primarily on the impact of oil prices on inflation; the effects on growth are considered insofar as they affect inflation. Section 2 outlines some of the reasons why oil prices are expected to remain high and volatile. Section 3 looks at forecasting oil prices while Section 4 outlines the possible implications of higher oil prices for economic growth and inflation. Finally, Section 5 examines the monetary policy implications of sustained high oil prices. The final section presents our conclusions.

Graph 1
Oil prices



Source: Bloomberg

2 Reasons for an era of high and volatile oil prices

The price of oil is essentially determined by four factors: general demand and supply factors (2.1), geopolitical factors (2.2), geological factors (2.3) and financial market factors (2.4). For a variety of reasons, it seems likely that in the foreseeable future[1] oil prices will remain both high and volatile.[2]

2.1 Demand and supply

Factor 1: Reversed causality: demand-driven oil prices

In the 1980s, the link between oil prices and economic cycles was still dominated by the unilateral impact of oil prices on the economy. However, today the increasing importance of demand for oil has reversed this situation: demand for oil and thus the price of oil are increasingly dependent on the global economy. To some extent, a rise in oil prices is a normal by-product of a global economic upswing. Recently, this has been strengthened by the extremely high growth momentum in China, which is now the world's second largest oil importer and oil consumer after the USA. It should be stressed that this is not a temporary phenomenon. On the contrary, the integration of China and India into the global economy most likely represents a rare structural shift whose economic implications are comparable to the integration of the USA in the global economy in the nineteenth century.

Demand has become a far more important factor in the past ten years

The graph of world GDP versus the oil price shows a gradual shift in the mid-1990s. Prior to the mid-1990s, the correlation was negative, and, since, it has been positive (Graph 2).[3]

According to the International Energy Agency (IEA, 2005), global demand for oil rose by 2.6 million barrels a day in 2004. That was a rise of 3% compared with the previous year and the sharpest hike for nearly 25 years. The IEA forecasts that in 2005 demand will rise further by 1.4 million barrels per day (about 1.7%) to around 84 million barrels per day. In view of the limits on production capacity, demand has thus become one of the key oil price drivers. Almost half of the rise in demand is attributable to emerging markets in Asia, with China alone accounting for nearly one third of the increase (Table 1).

1 The factors outlined in this section are essentially long-term in nature even though their impact may vary over time. For instance, Factor 3 (investment) will become more important than Factor 2 (low oil stocks) over time.

2 Statistically, the structural break in the volatility of oil prices has not been significant so far. This section outlines various reasons why its significance could rise once more observations are available.

3 The correlation was −0.4 before 1995 and has been +0.3 since. This linear representation is merely a rough approximation. Non-linear methods are normally used for accurate quantification (cf. Hooker, 1999; Hamilton, 2003). Moreover, the structural shift did not take place in a single year; it was a gradual process of transition.

With China and India, two very large economies have emerged as oil importers. Moreover, their potential indicates that in both countries economic momentum is merely in its infancy. Economies tend to be particularly dependent on oil in the initial development phase.

This trend has been cushioned to some extent by the reduced oil intensity of production processes in the industrialised countries. Nevertheless, North America accounted for a fifth of the rise in global demand for oil in 2004 (Table 1), making it the main demand driver along with the Asian countries (Graph 3). The higher relevance of demand does not only explain the hike in the oil price, it also shows why it has become more volatile. Cyclical fluctuations are by nature more volatile than fluctuations in structural, supply-side factors.

Graph 2
Oil prices and world GDP

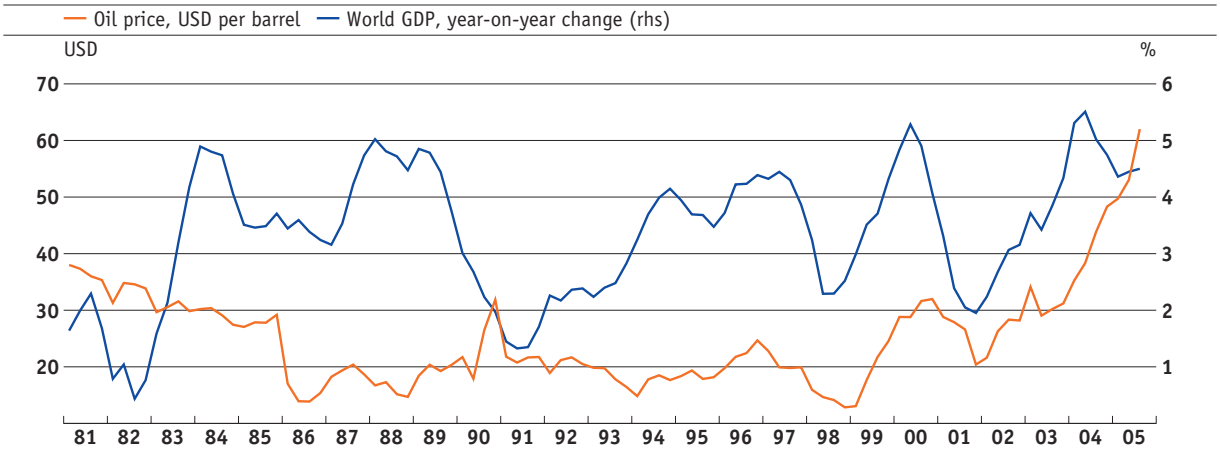


Table 1
Global oil demand by region

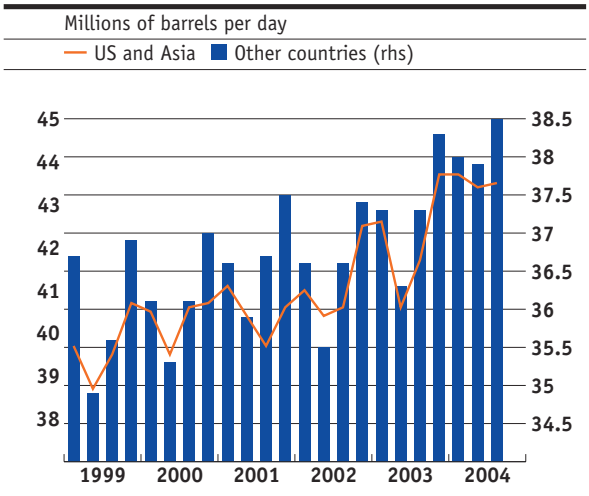
(million barrels per day)

	Demand	Annual Change			Annual Change (%)		
	2004	2003	2004	2005	2003	2004	2005
North America	25.19	0.47	0.61	0.36	2.0	2.5	1.4
Europe	16.44	0.20	0.24	0.11	1.2	1.5	0.7
OECD Pacific	8.63	0.14	-0.15	0.00	1.6	-1.7	0.0
China	6.38	0.55	0.86	0.50	11.0	15.6	7.9
Other Asia	8.57	0.22	0.47	0.24	2.8	5.7	2.8
Subtotal Asia	23.57	0.91	1.18	0.75	4.2	5.3	3.2
FSU	3.71	0.12	0.13	0.05	3.5	3.7	1.4
Middle East	5.88	0.20	0.32	0.29	3.7	5.7	4.9
Africa	2.81	0.04	0.07	0.09	1.7	2.4	3.3
Latin America	4.90	-0.10	0.17	0.12	-2.0	3.7	2.4
World	82.50	1.84	2.72	1.77	2.4	3.4	2.1

Graph 2:
During the 1990s the correlation between oil prices and GDP growth switched from negative to positive.
Sources: Bloomberg, Oxford Economic Forecast (OEF)

Table 1:
Source: International Energy Agency (IEA), 2005

Graph 3
Global oil demand



Graph 3:
Source: International Energy Agency (IEA), 2004

Gradual price rise

The way in which the oil price has risen is further evidence of the increasing significance of demand-side pressure. Prices rise in response to either a shortage of supply[4] or an increase in demand. However, while a reduction in supply, as occurred in the 1970s, affects prices immediately, an increase in demand, as has been the case since 2000, only gradually lifts prices.

Factor 2: Low stocks

Global competition increases pressure to cut production costs. Wide-ranging action has been taken in recent years to trim costs, and, as a result, global stocks have gradually been scaled back. With the increasing risk of rising oil prices, stocks have regained their attractiveness. Since 2004, oil stocks in the USA have been recovering from a 30-year low (Graph 4). This gradual increase in stocks is another factor boosting demand.

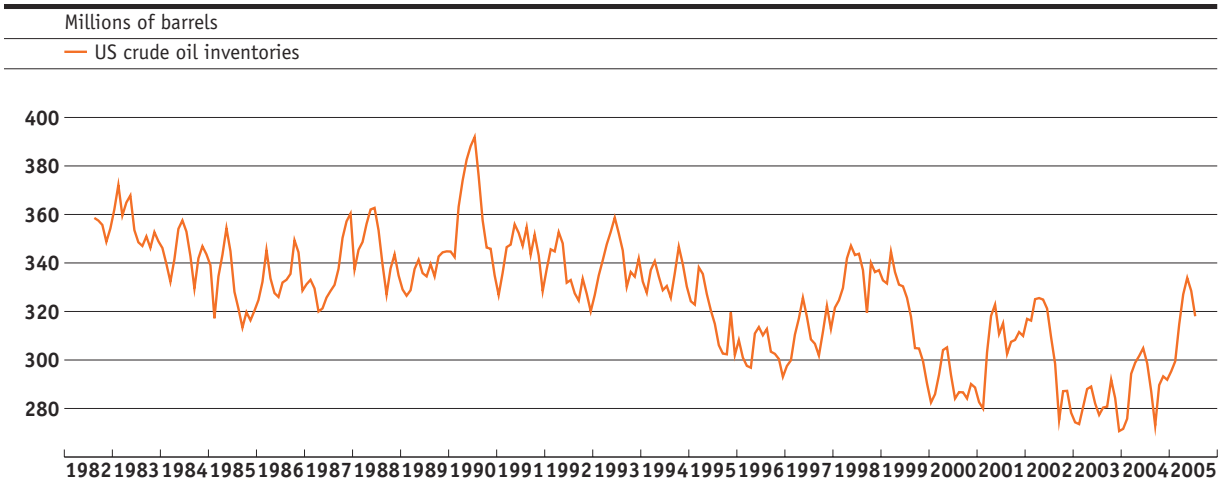
China has played a pivotal role in this issue as well, as its demand was severely underestimated in recent years. In the general low price environment of the late 1990s, an increase in oil stocks in the industrialised countries would have had relatively little impact on oil prices. However, in conjunction with an unexpected hike in oil demand from China, the same increase in oil stocks caused prices to spiral.

Factor 3: Turning point in investment cycle of oil facilities

Oil is formed from deposits of plants and micro-organisms on the ocean bed. It is generated over millions of years as a result of heat, pressure and the absence of air. The cost of extracting oil varies considerably among different regions. However, drilling costs only account for a comparatively small proportion of the overall cost of the end-product (after transportation and refining). There is some doubt whether this will hold true for the future. Investment in oil rigs has been seriously neglected in some cases, and the necessary replacement investment is likely to push up oil end-prices. According to the IEA (2005), the energy sector needs to invest around USD 16 trillion by 2030. The rise in oil prices has increased the profitability of investments in infrastructure, which should lead to downward pressure on oil prices in the longer term. However, this would require that decisions made in the oil-producing countries be depoliticised and that the increase in infrastructure investment actually lead to higher oil supply. In addition, because they lift the profitability of investment, rising oil prices also increase the value of oil reserves and thus the incentive to cap supply. Only when oil prices reach a level that makes switching to alternative energy sources a viable prospect, will oil producers have a direct economic incentive to exploit the technical capacity of their infrastructure to the full.

4 Hurricane Katrina provides renewed evidence of the high short-term vulnerability of oil supplies.

Graph 4
US crude oil inventories



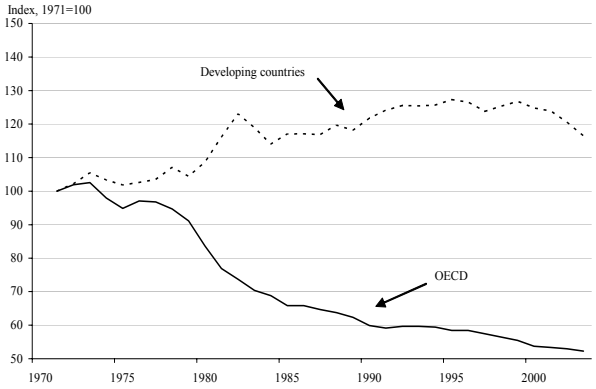
US crude oil inventories are only gradually recovering from their low point.
Source: Bloomberg

Factor 4: Differences in the efficiency of oil use

In the OECD countries, the oil intensity of the manufacturing industry and the consumer sector has halved since the oil shocks of the 1970s. Thus, in some countries it has become more and more difficult to put into effect further savings. At the same time, the emerging markets have made virtually no progress towards raising the efficiency with which they use oil (Graph 5). In particular, the amount of oil consumed by China is out of proportion to its output. This may be due in part to the type of industry, since heavy industry with genereally less energy-efficient technologies is most prevalent. Another explanation of the unusual ratio of oil imports to GDP is that domestic households use oil to run inefficient diesel generators.[5]

5 At the start of 2005, diesel accounted for about half of Chinese demand for oil (IEA, 2005). According to the OECD (2004), an increase in economic growth in China would lift the oil price in the next 25 years by about twice as much as an equivalent rise in GDP in the OECD countries.

Graph 5
Oil intensity (oil use per unit of output)



Source: Brook et al., 2004

2.2 Geopolitical factors

Factor 5: Simultaneous and unrelated events have increased geopolitical insecurity and raised concern about the domestic policy of key oil-producing countries

The oil market has always been highly political. Following the terrorist attacks on 11 September 2001 and the second Iraq war, geopolitical insecurity increased sharply, especially in the main oil-producing countries. Even if there are no further terrorist attacks, the fear triggered by the attacks to date is sufficient to exert upward pressure on oil prices and increase their volatility. Moreover, it should be remembered that since the turn of the millennium political unrest has not been confined to a specific region. Instead there have been an increasing number of simultaneous yet completely unrelated political crises. The oil market has not simply been affected by the altered situation in the Middle East. At almost exactly the same time it has been exposed to concerns about Venezuela, Nigeria and Russia. Here too, uncertainty alone is enough to boost prices.

Some political observers believe they can make out a worrying trend. Since the 1990s the world has been exposed to a political shock with international repercussions roughly every two years. The first attack on the World Trade Center in 1993 was followed in 1995 by terrorist attacks in Saudi Arabia and on the Moscow embassy. This was followed by the attacks in Kenya in 1998, on the World Trade Center in September 2001 and in Madrid and London in 2004 and 2005. This list of some of the major terrorist attacks suggests that this is a persistent problem to which there is neither a rapid nor a simple solution, thus further fuelling the general sense of insecurity. Here too, circumstances mitigate in favour of a further increase in both the level and volatility of oil prices. A market in which (volatile short-term) fears are gaining the upper hand over (long-term) fundamentals is particularly susceptible to volatility. The fact that last year's terrorist attacks in Madrid and this year's attacks in London did not have any major impact on the financial markets suggests that such fears had already been priced in.

Factor 6: Globalisation

Globalisation leads to an increased and faster transmission of shocks. Such a thing as a closed economy no longer exists. Evidently, this entails opportunities – such as the prospect that China will becoming a major driving force of economic growth in the long term – as well as risks. As economic interdependence increases, crises, whether local or global in nature, have a faster and more widespread effect than in the past.

Moreover, globalisation increases transport activities, which are the main purpose for which oil is used. The OECD (2004) expects the transport sector to be responsible for three-quarters of the increase in demand for oil in the period up to 2030.

Factor 7: Institutional change

In an environment of heightened insecurity, a strong institution such as OPEC could ease market fears. OPEC and especially the Middle East states have by far the largest oil reserves in the world.[6] The IEA predicts that the Middle East will raise its market share from 25% to around 40% in the next 30 years. In view of this, many market commentators assume that OPEC's influence will increase in the long term. Nevertheless, it is worth asking how effectively OPEC can control the price of oil in a market which is driven by demand and is also exposed to speculative interests. Some market observers feel that OPEC's hold on oil prices has declined steadily since the second half of the 1990s. For example, the reduction in oil production following the sharp drop in oil prices in late 1997 and 1999 and the staggered increase in output triggered by the record prices in summer 2004 only had a minor impact on prices. Additionally, OPEC's policy of holding production below the agreed floor could also have an unsettling effect. Thus it is argued that on the institutional side there is no immediate sign in the foreseeable future of a trend that could ease market tension.

6 According to the IEA/OECD (2004), about two-thirds of the world's known oil reserves are in OPEC countries.

As the experience of the 1970s shows, high oil prices trigger rationalization and substitution, to reduce dependence on oil.[7] Therefore persistently high oil prices could – contrary to widespread expectations – undermine OPEC's market power or reduce the speed at which it extends its influence, as happened in the 1970s.[8]

Besides, the oil price may have been kept comparatively low so far for institutional reasons. This can be demonstrated by the Hotelling rule, which states that in the long term the price of a non-renewable resource rises at least as fast as the price of a financial asset that generates a long-term return.[9] Obviously, this seems to conflict with the situation in the late 1990s when oil prices were at a record low. Contrary to the rule, at that time large quantities of oil were produced although selling prices were very low. In fact, the Hotelling rule only applies in perfect markets and thus seems unlikely to apply to those parts of the oil market where oligopolistic structures hold sway. As decisions on exploiting oil reserves become more democratic, the Hotelling rule is likely to become more relevant. Analogously to a floor option, the floor for the long-term return on oil is therefore likely to be around the same level as long-term interest rates.

7 Just as the coal era ended long before reserves were exhausted, so the oil era could end before the oil sources dry up, as the relative profitability of alternative energy sources increases.

8 The OECD (2004) estimates that a USD 5 dollar rise in the oil price compared with its reference scenario of USD 35 would reduce OPEC's market price by around 7% to just over 30% by 2030.

9 Owners of exhaustible resources maximise their profits either by extracting the resource now and investing the profits in interest-bearing instruments or by waiting until shortages raise the price of the resource. The Hotelling rule (Hotelling, 1931) shows the equilibrium at which the price increase compensates for the foregone interest.

2.3 Geological factors

Factor 8: Uncertainty about oil reserves

Estimates of known oil reserves and expected new finds vary enormously – often due to differences in the way reserves are defined. Currently, there are no standard criteria. Despite their inside knowledge, even the oil companies publish widely differing forecasts and estimates of their present reserves.[10] This reduces market transparency and therefore tends to push up prices. Moreover, such estimates are often politically coloured.

The OECD (Brook et al, 2004) puts current reserves at 1,000 billion barrels. Assuming output does not change and no further reserves are tapped, these reserves would be exhausted in about 40 years. As a result, some analysts take a pessimistic view.[11]

However, so far rising demand for oil has been covered by newly discovered reserves and the ratio of reserves to output has therefore remained constant over the past two decades.[12] Since this cannot be seen as a guarantee of future developments, the range of estimates and scenarios is expected to remain extremely wide. Regardless how sound one believes some of the estimates to be, they can have a direct impact on oil prices as soon as the market becomes exposed to speculation; the assumption that other market participants could act on the basis of certain forecasts is sufficient.

10 For example, in the 1970s BP believed that global output would peak in 1985 while Shell did not expect this to happen until 1999. Not only do forecasts differ according to analyst and timing, but even estimates of current reserves vary substantially. For instance, at the start of 2004 Shell attracted a good deal of attention by cutting its reserves estimation by 20%. Although Shell merely took this step to bring its estimation methods in line with the guidelines issued by the Securities and Exchange Commission (SEC) in the United States, it triggered great uncertainty. The ensuing discussion raised doubts about the reliability of all reserves estimations issued by the market, which subsequently led to higher prices.

11 Marvin King Hubbert is one of the best-known oil analysts who take a very critical stance on future oil market trends. In 1956 he published a famous forecast that oil output in the USA would begin to decline after 1972. Since output was rising quickly at the time, that was a bold statement which gave rise to considerable debate. However, he was quite right. From 1970 the USA shifted from a net exporter to a net importer of oil. Some analysts use Hubbart's geology and mathematics-based forecasting method nowadays to forecast when global oil production will peak. On this basis, output will peak between 2003 and 2008 ("Hubbart's peak"). This forecast underlies the basic assumption that global consumption is 2% on average and that reserves decline by 6%.

12 The largest reserves are in the Middle East, and new troves of oil have led to substantial revisions of the estimates. In 1944 reserves in this region were put at 16 billion barrels. However, estimates had risen to 116 billion barrels by 1975 and now stand at around 685 billion barrels (cf. Adelman, 1995).

2.4 The financial market

Factor 9: Oil as a financial underlying

The increased volatility in oil prices attracted new investors to the market. The resultant increase in liquidity has in turn made the market more attractive. The number of traders who are interested in oil as a financial instrument, rather than the fuel itself has risen significantly in recent years.

The price hike over the last two years was thus driven also by financial market expectations. Most observers felt that the price increase exceeded the level justified by the market situation at the time. In the first quarter of 2004, OPEC representatives put the speculation premium at USD 5 per barrel. In the third quarter of 2004, various market commentators put the premium at USD 8–10.[13] In its quarterly report, the BIS (2004) saw a high correlation (0.8) between the weekly change in the oil price and the changes in long positions held by non-commercial traders.

Given the unreliability of the available data, it is very difficult to estimate what proportion of a price rise is due to speculation. The only thing that is certain is that a tight market situation provides an incentive to speculate on higher prices.[14]

One reason why oil became an object of speculation at the start of this millennium was the greater dependence on demand (Factor 1), which increased the band within which prices fluctuated to a level that speculators found interesting. Additionally, investing in oil may have become more attractive because of the lack of alternatives. Following the end of the "new economy" boom, investors were looking for new opportunities. At the start of 1999 oil prices had dropped to a 25-year low and thus attracted little attention. Together with signs that demand for raw materials was gaining momentum, traders saw these low oil prices as an ideal basis for launching oil as a financial instrument.

13 For an overview of the literature on speculation and its impact on oil prices see Weiner (2002).

14 The significance of speculation versus the other factors should not be overestimated. For example, Weiner (2002) concludes that speculation only has a marginal impact on oil prices.

Factor 10: Expectations that the dollar will weaken

The OPEC member states control nearly 80% of the world's known oil reserves and currently serve about 40% of global demand. Since 2001 OPEC has set a target band of USD 22–28 a barrel.[15] Given the United States' record current account deficit, many market observers assume that the dollar will depreciate in the long run. Thus, in the long term, expectations that the dollar might fall could prompt OPEC to set a higher target band in dollars in order to offset the resulting deterioration in the terms of trade. Between the start of 2001 and mid-2005 the dollar dropped about a third against the euro. A corresponding adjustment to the band would probably bring the price to USD 29–37. In response to the recent oil price trends, OPEC announced that it would temporarily suspend the target band in 2005.

15 Based on a OPEC oil price basket – which was changed in mid-2005 – and usually is slightly below the price for the very light West Texas Intermediate crude oil.

3 Oil price forecasts

The previous section outlined various factors which indicate that oil prices will rise and volatility will increase. In view of the considerable uncertainty regarding all of these factors, any oil price forecast is likely to have a high standard deviation, restricting its significance. Therefore many observers confine their forecasts to qualitative statements – for example, to the general statement that the oil price will rise as strongly as demand allows. Despite the high forecast uncertainty, monetary policy makers need to make specific assumptions about future oil price trends for their GDP and inflation forecasts and have to consider its likely impact early. In this chapter some quantitative forecasting approaches are outlined briefly. Afterwards we look at the usage of oil price forecasts in macro-economic models.

3.1 Quantitative approaches to forecasting oil prices

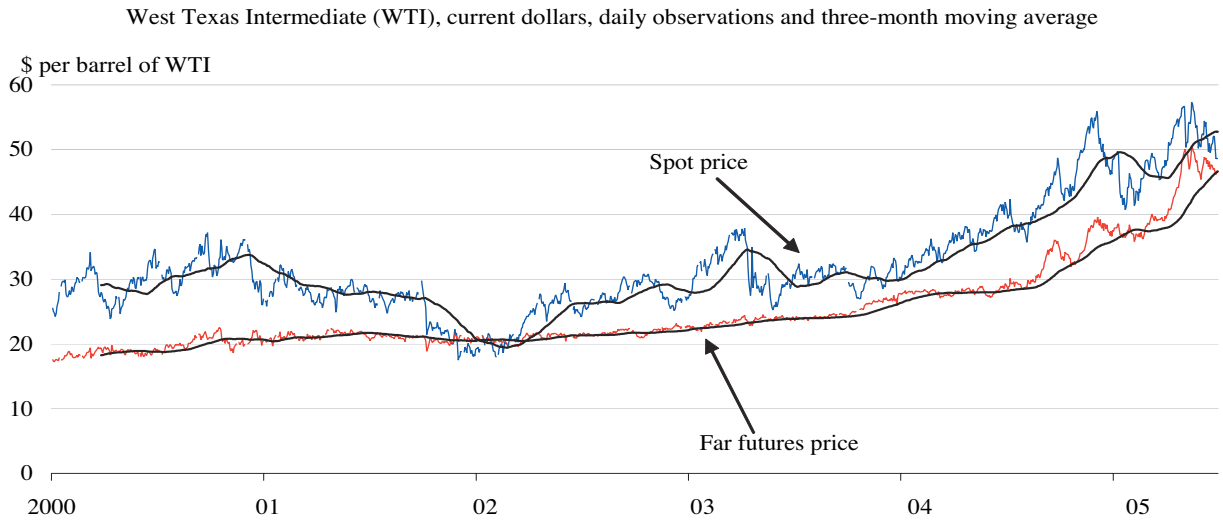
Economic forecasts are based on the principle that assumptions about the future can be derived from the past. However, in the case of oil, various empirical analyses have come to the conclusion that neither the extent of past price changes nor the duration of high-price phases provides any indication of when such phases are likely to end.

In the short term, various market indices can be taken as an indicator of how oil prices are likely to develop. Thus, forecasts may be based on performance spreads between stock market indices with different levels of exposure to energy stocks (e.g. Canadian market indices which contain a high proportion of oil securities versus German indices where energy only represents a small percentage) or the valuation of shares in oil companies. By contrast, market observers who take a longer-term view generally use a combination of two parameters: a measure of economic activity and an indicator of oil inventories.

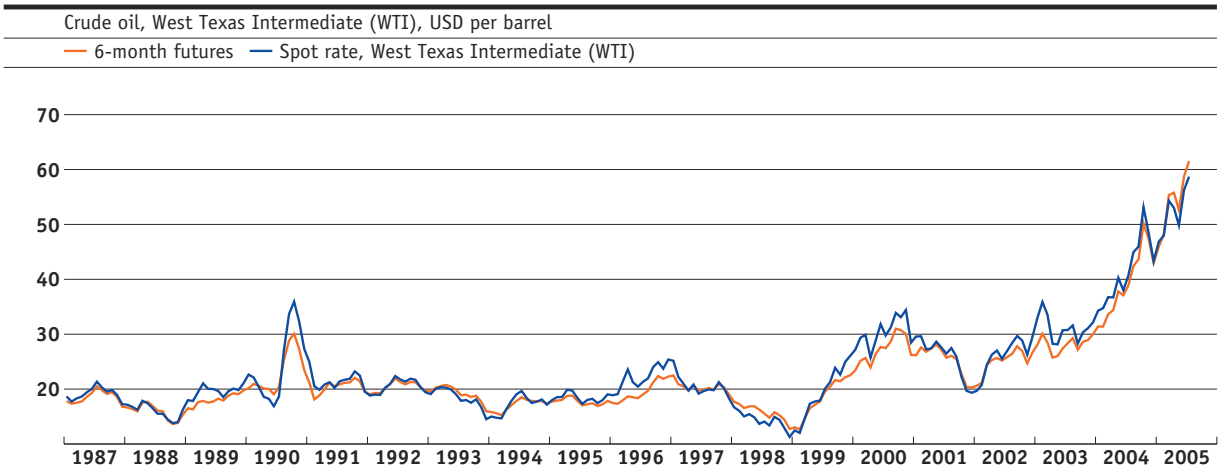
3.1.1 Forecasts based on futures contracts

Oil price forecasts are often based on exchange-traded futures contracts. After all, who could be better placed to assess future prices than investors who stake money on tomorrow's prices? Using forward rate contracts or futures to forecast tomorrow's spot price is a popular method of forecasting prices for anything from shares and exchange rates to commodities, for the latter with varying degree of success. While futures on gold tend to behave similarly to equities – meaning, futures prices are above their spot price ("contango") – this rule is increasingly being breached in the oil market. This means that the price of oil for delivery in up to a year's time is below the current market price. This market situation is known as "backwardation". Normally, arbitragers would be expected to empty their warehouses at high spot prices and fill them at lower futures prices, thus reducing the spread between spot and futures prices. That would enable them to reap substantial gains. However, between 2000 and the start of this year, backwardation was the rule on the oil market (Graphs 6 and 7). What were the reasons for this?

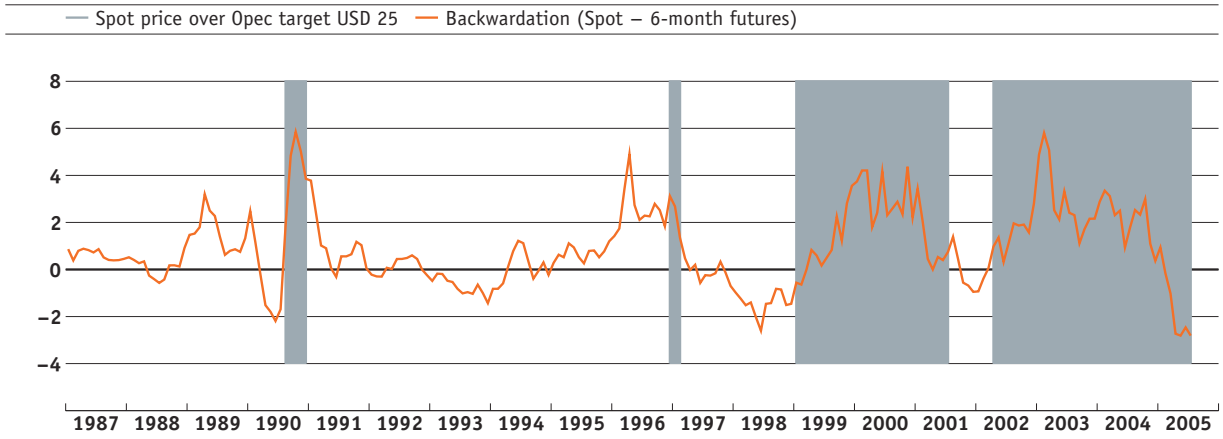
Graph 6
Spot rate and long futures



Graph 7
Spot rates and 6-month futures



Graph 8
Backwardation



Graph 6:
Source: OECD, 2005

Graph 7:
The spot rate is often above 6-month futures (backwardation, monthly).
Source: Bloomberg

Graph 8:
Backwardation on the oil market is most common when the spot price is above the OPEC target. The shaded areas show periods when the spot price was over USD 25 (OPEC corridor: USD 23–28, mean USD 25).
Source: Bloomberg

3.1.2 Reasons for backwardation

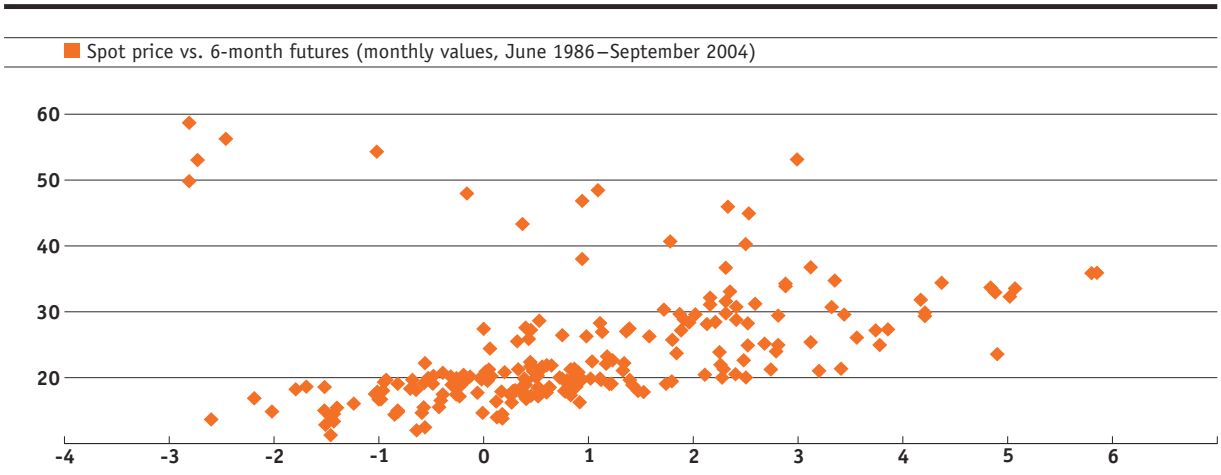
One explanation of backwardation is that market conditions hinder arbitrage. Unlike equities, for instance, arbitrage on the oil market is restricted by low market liquidity, seasonal fluctuations in supply and demand, the risk of interrupting the supply chain and maintenance costs.

Like other commodity markets, the oil market is often in backwardation. This is partly because the oil reserves still in the ground can be seen as free storage facilities. In other words, the situation is similar to a put option in the hands of the oil-producing countries. Furthermore oil is – unlike gold – essentially a factor of production rather than an object of speculation, despite its increasing popularity as a financial instrument. Heating and cars do not run on options. Consequently, risk aversion tends to be relatively high: people would rather fill their cars with expensive petrol today than run the risk that they could run out of fuel because they speculated that the price might drop tomorrow.

Besides restricted arbitrage, institutional factors can influence market expectations and compound backwardation on the oil market. Thus, backwardation mainly occurs in phases when spot prices are above the average of the OPEC target band. The oil market was in "contango" in 2001, when the spot price was around USD 20 and thus below the OPEC target band of USD 23-28, and tended to backwardation as soon as the spot price exceeded the target band (Graph 8).

This also follows from the observation that generally the higher the oil price, the greater the backwardation (Graph 9). It remains to be seen whether the latest price record that coincided with a "contango" situation is to be seen as a reverse of this trend on the futures markets.

Graph 9
Backwardation



Backwardation (Spot price vs. 6-month futures) rises as the spot price rises.
Source: Bloomberg

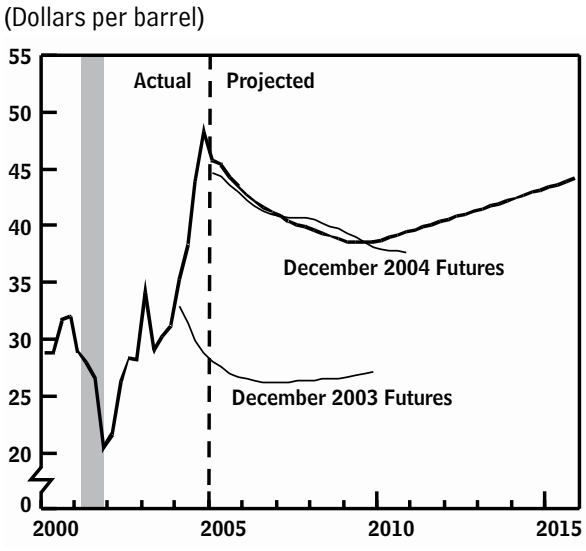
3.2 Use in macro-economic models

In macro-economic models as used by central banks and administrative authorities, futures prices are often used as an approximation of future oil prices. For example, in the budget published at the start of 2005 (CBO, 2005) the Congressional Budget Office in the US assumes, on the basis of futures prices, that oil prices will drop by 2009 (Graph 10). Similarly the Bank of England has stated (2000) that it still sees the futures market as the best indication of future oil price trends.

Therefore, in the long backwardation phase between 2000 and the start of 2005, oil price trends were systematically underestimated.[16] Futures prices are thus a controversial indicator of long-term spot prices. Haubrich, Higgins and Miller (2004) claim that while the oil futures market may be useful for hedging or speculative activities, it is not very suitable as a basis for forecasting. Although the drawbacks of using futures prices for forecasting purposes have become evident in recent years, there is currently no superior alternative available.[17] Thus, at the SNB, futures prices also serve as a basis for oil price assumptions, which – in addition to other factors – are taken into account as external variables in making the quarterly inflation forecasts. Nevertheless, they do have to be treated with a good deal of caution.

16 Remarkably, Graph 10 comes from the CBO (2005, p. 42). Nevertheless, the CBO is sticking to its forecast of dropping oil prices, in line with futures prices.
17 Chinn, LeBlanc and Coibion (2001) conclude that although futures do not provide very accurate forecasts, at least until 2000 (shortly before the prolonged backwardation phase) the corresponding forecasts were free of distortion.

Graph 10
Futures as a forecast of oil prices



Source: Congressional Budget Office (CBO)

Furthermore, information on the futures market should not simply be used as an indicator of point forecasts; it should also be used as a gauge for forecast uncertainty.[18]

4 Pass-through channels

As outlined in section 2, several factors indicate that in the medium term the oil price will remain high and probably also more volatile. Oil prices impact the economy in a variety of ways. First, economic growth is dampened by higher oil prices – in the short term through demand and in the longer term through supply-side effects. Moreover, the direct and indirect effects of higher oil prices are reflected – at least temporarily – in higher inflation.[19]

4.1 The oil price and economic growth

As outlined in the introduction, this paper focuses on implications of higher oil prices on monetary policy and thus on the pass-through effect to inflation. Since the inflationary impact is determined, in part, by the implications for economic growth, the growth effects are outlined briefly here.

The expected economic consequences of higher oil prices are mainly dependent on the duration of the shock, the assumed monetary policy response and the assumed oil intensity of an economy. Here, we look in particular at the impact of unexpectedly sharp price increases (oil shocks).

Demand and supply

In the short term, an oil price shock reduces demand. It has the same effect as a tax, leading to a direct reduction in purchasing power. In the medium term, a classic supply-side effect develops as manufacturing becomes more expensive and the profitability of production facilities declines. In the long term, the supply-side effect is amplified as investment drops, thus reducing the capital stock. If oil prices remain high for a long time, a substitution effect is triggered as investment in alternative sources of energy becomes more attractive.[20]

18 An application can be found, e.g., in Bernanke (2004).
19 A third channel for oil prices to impact on inflation is through a change in the terms of trade. This is examined in a separate sub-section because its quantitative relevance is declining.
20 Whether this makes up for, or even more than offsets, the decline in investment is a matter for debate. Similarly, there is much controversial discussion about whether the government should subsidise the search for alternative sources of energy, by levying an energy tax that increases or stabilises prices additionally over the market signal.

Extent of economic effects

The quantitative correlation between oil prices and economic growth is complex and highly controversial, and thus will be mentioned here only briefly. The economic consequences differ according to the model used and the assumed monetary policy response. Nevertheless, the conclusions tend to be similar.[21] Accordingly, a USD 10 rise in the price of oil is expected to cut GDP by just under 0.5% and raise inflation by just over 0.5%.[22] Overall, most economists consider the impact of the recent oil price hikes as noticeable but in no way comparable to the effects in the 1970s. Different results can be explained mostly by different modelling of the monetary policy response function or by frictions in the labour market. Risk management considerations frequently lead central banks to assume stronger impacts so that the estimated growth loss can be seen as an upper limit.

The IEA/OECD (2004) has simulated a permanent rise in the oil price from USD 25 to USD 35. The impact on GDP and inflation was absorbed almost entirely within a single year. This scenario, which has been shown to be very modest in the light of the subsequent hike in oil prices, reduced growth in the OECD countries by 0.4 percentage points in the first year, and increased inflation by 0.5 percentage points.[23] The SNB has also simulated various oil price scenarios, including more pessimistic ones. The results did not deviate significantly from the above findings.

Terms of trade: international distribution of losses

An economy's sensitivity to fluctuations in the oil price depends on the oil intensity of production and consumption as well as on its oil reserves. Although oil intensity is higher in the United States than in the EU, this is more than offset by the fact that the US has its own oil reserves. Therefore, it is mostly assumed that the US's sensitivity is slightly lower than the EU's. Switzerland's situation is comparable to the EU's. Although it is entirely dependent on imported oil, most of its added value comes from the largely energy-independent service sector.

The differences in the impact on GDP growth and inflation rates within the OECD block normally fluctuate within a narrow range of 0.1 to 0.2 percentage points. For some time, the terms-of-trade losses resulting from oil price rises have tended to be comparatively low (Graph 11).[24] The impact is likely to be greater in Asia, which is heavily dependent on oil imports. Moreover, the increased volatility of the oil price will have an above-average impact on some specific GDP components. Since globalisation is reducing companies' pricing power, higher oil prices are increasingly likely to be reflected in a reduction in margins and profitability. Greater oil price volatility will therefore tend to lead to increasingly volatile investment and, to a lesser extent, to greater fluctuations in consumer spending.

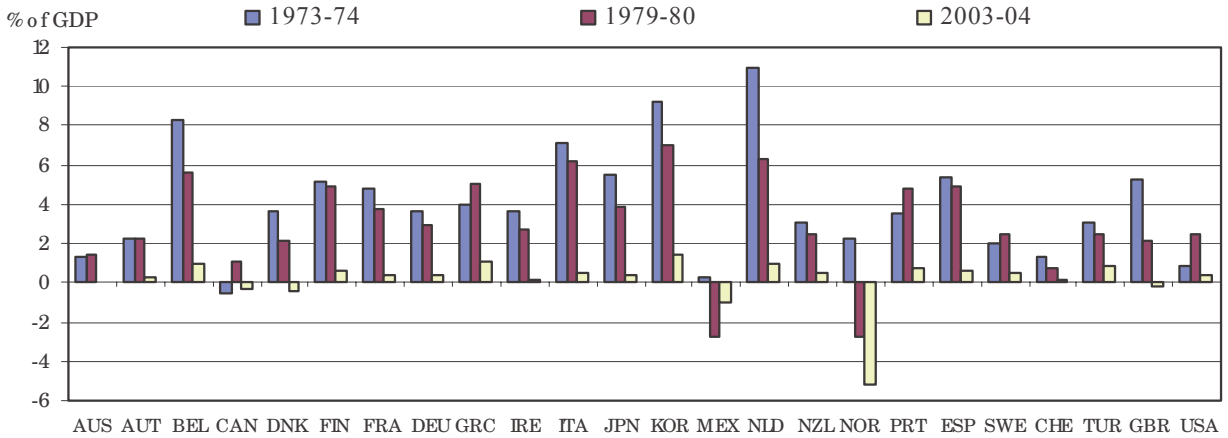
21 Cf. Brook et al (2004), OECD (2004) and IMF (2000) and the references therein.

22 A price of around USD 30 is normally assumed. Although the example given here has been confirmed by a number of international studies, it should be noted that new reduced-form estimates which take asymmetric effects into account point to a far greater drop in GDP – cf. Jimenez-Rodriguez and Sanchez (2004) and Hamilton (2003). The increased impact of reduced-form models could be due to their increased emphasis on the supply channel. As little research has been carried out on the form and stability of these non-linearities, the results are controversial.

23 A comparable analysis by the IMF (2000) came to a similar conclusion, as did an analysis by the OECD (Brook et al., 2004) assuming a USD 15 hike in the oil price.

24 Sensitivity to oil price shocks also depends on the dollar exchange rate. Most market commentators assume that the dollar will weaken (Factor 11), thus making oil imports less expensive and cushioning the impact of the higher price of oil in dollars.

Graph 11
Declining terms-of-trade losses in the OECD following an oil price rise



Source: OECD, 2004

The asymmetric effect of oil price shocks

Another interesting macroeconomic question is whether an economy returns to its initial position if oil prices rise but subsequently drop back to their initial level. In other words, does a temporary rise in the price of oil have a sustained or a temporary impact on the economy?

Empirical evidence suggests that the reduction in growth caused by higher oil prices exceeds the increase in growth generated by declining prices.[25] This asymmetric effect is mainly due to the fact that wages respond faster to rising inflation rates than to declining inflation (downward wage stickiness). Higher oil prices pass through into core inflation more than lower oil prices. This often results in a sharper monetary policy response and thus has a greater economic impact in the case of rising oil prices. This asymmetry mainly unfolds in prolonged periods of price rises/declines. By contrast, if the increase in the oil price is temporary and the second round effects are low, once the oil price has receded again there is normally a surge in growth that makes up for the previous shortfall. The impact of oil prices on inflation is of great importance for monetary policy and is outlined in detail below.

25 Cf. Hamilton (2003), for example. Hunt et al (2001) present results for the US, the euro area and Japan with the aid of the IMF's Multimod. On the basis of firm data, Davis and Haltiwanger (2001) found that the impact of a rise in oil prices on the US labour market is ten times greater than the impact of a decline in the oil price.

4.2 Pass-through of oil prices to inflation

The impact of oil prices on inflation is of central importance for a monetary policy striving to maintain price stability. There are numerous indications that this "pass-though" effect has changed in recent years.

Oil prices are passed through directly via various products...

The price of crude oil has a direct effect on inflation through petrol prices and the cost of heating. Its impact can be estimated from the weighting of oil products in the consumer price index (CPI). Because of different consumption patterns, the weighting may vary from one country to another. Because of its use in a wide variety of products (e.g. plastics), a rise in the oil price affects many components of the index.

...increasingly fast...

Oil price rises therefore affect consumers fairly quickly. Recently, there has been a tendency to adjust prices faster because it is becoming simpler and cheaper to do so (lower "menu costs"). As a consequence, fluctuations in the oil price become visible in the CPI earlier than in the past. Between 1984 and 1996 oil prices impacted the Swiss CPI slowly and the correlation was still significantly positive even two years later. In contrast, since 1997, the pass-through has been completed almost fully within six months. This does not appear to be excessively fast by international standards; according to a report published by the IMF (2000), pass-through effects become visible faster in the USA than in Europe and Japan.

...but to less extent in the CPI

Although the pass-through has become faster, its impact has declined. This is partly because more efficient use of energy has reduced the weighting of energy prices in the CPI. In Switzerland, heating oil was given a weighting of 2–3% in the 1970s and 1980s. Despite higher oil prices, this had dropped to 1.4% by 2005.[26] At the same time, globalisation has increased competition and thus reduced the magnitude of price rises. Other reasons for the declining second round effects in Switzerland, apart from increased competitive pressure, are increasing deregulation and, thanks to the low inflation rate in the 1990s, the increased credibility of the SNB.[27]

Declining pricing power and lower "menu costs" can be seen by comparing producer and consumer prices. Between 1984 and 1999 the correlation between the two was around 0.7. Between 2000 and 2004 this dropped to around 0.5. Moreover, before the year 2000 consumer prices lagged producer prices by about 6 months, whereas now they move roughly in tandem (Graph 12).[28]

26 Swiss Federal Statistical Office (BFS/SFSO, 1966-2005). While heating oil has a weighting of 1.36%, crude oil products overall account for 4.2% of the Swiss CPI.

27 The reduction in knock-on effects resulting from greater confidence in monetary policy is documented, for example, in Hooker (1999).

28 Cf. BIS (2005, p. 18ff) on the reduction in the knock-on effects of rising raw material prices on import prices and of these on inflation in the main industrialised countries in 1990-2004 compared with 1971–1989.
Evidence that the impact of the pass-through is declining is also found internationally and in more detailed analyses. For example, Hooker (1999) applied a Phillips curve approach to the US. This showed that oil prices had a major impact on both core and headline inflation rates before 1980 and that the influence has dropped off significantly since then.

Core inflation has become more important for monetary policy

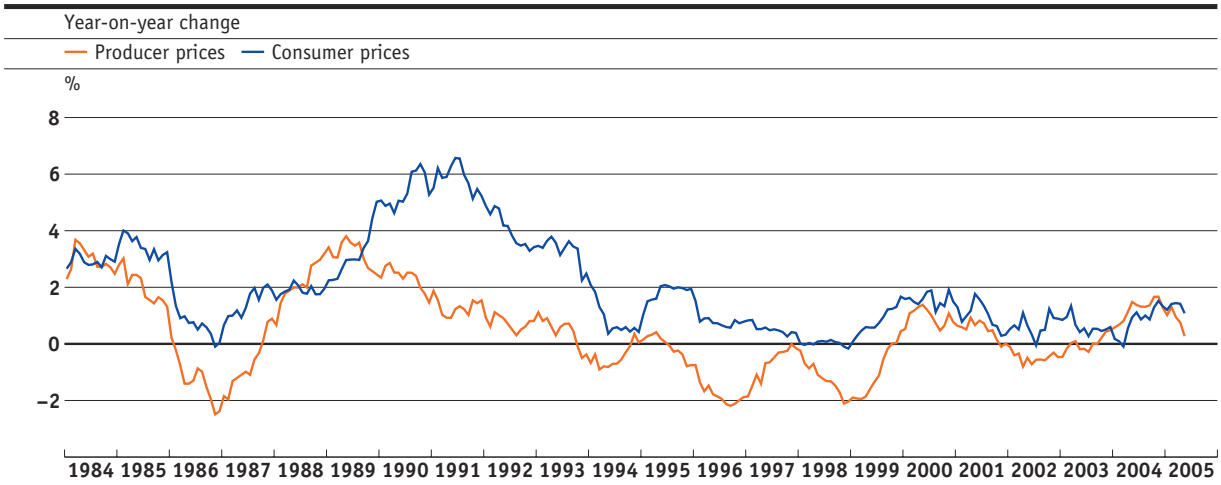
The objective of monetary policy is to maintain low inflation in the medium term. More volatile oil prices increase the frequency with which base effects distort the current CPI. That in turn increases the importance of core inflation for monetary policy. Since core inflation disregards such effects, it provides an insight into the real price pressure in the economy. Using core inflation means that the dangerous second round effects of a hike in oil prices can be distinguished from the initial impact of the price rise, which is of less relevance for monetary policy.

Oil prices affect core inflation through expectations and pay rises

Changes in oil prices affect the core inflation rate over two channels. The first is through expectations: Since many contracts (for example, rent contracts) are either implicitly or explicitly linked to the CPI, a rise in CPI rises expectations of a general rise in price pressure. In other words, consumers assume that oil prices will not be absorbed through relative price shifts, but that the relative price situation will be restored by a rise in the price of non-oil products. The second channel follows from the assumption that, in the face of rising oil prices, consumers will endeavour to make up for the reduction in their real purchasing power through pay raises. This can trigger a wage-price spiral. Empirical studies show that both mechanisms raise the core inflation rate by about the same amount.[29]

29 Cf. Hunt et al. (2001).

Graph 12
Producer and consumer price indices



Source: SNB

5 Oil prices and monetary policy in a new paradigm

The previous sections looked at the factors influencing oil prices and their impact on the economy and inflation. They also addressed the resulting implications for monetary policy. This section summarises the relationship between oil prices and monetary policy and introduces some new aspects. Our conclusion is that a range of factors point to the need to alter the monetary policy response.

An oil price shock confronts monetary policy with a fundamental trade-off. A restrictive monetary policy is needed to counter rising inflationary pressure, while efforts to offset real economic effects call for a more accommodative policy. The monetary policy response can therefore have a major influence on the extent to which higher oil prices impact inflation and the real economy. The extent of this influence has long been the subject of controversial debates. This debate has been made more difficult by the fact that the oil price is increasingly driven by demand. It is becoming more and more difficult to disentangle the monetary policy response to an oil shock from the response to a general increase in inflation. Bernanke, Gertler and Watson (1997) endeavoured to separate these effects. They found that the main output effect is caused not by higher oil prices but by the resultant tightening of monetary policy.[30] Sims (1997) and Hamilton and Herrera (2000) interpreted these findings to suggest that monetary policy can only prevent the drop in growth by allowing higher inflation. The optimal monetary policy answer to oil price shocks is likely to remain a subject of debate in the future. However, there are various reasons why a shift in the monetary policy response can be expected even though the academics have not yet reached a final conclusion. These are outlined below:

30 However, the authors stress that their findings do not necessarily indicate a sub-optimum monetary policy.

a) Faster but less pronounced pass-through effects

The monetary policy response depends to a large extent on the second-round effects. If higher oil prices only have a temporary impact on the CPI, a more restrictive monetary policy is not needed to check the risk of sustained inflationary pressure. By contrast, if the core inflation rate were to rise, this would indicate second-round effects.[31] Monetary conditions would therefore have to be tightened to prevent a permanent rise in inflation. Otherwise there are likely to be high economic costs resulting from a credibility loss for monetary policy, which could lead to higher inflation expectations.[32]

As outlined in section 4.2, the recent oil price increases seem likely to impact the CPI faster than in the past, although their impact may be less pronounced. Alongside declining dependence on oil, this is attributable to more efficient use of oil and, in particular, global competition, which has reduced companies' pricing power. Thus, there is less risk of an oil-price-driven inflationary spiral at present.

b) Stabilisation mechanisms are at work

Another aspect of the relationship between the oil price and monetary policy has changed. As mentioned, the oil market is increasingly demand-driven. While demand-driven increases make oil prices more volatile, they also act as an automatic stabilisation mechanism. A wide range of factors drive the oil price upwards. At the same time, these same increases in the price dampen overall demand, which is one of the main price drivers.[33] Although monetary policy still faces the fundamental dilemma of whether to counteract higher inflation or lower growth, it is supported by this automatic stabilisation mechanism. Nevertheless, finding the appropriate monetary policy response to an oil price shock remains challenging.

31 Alongside the various core inflation rates, consumption and investment in capital goods are regarded as indicators of knock-on effects.

32 Cf. Hunt et al. (2001).

33 Thus, economic normalisation in China, not simply as a result of high oil prices but possibly also as a result of the new currency regime, would exert downward pressure on oil prices in the same way as it pushed them upwards in the boom phase.

c) The economy is not overheated

A key factor for monetary policy, apart from the duration and extent of the oil shock, is the economic environment in which the oil price increase occurs. One reason why the oil shocks of the 1970s were so severe was that the economy was booming and close to overheating. However, the present global economic situation is dominated by restructuring and consolidation despite high overall growth rates.

d) Reduced impact of increased oil price volatility on long-term inflation expectations

As a result of the successful monetary policy efforts of key central banks in recent years, long-term inflation expectations are well anchored within the price stability range. Consequently, highly volatile oil prices are unlikely to have a negative effect on long-term inflation expectations. As long as the central banks continue to pursue a credible monetary policy, inflation expectations will be held in check. This in turn reduces the pressure on them to respond to short-term rises in oil prices.

e) A lower neutral interest rate

Sooner or later, global interest rates will return to a neutral level. However, the question rises whether they will be lower than in the past. A few years ago, a constant interest rate was considered to provide a reasonable approximation of the neutral interest rate. It is now fairly clear that this no longer holds true. As shown e.g. by Woodford (2003), the neutral interest rate can vary over time as a result of real economic shocks. One such major structural shift is, in particular, the increase in international competition – one result of globalisation – as it limits the scope for price increases. This influences the long-term interest rate compatible with price stability. Despite increasing competition, it seems unlikely that international interest rates can be held at the present level in the long term. However, unlike in the case of previous oil shocks, it is necessary to consider that the neutral interest rate could be lower than in the past and therefore that the restrictive impact of raising interest rates could be felt faster than in the past.

6 Concluding remarks

In the light of recent market trends, the oil price has become one of the most keenly followed components of the consumer price index. Numerous driving forces are responsible for the current high and volatile oil prices. Oil prices affect inflation through a variety of channels. Various arguments currently suggest that the monetary policy response to higher oil prices should be less pronounced than in the past. These include: pass-through has become faster but less pronounced, automatic stabilisation mechanisms are at work, the economy is not overheated, monetary policy is focused on long-term targets, and the neutral interest rate can be expected to be lower.

Does this new paradigm make monetary policy easier or more difficult? The challenge facing monetary policy, apart from record (nominal) oil prices, is that international interest rates are still low. The broad consensus is that monetary policy should show little or no reaction to oil shocks as long as they do not affect the core inflation rate. However, that does not necessarily mean adopting a wait-and-see approach. If monetary policy gets behind the curve, inflation expectations are likely to be adjusted. In the long term, such changes can only be reversed at considerable real expense.[34] In the new paradigm, as in the old one, monetary policy therefore needs to be conducted with great care. Swiss monetary policy has attested broad credibility. That is the result of more than ten years of price stability and the new monetary policy concept applied since the start of 2000.[35] The fact that inflation expectations are well anchored is probably the most important asset in monetary policy; given that, asset monetary policy makers need to be less frightened by a prolonged high and volatile oil price than in the past.

34 This prompted Gramlich (2004) to make the much-quoted remark that the worst possible outcome for monetary policy practitioners is a solution that cuts inflation adrift "from its moorings".
35 Cf. Gerlach-Kristen (2005).

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