Philipp M Hildebrand: Monetary policy and oil prices - a new paradigm?

Speech by Mr Philipp M Hildebrand, Member of the Governing Board of the Swiss National Bank, to the Swiss-American Chamber of Commerce Union League Club, New York, 18 November 2004.

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1.   Introduction

The rapid rise in oil prices since the beginning of 2004 brings painful memories of the global economic consequences of the oil shocks during the 1970s. Crude oil prices reached a nominal all-time-high of 55 USD per barrel WTI at the end of October. The current 46 USD mark is comparable to the previous all time nominal price peak in 1979.

Apart from similar nominal oil price levels, today's macroeconomic conditions are very different from those of 1970s. Presently, inflation rates are low throughout much of the world. Inflation expectations are generally well anchored. Central banks have proven their commitment to price stability. In real terms, the current spot price for crude oil is nowhere near the peak levels of the late 1970s. Moreover, during the last thirty years, developed economies have become substantially less dependent on oil (see Figure 1).

The 1970s are not an appropriate model for today's economic environment. Nonetheless, recent oil price developments have been remarkable. Since 2000, the average price of light, sweet crude oil has been around 30 USD. This is significantly higher than the average price level of 18 USD between 1986 and 1999. Even if one adjusts these prices for inflation, the difference remains substantial. While not establishing a statistically reliable trend, these figures provide at least tentative support to the hypothesis of an upward level shift in the equilibrium price range of oil (see Figure 2).

For a central bank concerned with maintaining price stability, it is important to examine such a hypothesis in some detail. My remarks today will initially focus on a number of factors that support the equilibrium price level shift argument. I will then briefly examine to what extent information extracted from the oil market confirms the hypothesis of a persistent level shift in oil prices. Finally, I will discuss how higher oil prices affect aggregate output and inflation and consider their consequences for monetary policy with a brief reference to the current economic situation and monetary policy challenges in Switzerland.

2.   Oil price level shift hypothesis

Demand and supply of oil are strongly affected by increasing global integration. Throughout the 1980s, the relationship between oil prices and economic output was characterized by a largely one-way causal effect from oil prices to economic growth. Today, the opposite dynamic appears to have become more relevant. The demand for oil and the price of oil is increasingly a function of global economic developments. In other words, an increase in the price of oil can be viewed as a consequence associated with an acceleration of global economic growth. A simple statistical calculation provides evidence of a structural break in the relationship between world GDP and the price of oil in 1995. Before 1995, the correlation between GDP and oil prices was –0.4. During the period 1995 to 2004, the correlation stands at +0.3 (see Figure 3).

Against this backdrop, economic developments in China play a crucial role. The integration of China into the world economy is likely to be a historic event. Indeed, its long-term economic consequences strike me as comparable to those associated with the integration of the emerging U.S. economy into the world economy at the end of the 19th century. China has become the second largest importer and consumer of oil behind the United States. The longer-term oil demand effect associated with Chinese growth is potentially vast. The fact that China is poor in natural resources undoubtedly strengthens the Chinese authorities' resolve to avoid any potential energy shortages. The International Energy Agency IEA estimates that global demand for oil will increase by 2.5 million barrels per day or in excess of 3% this year. This represents the highest increase in global demand for oil during the past quarter of a century. Virtually half of that increase in demand can be attributed to the Asian emerging markets with China accounting for over 32% of the additional demand. Needless to say, China is merely at the beginning of its growth dynamic. Even if we assume that the Chinese growth path will not be linear

and that with time, Chinese corporations and households will use energy more efficiently, buoyant demand for oil is likely to remain a dominant feature of the Chinese economy.

On the supply side, the oil market has always been highly sensitive to political risk. Potential geopolitical risks in the most important producer nations have, however, dramatically increased after 9/11 and the war in Iraq. Moreover, geopolitical uncertainty is not restricted to the Middle East. Political developments in Venezuela, Nigeria and Russia have all adversely affected the oil market. Compared to previous times of heightened geopolitical tension, the global political landscape appears particularly prone to protracted uncertainty with regard to productive capacity, existing supplies, as well as transportation facilities of oil. Even if further terrorist attacks can be avoided, the current climate of far-reaching geopolitical uncertainty is likely to exert upward pressure on oil prices.

Low oil inventories in the U.S. and elsewhere also provide support for the hypothesis of a persistent upward shift in prices. U.S. inventories are slowly recovering from a 30-year record low (see Figure 4). Initial inventory restocking efforts may exacerbate upward price momentum. As long as inventories remain low, the industrial sector remains in a vulnerable position and is thus willing to pay up despite high prices. Here too, China plays an important role. The demand for oil in China appears to have been greatly underestimated by oil producers. If the developed countries had rebuilt inventories as late as the 1990s, the effect on prices would have likely been more modest. Low inventories and the demand explosion coming out of China have been a potent combination in support of higher oil prices. Going forward, an easing of inventory pressure is likely. However, assuming global demand remains robust, inventory rebuilding is unlikely to have a significant impact on the fundamental supply and demand structure of the oil market in the short term.

Inadequate investment spending in production, refinery and transportation infrastructure over the past decade is another factor frequently used in support of the hypothesis of a persistent level shift in average oil prices. Available industry figures suggest that both new as well as replacement investments have been insufficient to support a substantial increase in oil production. Significant investments are required to turn heavy, sour crudes with high sulphur content and high density into ever more demanded light, sweet quality grades (see Figure 5). If the market is allowed to function, higher oil prices and higher quality spreads will in time encourage drilling, refinery and shipping investments which will eventually contribute to higher output. Politics could, however, impede this process. Investment decisions in many oil producing countries have become intensely politicized. The absence of important oil producing countries from WTO underlines the need for a more productive climate for international investments. It might therefore be overly optimistic to expect the market to generate an immediate incentive to boost oil related investment spending.

Beyond these demand and supply driven factors in support of a price level shift hypothesis, the growing importance of oil as a financial asset class is an additional factor to consider. Beginning around the time of the bursting of the technology bubble in the spring of 2000, the futures market for oil became a relatively sought after financial asset class. Increasingly accommodating global monetary conditions throughout much of the world economy may well have facilitated this process. This asset allocation shift is reflected in a marked increase in the liquidity of oil futures contracts together with upward trending prices (see Figure 6). There is some evidence that hedge funds have been particularly active in the oil futures market. In a recent study, the BIS notes a high correlation (0.8) between the weekly oil price changes and changes in long positions of non-commercial traders of oil futures.[1] Market estimates suggest there could be a single digit dollar per barrel speculative premium on the oil price.[2]

3.   What does market tell us?

Oil price development in the past decade has been characterized by short-term spikes in the spot price ranging from 11 to 40 USD per barrel for WTI crude. Meanwhile, futures prices remained well anchored around 20 USD per barrel. The recent run-up in oil spot prices however was part of a shift of the entire curve. Market estimates of the long-run marginal cost of oil nearly doubled and now stands

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[1]   BIS Quarterly Review, September 2004, p 6.

[2]   For a survey on the literature on speculators and their impact on price developments in the oil market, see Weiner, R, (2002): "Sheep in wolves' clothing? Speculators and price volatility in petroleum futures", *Quarterly Review of Economics and Finance*, 42 (2), 391-400.

at 35 USD per barrel for WTI delivery in 5 years (see Figure 7). Moreover, despite the most recent sharp correction in spot prices from 55 to 46 USD per barrel WTI, long-dated futures prices have receded only marginally. Since 2002, prices of oil futures are generally quoted below expected spot prices - a state labeled backwardation. Backwardation implies uncertainty about production and supplies and effectively favors further inventory draw downs (see Figure 8). Price information extracted from the market appears to confirm that at least for the time being, average oil prices are likely to remain elevated compared to historical price ranges.

Forecasting market prices is an inherently difficult endeavor. Immense uncertainties on the supply side make oil price forecasts particularly challenging. Reserve figures can be increased rapidly by the discovery of new oil fields or by exploitation at greater margins due to new technologies. Proven oil reserves in the Middle East, for example, increased from 16 billion barrels in 1944 to 116 billion barrels of meanwhile extracted or still available reserves in 1975. In 1984, 200 additional barrels were added to the proven reserves in the Middle East, which now stand at 685 billion barrels out of a total of roughly one trillion barrels worldwide.[3]

Despite great difficulties of forecasting oil prices, monetary authorities cannot shy away from considering different hypotheses. In essence, central bankers have to think about risk and probability weighted scenarios. As I have tried to demonstrate, there is considerable evidence suggesting that oil prices may not rapidly revert to previous average price ranges. The future could, of course, turn out differently. Supply elasticity tends to be underestimated, sometimes dramatically so. Indeed, in the late 1970s, oil prices were projected to rise substantially. As we now know, market forces prevailed. Supply was increased and prices eventually fell. Nonetheless, from today's vantage point, the hypothesis of a level shift in the equilibrium price range of oil strikes me as plausible. Moreover, given the importance of oil prices to the overall dynamic of the global economy, we need to consider the likely impact of higher oil prices on aggregate output and inflation and what it means for monetary policy.

4.   Impact on output and inflation

Oil prices affect the economy through different transmission channels. In the short term, an oil price shock adversely affects aggregate demand. A rise in the price of oil resembles an excise tax and leads to a loss of purchasing power. In the medium term, higher oil prices lead to higher production cost and a reduction in the rate of return on capital. In the long term, the oil price shock leads to diminished investments and a reduction in the capital stock.

Different models and differing assumptions about the reaction function of monetary policy imply varying output consequences. In March 2004, the OECD used their macroeconomic model to simulate a permanent increase in oil prices of 10 USD from the then price of 25 USD to 35 USD. The effect impacted the OECD economy within a year with a reduction in output of 0.4% and an increase in inflation of 0.5%. At the Swiss National Bank, we are conducting similar simulations, including more pessimistic ones. To date, our results have not deviated substantially from those of the OECD.

Different countries respond differently to oil shocks. There are winners and there are losers. A country's vulnerability is essentially a function of its oil reserves and its oil intensity. The winners of an oil shock are net exporters. The losers are net oil importers. In a perfect equilibrium model, one could imagine a world in which the net output loss in oil importing countries is offset by the output gain in oil exporting countries. Empirically, the petrodollar transfer induced wealth gain in exporting countries does not appear to fully compensate aggregate demand losses in importing countries.

The oil intensity of the Indian and the Chinese economy is substantially higher than that of the U.S. economy which in turn is still higher than that of the European or the Swiss economy. On the other hand, the U.S. is less dependent on oil imports than the European Union, let alone Switzerland. Structural characteristics of an economy can also affect the economic impact of an oil price shock. Rigid labor markets, for instance, can lead to asymmetric effects on output. The output loss in the event of a rise in oil prices can exceed the output gain in the event of a corresponding decline in oil prices. It is generally assumed that the overall impact of an oil shock is somewhat less pronounced in the U.S. than in Europe. Finally, exchange rates can play a role. As a result of the substantial decline

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[3]   See eg M A Adelman (1995): "The Genie out of a Bottle: World Oil since 1970", MIT Press, Cambridge.

in the U.S. dollar against most non-Asian currencies, the recent increase in the price of oil in local currency has been less pronounced in Europe.

For a central bank concerned with maintaining price stability as the bedrock condition for sustained economic development, the crucial question is how a level shift in the equilibrium price range of oil would impact longer-term inflation rates.

Oil prices have a direct impact on inflation because the price of crude oil immediately impacts gasoline and heating oil prices. The inflation effect depends on the weight of oil based products in the CPI. In Switzerland, heating oil makes up 1.2% of the CPI. Total oil based products represent 3.8% of the CPI. In the United States, energy commodities represent 3.5% of the CPI, while total energy is weighted with 7.1%.

Traditionally, changes in oil prices fed through to the Swiss CPI slowly. A survey of the data between 1984 and 1996 reveals that oil prices and the CPI were still positively correlated after two years. Since 1997, a change in oil prices seems to affect the CPI more rapidly. The transmission is virtually complete after a mere six to twelve months. While the speed of the pass through from oil prices to the CPI has nearly doubled, the magnitude of the transmission has declined (see Graph 9). Integrated global capital and goods markets have increased competition and led to a generalized reduction in pricing power. In a fiercely competitive environment, producers find it difficult to transfer higher oil prices to consumers. Ongoing competitive pressures and further globalization constitute barriers to incorporating higher oil prices in the price- and wage-setting behavior. A credible central bank with a long-term record of price stability is an additional key parameter ensuring that higher oil prices do not spill over into elevated longer-term inflation expectations.

Given the rapid pass through from changes in the price of oil to the CPI, headline inflation figures are subject to frequent base effect related distortions. As a result, various core inflation measures become more important. These reflect the longer-term price dynamics in an economy. In the event of an adverse oil price shock, a good core inflation measure will only rise by the amount of second round effects on other goods prices.

There are effectively two transmission channels from a rise in headline to a rise in core inflation. Higher headline inflation can adversely affect longer-term price expectations. Rising headline inflation can therefore give rise to expectations of higher prices across the board. Alternatively, consumers can attempt to compensate their oil price related purchasing power losses by demanding higher wages. Such consumer behavior can trigger adverse wage- and price-setting behavior which would require a response from monetary policy authorities in an effort to preserve price stability.

5.   Monetary policy implications

The response of monetary policy to oil shocks is therefore a function of the extent to which higher oil prices feed through to higher core inflation rates. In the event of a mere spike in headline inflation in the aftermath of an adverse oil price shock, it would be unwise for a central bank to force a reduction in aggregate demand to lead headline inflation back to its target. Instead, the appropriate policy stance is to "look through" the temporary rise in headline inflation. On the other hand, a central bank must remain vigilant and look out for possible signs of second round effects from a rise in oil prices.

Despite high and volatile oil prices, there are few signs of underlying inflationary pressures building up in the world economy so far. CPI and PPI core inflation rates remain contained and wage growth is moderate, both in the U.S. as well as in Europe. Moreover, despite near-record global economic growth in 2004, there are substantial unutilized capacities in the U.S., Japan, and Europe. As a result, despite record oil prices a few weeks ago, global inflation expectations appear to be well anchored.

The growth outlook for Switzerland remains constructive, supported by an expansionary monetary policy stance. The rise in oil prices has, however, dampened domestic demand. Weakness in Germany and, more recently, in France are exacerbating the situation. Economic growth is unlikely to accelerate into 2005. Upward pressure on the exchange rate may exert additional unwelcome downward pressure on aggregate demand. Some slack in Swiss labor and product markets is likely to prevail. The output gap will close in 2006 at the earliest. In such an environment, it will take time for the unemployment rate to decline from the current 3.7%. Real wage growth is well contained with growth rates fluctuating around 1% per year since 2001. Core inflation rates remain moderate at around 1%. Despite substantially higher oil price related CPI and PPI inflation since August of this year, longer-term inflation expectations remain firmly anchored as swap spreads and consensus

forecasts confirm. The growth rates of Swiss monetary aggregates and the development of credit confirm the overall picture of a moderate inflation outlook.

The key challenge for monetary policy authorities - in Switzerland and elsewhere - will be to continue to firmly anchor these longer-term inflation expectations. As I mentioned earlier, notwithstanding high oil prices, circumstances are favorable. Price stability has been all but achieved in much of the developed world. Even developing countries are enjoying relatively low and stable inflation rates. Various forms of credible monetary policy frameworks are anchoring future inflation expectations. Higher oil prices appear to feed through to higher headline inflation more rapidly than in the past but the magnitude of the effect appears to have declined. Finally, the world economy is hardly overheating. Indeed, judging by the OECD's global leading indicator, the recent growth momentum is abating. Moreover, to the extent that the recent oil price shock is to a significant extent demand driven, dampening global growth will at least to some extent be self-stabilizing with regard to underlying inflation pressure.

Compared to the time of the last great oil shock in the late 1970s, monetary authorities operate under a different paradigm to the extent that they can afford to "look through" what are likely to be temporary spikes in headline inflation associated with what is likely to be a demand driven level shift in the equilibrium price range of oil. Indeed, in some cases, monetary policy may find itself in a position to be able to respond to the output loss associated with higher oil prices. "Looking through", however, must not be confused with being complacent. As Fed Governor Gramlich has stated in a recent speech on oil shocks and monetary policy, the worst possible outcome for monetary policy makers would be "to let inflation come loose from its moorings".[4] Central banks will remain vigilant in their examination of longer-term inflation expectations. The Swiss National Bank, for one, would promptly react if there were any indications in its quarterly inflation forecast that second round effects were likely to undermine its long-term track record of maintaining price stability in support of maximum sustainable economic growth.

Appendix

Figure 1

Nominal and real oil prices on oil   **Economic dependency**

in bbl/th GDP in PPP
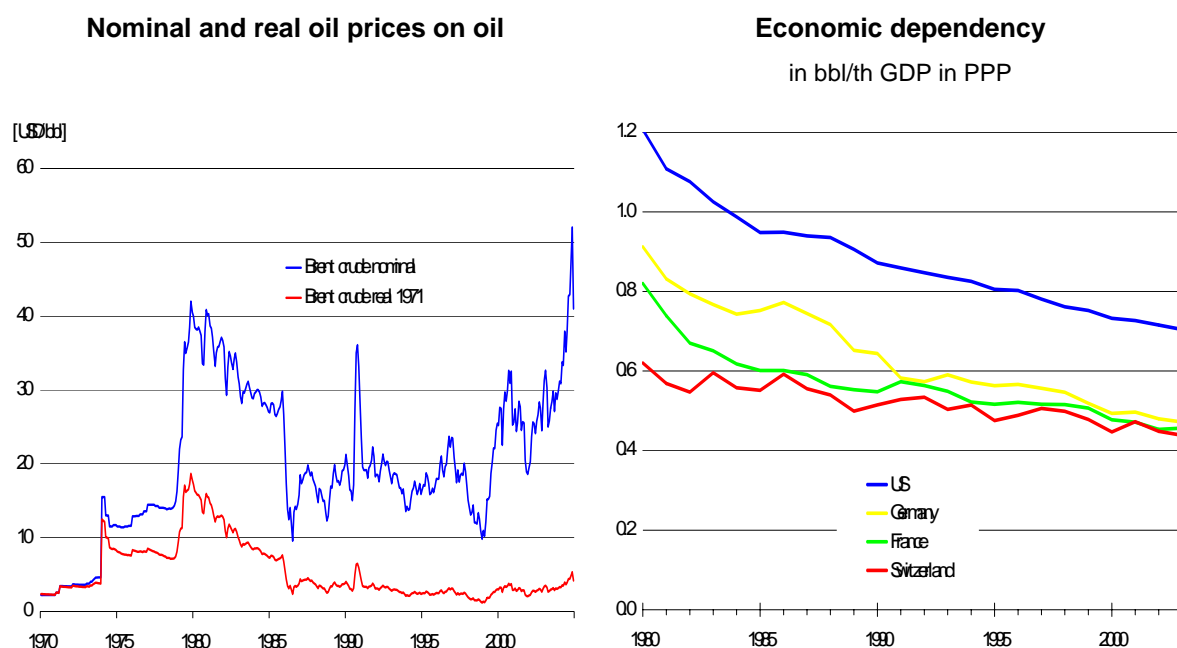
Source: BP, OECD, GS

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4   Edward M Gramlich, "Oil Shocks and Monetary Policy", Remarks at the Annual Economic Luncheon, FRB Kansas City, Missouri, 16 September 2004.

Figure 2

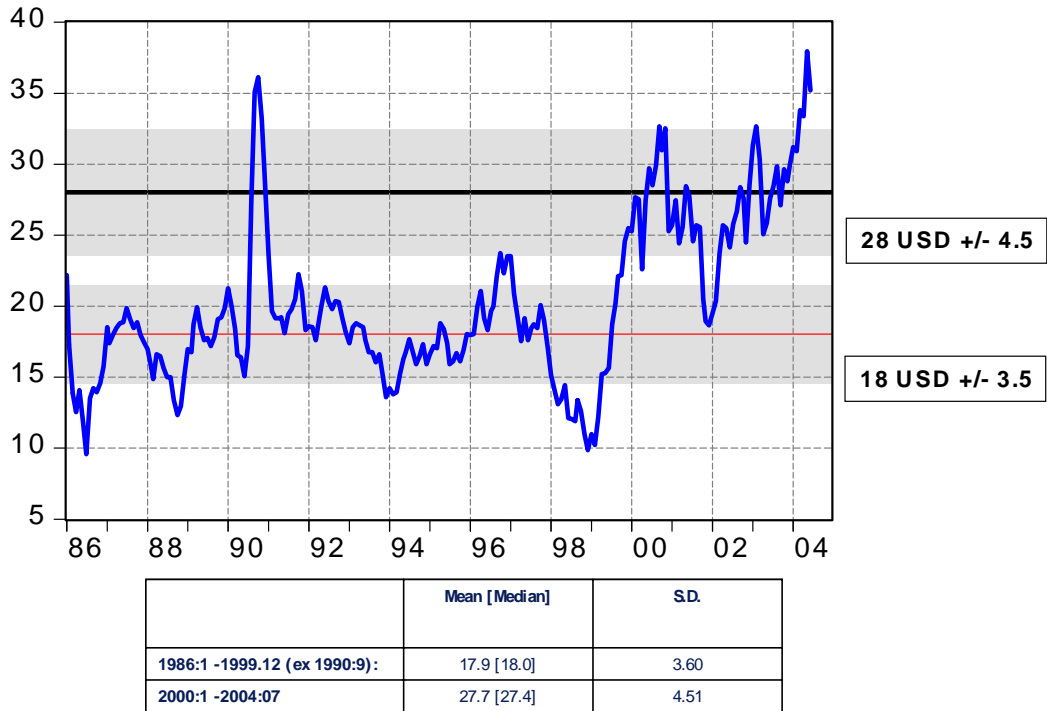**Oil price average level and volatility**

	Mean [Median]	S.D.
1986:1 -1999.12 (ex 1990:9) :	17.9 [18.0]	3.60
2000:1 -2004:07	27.7 [27.4]	4.51

Figure 3

Correlation between oil price and GDP

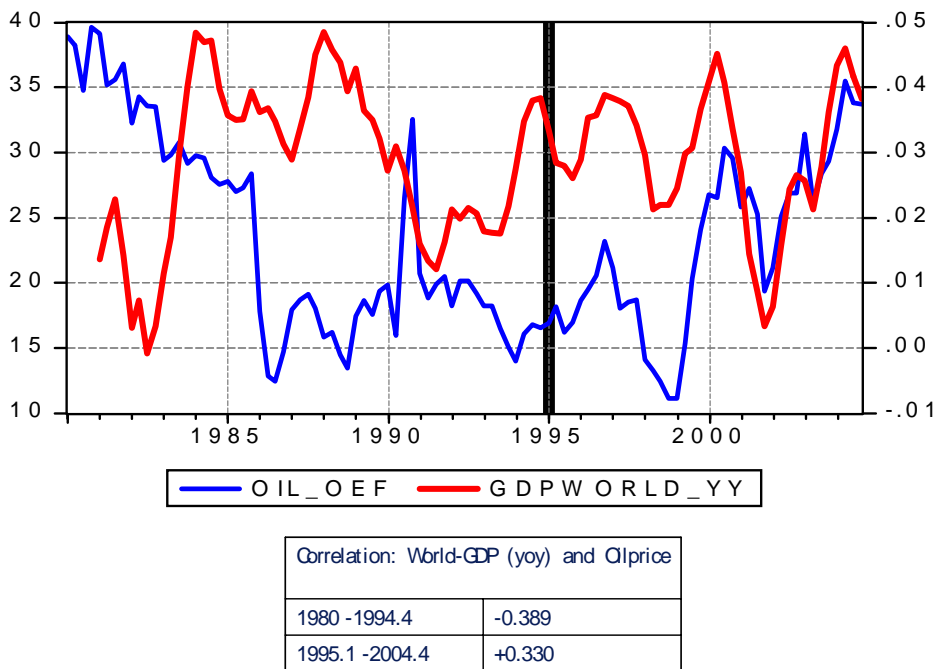| Correlation: World-GDP (yoy) and Oilprice	
1980 -1994.4	-0.389
1995.1 -2004.4	+0.330

Figure 4

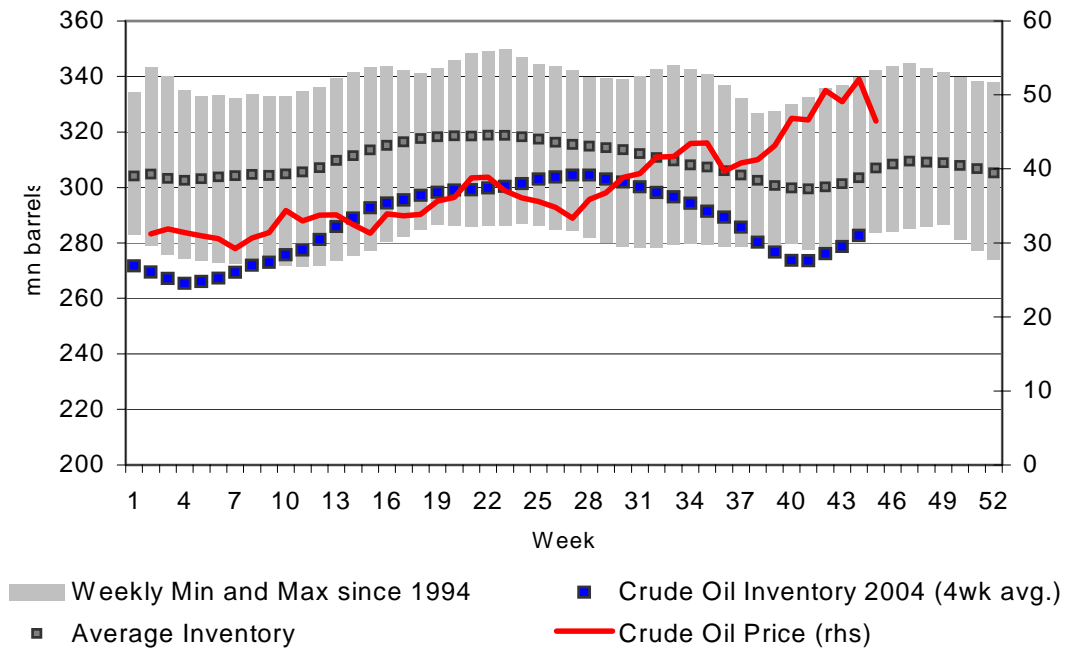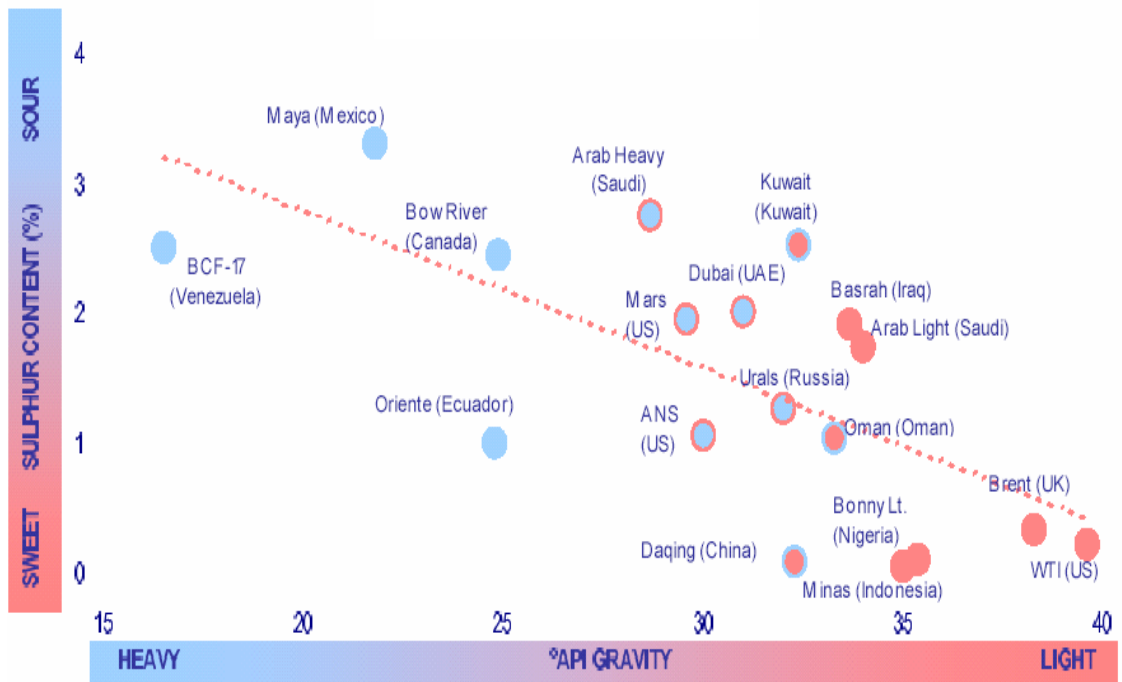**US oil inventories**

Figure 5

Crude grade qualities

Source: JPMorgan Commodities Research, Energy Intelligence Group

Figure 6

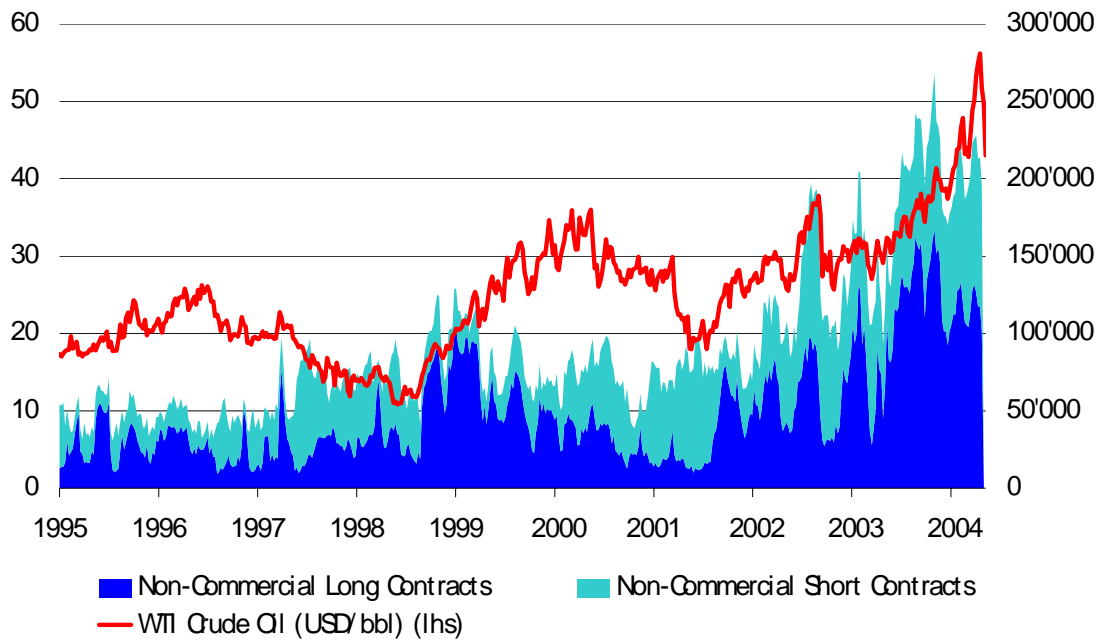**Crude oil futures contract volumes (NYMEX)**

- Non-Commercial Long Contracts
- Non-Commercial Short Contracts
- WTI Crude Oil (USD/bbl) (lhs)

Figure 7

Historical WTI futures price curves

Years to expiry

- 2004-11-12
- 1 year ago
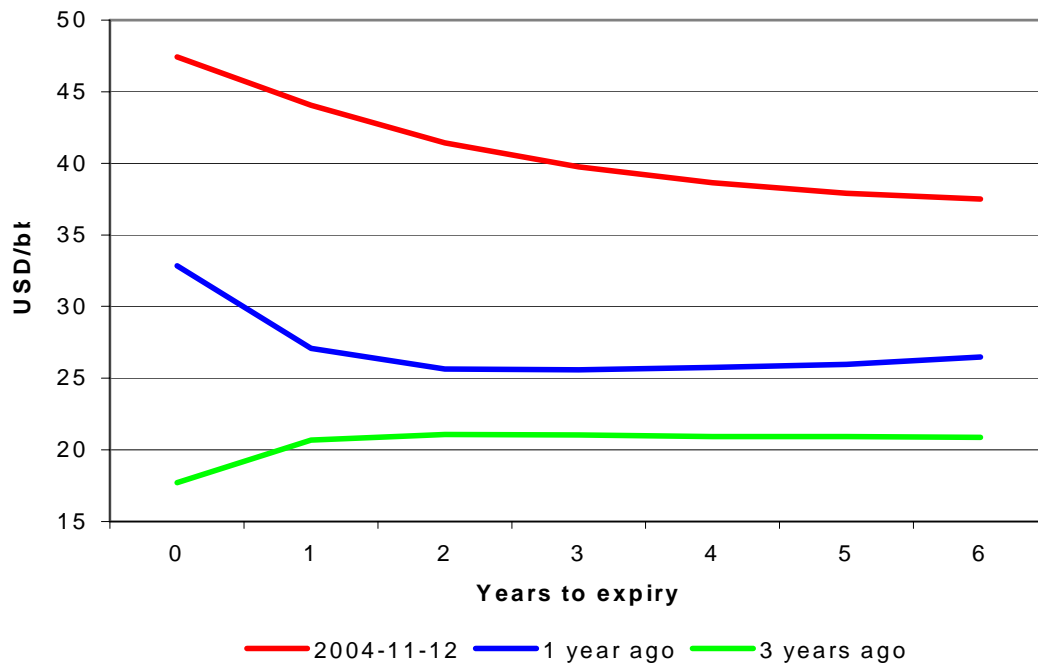- 3 years ago

Figure 8

Backwardation

Oil Spread (Spot - Futures 3M) in USD
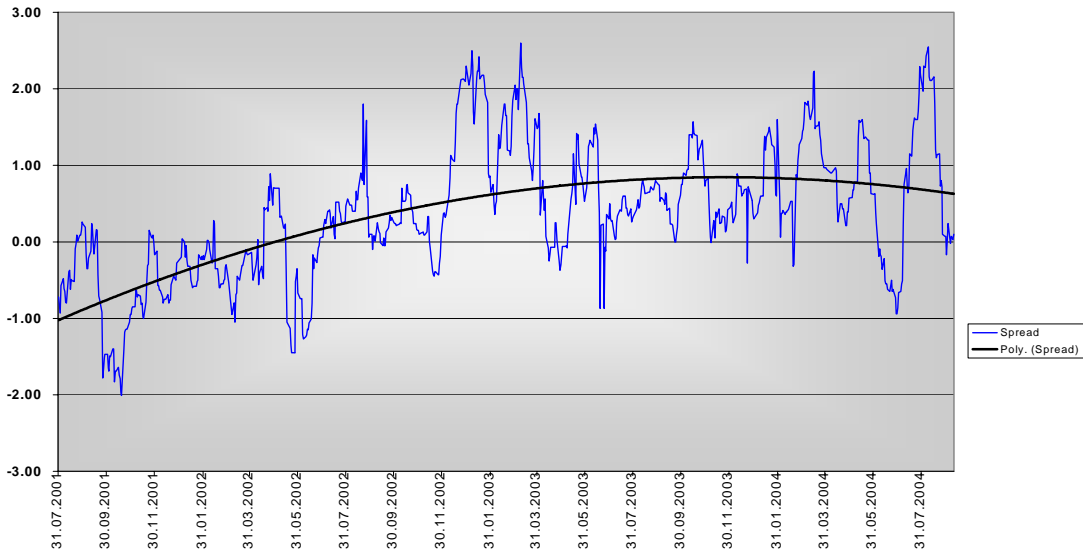

Figure 9

Cross-correlations between oil price and Swiss CPI

Sample: 1984:01 1996:12
Included observations: 156
Correlations are asymptotically consistent approximations

OIL_YY,CPI_YY(-i)	OIL_YY,CPI_YY(+i)	i	lag	lead
		0	0.4646	0.4646
		1	0.4137	0.4738
		2	0.3551	0.4701
		3	0.3059	0.4715
		4	0.2620	0.4693
		5	0.2144	0.4633
		6	0.1696	0.4561
		7	0.1291	0.4520
		8	0.0942	0.4451
		9	0.0630	0.4370
		10	0.0209	0.4084
		11	-0.0259	0.3679
		12	-0.0718	0.3293
		13	-0.0970	0.3134
		14	-0.1176	0.3022
		15	-0.1345	0.2933
		16	-0.1412	0.2957
		17	-0.1438	0.2972
		18	-0.1419	0.2960
		19	-0.1413	0.2906
		20	-0.1436	0.2832
		21	-0.1501	0.2742
		22	-0.1547	0.2655
		23	-0.1588	0.2547
		24	-0.1593	0.2434

Sample: 1997:01 2004:12
Included observations: 91
Correlations are asymptotically consistent approximations

OIL_YY,CPI_YY(-i)	OIL_YY,CPI_YY(+i)	i	lag	lead
		0	0.8032	0.8032
		1	0.7223	0.7552
		2	0.6323	0.6889
		3	0.5656	0.6302
		4	0.4988	0.5801
		5	0.4546	0.5447
		6	0.3705	0.5221
		7	0.2883	0.4744
		8	0.2063	0.4436
		9	0.1494	0.3823
		10	0.0577	0.3034
		11	-0.0541	0.2032
		12	-0.1936	0.0936
		13	-0.2799	0.0238
		14	-0.3353	-0.0088
		15	-0.3930	-0.0505
		16	-0.4393	-0.0685
		17	-0.4858	-0.0924
		18	-0.5080	-0.1446
		19	-0.5172	-0.1824
		20	-0.5359	-0.2442
		21	-0.5878	-0.2786
		22	-0.6284	-0.2866
		23	-0.6559	-0.2974
		24	-0.6236	-0.2956