

# ***Energy and Development 2008***

## The outlook for oil

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The logo for the Centre for Global Energy Studies (CGES) is located in the bottom right corner. It consists of the letters 'CGES' in a bold, black, sans-serif font, positioned to the right of a yellow square. The square and the text are partially enclosed by a blue and grey rectangular frame.

**CGES**

# Key issues

- Some contend that the oil price surge to record highs was part of a more general **asset price bubble** based on cheap money. Is this true?
- Now that the credit crunch has pricked the asset price bubble, can we expect **a return** of oil prices **to more 'sensible' levels**?
- Or has there been a **'paradigm shift'** in oil that will keep prices high (above, say, \$100/bbl) despite short-term weakness?
- What lay **behind the surge in oil prices** that took WTI to the threshold of \$150/bbl and prompted Goldman Sachs to predict \$200/bbl?
- What are the **fundamental truths** — if any — in the oil business?

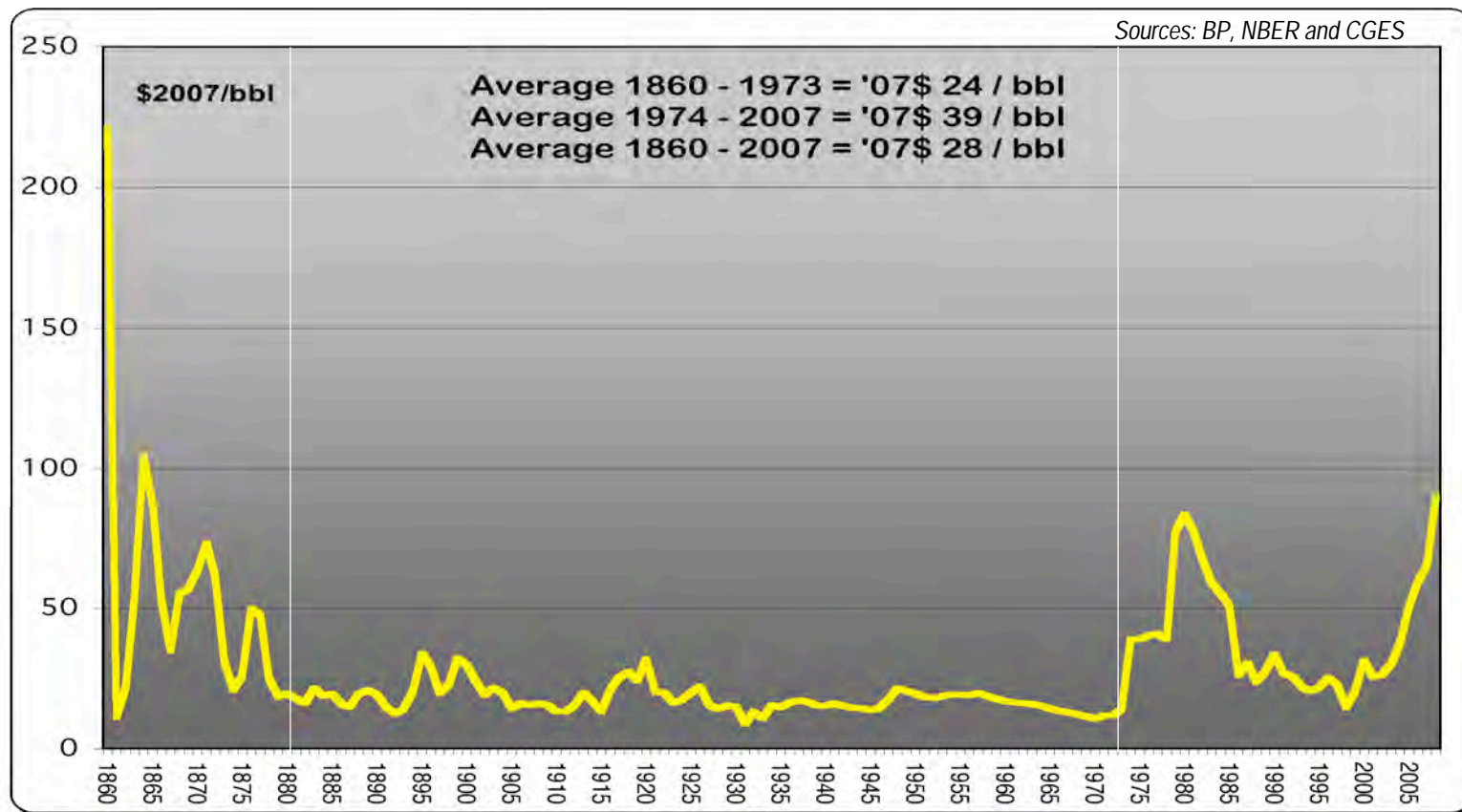
# Bursting bubbles

- The Baltic Dry Cargo Index is down **90%** since May '08.
- Oil has dropped around **60%** from its peak.
- Copper has fallen by **40%** from the peak.
- Wheat is down by **50%** from its highest level.

# Oil's fundamental truths

- Oil exploration remains a gamble despite technological progress.
- From the very beginning there have been those who fear the world is running out of oil; the idea that oil is peaking is not new.
- Oil demand is relatively insensitive to oil prices and reacts to changes in these prices with long lags.
- Oil supply responds to oil prices too, but in a complicated fashion.
- As a result, the oil market is subject to large price swings, unless ...
- ... oil supplies are controlled and managed in the interests of price stability.
- Pre-1973 the oil majors managed supplies; since then OPEC has arrogated to itself this role.
- OPEC has tried to stabilise prices by fixing prices (OGSPs from 1974 to 1983), by Saudi Arabia acting as the residual supplier (1983-85), by quotas (1986-98) and since 1998 by trying to control stocks.

# The price of oil adjusted for inflation (1860-2008)



Between 1860 and 1880 rampant competition caused oil prices to be highly volatile. Thereafter the Rockefeller model took hold and the integrated oil companies proceeded to stabilise the oil price for decades. After World War II the world experienced the golden age of oil price stability, which lasted until the year 1973 and the first oil price spike. Since then the oil price has become volatile once again.

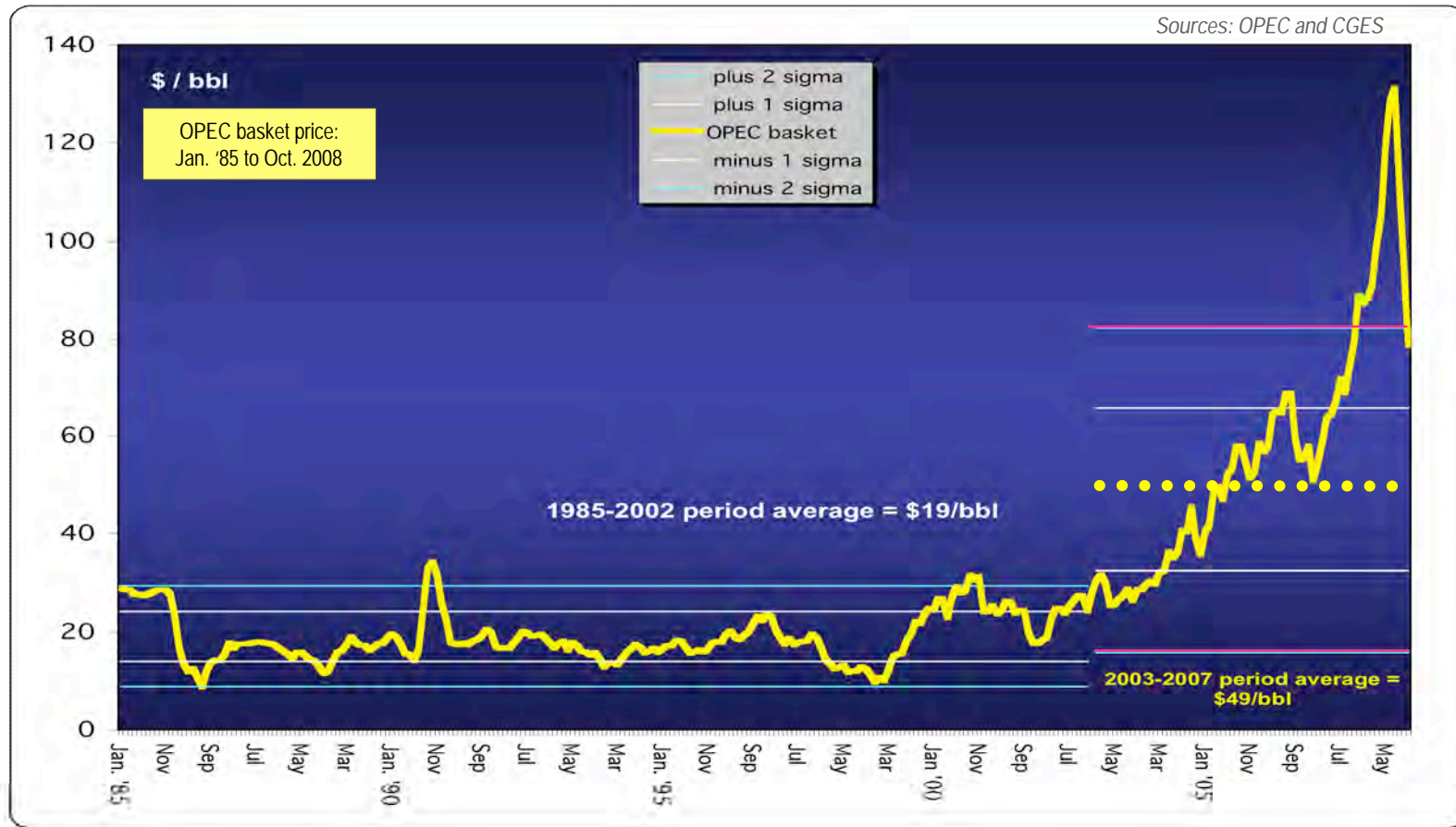
# What determines the price of oil?

- **IN THE SHORT RUN** : *spot oil prices* are driven by the imbalance between desired and actual inventory cover, while *futures prices* are heavily influenced by news about oil inventories, demand/supply, OPEC's output and its spare capacity, and political developments. Oil is also a commodity and attracts attention as an alternative form of investment, competing with equities and fixed-income assets. Spot and futures prices constantly interact.
- **IN THE MEDIUM TERM** : oil prices are driven by oil demand, the world's spare capacity, the non-OPEC countries' oil reserves position and their production, and OPEC's investment intentions and oil price targets. They say prices in the medium term revert to the mean.
- **IN THE LONG RUN** : costs of supply have a big influence on oil prices in the long term. These in turn are affected by discoveries, gross additions to reserves, depletion rates, access to reserves, technological advances, investment in productive capacity, OPEC's policies, and trends in oil demand and non-OPEC supplies.

OPEC would have to realise that there is no natural law which provides for the sale of a commodity in abundant supply at prices which are many times its cost.

— Paul Frankel, “Oil : the facts of life” (1962 essay)

# Reversion to the mean, perhaps, but which one?



It is highly improbable that the oil price will revert to its 1985-2002 average of \$19/bbl. The question is whether it will revert to the 2003-07 mean of \$49/bbl, which represents the average price of oil over the period during which oil demand grew strongly and non-OPEC supplies started to falter. Notice the marked increase in volatility in the latter period.



# Ten reasons why oil prices reached recent heights

1. Dollar weakness, inflation
2. Strong oil demand growth
3. Slow growth in non-OPEC oil supplies
4. Speculation in oil futures markets (geopolitics)
5. OPEC's oil price ambitions
6. Fear that we have reached 'peak' oil
7. High marginal costs
8. Structure of the oil industry
- ★ 9. Low oil inventory cover
- ★ 10. OPEC's low spare output capacity

# The oil price spike of 2008 was not due to the Dollar

US Dollar exchange rates (currency per \$) on the 1st January 2007	
Euro	0.758
Yen	119.1
Yuan	7.818
£ Sterling	0.511



US Dollar exchange rates (currency per \$) on the 30th June 2008	
Euro	0.635 (-16%)
Yen	106.2 (-11%)
Yuan	6.859 (-12%)
£ Sterling	0.502 (-1.7%)

NB. Dated Brent on the 30th of June 2008 was \$138.4/bbl.

Implied price of Dated Brent on the 22nd of May 2008 taking into account these exchange rate changes and 5% US inflation over the period, based on a price of Dated Brent of \$58.49/bbl on the 1st of January 2007:

Euro related	\$71 per bbl
Yen related	\$68 per bbl
Yuan related	\$68 per bbl
Sterling related	\$62 per bbl

# Is strong oil demand growth to blame?

	2004	2005	2006	2007	2008
	tbpd	tbpd	tbpd	tbpd	tbpd
<b>OECD</b>	<b>670</b>	<b>340</b>	<b>- 240</b>	<b>- 430</b>	<b>-1090</b>
<b>of which USA</b>	<b>350</b>	<b>70</b>	<b>120</b>	<b>150</b>	<b>- 700</b>
<b>Non-OECD</b>	<b>1210</b>	<b>750</b>	<b>690</b>	<b>930</b>	<b>930</b>
<b>Former CPEs</b>	<b>1010</b>	<b>340</b>	<b>690</b>	<b>390</b>	<b>350</b>
<b>of which China*</b>	<b>900</b>	<b>270</b>	<b>520</b>	<b>325</b>	<b>300</b>
<b><u>GRAND TOTAL</u></b>	<b>2890</b>	<b>1430</b>	<b>1140</b>	<b>890</b>	<b>190</b>
	3.9 % ↑	1.9 % ↑	1.4 % ↑	1.0 % ↑	0.2 % ↑

\* Includes large inventory builds in 2004.

Note that the trend rate of oil demand growth since 1986 has been 1.6% per annum. Below trend oil demand growth of 1.4% and 1.0% in 2006 and 2007 respectively — despite continuing strong economic growth — suggests that high oil prices have dampened down the rate of oil demand growth. In 2008, an expected economic slowdown, coupled with high prices, will take the global rate of growth of oil demand down to 0.2% p.a., and even lower if a recession materialises.

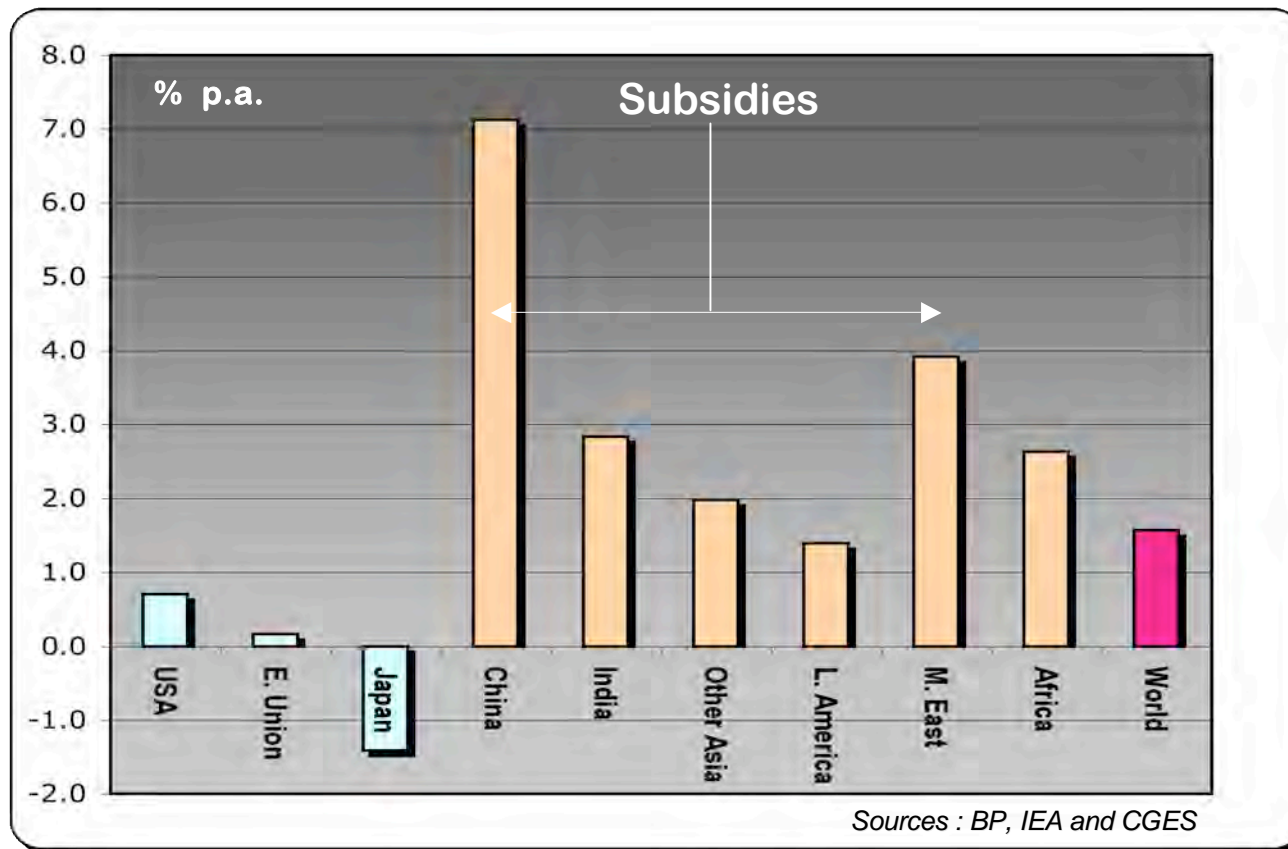
# Oil demand's key feature

- Oil demand is relatively insensitive to changes in the real price of oil, but the price elasticity of demand is not zero and increases in the oil price have been considerable (9.4% a year in real terms between 2000 and 2007).

Implied price elasticities of oil demand over the period 2000-2007

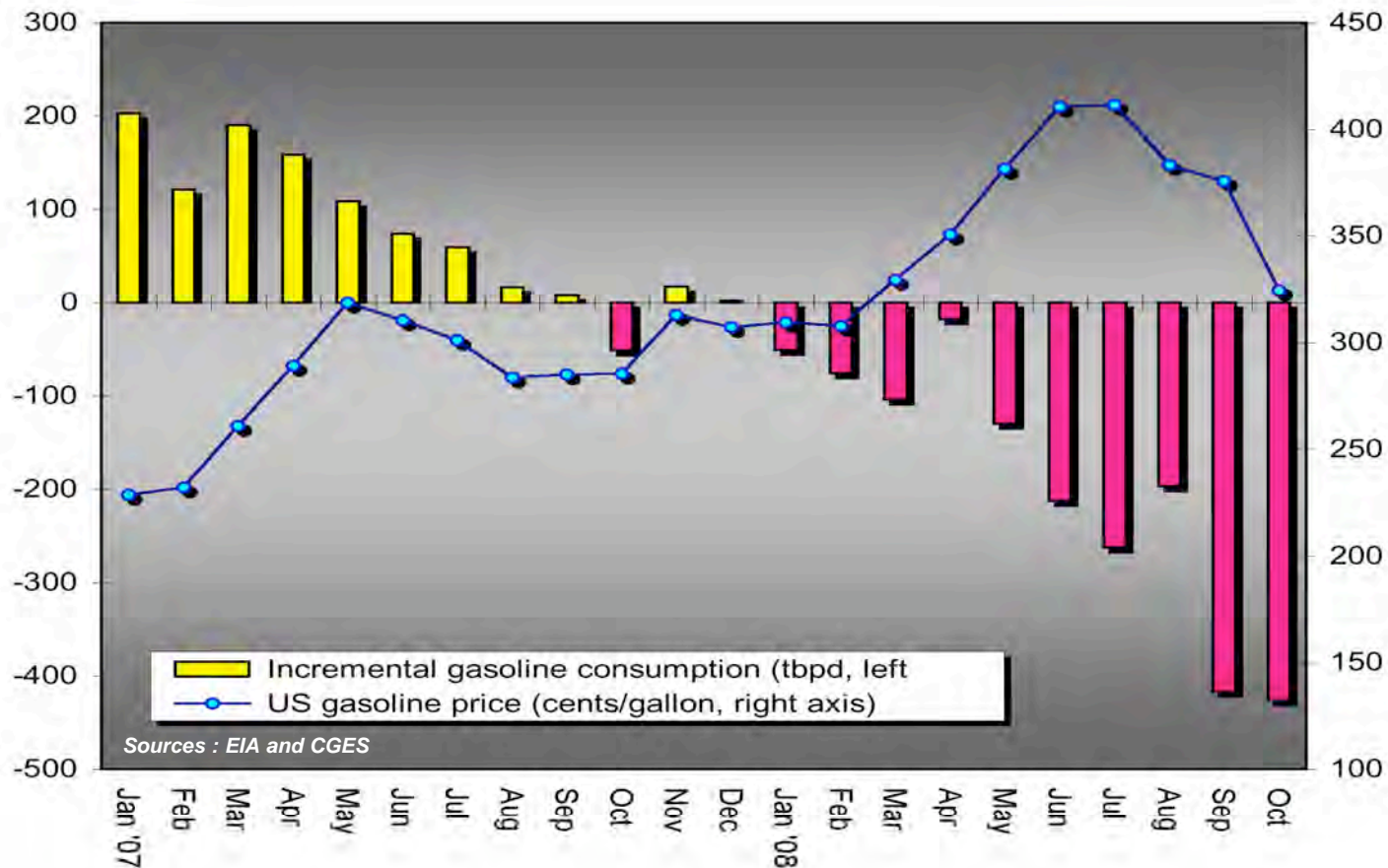
• <b>World</b>	<b>- 0.3</b>
• <b>USA</b>	<b>- 0.2</b>
• <b>Japan</b>	<b>- 0.4</b>
• <b>China</b>	<b>- 0.3</b>
• <b>India</b>	<b>- 0.6</b>
• <b>Germany</b>	<b>- 1.0</b>
• <b>France</b>	<b>- 1.4</b>
• <b>Iran</b>	<b>- 0.1</b>
• <b>S. Arabia</b>	<b>0.0</b>

# Incremental oil demand growth 1985-2007



Note that during this period global oil demand growth was 1.6% per annum and economic growth averaged 3.7% a year.

# Gasoline demand growth in the US and the price of gasoline



There can be little doubt now that high gasoline prices in the US have had a large adverse effect on gasoline demand growth. The slowing US economy is also kicking in at present to exacerbate the impact of high gasoline prices and send incremental gasoline demand heavily into negative territory.

# Global oil reserves are not a problem

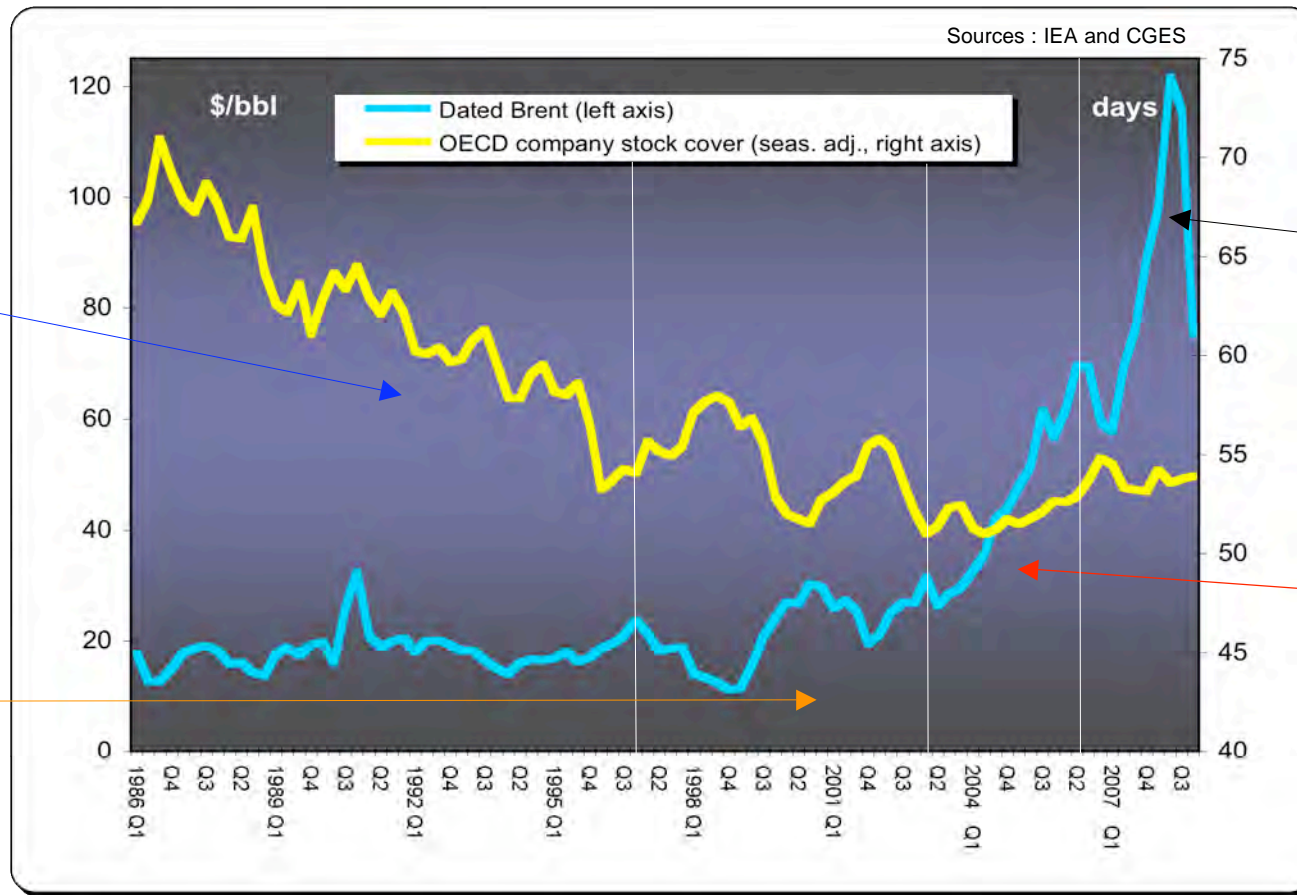
	<u>bn barrels</u>
<b>Cumulative oil production <sup>1</sup></b>	<b>1,064</b>
<b>Remaining oil reserves <sup>2</sup></b>	<b>1,156</b>
<b>Reserves growth <sup>3</sup></b>	<b>378</b>
<b>Undiscovered conventional oil <sup>3</sup></b>	<b>402</b>
<b>GRAND TOTAL</b>	<b>3,000</b>

1. Until the 1st of January 2008. The figure refers to crude oil only. Sources are the Oil and Gas Journal, DeGolyer and MacNaughten, and the CGES.

2. On the 31st of December 2007, as reported by the Oil & Gas Journal, representing 43 years of reserves at current rates of oil production. Note that we have excluded tar sands from Canada's total as given by the OGJ.

3. We have arrived at these figures by subtracting cumulative output and remaining oil from 3,000 bn bbls and then pro-rating the result by the US Geological Survey's split between reserves growth and undiscovered oil.

# What about stock cover?



In this period OECD company inventory cover was trending downwards without any noticeable effect on the oil price.

Period during which stock-cover and the oil price moved in opposite directions.

Stock cover has been fairly static, but oil prices seem to have over-reacted.

Period during which stock-cover and the oil price were moving in the same direction.

Between 3Q96 and 2Q03 oil prices seemed to be the mirror image of OECD company inventory cover, rising when cover was low and falling when cover was high. From 2Q03 onwards forward cover rose from 51 days to 55 days, yet oil prices rose relentlessly, except for two episodes of price weakness (4Q05 and 4Q06-1Q07), both associated with rises in inventory cover. Since 1Q07 OECD company stock cover has not changed much and yet oil prices have soared and then tumbled.

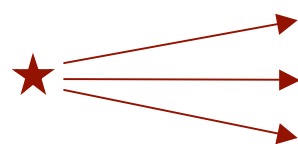


# What about OPEC's spare capacity?

		1998-2008
Incremental ...		mbpd
	<b>World oil consumption</b>	<b>12.25</b>
<b>Contributions to supply</b>		
36 %	Non-OPEC production	4.40
16 %	OPEC's output of NGLs	2.01
5 %	Processing gains	0.62
4 %	Biofuel production	0.46
38 %	OPEC's output of crude oil	4.63
1 %	Stock changes	-0.13
100 %	<b>World oil supplies</b>	<b>12.25</b>
	<b>OPEC capacity</b>	<b>1.73</b>

The heart of the problem: OPEC's capacity growth has been disappointing

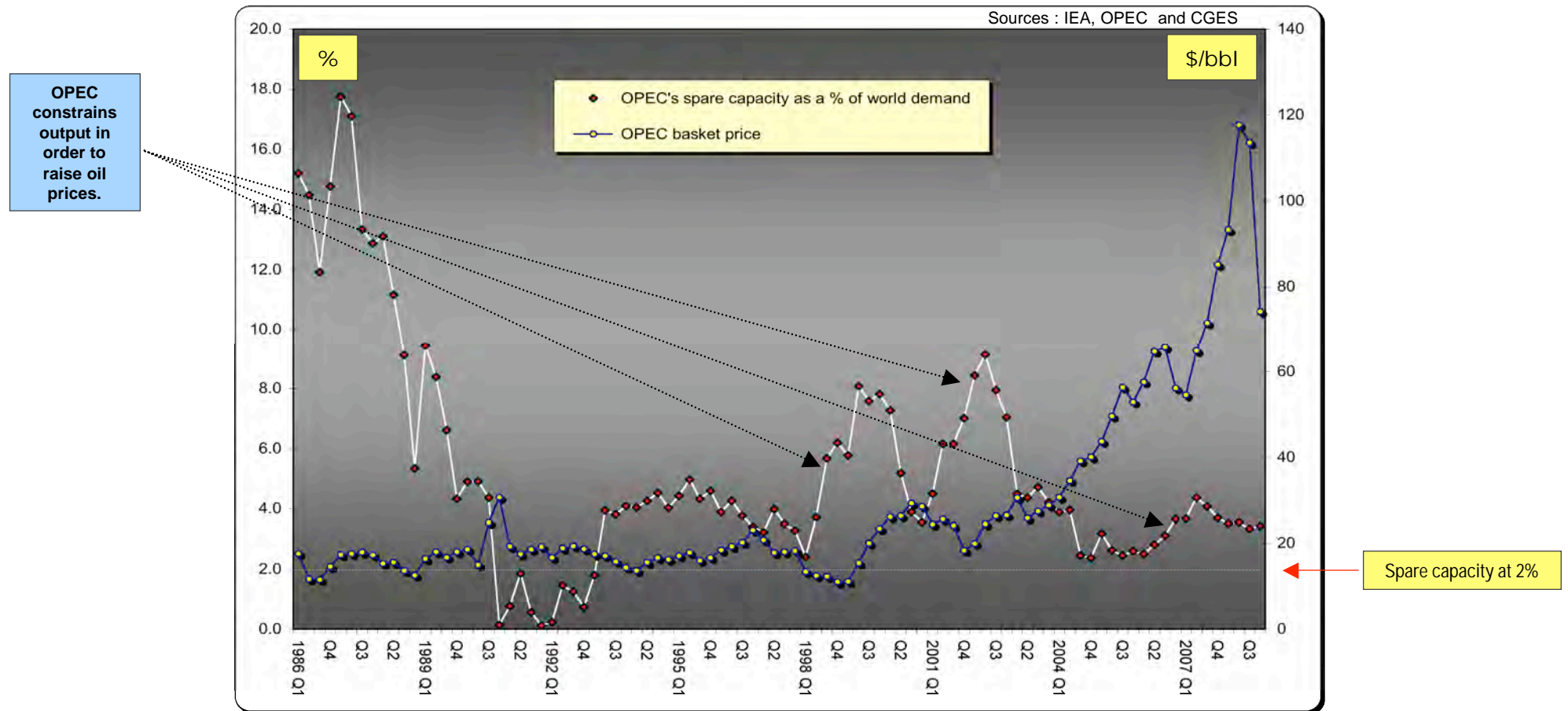
	Capacity change 1998-2008 mbpd
<b>Saudi Arabia *</b>	1.06
<b>Iraq</b>	0.65
<b>Iran</b>	0.17
<b>Kuwait *</b>	0.48
<b>U.A.E.</b>	0.12
<b>Qatar</b>	0.16
<b>Libya</b>	0.35
<b>Algeria</b>	0.57
<b>Nigeria</b>	-0.33
<b>Venezuela</b>	-0.95
<b>Indonesia</b>	-0.55
<b>TOTAL</b>	<b>1.73</b>



Since the oil price collapse of 1998, OPEC has not added much new capacity. Ageing oilfields in Indonesia, civil unrest in Nigeria, a lack of investment in Venezuela and economic sanctions imposed on Iran, have all taken their toll. Note that Iraq's capacity remains below the level reached prior to the 2003 invasion.

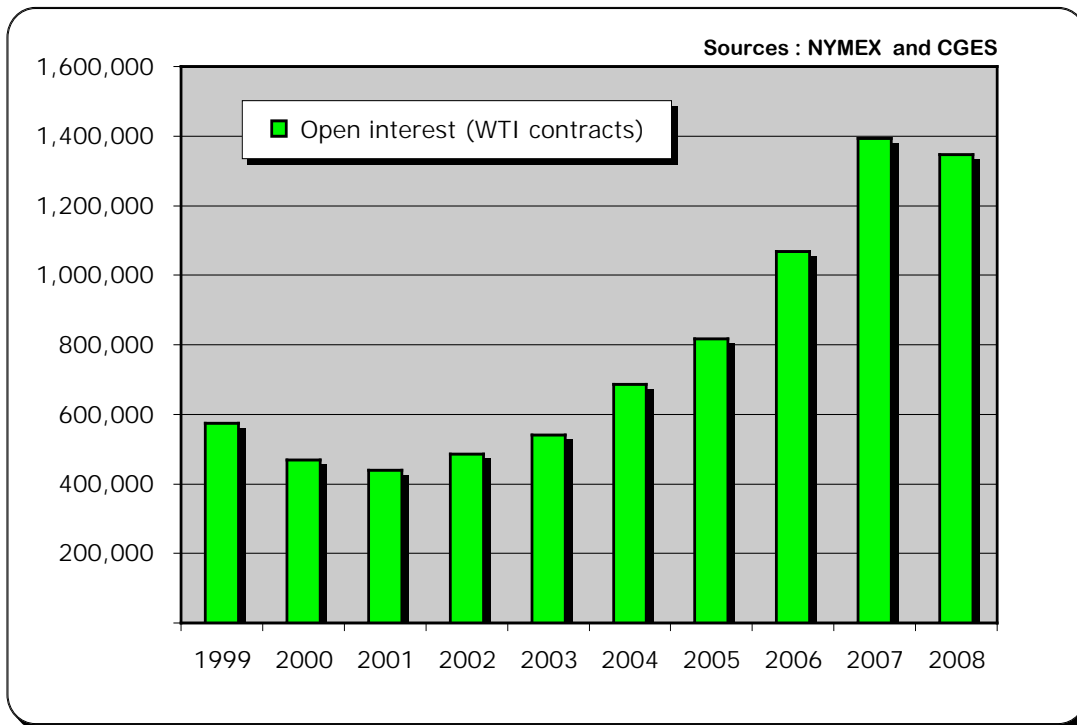
\* plus half the Neutral Zone

# Can OPEC's low spare output capacity explain the oil price surge?



Low spare capacity (as a % of global demand) is generally associated with high prices and vice versa. However, the relationship is distorted by OPEC's occasional drives to push up oil prices by constraining production and thus raising spare capacity (e.g., in 1998-99, 2002 and in 2006-07). Between 2Q03 and 4Q04 spare capacity genuinely became much tighter. Spare capacity then increased between 3Q05 and 2Q07, only to decline slightly from 3Q07 to date.

# The elephant in the room: growth in crude oil open interest at NYMEX



**Annual growth rates of open interest positions (average of long and short)**  
**2001 to 2007**

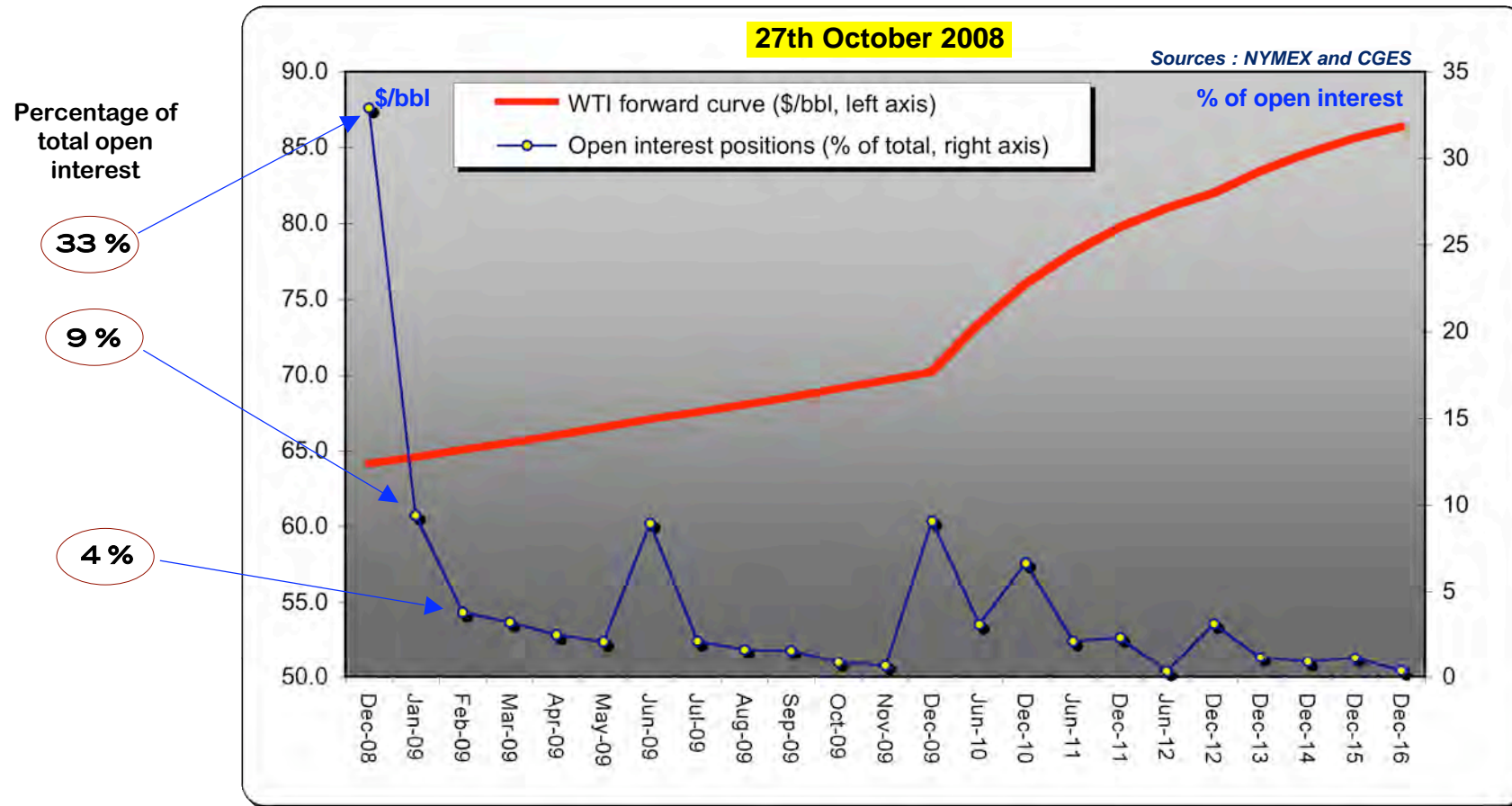
<b>Commercial</b>	<b>13%</b>
<b>Non-commercial</b>	<b>23%</b>
<b>Non-reporting</b>	<b>8%</b>
<b>TOTAL</b>	<b>19%</b>

Open interest in WTI grew exponentially at 19% per annum between 2001 and 2007. Much of this surge occurred between 2004 and 2007. A new investor class of commodity investors, hedge funds and financial players emerged. The funds tracking commodity indices (like the Goldman Sachs and Dow Jones-AIG indices) grew dramatically from \$8bn in 2000 to around \$130bn in 2006 before a sell-off at the end of 2006. They came back into the market in 2007. Note that the assets under pension fund management worldwide exceed \$21 trillion; note also that so far in 2008 there has been a decline in open interest positions.

## Evidence by Michael Masters of Masters Capital Management before a US Senate Committee hearing in May 2008

- **The severe bear market in equities over the period 2000-2002 drove institutional investors into commodities, which usually trade inversely to fixed-income and stock portfolios.**
- **As a result, assets allocated to commodity index trading jumped from \$13 billion at end-2003 to \$260 billion by March 2008. Over this period the prices of the 25 commodities making up these indices surged by 183%.**
- ***“The huge growth in demand [for futures contracts] has gone virtually undetected by classically trained economists, who almost never analyze demand in futures markets.”***
- ***“Refiners have told me that the price of oil, excluding the impact of speculation, would be in the \$65 to \$70/bbl range.”***

# WTI oil futures — the forward curve Dec. 2008 to Dec. 2016

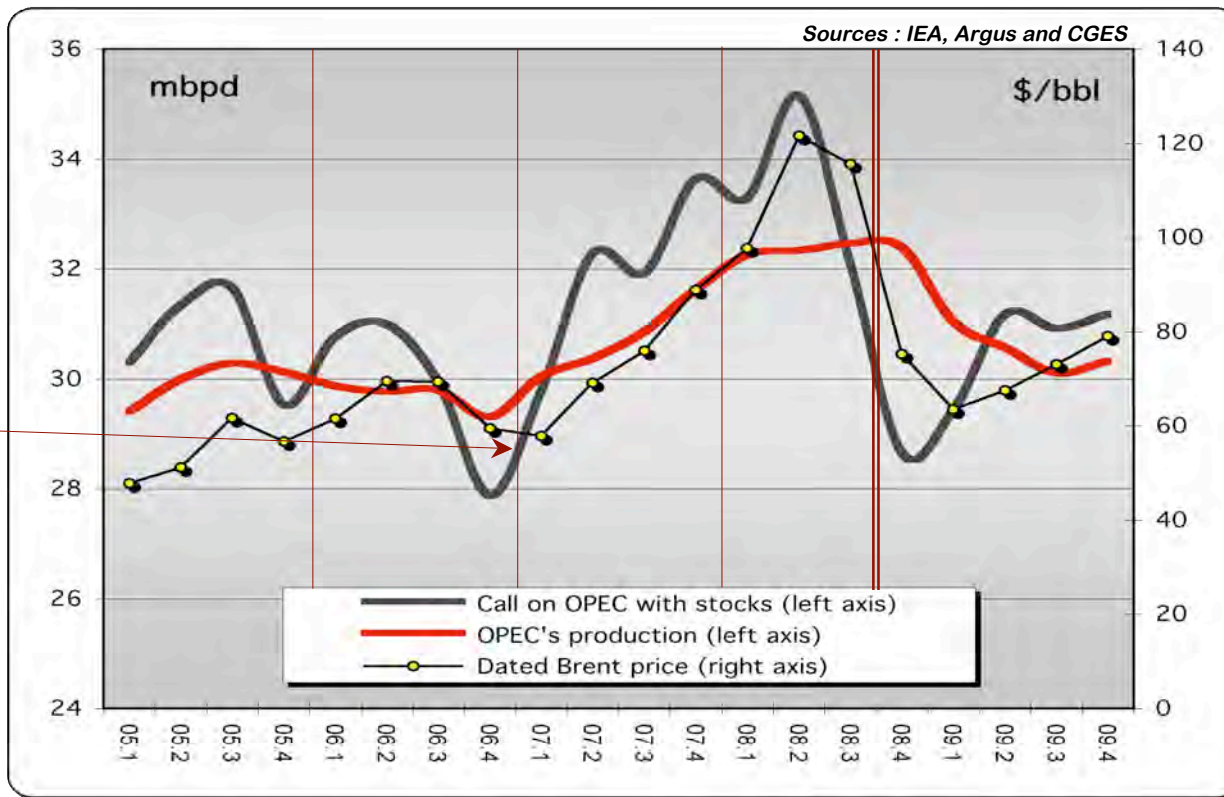


Most of the open interest is concentrated in the front month (33% of the total) and the first three months (46% of the total). The whole forward curve is contangoed all the way out to 2016, which suggests that the market does not expect the current weakness to last too long.

# OPEC's new quotas and the required 5.5% cut

	Quotas Nov-07 tbpd	Quotas Oct-08 tbpd	Production Oct-08 tbpd	Excess production Oct08 tbpd	Required cuts with new quotas tbpd	Required cuts with new quotas %
Saudi Arabia	8943	8477	9282	339	-805	-9
Iraq	-	-	-	-	-	-
Iran	3817	3618	3940	123	-322	-8
Kuwait	2531	2399	2550	19	-151	-6
U. A. E.	2567	2433	2500	-67	-67	-3
Qatar	828	785	830	2	-45	-5
Libya	1712	1623	1740	28	-117	-7
Algeria	1357	1286	1380	23	-94	-7
Nigeria	2163	2050	1950	-213	100	5
Venezuela	2470	2341	2380	-90	-39	-2
Angola	1900	1801	1840	-60	-39	-2
Ecuador	520	493	510	-10	-17	-3
<b>Total</b>	<b>28808</b>	<b>27308</b>	<b>28902</b>	<b>94</b>	<b>-1594</b>	<b>-6</b>

# Oil price prospects until the end of 2009



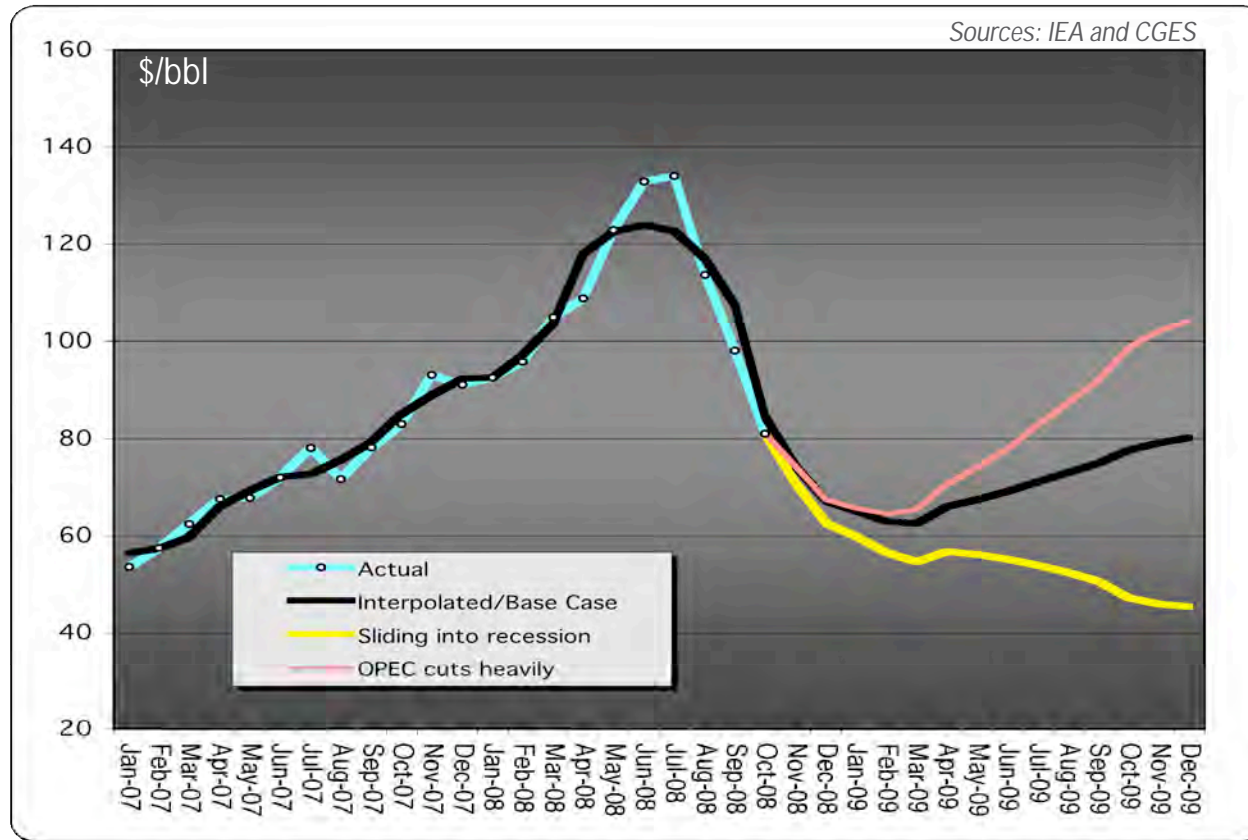
\* Note that Angola is included in the OPEC numbers from Jan '07 and Ecuador from Dec '07

\* Note that Indonesia is excluded from the OPEC numbers from Jan '09

The key to the oil price lies in the call on OPEC (including desired stocks) versus OPEC's output. Angola's figures distorted the picture for 2007, but the key feature of the year was a significant tightening of the oil market, with the call on OPEC exceeding OPEC's production for almost the whole of 2007. This continued into 2008, peaking in 2Q08, but since then the call on OPEC (with stocks) has been falling steeply, requiring output cuts from OPEC in the 1st and 2nd quarters of 2008 to slow down and eventually reverse the oil price decline. The CGES view is based on a global economic slowdown in 2008 and 2009.



# Oil price scenarios: 2008-9



If the world were to slide into recession, oil demand would actually decline in 2009 and the price of oil would drop under \$60/bbl, despite OPEC cuts that reach 1.5 mbpd below current levels by the middle of next year. OPEC needs to cut its production early on in 2009, and keep cutting, to keep the oil price from gathering downward momentum and eventually guide it back up above \$100/bbl by 4Q09.

# How to improve matters?

- Oil should be de-politicised and, ideally, de-nationalised.
- Since this looks unlikely, the second best solution is for OPEC to set annual output targets and allow global inventories to take the strain.
- OPEC's annual production targets should be based on estimates of world oil demand, non-OPEC supplies, desired stock-cover and its oil price targets.

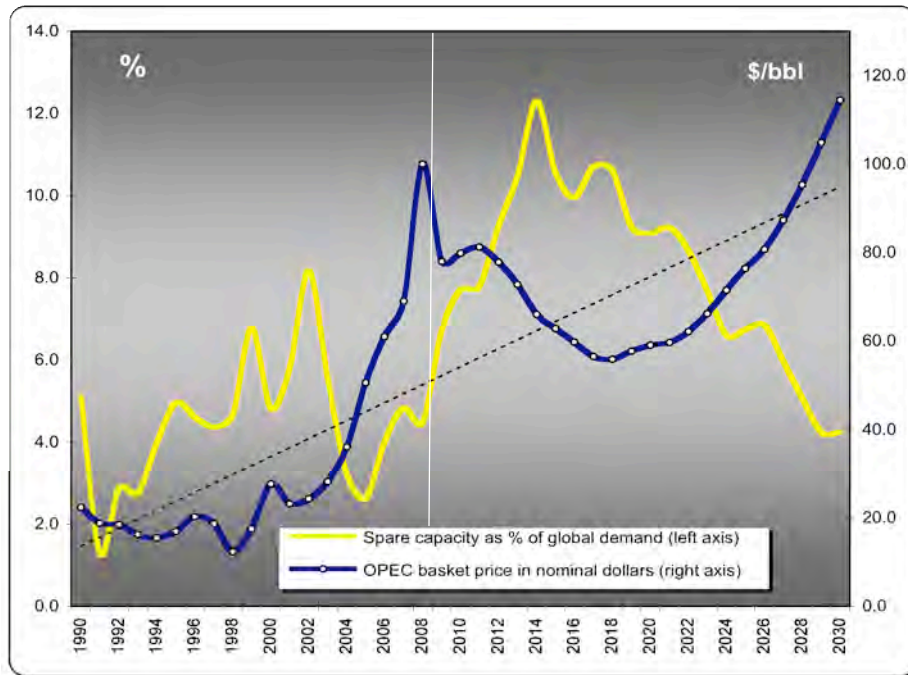
# A few words about the longer term

- In its 2007 World Energy Outlook the IEA painted a picture of oil supplies chasing robust oil demand, with oil prices above \$65/bbl till 2010 and rising thereafter to \$81/bbl by 2020. OPEC remains in the driving seat, its output reaching 48% of global consumption in 2020.
- The IEA sees oil demand growing by 19 mbpd (1.5% a year) between 2006 and 2020, despite oil prices well above \$65/bbl and slower economic growth after 2015. Worries about the security of oil supplies and environmental issues lead to an alternative scenario in which governments use an array of powers at their disposal to curtail oil demand.
- After the oil crises of the 1970s, most observers predicted that oil prices would rise inexorably, because oil demand was considered highly inelastic and alternative supplies inadequate. These predictions proved to be entirely wrong. Could we be making the same mistakes once again?
- The key issue is whether the free market system can prevent what some people are calling 'the impending oil crunch' from taking hold?

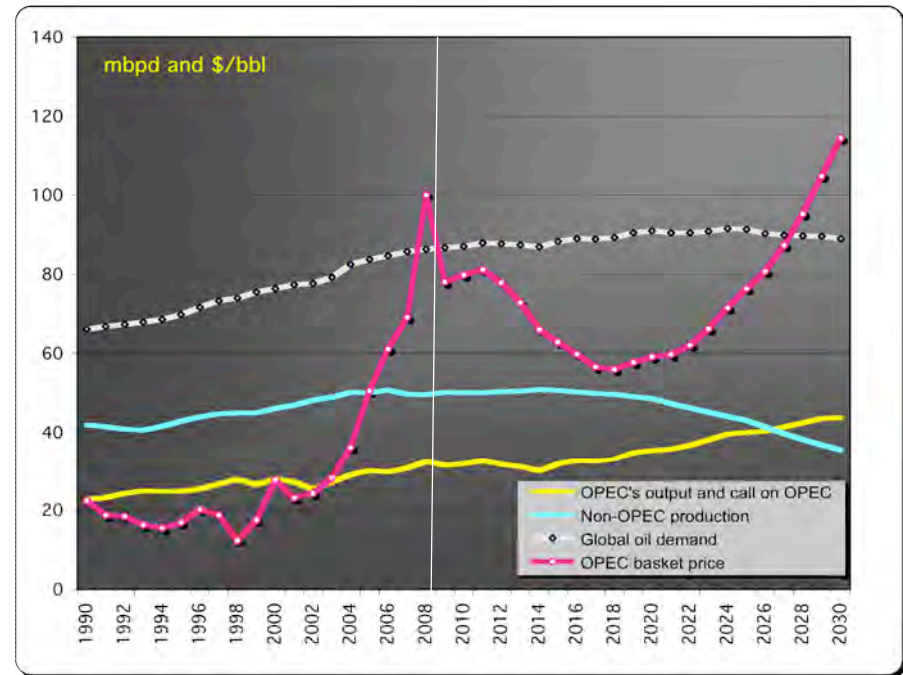
# The IEA's forecasts — some comments

- It is clear that the IEA's forecasts of oil demand are not very responsive to changes in the price of oil. This is a common point of view.
- The future trajectory of oil demand in this sort of scheme is largely driven by economic growth and the intensity of oil use.
- Once oil demand is determined, prices play the role of eliciting the appropriate supplies to satisfy demand, hence the talk of '**oil crunches**' and '**investment needs**'.
- In fact, oil demand is responsive to oil prices, albeit with lags. To neglect this relationship means missing a key mechanism that brings oil demand into line with the available supply.
- It is not easy to disentangle the effect of oil prices and economic growth on oil demand. The CGES' work on the very long-run price elasticity of demand for oil suggests a value around -0.7, implying that a 10% increase in the real price of oil leads over time to an 7% fall in the consumption of oil, ceteris paribus.

# Looking at the oil price both near and far



As OPEC's spare capacity builds up after 2008 the oil price begins to weaken, reaching a trough around 2018 and rising thereafter with gathering speed as spare capacity drops to the 4% level. From 2020 onwards the oil industry will have entered the fourth and final phase of its life cycle.



The recent spate of high oil prices has come before its time, resulting in weaker oil demand growth than otherwise would have been the case. Non-OPEC supplies reach a plateau around 2015 and decline inexorably after then. World oil supplies peak at or near 2022, as does oil demand.

# Concluding remarks

- The oil price peak of \$147/bbl in July 2008 is highly unlikely to be seen again for the foreseeable future, unless the geopolitical scene deteriorates rapidly (because of Iran).
- OPEC will try to keep prices above \$80-90/bbl; the outcome will depend on the struggle between the impending recession and the fiscal needs of the oil-producing states.
- In the longer term, oil demand growth is likely to slow up considerably due to high oil prices and concern about the environment.
- The world's oil resources are ample; getting them out of the ground is the problem. Key questions : (1) is there the desire to do so, (2) will there be enough investment by OPEC and the oil companies, (3) will there be political stability?