

Understanding the Oil Future

...by Examining the Past

2009 International Energy Workshop

17-19 June 2009

Venice, Italy



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DISCLOSURES AND ANALYST CERTIFICATIONS ARE LOCATED IN APPENDIX 1.

A Passion to Perform.

Deutsche Bank 

What We Can Learn about Energy and Geopolitics ...from the Covers of *The Economist* magazine

What does the past tell us about the future?



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June 2008

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Economic Vulnerability and Slowdown

November 2007

April 2008

The US accounts
for about 22% of
global GDP.



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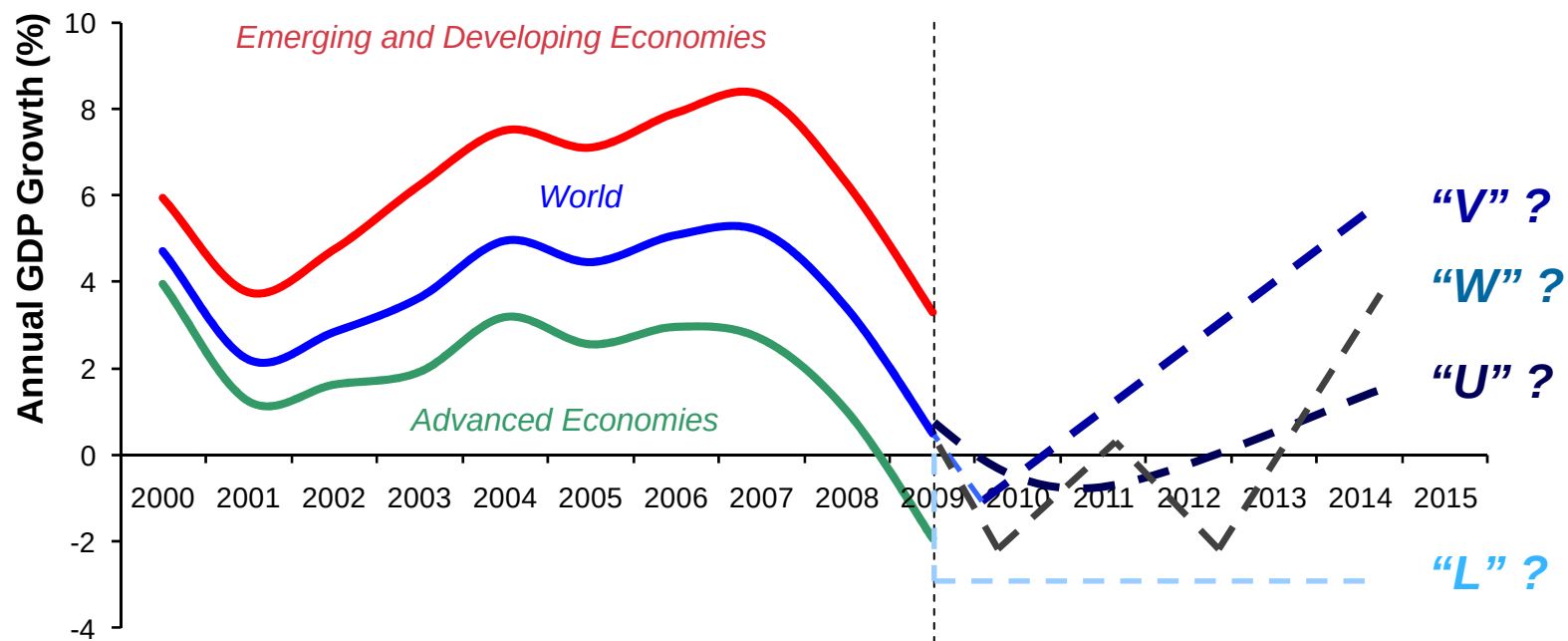


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Alphabet Economics

Outlook	Upturn	Comment
Speedy Recovery	V-shaped (2001)	After slipping into recession in the third quarter of 2008, G3 growth resumes in the third quarter of 2009 and growth accelerates rapidly into 2010. Probability: 10%
Mild Recession <i>Long drawn out recovery</i>	U-shaped (1990)	Aggressive central bank easing and a quick resolution to G3 banking sector problems leads to a recovery taking hold sometime at the end of 2009, but, growth remains below trend during 2010. Probability: 35%
Severe Recession <i>Long drawn out recession</i>	W-shaped (1981)	Fiscal and infrastructure stimulus packages lead to a short term boost in GDP during the middle of 2009. However, these effects fade during 2010 and growth Specifically in China stages a second downleg into 2010. Probability: 40%
Depression	L-shaped (1929)	The weakness in commercial sector activity inflicts another wave of financial damage on the banking sector. Equity markets collapse further, unemployment rises rapidly and deflation takes hold. World economic activity contracts again in 2010/11. Probability: 15%

The Shape of the Economic Recovery Matters



Source: CSIS, IMF, Deutsche Bank

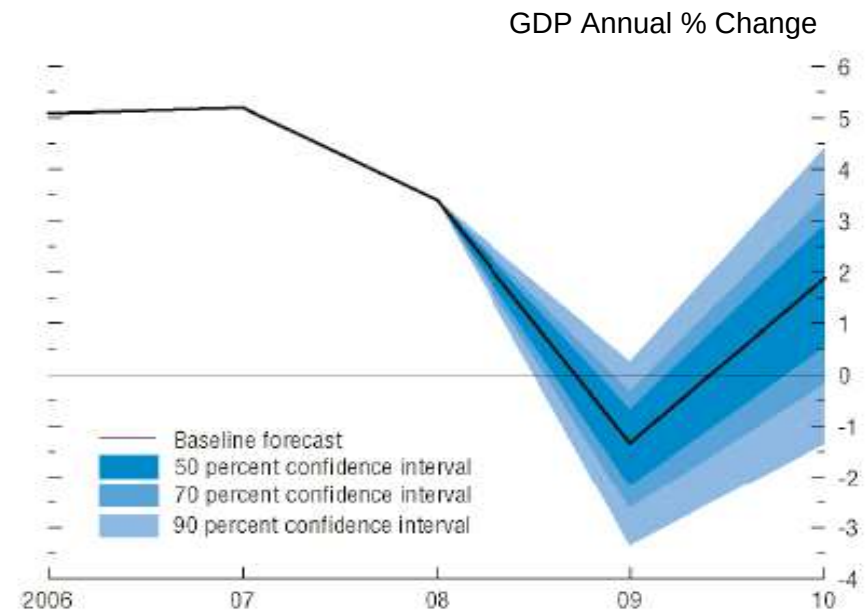
If the emerging market economies stumble, world GDP could sink



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How Low Could Economy Go?



Source: International Monetary Fund, April 22, 2009

World Economic Outlook from Deutsche Bank

World economy in deep recession

We are starting to see some signs that sufficient action on the financial front is attenuating the risks that the global economy will be mired in a prolonged period of sluggish growth.

y-o-y % change	2007	2008	2009E	2010E	Weights
US	2.0	1.1	-3.2	0.7	20.4
Euro Area	2.6	0.7	-3.9	0.8	23.0
Japan	2.1	-0.7	-8.0	-0.3	6.2
Other OECD	2.4	0.5	-2.0	1.5	7.1
OECD	2.3%	0.7%	-3.9%	0.7%	56.7
China	11.9	9.0	7.5	7.2	12.0
Other Asia (1)	6.2	4.6	0.0	4.2	11.6
EMEA (2)	6.6	4.3	-1.8	3.7	8.9
Latin America	5.4	4.2	-1.3	2.9	6.2
FSU (3)	8.0	4.5	-4.5	2.5	4.6
Non-OECD	7.9%	5.7%	1.0%	4.6%	43.3
World	4.7	2.8	-1.7	2.3	100.0

(1) Non-OECD Asia ex-China, (2) E. Europe, Mid-East, Africa, (3) Former Soviet Union

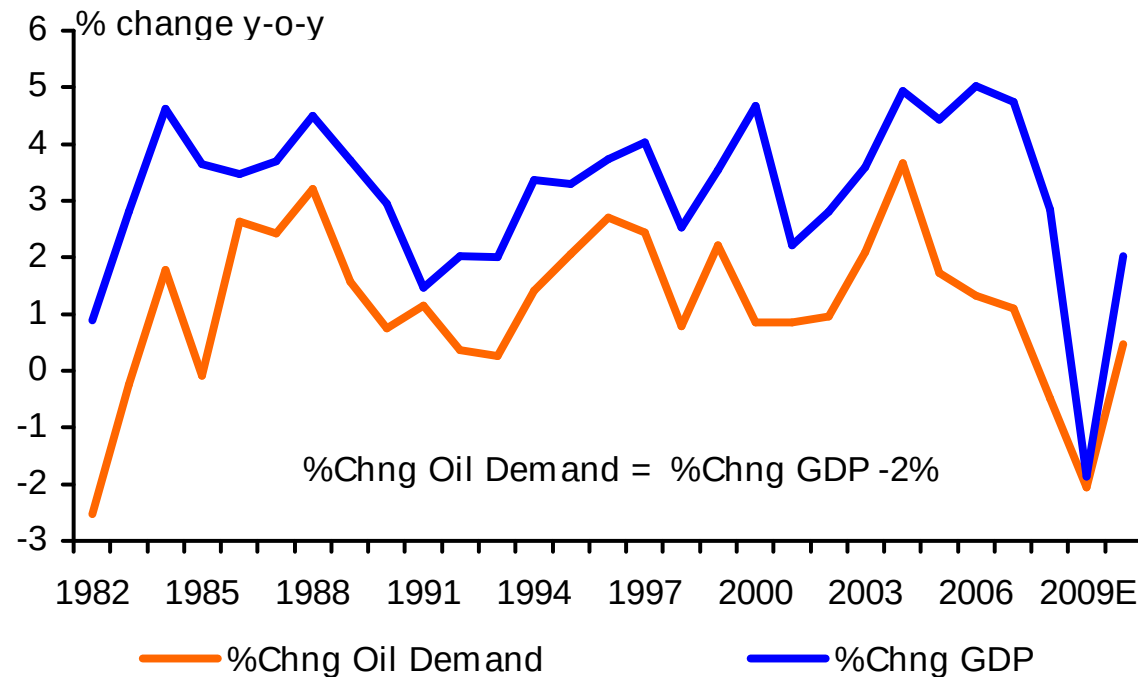
- Although we consider the economic outlook sketched above to be the most likely outcome, we see it subject to a much higher degree of uncertainty than usual. Risks are big and lie both on the up and downside.
- We believe that recovery basically depends on four factors successfully coming together: (1) monetary easing; (2) fiscal easing; (3) bank restructuring; and (4) a boost to confidence. At present, the US appears closest to fulfilling all four of these conditions. The early signs from the UK also give grounds for cautious optimism in that nation.
- Failure of the bank restructuring program in the US could induce a renewed tightening of credit conditions, leading to a deeper and more extended economic slump at the global level.

World Slowdown Impacts Oil

World oil demand grows at about 2% less than global GDP.

If global GDP is down 2% in 2009, oil demand could fall by 4%, or potentially more than 3mmb/d.

What does a global recession mean for oil demand?



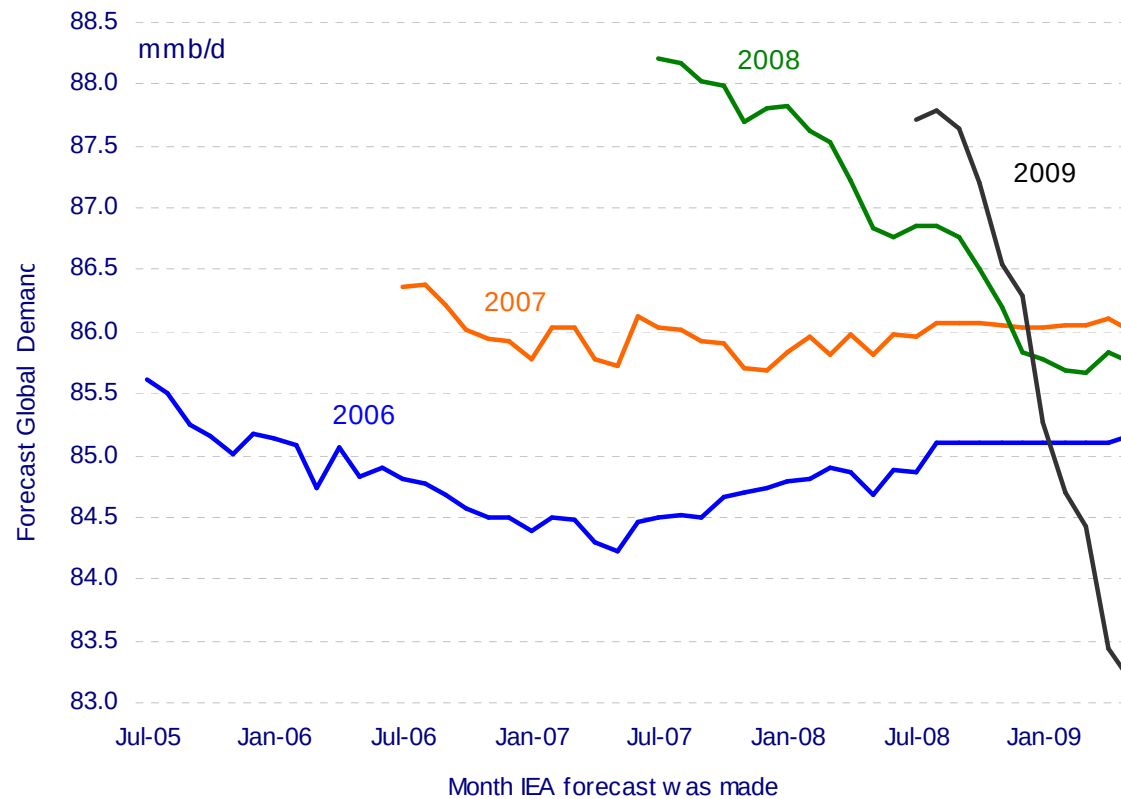
Source: IEA, IMF, DB Global Markets Research

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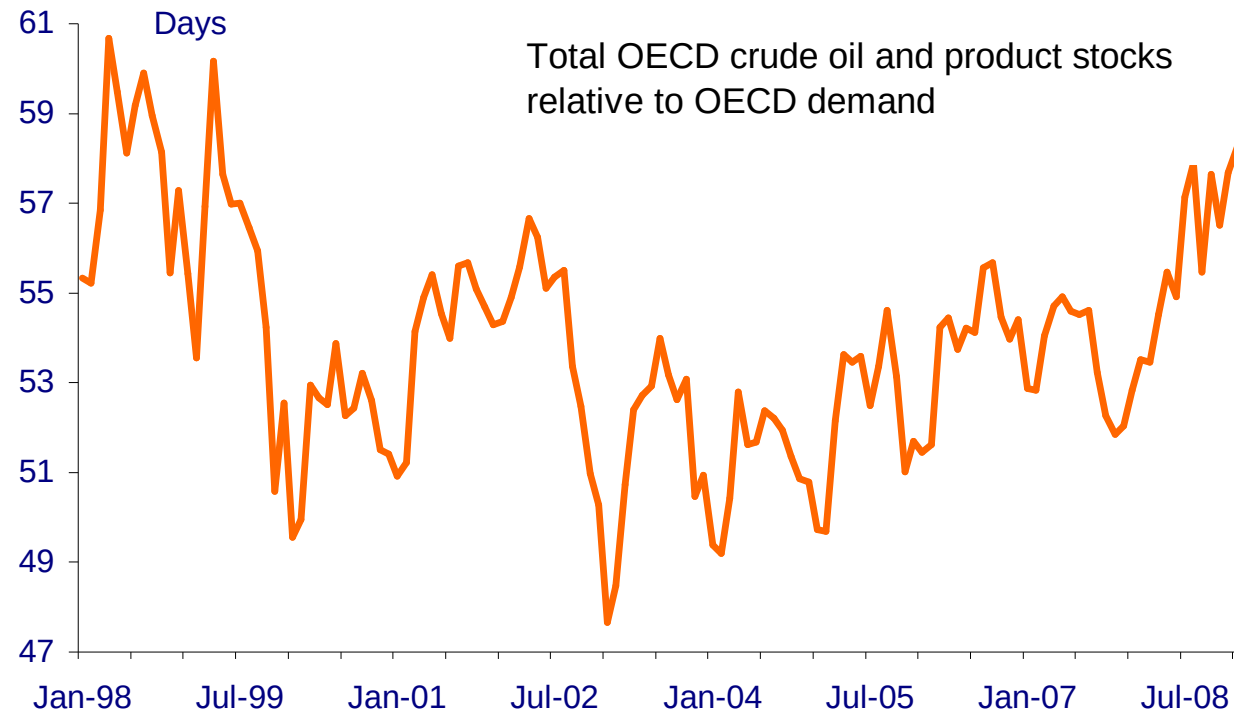


Source: IEA, DB Global Markets Research

OECD Inventories Rising

Days forward cover of OECD crude and product stocks

Another (usual)
sign of near-
term weakness
in the oil
markets.



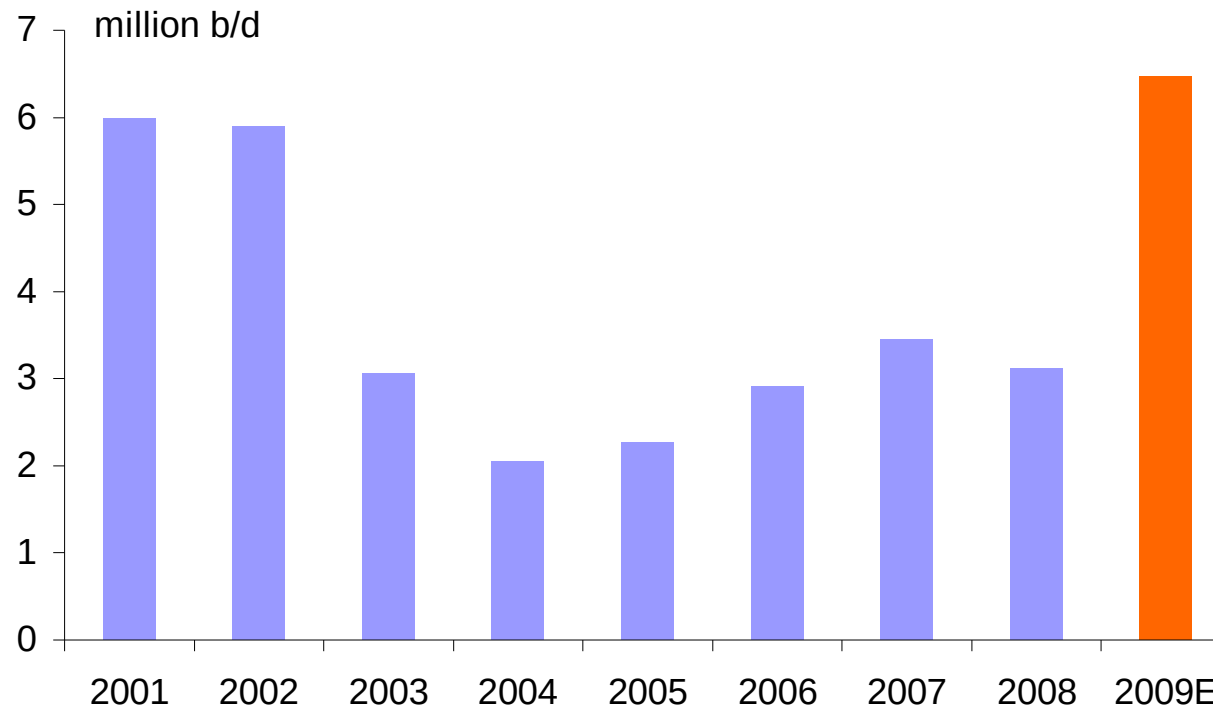
Source: IEA, DB Global Markets Research

OPEC Spare Production Re-Building

As OPEC cuts quotas, spare capacity increases

The lack of spare OPEC production capacity played a strong role in the run-up in oil prices in 2003-08.

This is reversing in 2009-10.



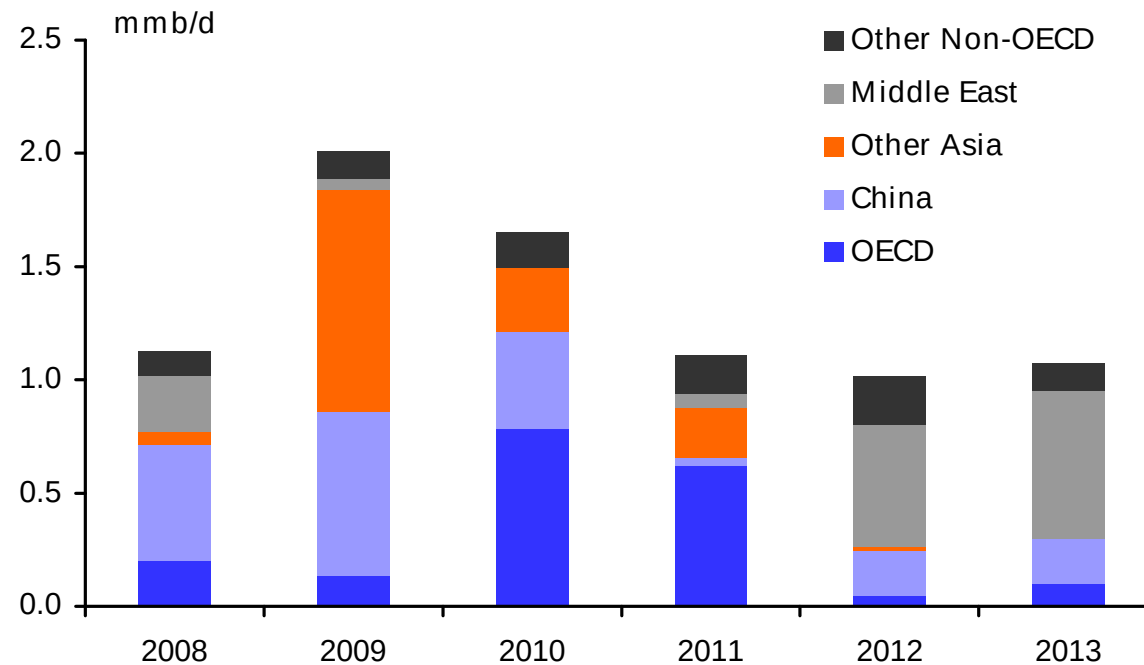
Source: IEA, DB Global Markets Research

Refinery Capacity Additions

Distillation capacity rising faster than demand in 2009 and 2010

The lack of spare refining capacity played a strong role in the run-up in oil prices in 2007-08.

This is reversing in 2009-10.



Source: IEA, DB Global Markets Research

Drowning in Oil

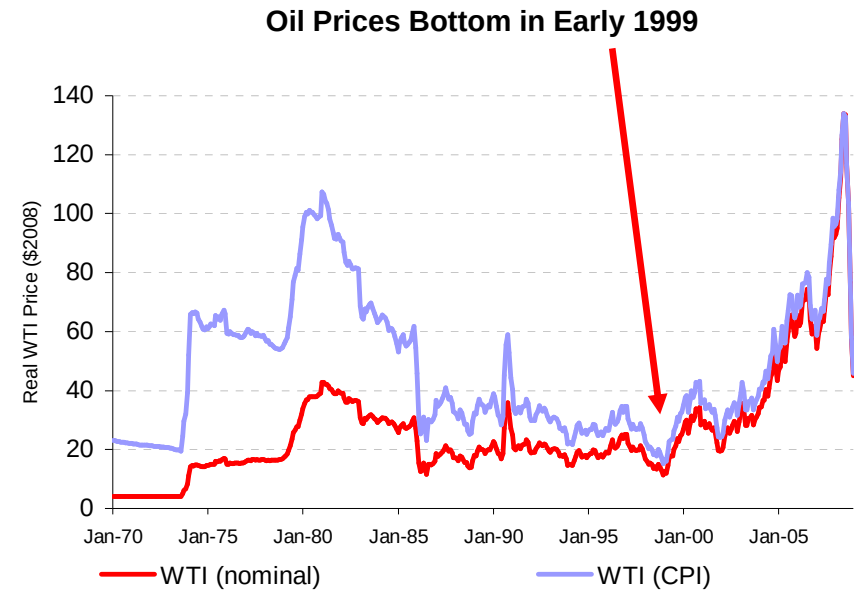
March 1999

When it seemed like oil would be cheap forever



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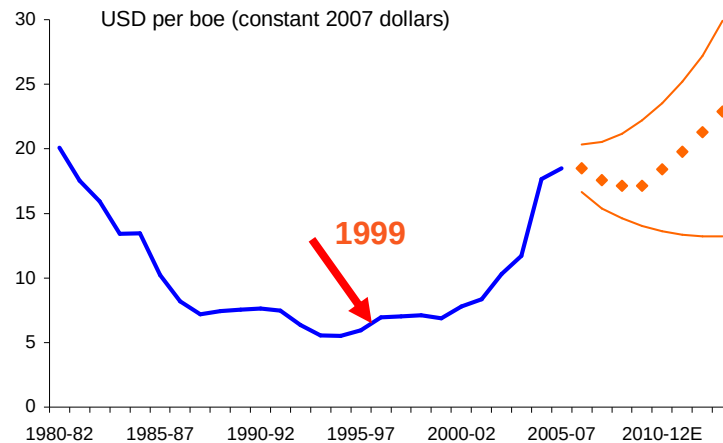
Source: Nymex, US Dept of Commerce, DB Global Markets Research

What Does It Cost to Find a Barrel?

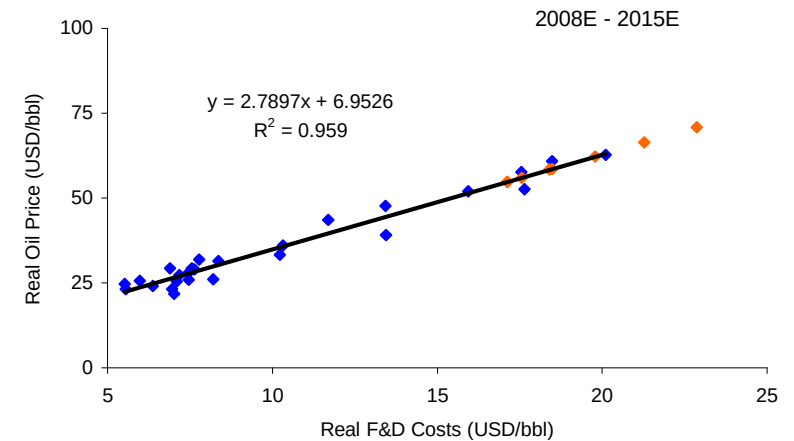
Worldwide finding costs (USD/bbl)

Finding and development costs rose rapidly from 2003, but could level off or decline, at least for a while, due to the economic downturn

If technology improved, costs could fall further.



Oil prices & finding costs are related



Source: DOE/EIA, DB Global Markets Research

- We estimate that finding and development costs were flat in 2008 at circa USD18.50/bbl, and could decline into 2009-10 before rising again after 2011. This implies that F&D costs could reach circa USD23-30/bbl in 2015.
- F&D costs have tended to be closely related to the oil price. Since 1980 we find that the oil price has tended to equal to 2.8x F&D costs plus USD7/bbl. This multiplier takes into account taxes and gross margin.
- Recently, a “simple” multiplier of 3x to 4x is observed in the data.
- To get oil to USD200/bbl on a cost basis is nearly impossible. The same is true of USD20/bbl oil. However USD90-100/bbl in the 2015 timeframe remains consistent with this data.

End of the Oil Age

October 2003

Not enough of a good thing?

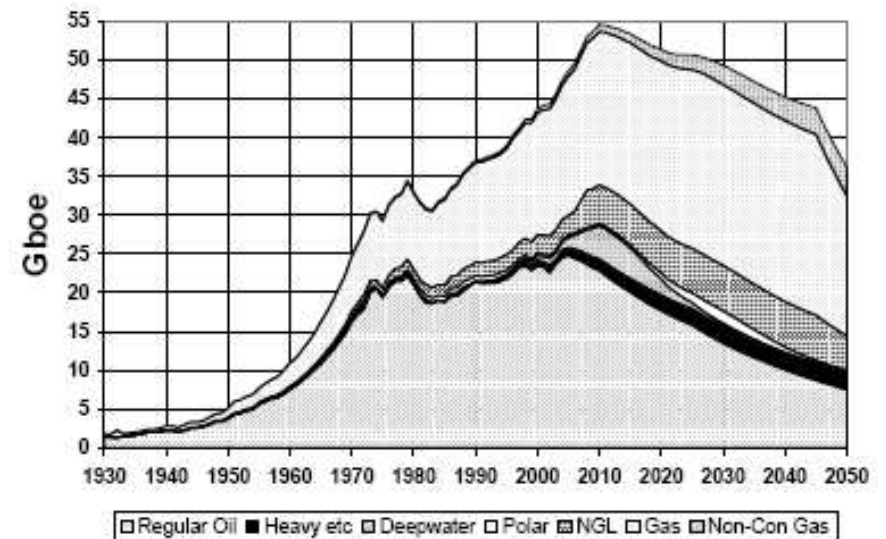
Some analysts think that global oil production will peak within the next few years.



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Peak Oil and Peak Gas



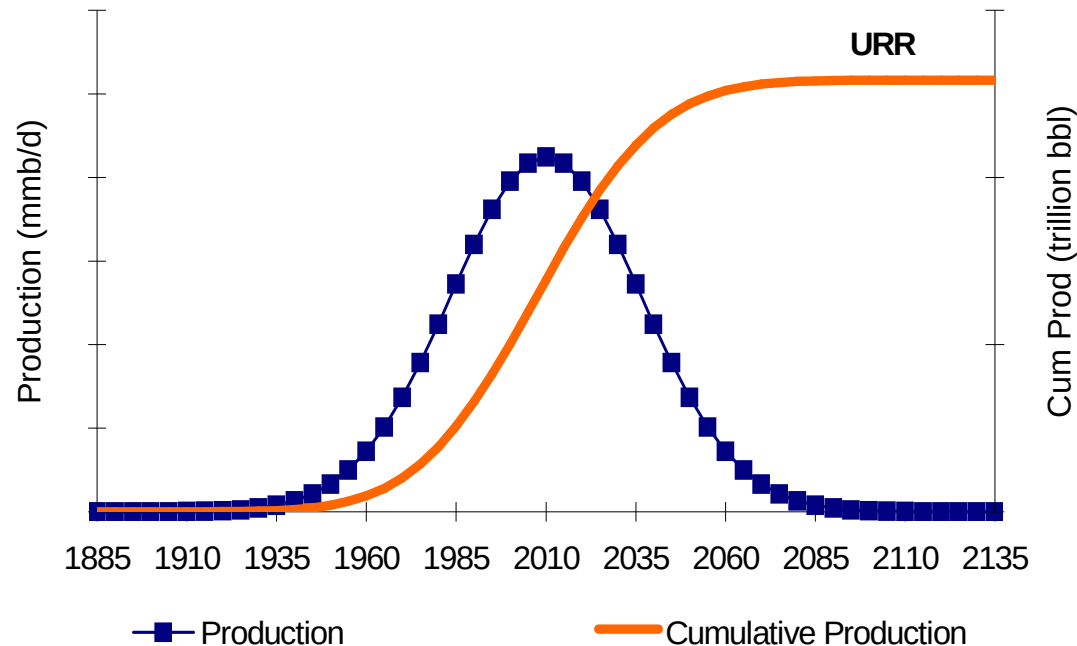
Source: Association for the Study of Peak Oil

Are We Running Out?

Hubbert Peak Curve (Idealized)

“...doomsayers
hard at work
fanning the flames
of hopelessness
and pessimism”

Leonardo Maugeri



“Peak Oil” Theory

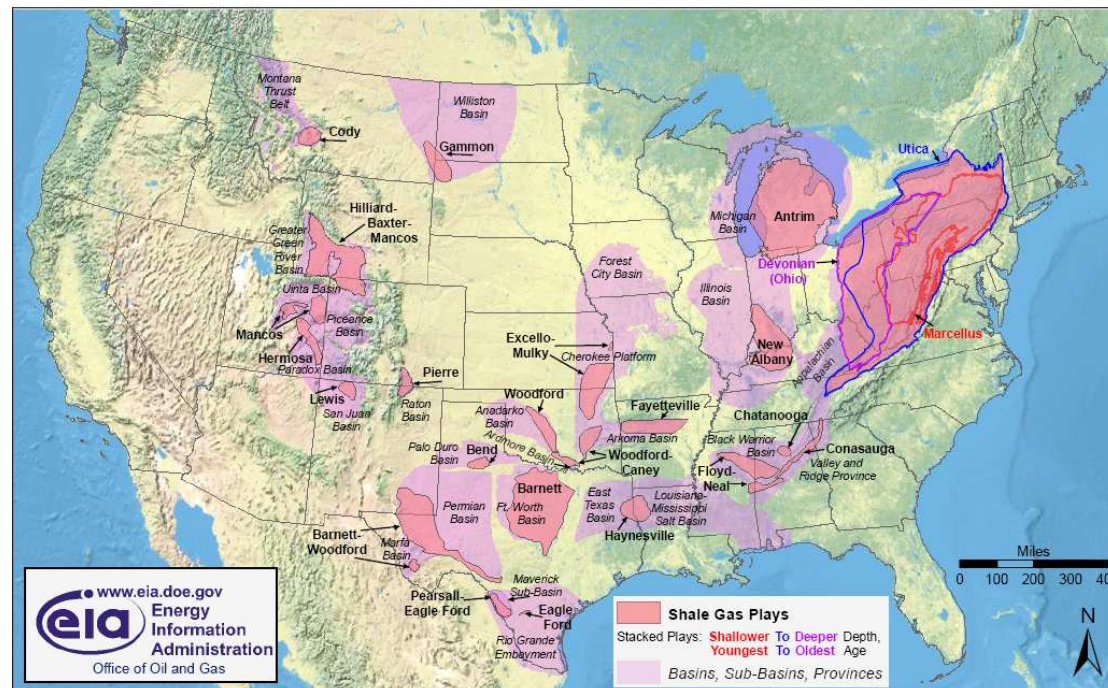
(1) requires a “final” estimate of the level of ultimately recoverable reserves (URR)... but URR estimates have been rising.

(2) assumes that once half of the world’s reserves have been used up, production must fall... but that point keeps moving ahead in time.

- Dr. M. King Hubbert, a geologist for Shell and the USGS in the early 1960s, used a bell curve to correctly predict the 1972 peak in US oil production. A number of followers have attempted to extend Hubbert’s methodology to forecast a world oil peak this decade.
- Hubbert models do not account for changes in technology, costs, prices, or politics - all of which can have a huge impact on the actual shape of the production curve. Hubbert peak oil models assume a symmetric curve to determine the year and amount of peak production.
- Increases in subsoil knowledge, the spread of technological progress, and the advancement of drilling – along with political decisions and oil price changes – have shown time and again that peak production can be increased and delayed, so the decline phase of the bell curve can be shifted to the right.

Shale Gas in the US... an unrecognized CO2 option?

Major US shale basins



- Independent natural gas producers are increasingly optimistic about their ability to develop shale plays around the US.
- The Barnett shale in Texas has been a huge success. DOE's gas supply models may be underestimating the potential strength of domestic production.
- If the industry is successful in conveying the "supply security" message, natural gas could receive favorable treatment from Washington policymakers, but this will take time and effort

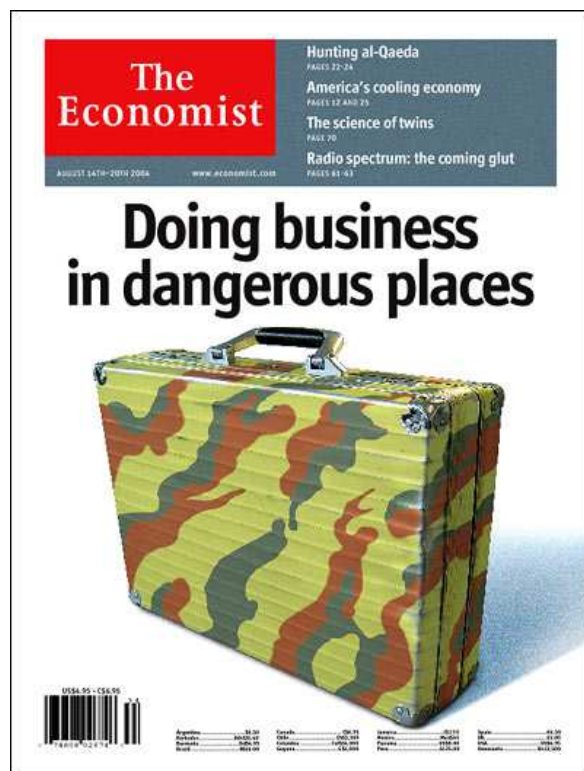
Source: DOE/EIA, DB Global Markets Research

Doing Business in Dangerous Places

August 2004

Most of the growth in oil production is NOT coming from vacation spots

Many experienced international oil companies say that instability is more of a problem than “dangerous places”.



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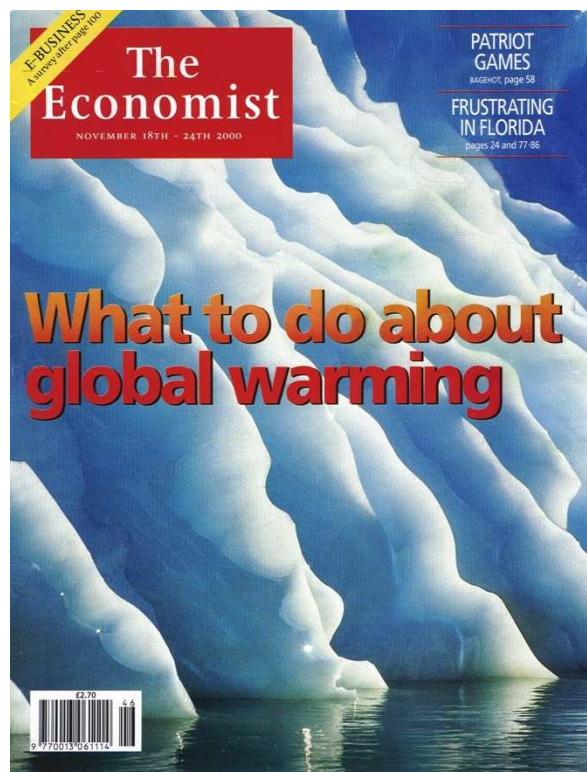
Top World Oil Producers (kb/d)

Rank	Country	Production
1	Saudi Arabia	10,248
2	Russia	9,874
3	United States	8,457
4	Iran	4,034
5	China	3,912
6	Mexico	3,500
7	Canada	3,422
8	United Arab Emirates	2,948
9	Venezuela	2,670
10	Kuwait	2,616
11	Norway	2,565
12	Nigeria	2,353
13	Brazil	2,250
14	Algeria	2,174
15	Iraq	2,097

Source: US DOE/EIA, 2007 rankings

What to Do About Global Warming November 2000

Europe was way ahead of the US curve on this topic



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Dealing with climate change got delayed

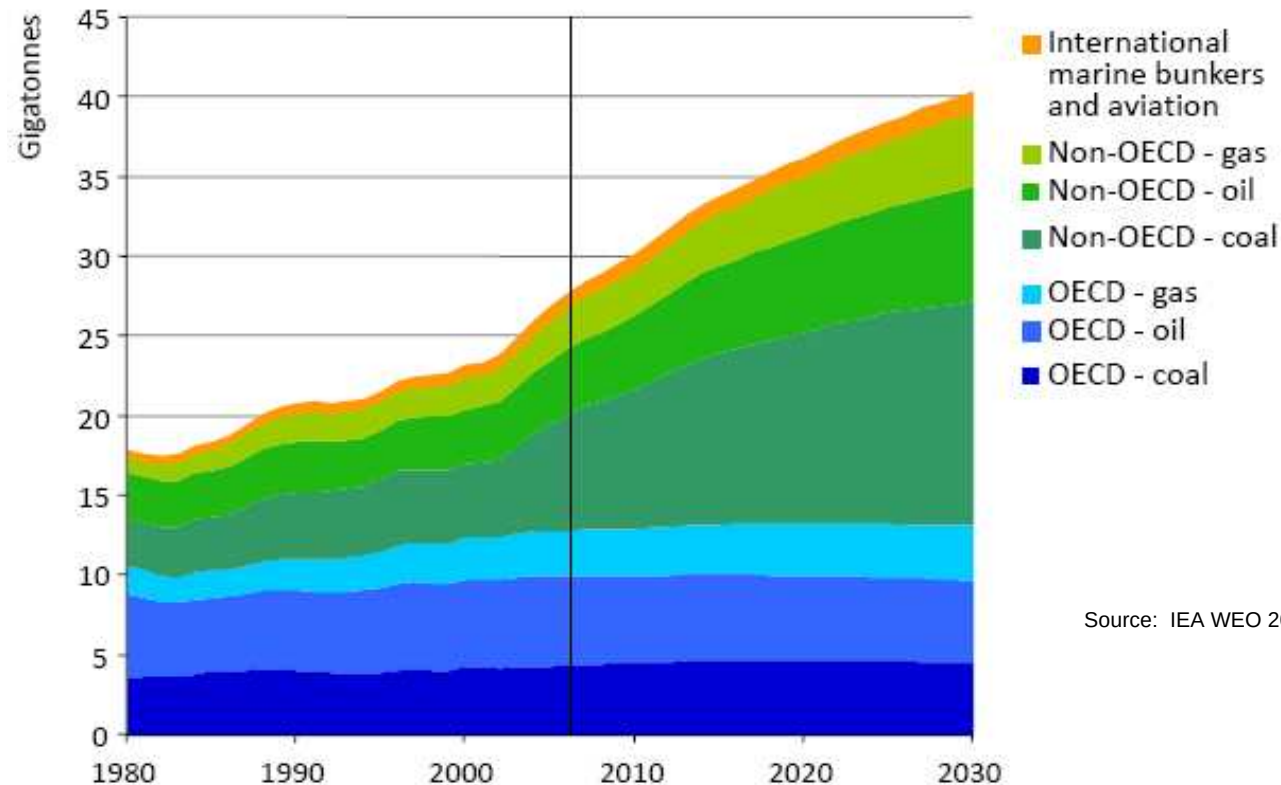
- There were still a lot of climate skeptics in 2000.
- Al Gore did not win the November 2000 US presidential election and had not yet won the Nobel Prize.
- The Bush administration thought US voters would never accept the pain... interestingly, the outcome of the June 2008 debate in the US Senate supports this contention.

Source: DB Global Markets Research

Energy-Related CO2 Emissions (Business as Usual)

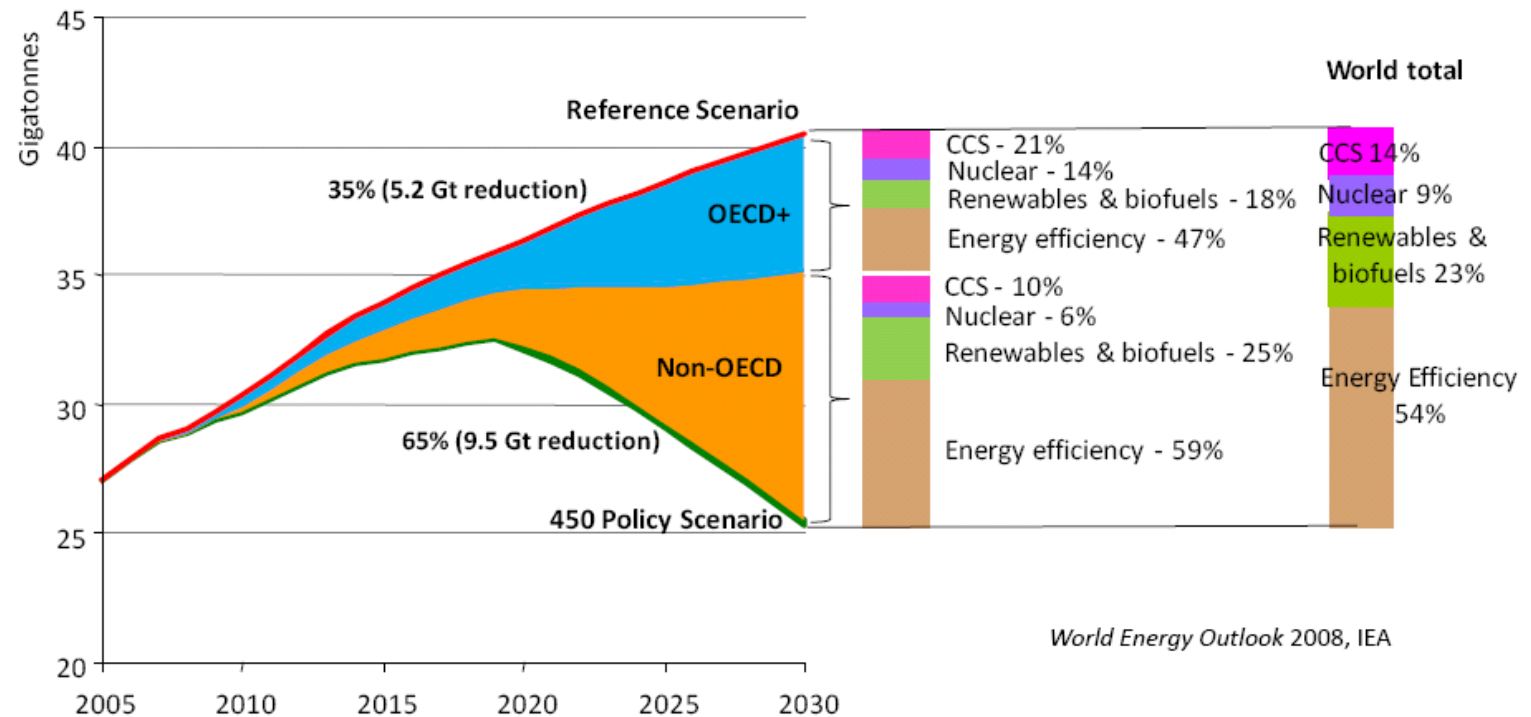
CO2 emissions are headed from 30 gt/yr now to 40gt/yr in 2030

97% of the projected increase in emissions between now & 2030 comes from non-OECD countries.
Three-quarters comes from China, India & the Middle East alone.



Achieving the 450ppm Scenario

To hold CO₂ in the atmosphere to 450ppm requires a 25gt/yr emission limit



Outlook

- Efficiency gains and deployment of existing low-carbon energy account for most of the savings
- OECD and Non-OECD countries must both work towards reducing CO₂ emissions
- The scale of effort required is substantial

Getting Rid of CO2 Is Not Going To Be Easy

Nine ways to offset one gigatonne of CO2

Amount needed is 8 gigatonnes for the 550 ppm case, and 15 gigatonnes for the 450 ppm case.

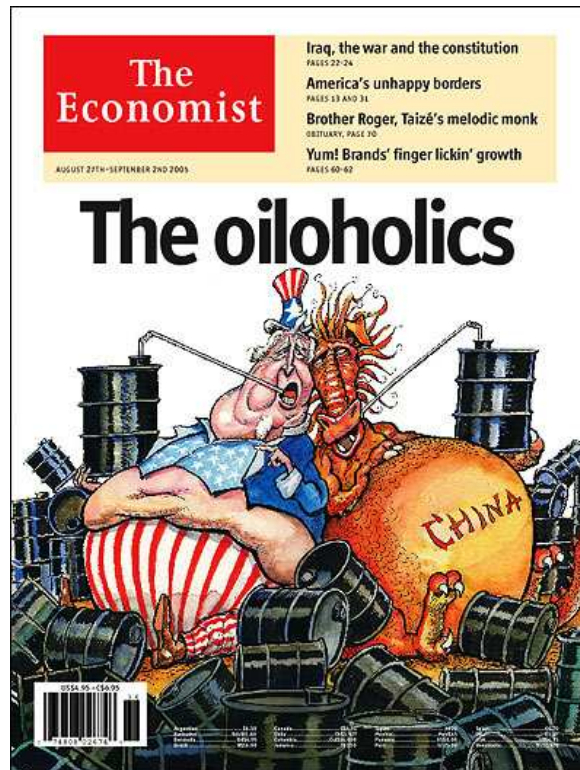
Some scientists are saying 350 ppm or less is required to avoid an upset.

Today's Technology	Actions that Provide 1 Gigaton / Year Mitigation of Carbon Dioxide
Coal-Fired Power Plants	Build 320 "zero-emission" 500-MW coal-fired power plants (in lieu of coal-fired plants without CO ₂ capture and storage) (73% CF)
Geologic Sequestration	Install 1,000 sequestration sites like Norway's Sleipner project (1 MtCO ₂ /year)
Nuclear	Build 130 new nuclear power plants, each 1 GW in size (in lieu of new coal-fired power plants without CO ₂ capture and storage) (90% CF)
Electricity from Landfill Gas	Install 7,700 "typical" landfill gas electricity projects (typical size being 3 MW projects at non-regulated landfills) that collect landfill methane emissions and use them as fuel for electric generation
Efficiency	Deploy 290 million new cars at 40 miles per gallon (mpg) instead of new cars at 20 mpg (12,000 miles per year)
Wind Energy	Install 170,000 wind turbines (1.5 MW each, operating at 0.45 capacity factor) in lieu of coal-fired power plants without CO ₂ capture and storage
Solar Photovoltaics	Install 1.7 million acres of solar photovoltaics to supplant coal-fired power plants without CO ₂ capture and storage (assuming 10% cell DC efficiency, 1700 kWhr/m ² solar radiance, and 90% DC-AC conversion efficiency)
Biomass Fuels from Plantations	Convert to biomass crop production a barren area about 5.4 times the total land area of Iowa (c. 200 million acres)
CO ₂ Storage in New Forest	Convert to new forest a barren area about 2.5 times the total land area of the State of Washington (over 100 million acres... assumes Douglas Fir on Pacific Coast)

Source: DOE Climate Change Technology Program, <http://www.climatechange.gov/stratplan/final/index.htm>

A theme that does not go away easily

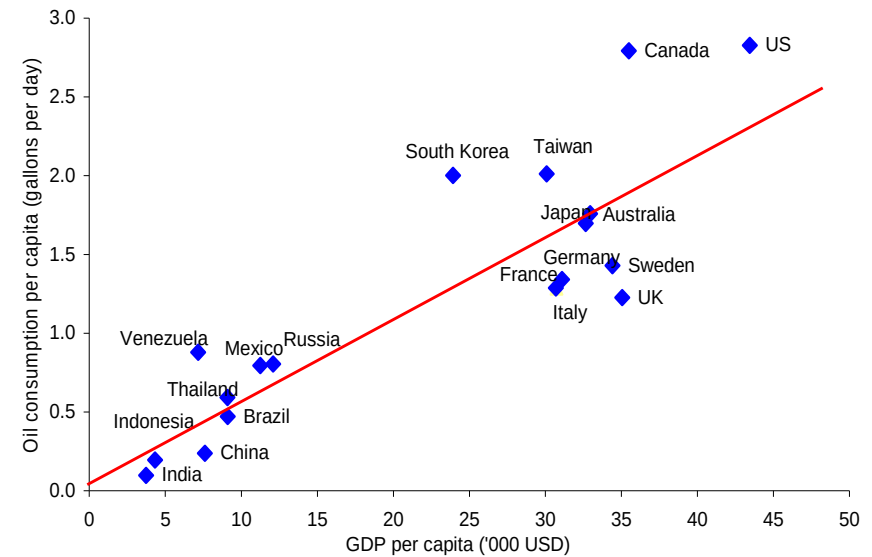
Twenty five years ago, South Korea and Taiwan were where China and India are now.



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Per Capita Oil Consumption Relative to GDP



Source: IMF, IEA DB Global Markets Research

- One third of the world's population is just entering the middle class and want the oil-consuming lifestyle that goes with that.

Oil Shocks

April 2005

What oil price level will it take to shock US consumers? Developing countries?

Consumers in low-tax countries feel the impact of crude oil price increase more than those in high-tax countries.

Many nations still control (subsidize) consumer prices.



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Oil Price Required to Qualify as Extreme – Mar 2008

Indicator	Oil price level
In real terms (PPI)	USD94
Analyst forecasting error	USD116
In real terms (CPI)	USD118
Versus the US dollar	USD120
Futures market forecasting error	USD130
Relative to per capita income	USD134
As a percent of US disposable income	USD145
As a share of the S&P500	USD145
As a percent of global GDP	USD150
Average	USD128

- Nominal prices of WTI went up by a factor of 10 between 1970-73 and 1980-83, roughly \$3.50 going to \$35/bbl).
- If we take 2000-03 as a starting point (nominal price of about \$25/bbl) it appeared to some that we might need to get to \$250/bbl in 2010-13 to have a similar “shock” impact on consumer behavior, but we think \$150 was the breaking point.

Source: DB Global Markets Research

Unstoppable Nuclear Ambitions?

May 2006

Nuclear Weapons Controversy

Iran is the 4th
largest oil
producer in the
world...

..and the 5th
largest exporter.



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Top World Oil Net Exporters (kb/d)

Rank	Country	Exports
1	Saudi Arabia	8,038
2	Russia	7,054
3	United Arab Emirates	2,507
4	Norway	2,340
5	Iran	2,326
6	Kuwait	2,291
7	Nigeria	2,082
8	Venezuela	1,960
9	Algeria	1,907
10	Angola	1,711
11	Libya	1,584
12	Iraq	1,501
13	Mexico	1,381
14	Kazakhstan	1,213
15	Canada	1,058

Source: US DOE/EIA, 2007 rankings

Trouble with Russia's Economy

March 2008

Russian production declines for the first time in a decade

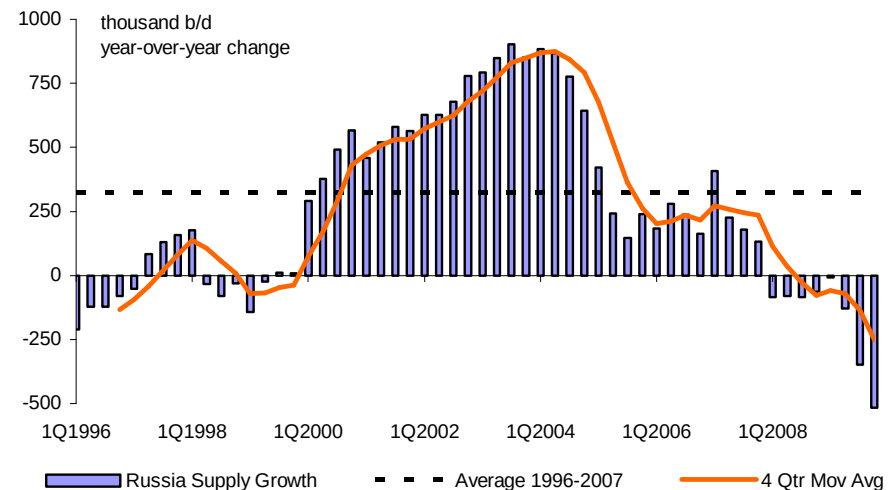
Putin's policies in his first term worked but in his second term were a disaster for oil output.



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Russian Oil Production Growth



- The Russian government's policy of hostility to its own oil entrepreneurs, growing disdain for foreign capital, and desire to maximize taxes regardless of the impact on capital investment brought an end to the growth in production that characterized President's Putin's first term (2000-2004).
- Although "peak oil" proponents are citing the development as proof that global production is faltering because of geological constraints, we see the situation as offering strong evidence that oil production problems are being driven more by "above the ground" problems.

Source: IEA, DB Global Markets Research

America's Fear of China

May 2007

How some Americans see China and Chinese companies... Panda Kong?

Big competitors
on the loose

Inefficient

Subject to
undue political
influence

Sanctions
busters

Source:

DB Global Markets Research



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March 2009

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Green Dreams and the Greening of America

The Risky Boom (Nov 2006)



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Greening Up (Jan 2007)



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The End of Cheap Food

December 2007

What are biofuel mandates doing to the world's food costs?

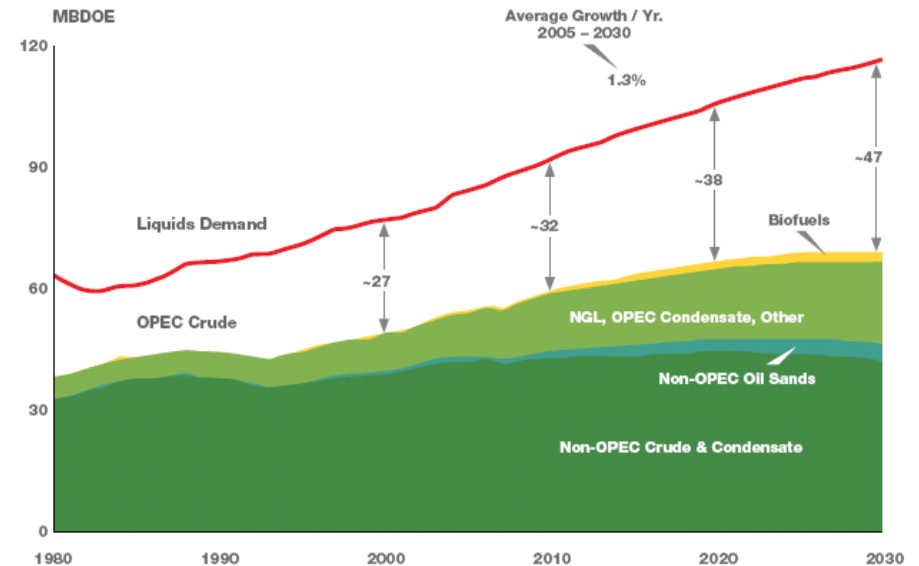
What happens when we get a good drought and the corn crop fails?



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Global Demand for Liquid Fuels



- Converting food (corn and soybeans) into gasoline and diesel turns out to be not such a good idea.
- Second-generation biofuels (cellulosic) that do not depend on edible plants make much more sense.
- The scale of liquid fuels demand, however, remains a difficult obstacle for biofuels (see figure above from ExxonMobil Energy Outlook 2008).

Source: DB Global Markets Research

The Panic About the Dollar

December 2007

What is the shifting dollar doing to commodities and oil?

The dollar-oil regression is not perfect, but traders like it...

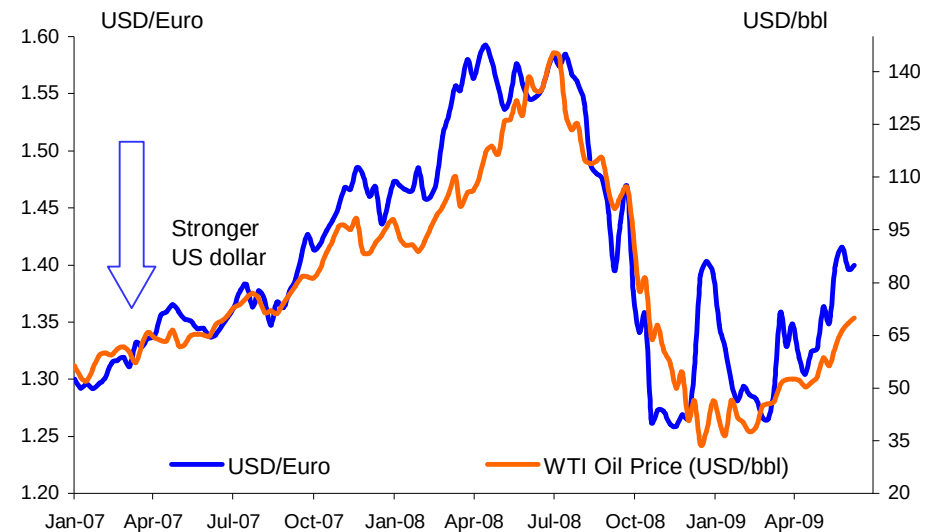
...and a recent study by the IMF says that gold and oil are sensitive to movements in the dollar.



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Oil Climbs as the Dollar Flames Out... then Reverses ...then climbs again



- According to the IMF, in the long run, a 1% depreciation in the US dollar is associated with circa 1% increases for gold and oil prices.
Pathways: purchasing power/costs, financial assets, monetary policy
- In the short run, the elasticity is close to 1, but higher for gold than for crude oil, says the IMF.
- We believe the relationship between oil prices and the US dollar is highly unstable. However, the EURUSD at 1.25 implies USD35/bbl oil, and a 1.50 rate implies oil at over USD100/bbl.

Source: Nymex, Bloomberg, DB Global Markets Research

A Glimmer of Hope

April 2009

The stock market pulls oil down and then up

Looking ahead to 2010, we wonder what sector will lead the economy out of recession?

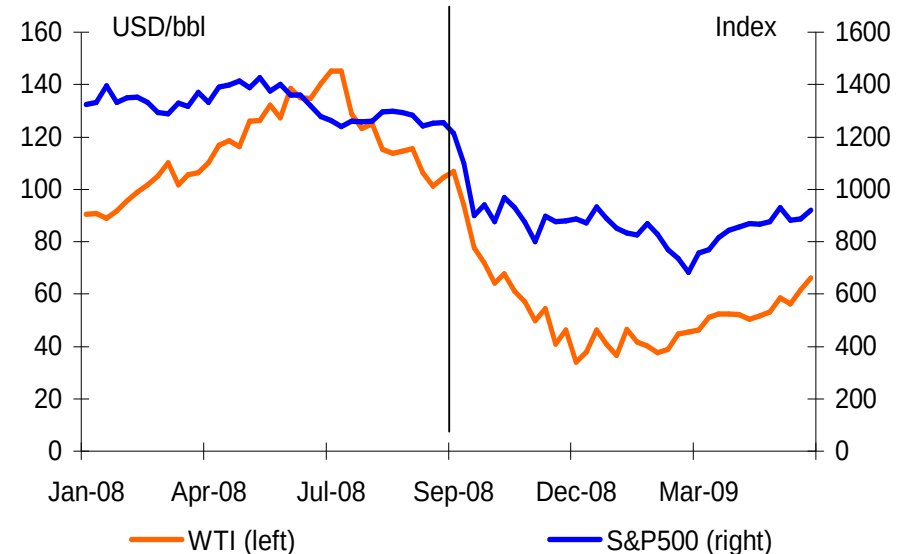
Households have negative buying power, capital spending will be crimped by a record amount of excess capacity, residential investment will be hamstrung by foreclosures, and spending on commercial structures has only recently turned downward.



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WTI Crude Oil and the S&P500



- Since 1948, the S&P500 has tended to turn higher six months before the US recession ends.
- If sustained, the rally in the S&P500 today would suggest equity markets are calling for the US to leave recession from September 2009. We believe this is too optimistic and consequently view equity market rallies during the second quarter as based on shaky foundations.

Oil Prices and Commodity Funds Flows

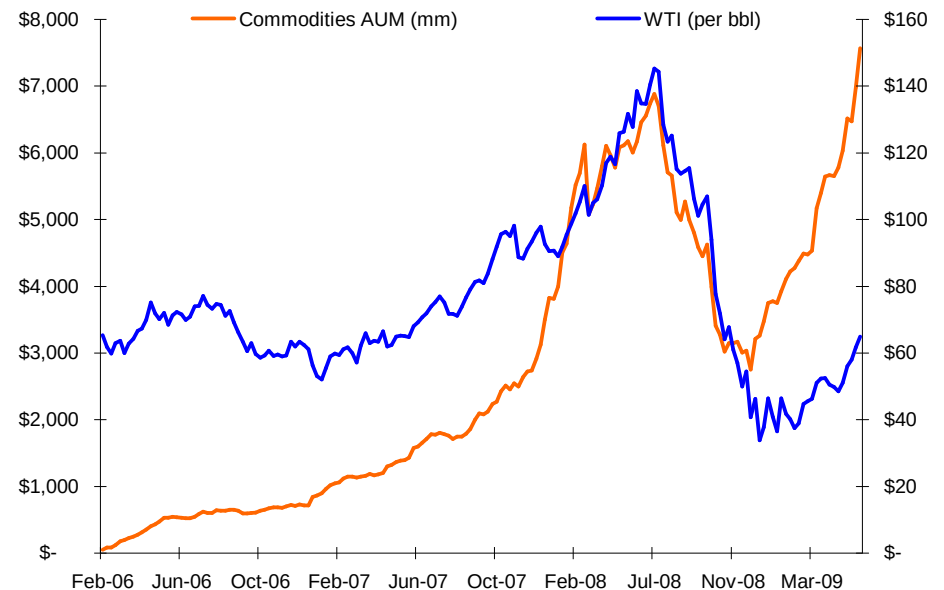
What role is being played by funds flows?

A more upbeat assessment of world economic outlook has been accompanied by a surge in flows into commodity ETFs and ETNs.

Today assets under management in Powershares commodity products registered in the US are greater than the peak in 2008 when some commodity prices such as crude oil were trading at more than double current levels.



Powershares Assets Under Management vs. WTI Oil



Source: Powershares, Bloomberg, DB Global Markets Research

- The collapse in commodity prices during the second half of last year provided investors with a new opportunity to gain exposure to commodities during 2009, and flows have picked up considerable since the start of 2009.
- However, continuation of the trend may require more convincing evidence of positive growth returning in the US.
- All of the normal caveats concerning the impact of "speculation" on prices (with most research suggesting that speculators do NOT set prices) should be kept in mind.

Other Things to Worry About

Pandemics (May 2009)



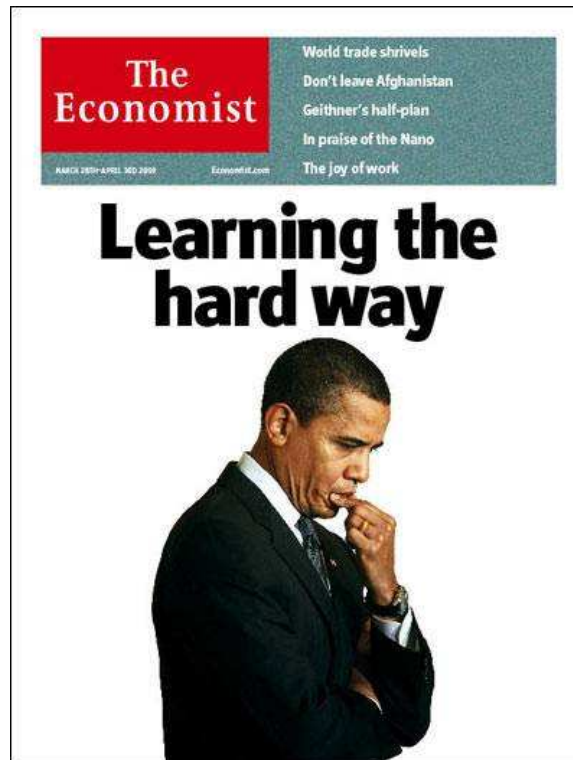
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Business vs. Government (May 2009)



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Energy policy under the Obama administration



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- Longer-term policies strongly tied to climate change and alternative fuel proposals that will be a challenge to implement during an economic downturn
- An emphasis on infrastructure spending to create jobs
- Some of the “redistributive” taxation policies may be implemented via less visible accounting (LIFO to FIFO) and other such tax rules aimed at the oil industry
- New regulations on energy trading activity seem likely, but many of these are already underway at the CFTC- all moving toward more transparency
- Increased OCS drilling and more nuclear power likely to be supported, but perhaps not *enthusiastically*
- Renewable energy and electric autos receive fervent backing, and renewable portfolio standards and “smart grid” improvements will be promoted for electric utilities

What Are the Policy Prescriptions?

There is no single, easy solution to the global challenges ahead

- Encourage energy efficiency across all sectors
- Encourage all fuels – diversity is key
- Price externalities (carbon is an externality)
- Encourage trade and investment
- Avoid “easy” solutions that make problems worse
- Establish global standards for measuring carbon
- Enhance science & engineering capabilities

Source: US National Petroleum Council, DB Global Markets Research

Adam Sieminski

Chief Energy Economist for Deutsche Bank, working with the Bank's global commodities research and trading units.

Drawing on extensive industry, government and academic sources, Mr. Sieminski forecasts energy market trends and writes on a variety of topics involving energy economics, climate change, politics and commodity prices. From 1998 to 2005 he served as the energy strategist for Deutsche Bank's global oil & gas equity team. Mr. Sieminski was the senior energy analyst for NatWest Securities in the US during 1988-1997, covering the major US international integrated oil companies. He received both his undergraduate degree in Civil Engineering and a masters in Public Administration from Cornell University.

He has been president of the US Association for Energy Economics and the National Association of Petroleum Investment Analysts. He is a member of the US National Petroleum Council, an advisory group to the US Secretary of Energy, and helped author the NPC's Global Oil and Gas Study: *The Hard Truths*. He also acts as a senior advisor for the Center for Strategic and International Studies in Washington and is an advisory board member of the Global Energy and Environment Initiative at Johns Hopkins / SAIS. He is a member of the London, New York and Washington investment professional societies, and holds the Chartered Financial Analyst (CFA) designation.



Appendix 1 – Certification and Disclaimer

Analyst Certification

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