CGES
CENTRE *for* GLOBAL
ENERGY STUDIES

IENE's 17th National Energy Conference

Key oil-related issues

Leonidas P. Drollas

Director and Chief Economist

Centre for Global Energy Studies

The Evgenides Foundation, Athens
31st October 2012

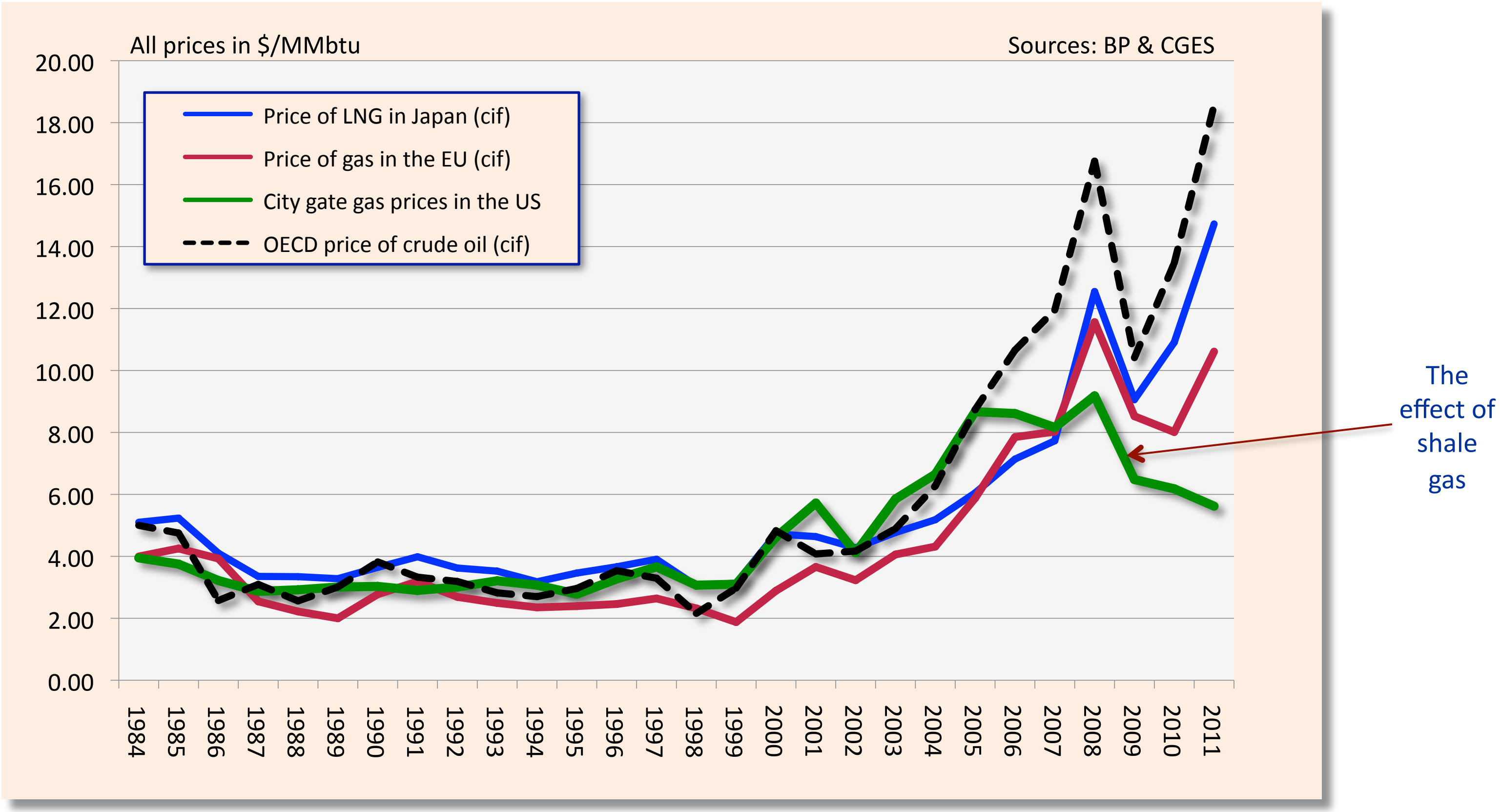
Key oil-related issues

CGES
CENTRE for GLOBAL ENERGY STUDIES

- **Oil prices matter?** Oil is the world's single largest industry (7% of global GDP); oil prices influence gas and coal prices, and consumer price inflation too.
- **What determines oil prices?** Some believe it is market fundamentals; others point to financial factors. As for costs, can they justify $100/bbl plus oil?
- **What is Saudi Arabia's role?** OPEC's leading member, with 71% of global spare production capacity, the Kingdom's growing need for funds has led it to target ever higher oil prices.
- **Iran's nuclear standoff:** a hot topic; how will it evolve and with what consequences for the oil market and the global economy?
- **Spare oil production capacity:** is 3.8% (all in OPEC) too low for comfort?
- **The shale revolution:** what does it mean for oil – and, of course, gas?
- **China's importance:** the Chinese giant is fully awake and has been shaking the world for some time now (as Napoleon warned); will it slow down?

The effect of oil prices on gas prices

CGES
CENTRE for GLOBAL ENERGY STUDIES

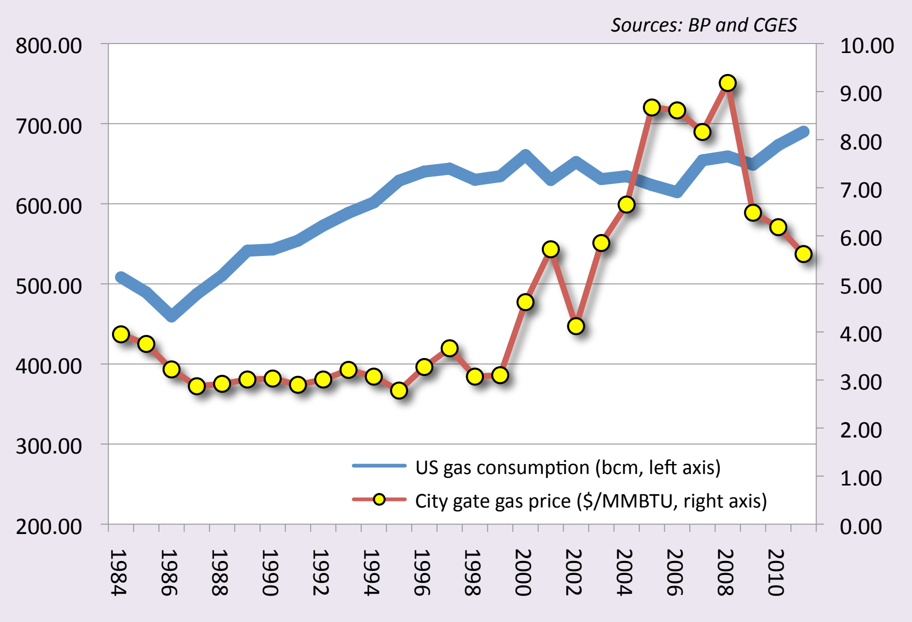


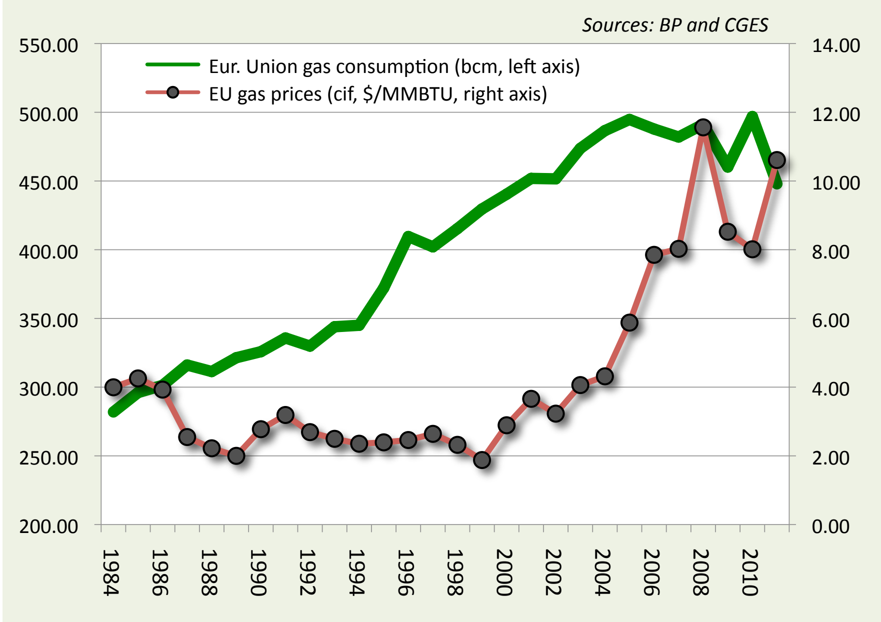
Gas prices in Europe and Japan are related to oil prices via long-term contracts and thus follow changes in oil prices with (variable) lags. This observation is not applicable to the United States, especially after 2005 when the shale gas revolution got underway.

17 Knightsbridge, London SW1X 7LY **Tel:** +44 (0)20 7235 4334 **Fax:** +44 (0)20 7235 4338 **Email:** marketing@cges.co.uk **www.cges.co.uk**

Gas price changes and gas demand in the US and the EU

CGES
CENTRE for GLOBAL ENERGY STUDIES



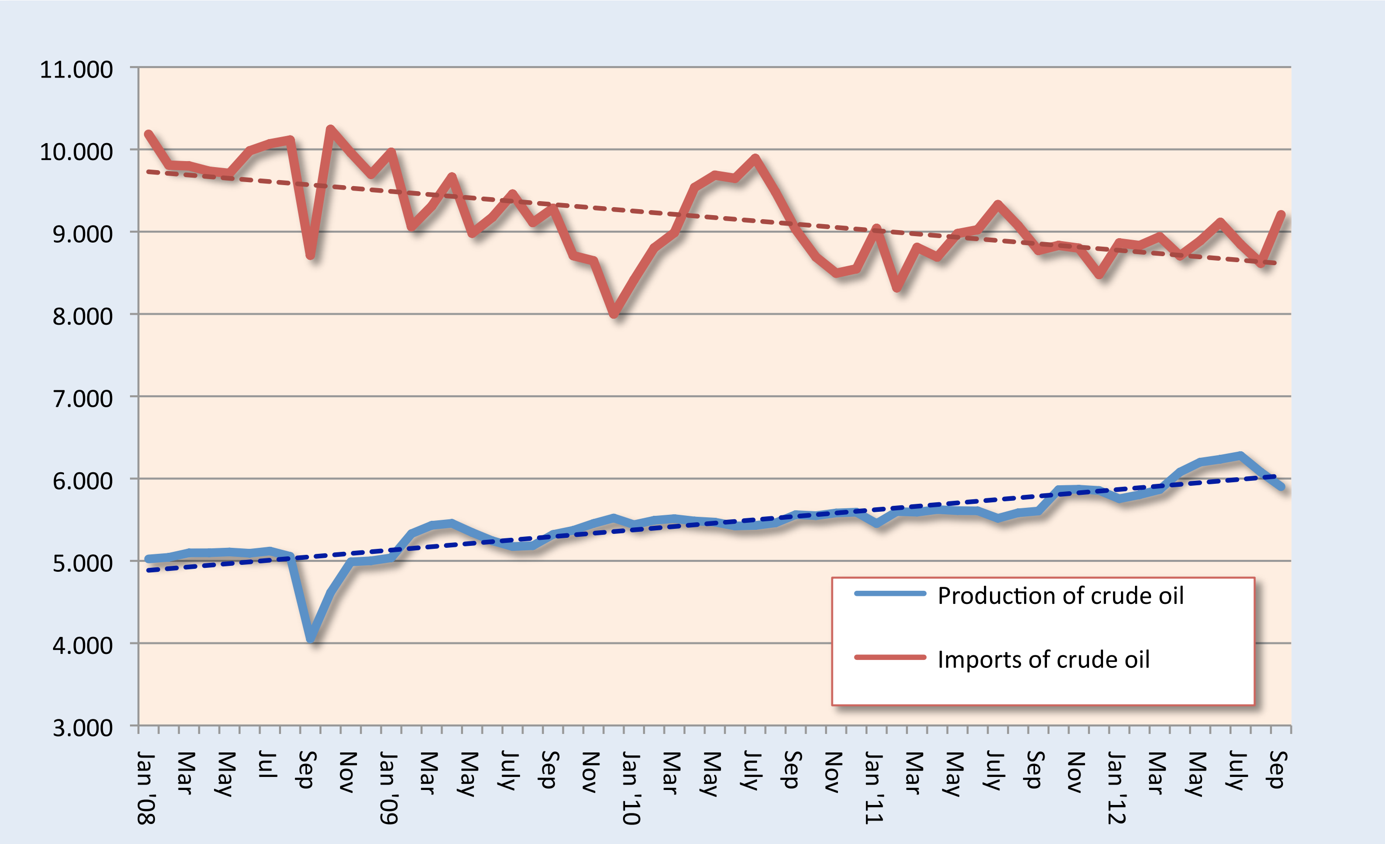


Due to the shale gas revolution in the United States there has been a decoupling of gas prices from oil prices (see a previous graph). This decoupling started in 2005 and has continued since then. The Henry Hub US wholesale price has dropped more sharply than the city gate prices shown here. Be that as it may, the fall in US gas prices has stimulated once again the demand for natural gas in the world's largest market for this fuel. In contrast, gas consumption in the European Union was lower in 2011 than in 2005, largely due to the almost doubling of gas prices between 2005 and 2011. Gas prices in the EU are driven by oil prices through oil-linked term supply contracts for roughly half of the gas needed. For 15 years now there have been disputes between major suppliers Gazprom and Statoil and their customers about these supply contracts.

The impact of shale oil on US oil imports

CGES
CENTRE *for* GLOBAL
ENERGY STUDIES

US Production and imports of crude oil : Jan-08 to Sep-12, in mbpd



The shale oil revolution in the United States has resulted in a production increase of around 1 mbpd between Jan-08 and Sep-12, and a concomitant decrease in crude oil imports of about the same magnitude.

Can oil costs justify $100/bbl plus oil?

CGES
CENTRE for GLOBAL ENERGY STUDIES

Sources: PIW, Argus and CGES

	$ per peak daily barrel	F-B-U cost $/bbl	Date on stream
Haradh III project, S. Arabia	2,500	1.3	producing
Khurais field, S. Arabia	10,000	5.3	available
Jubarte, N. Campos basin, Brazil	15,556	7.7	2015
Chicontepec, Mexico	15,000	9.2	ongoing
Manifa field, S. Arabia	17,500	10.2	2013
Jubilee field, Ghana	17,875	10.4	producing
Hild offshore field, Norway	27,686	16.0	2016
Carabobo projects, Venezuela	33,333	20.5	ongoing
Heavy oil projects, Iran	40,000	24.7	2015
Clair Ridge project, UK North Sea	59,167	30.8	2016
S. Iolotan Phase I, Turkmenistan	58,188	35.9	producing
Kashagan *'final'*, Kazakhstan	85,000	40.0	2018

- Based on a formula for capital and operating costs given in *"The Economics of Petroleum Supply: papers by M. A. Adelman, 1962-1993"*, The MIT Press, Cambridge, Mass., page 201.
- For comparison, the Kearl oil sands project (ExxonMobil and Imperial Oil) in Canada has fully-built-up costs of $32/bbl for the mining project and an estimated $15/bbl for the upgrader, yielding a total cost of $47/bbl.

Fundamentals – the need for OPEC oil

CGES
CENTRE for GLOBAL ENERGY STUDIES

Sources: IEA and CGES

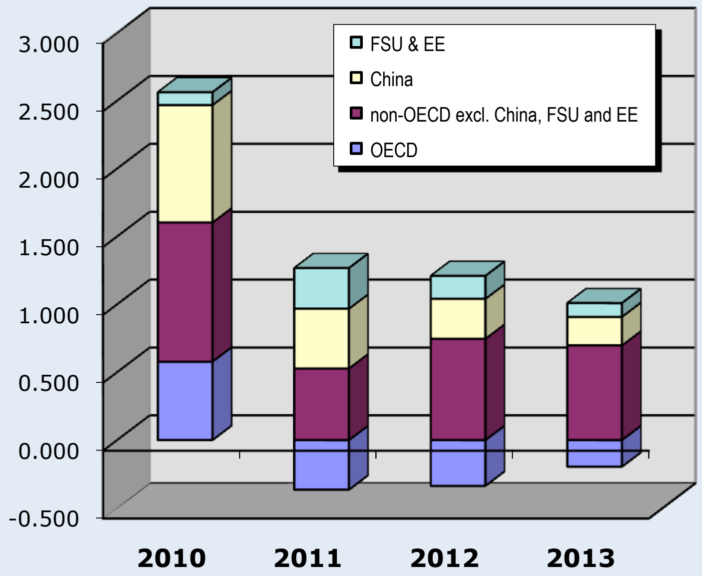
Incremental oil demand, supply and call on OPEC	2010	2011	2012	2013
	mbpd	mbpd	mbpd	mbpd
Oil demand	**2.56**	**0.90**	**0.87**	**0.81**
less non-OPEC supply	**1.24**	**0.14**	**0.22**	**0.47**
less OPEC's NGLs equals	**0.46**	**0.45**	**0.43**	**0.27**
Call on OPEC (zero stockchange)	**0.87**	**0.31**	**0.22**	**0.07**
less previous year's stockchange	**-0.58**	**-0.92**	**-0.68**	**0.74**
equals need for OPEC oil	**1.45**	**1.23**	**0.90**	**-0.67**
Change in OPEC's output	**0.53**	**0.55**	**1.64**	**-0.53**
Global stockchange	**-0.92**	**-0.68**	**0.74**	**0.14**
% change in Dated Brent	**29**	**40**	**0**	**-8**

For two years running (**2010** and **2011**) the need for additional OPEC oil exceeded increases in its output, causing large global stock draws and sharp increases in the price of oil. **This year** there will be a significant stock build, but the effect on oil prices will be minimal because of the need to rebuild inventories. **In 2013**, cuts in OPEC's output will be required to prevent oil prices from falling heavily.

Incremental oil demand and supply by major groupings

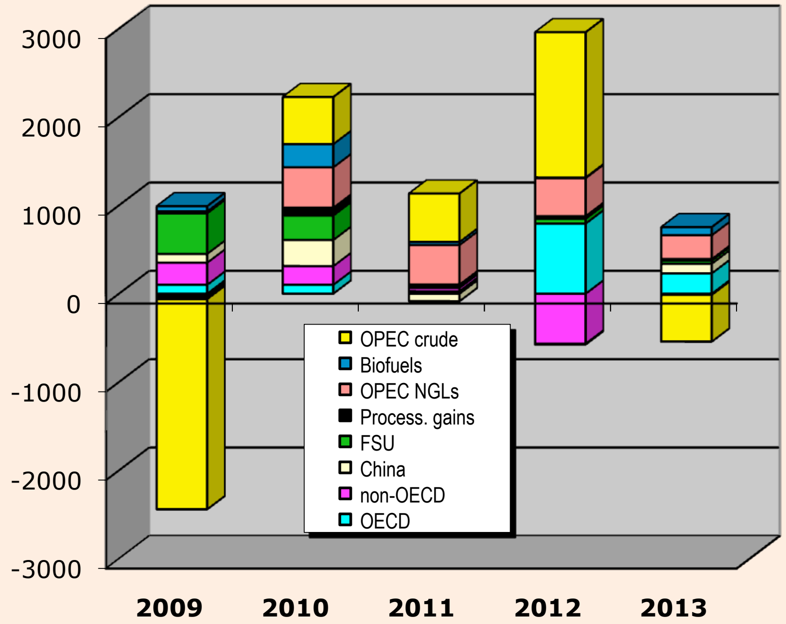
CGES
CENTRE *for* GLOBAL ENERGY STUDIES

Incremental oil demand (mbpd)



Sources: IEA and CGES

Incremental oil supply (tbpd)



Sources: IEA and CGES

Note the decline in China's incremental demand for oil since the recovery year of 2010.

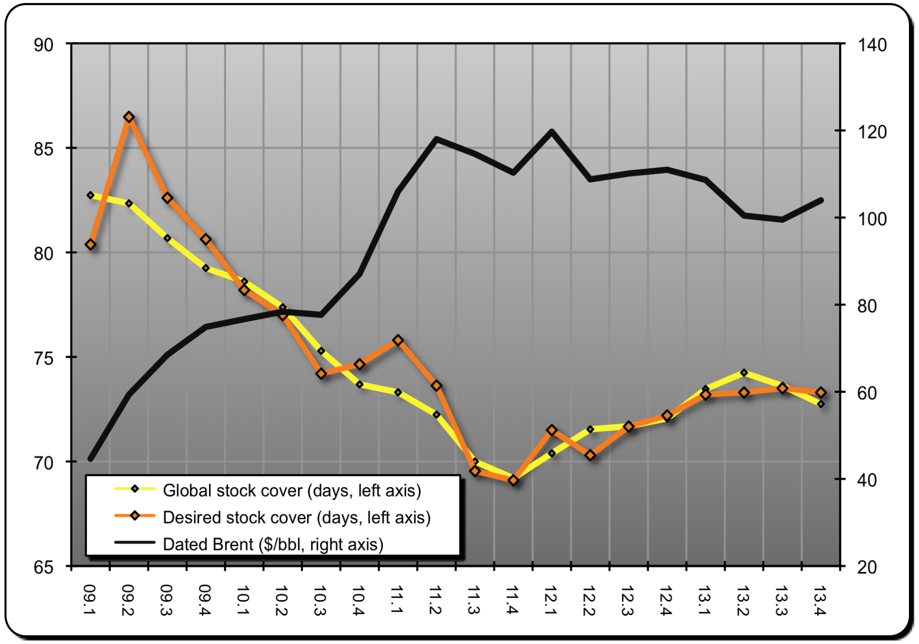
OPEC did not increase its oil production enough in both 2010 and 2011, after the very large cut in 2009.

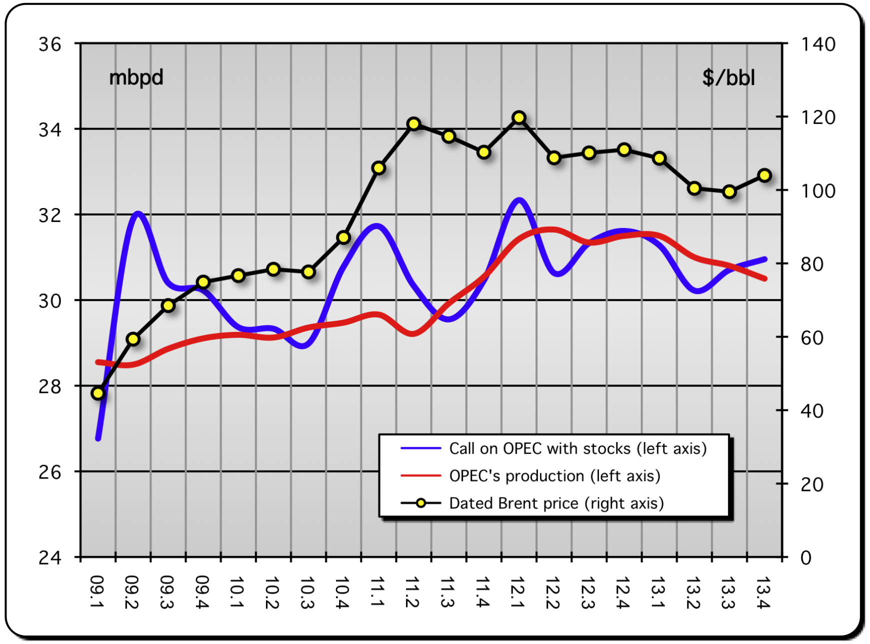
Oil fundamentals: global stock cover and the need for OPEC oil

CGES
CENTRE *for* GLOBAL
ENERGY STUDIES

Call on OPEC oil plus stocks, OPEC production and Dated Brent, quarterly from 1Q09 to 4Q13

Sources: IEA, Argus and CGES





Differences between global demand and supply cause changes in the world's inventory levels. The amount of oil held in storage typically exceeds or falls short of the desired amount, setting up forces that lead to oil price changes. The zero-stock-change need for oil from OPEC (the world's residual supplier) is augmented or diminished according to the difference between desired and actual global stock cover. The call on OPEC oil including stock needs, when compared with OPEC's actual level of production, generates dynamic forces that cause oil prices to change in the appropriate direction. We are anticipating a period of rising stock cover during the course of 2013, accompanied by cuts in OPEC production in order to let oil prices down gently.

The Iran factor

CGES CENTRE for GLOBAL ENERGY STUDIES

Iran's oil exports

Oil exports to	Jan-12 tbpd	May-12 tbpd	Jun-12 tbpd	Jul-12 tbpd	Aug-12 tbpd	Sep-12 tbpd	*Δ Jan-Jul* tbpd	*Δ Jan-Sep* tbpd
Europe	600	190	30	0	0	0	-600	-600
Turkey	190	150	110	70	220	180	-120	-10
Japan	300	175	170	80	100	95	-220	-205
S. Korea	230	200	150	80	20	100	-150	-130
China	500	520	500	480	490	520	-20	20
India	250	205	200	160	200	230	-90	-20
Other Asia	200	300	350	250	350	350	50	150
Africa	50	0	80	30	30	30	-20	-20
TOTAL	**2320**	**1740**	**1590**	**1150**	**1410**	**1505**	**-1170**	**-815**

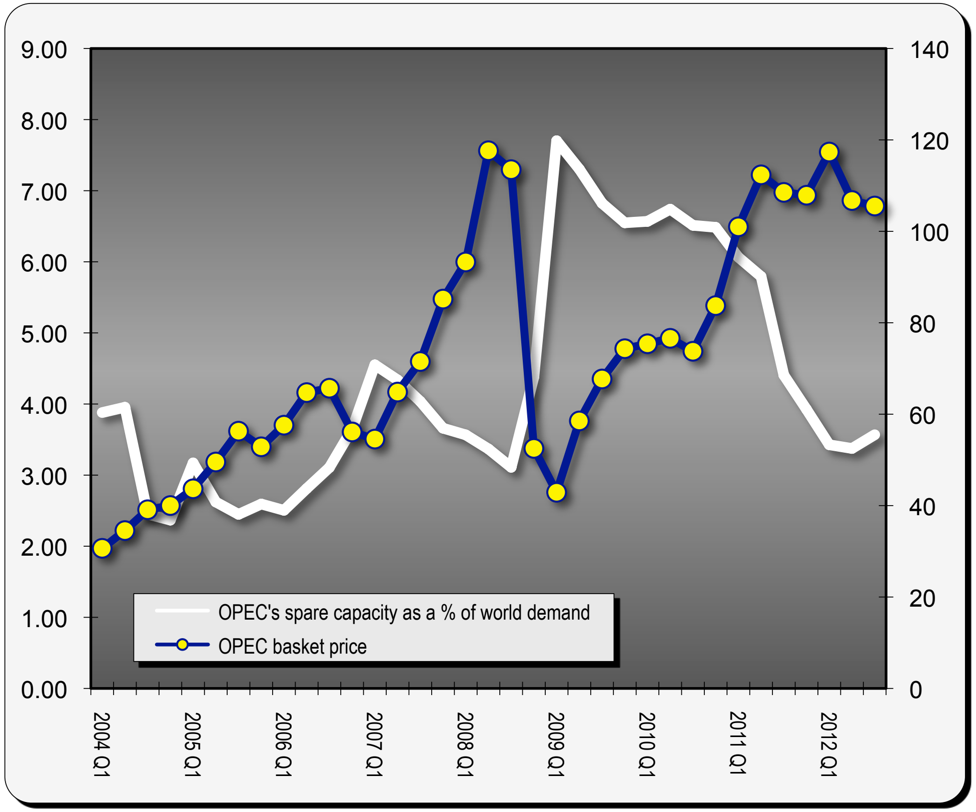
Iran's oil exports reached a low point in July 2012 due to the EU's sanctions, but they had recovered somewhat by September, with boosts in Iranian exports to S. Korea, China and India. From Jan-12 to Sep-12 the OPEC member-countries managed to increase their net output by 240 tbpd.

Δ in OPEC's output, Jan-12 to Sep-12

	tbpd
Iraq	530
Libya	520
S. Arabia	105
Nigeria	30
Kuwait	170
Total	**1355**
Iran	-910
Qatar	-47
Algeria	-60
Other	-97
Total	**-1114**

The world's spare oil production capacity

OPEC's spare capacity as a % of global oil demand and the OPEC basket price ($/bbl)



As expected, OPEC's spare capacity is inversely related to the price of oil, since OPEC is the world's residual supplier of oil. However, a word of caution is needed: one must distinguish between voluntary and involuntary changes in OPEC's spare capacity. When OPEC cuts production to boost prices, spare capacity inevitably rises.

OPEC's output and its spare capacity				
	Output Aug-12	Output Sep-12	Spare capacity	Percent of the total
* plus Neutral Zone	mbpd	mbpd	mbpd	%
Saudi Arabia*	9.85	9.82	2.42	**71**
Iraq	3.12	3.19	0.00	**0**
Iran	2.71	2.70	0.15	**4**
Kuwait*	2.90	3.00	0.03	**1**
U.A.E.	2.56	2.63	0.15	**4**
Qatar	0.73	0.73	0.05	**2**
Libya	1.42	1.52	0.00	**0**
Algeria	1.19	1.18	0.07	**2**
Nigeria	2.35	2.17	0.19	**6**
Venezuela	2.35	2.30	0.09	**2**
Angola	1.85	1.61	0.27	**8**
Ecuador	0.50	0.50	0.00	**0.1**
TOTAL	**31.53**	**31.35**	**3.41**	**100**
Global oil demand in 3Q12		**90.2**	**3.8%**	
World output of NGLs		**14.0**		
Global output of crude only		**76.2**	**4.5%**	

Saudi Arabia possesses the lion's share of global spare capacity, which confers upon it the ability to influence the price of oil through its output policy. Kuwait, Qatar and the UAE usually follow the Kingdom's lead in pricing policy. Note the difference in spare capacity as a percentage of global oil demand including and excluding NGLs.

Oil fundamentals and financial markets

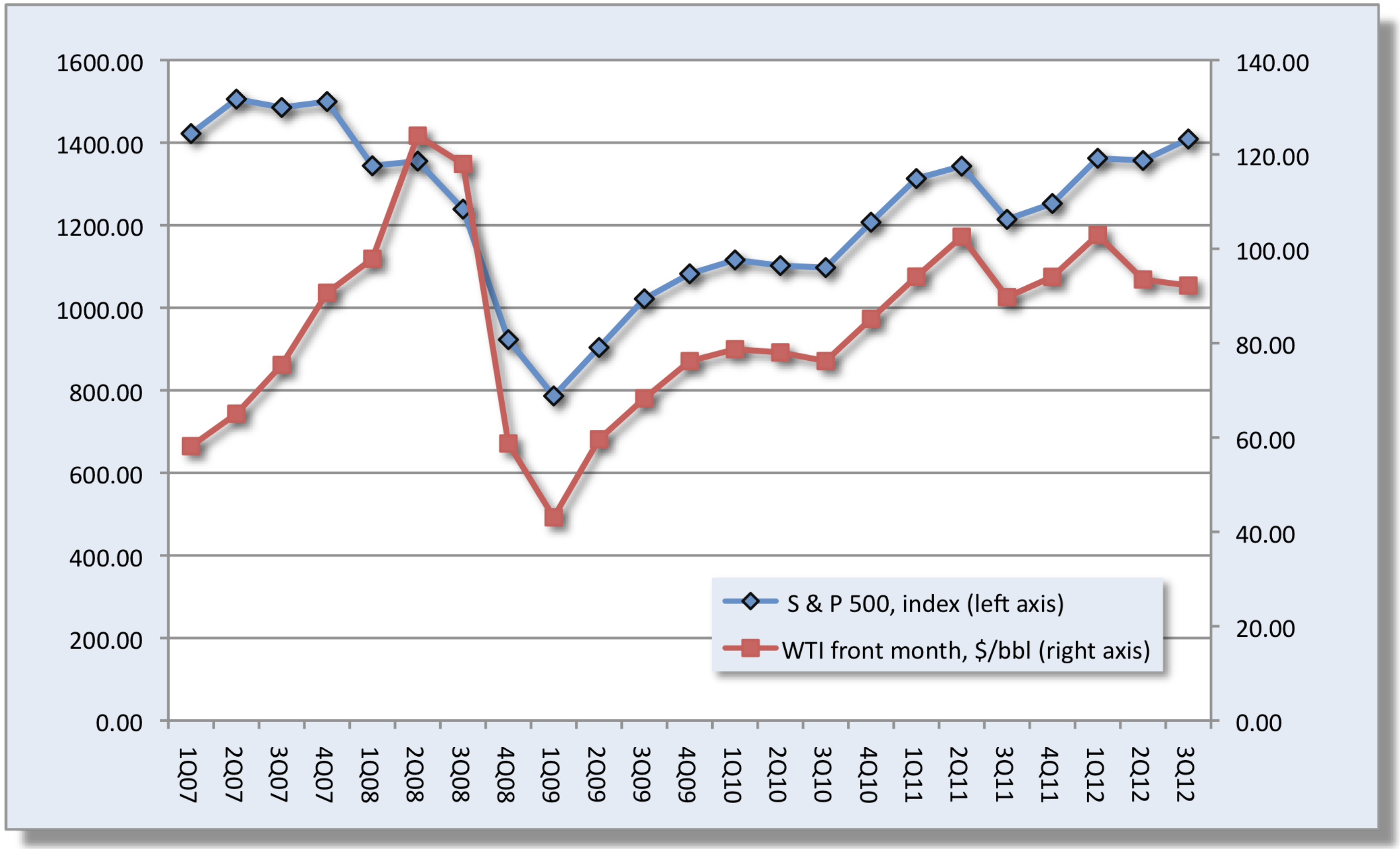
CGES CENTRE for GLOBAL ENERGY STUDIES

- There are three basic **motives for holding inventories of oil** – (a) the transactions motive, based on the need to meet demand, (b) the precautionary motive and (c) the speculative motive.
- These days, with fully developed **oil futures markets**, the desire to acquire or sell oil can also be satisfied through the purchase and sale of oil futures.
- Participation in the futures market is generalised, incorporating both those who wish **to hedge** their purchases or sales of physical oil as well as those who only wish **to speculate**, having no desire to take physical delivery of the oil.
- Speculators or 'investors', have helped to transform oil from being just a physical commodity into **an asset play** as well, subject to macroeconomic considerations such as bond yields, the Euro/USD exchange rate and the search for higher returns in a low-yield world.
- 'Investors' play a role in determining the shape of the forward curve and this in turn affects the physical spot market through **cash-and-carry hedging operations**. A contangoed curve encourages the holding of stocks in a glutted oil market, whereas a backwardated curve discourages holding more inventories than necessary.

Oil as an asset class

CGES
CENTRE *for* GLOBAL ENERGY STUDIES

The Standard and Poor's 500 index of leading US shares versus the price of oil (quarterly, 1Q07 – 3Q12)

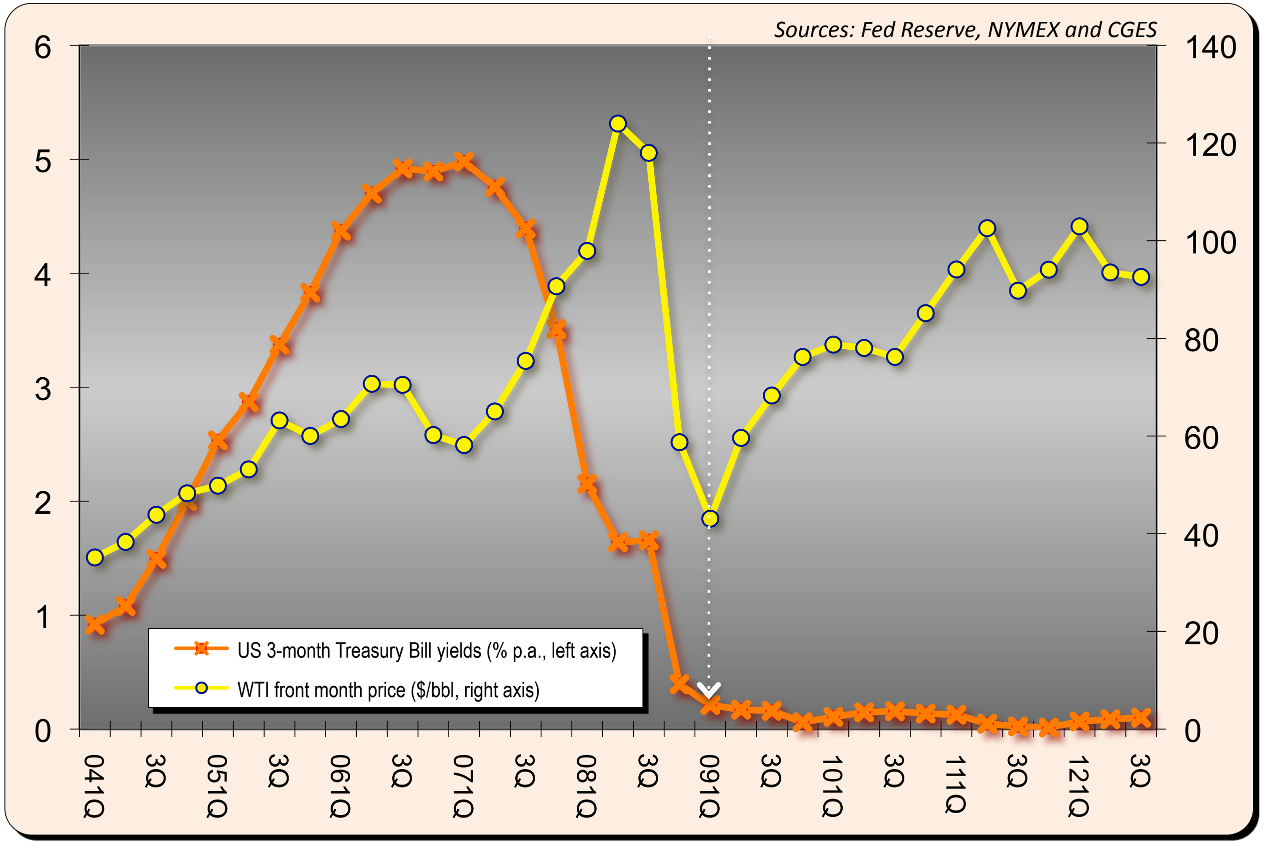


Leading up to the financial crisis of late 2008 there was no apparent connection between US equities and the price of oil, but from 3Q08 onwards the two series began to move in the same direction, especially between 1Q09 and 3Q12, when the correlation coefficient between the two was 96.5%. Just recently the two series have diverged somewhat, the S&P 500 registering a buoyancy that is not reflected in the way the price of WTI has moved.

The US' cheap money policy and oil prices

CGES
CENTRE *for* GLOBAL ENERGY STUDIES

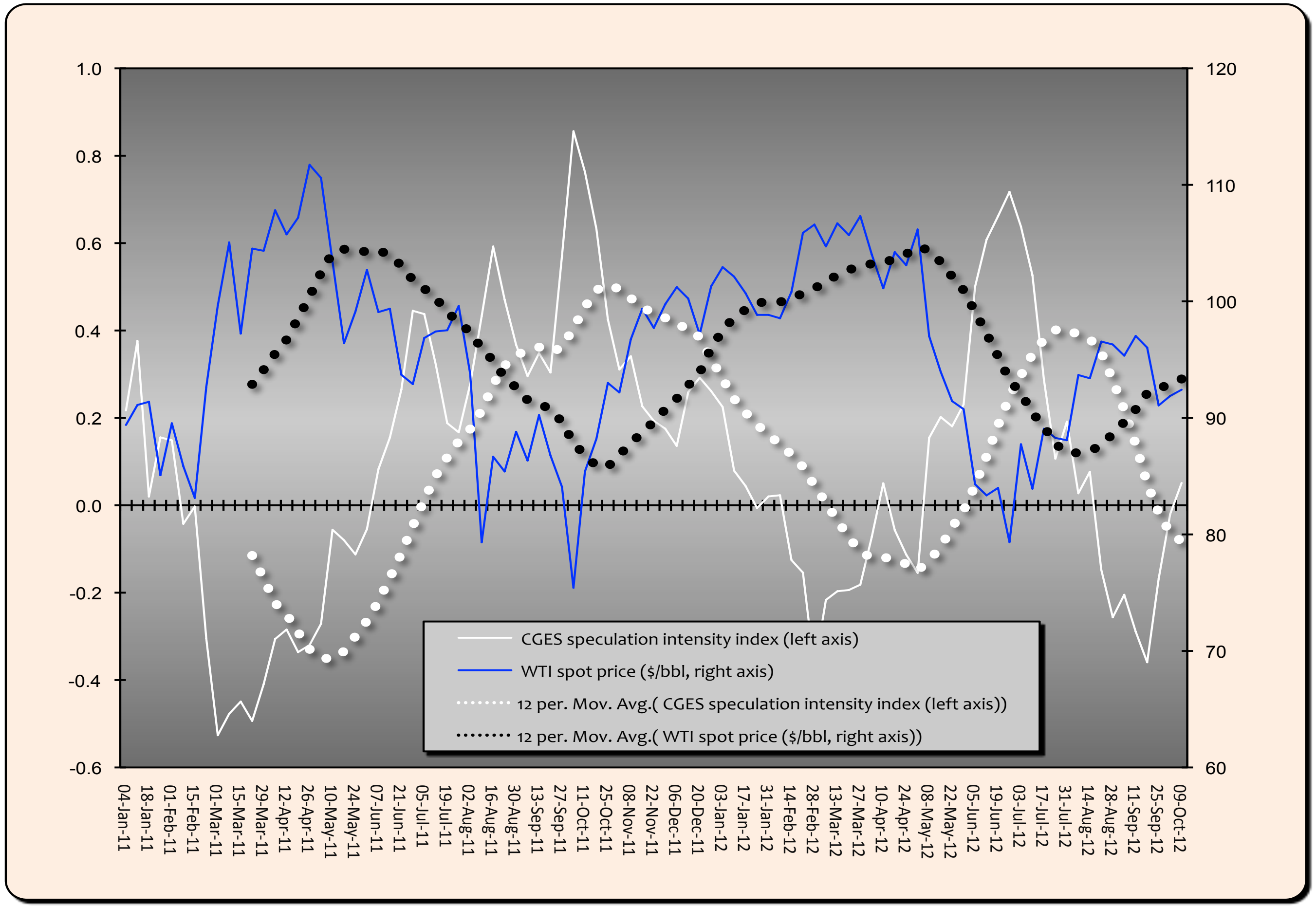
US 3-month Treasury Bill yields and the WTI front month price (quarterly, 1Q04 – 3Q12)



Until the third quarter of 2006 the US 3-month TB yield and the price of oil were heading in the same direction, reflecting in part the strength of the US economy. Thereafter, as economic growth started to weaken Ben Bernanke's Fed began to pursue a cheap money policy, which became an ultra-cheap policy from 4Q08 onwards as the US entered a deep recession that lasted a year. Since then the Fed has continued with its cheap money policy, which has played a part in raising and keeping oil prices high.

Oil prices and speculation

The CGES' index of speculation intensity and WTI, weekly from Jan-11 to Oct-12

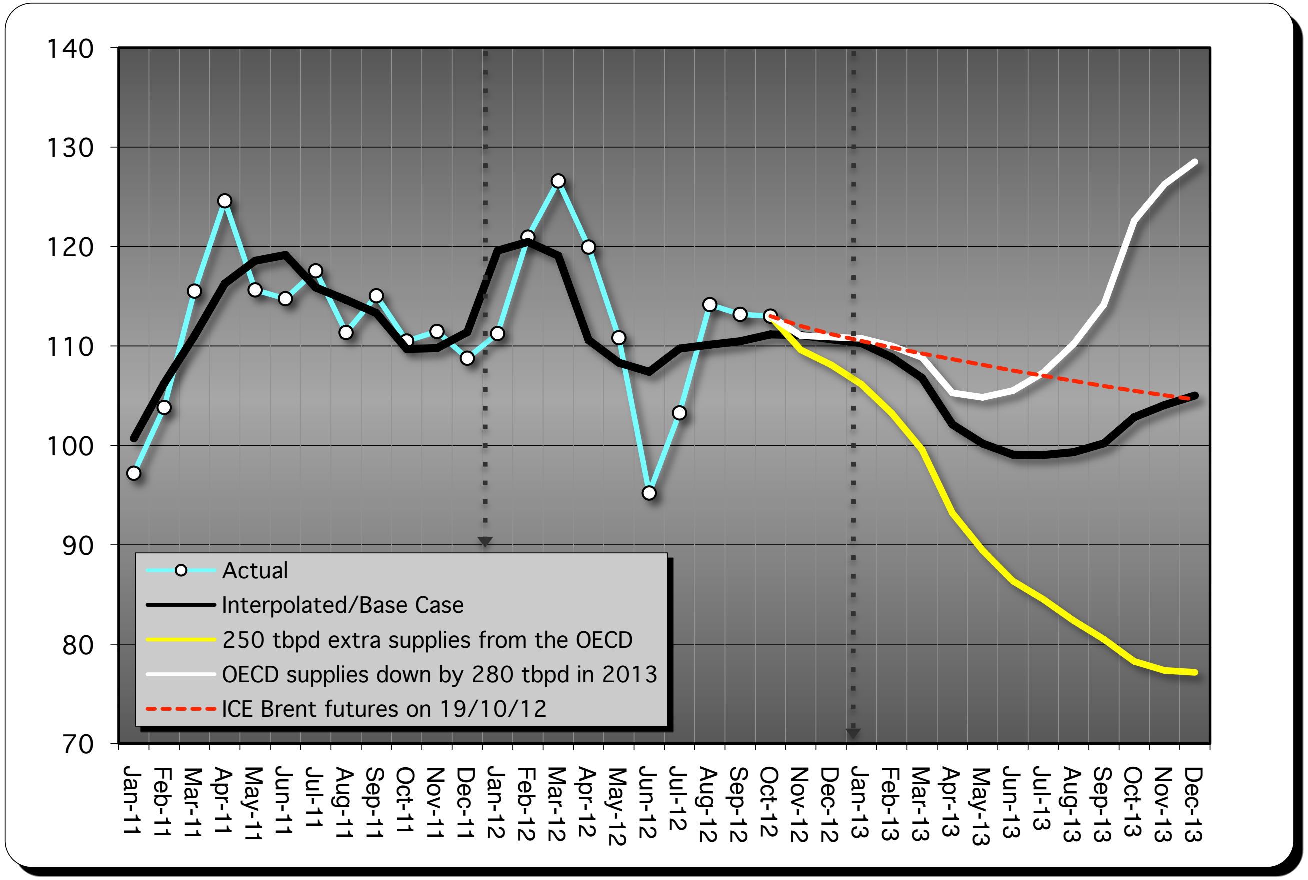


The CGES' index of speculation intensity regarding the oil futures contract on NYMEX seems to be inversely related to the spot price of WTI; levels of pure speculative activity tend to rise when WTI is falling and vice versa.

The CGES price outlook

CGES
CENTRE for GLOBAL ENERGY STUDIES

Dated Brent oil price forecasts



In all three cases OPEC cuts production in 2013 by 0.5 mbpd on average compared with 2012 in order to prevent the price of the OPEC basket dipping much below $100/bbl. Dated Brent averages $103/bbl next year in the base case versus $112/bbl for 2012.

Key uncertainties

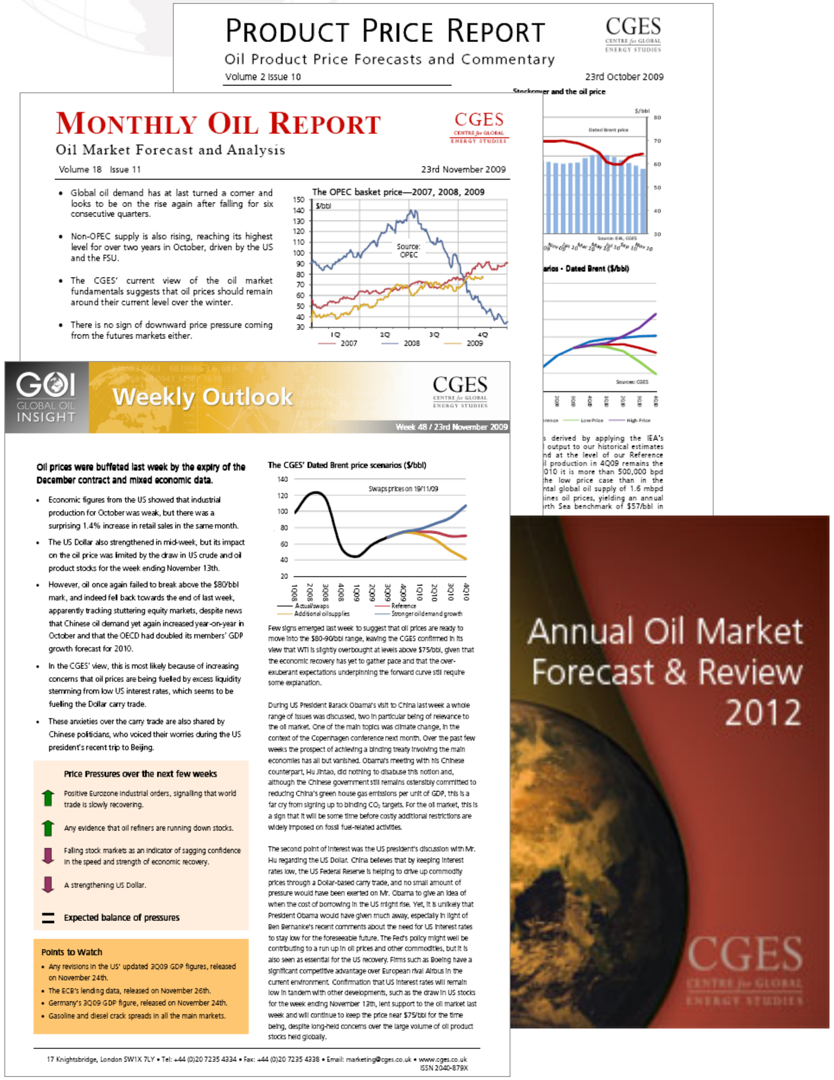
CGES
CENTRE for GLOBAL
ENERGY STUDIES

Evaluating the uncertainties surrounding our Reference Case

	Effect on oil price	Relative size of effect	Volume effect in tbpd	Probabilities %
Chinese economy slows down further	-	2	150	6
EU oil demand weakens	-	2	200	6
US economy grows faster than expected	+	2	150	4
OPEC cuts back production	+	3	300	5
Iraqi production increases faster	-	3	250	5
Iranian oil exports rise again	-	2	200	5
Turkish-Syrian crisis intensifies	+	3	250	10
Tension rises regarding the Iranian nuclear standoff	+	10	1000	3
Likelihood of oil prices being higher than predicted	3 %	over the next 12 months		
Likelihood of oil prices being lower than predicted	2 %	over the next 12 months		

These uncertainties are designed to delineate the boundaries surrounding our base case. The table concludes that there is a 1 in 33 chance that oil prices will be higher than our base case next year (i.e., \$103/bbl for Brent) and a 1 in 50 chance that they will be lower.

The CGES' Oil Market analysis



The CGES produces a number of reports offering crude oil and product market analysis

The *Global Oil Insight* package, which includes …

- **Weekly Outlook**
- **Oil Market Prospects with Price Forecasts**
- **Industry Watch**
- **Monthly Comment**
- **Bi-monthly Focus**

The *Monthly Oil Report*

- Monthly crude oil market analysis and price forecasts

The *Product Price Report*

- Monthly oil product market analysis and price forecasts

The *Annual Forecast and Review 2012*

- Annual review and forecasts of oil market fundamentals

17 Knightsbridge, London SW1X 7LY **Tel:** +44 (0)20 7235 4334 **Fax:** +44 (0)20 7235 4338 **Email:** marketing@cges.co.uk **www.cges.co.uk**