

Oil prices: fundamentals or speculation?

Bank of England, June 13th 2008

Christopher Allsopp

New College and OIES

Bassam Fattouh

SOAS and OIES

Outline

- Oil prices appear increasingly detached from fundamentals
- Previously, views about ‘fundamentals’ appeared to play a key role
- We explain this by the disappearance or diminution of ‘feedbacks’ stabilising longer term expectations of the oil price
 - The lack of response of the world economy this time round
 - Supply
 - Demand
 - The behaviour of OPEC
- Adds up to ‘indeterminacy’ and great uncertainty about ‘fundamentals’.
- Role of speculation?
 - OPEC behaviour and speculation
- The coordination problem
- Conclusions and some policy issues

Conventional wisdom

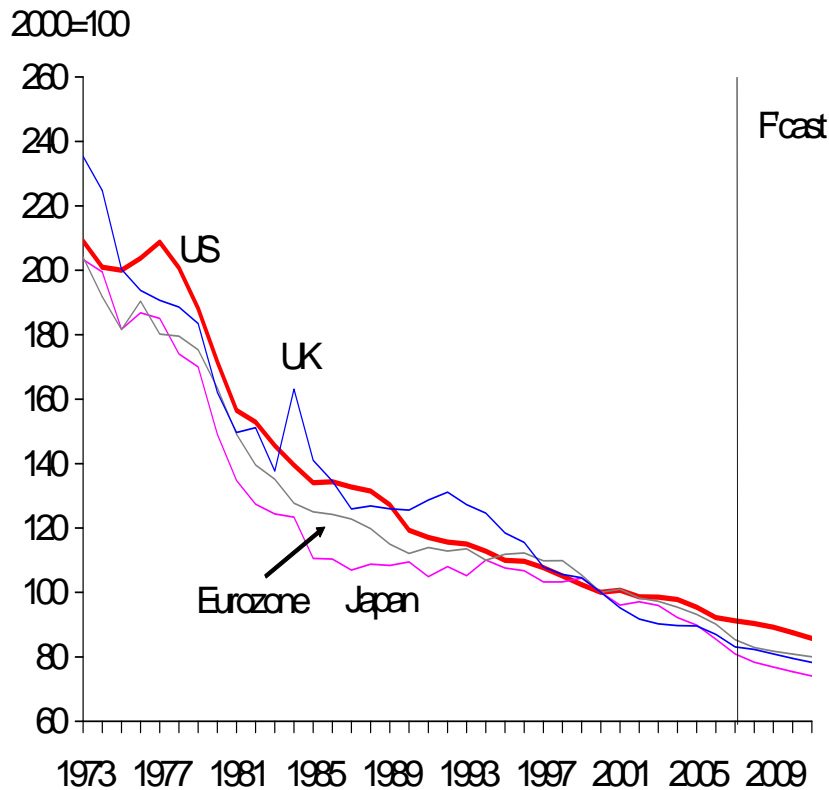
- OPEC defends a price floor and a price ceiling
- High oil prices will have an adverse impact on world growth/inflation affecting global demand for oil
- High oil prices will induce greater supply response from non-OPEC countries with a lag
- High oil prices will encourage substitution at the margin
- Spare capacity will cushion oil market against adverse political shocks
- High degree of determinacy in the future oil price – based on ‘fundamentals’.
- The effect on expectations as prices rise or fall at the ‘front end’

Feedback 1: The world economy

- Conventional wisdom, based on the past
 - If oil prices rise a lot, the world economy goes into recession. Stagflation and a monetary policy response
 - This lowers oil demand – possibly for a long time – limiting anticipated oil price rises
- Response this time very muted compared with the past
 - Smaller this time? No
 - The lack of an inflation response (compared with 1970s and 1980s)
 - Structural change
 - The China factor
 - Better policies
- Anticipated monetary response – offsetting
- Not much effect on growth in Asia
 - Price subsidies or offsetting tax policies
- Market expectations and OPEC behaviour both affected
- Is this about to change?? (World economy worries, food price inflation, Asian oil price subsidies: nominal wages)

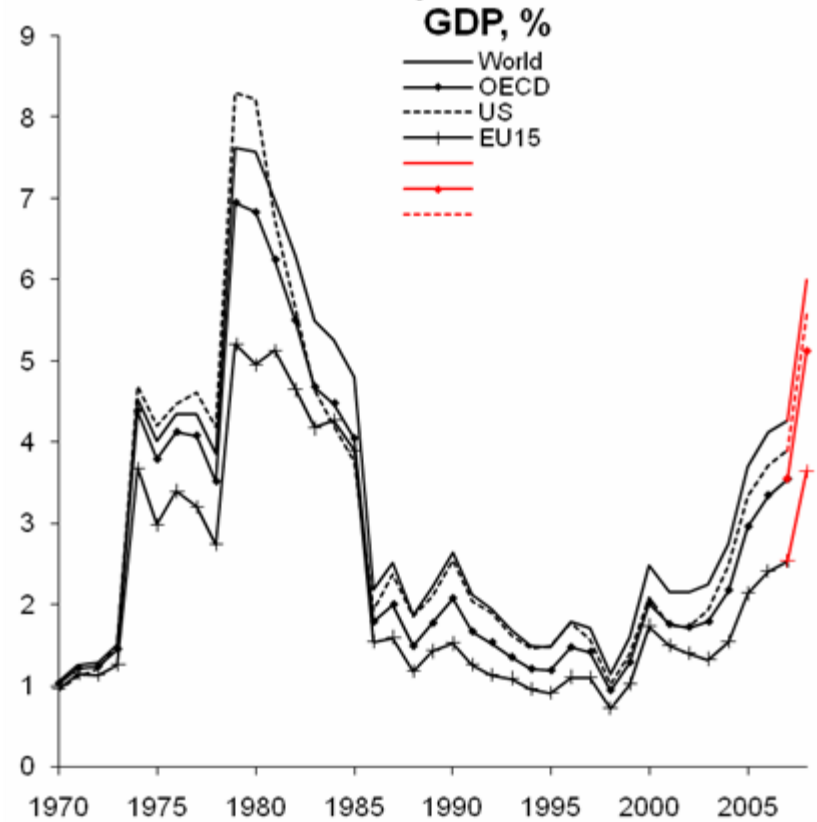
Oil Shock Large despite fall in share of oil expenditure

Global: Oil intensity

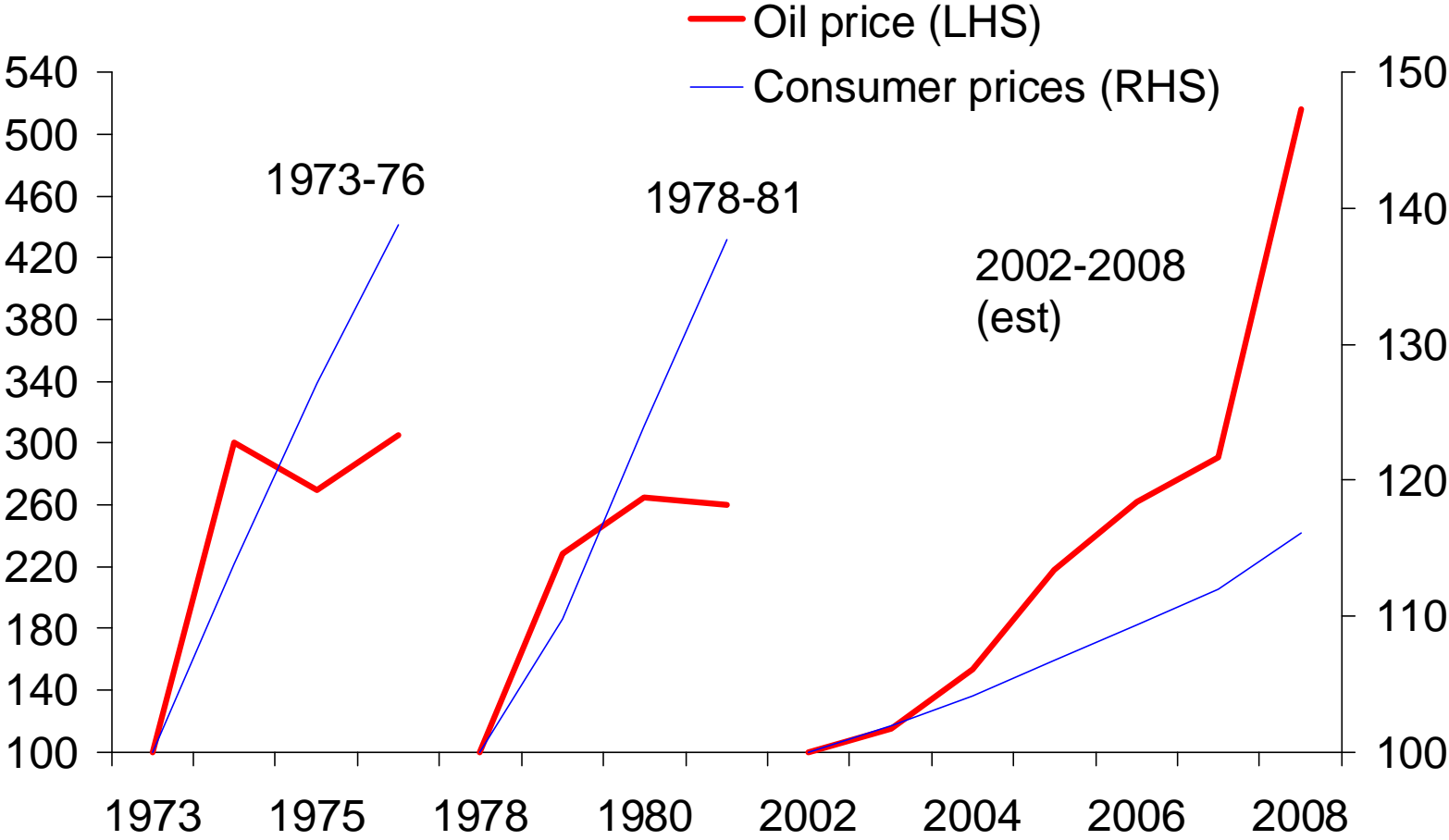


Source: Oxford Economics

Petroleum expenditure as share of

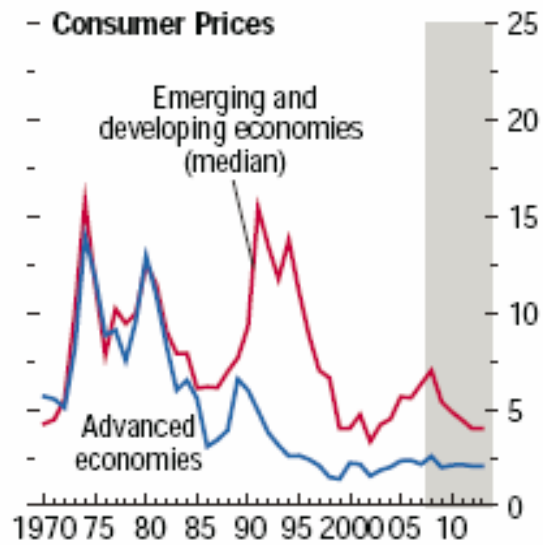
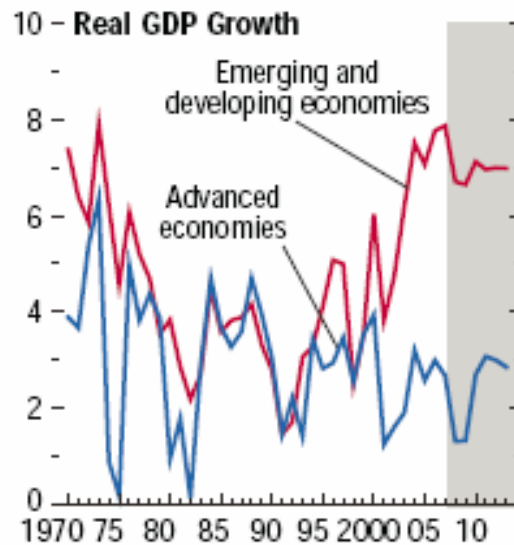
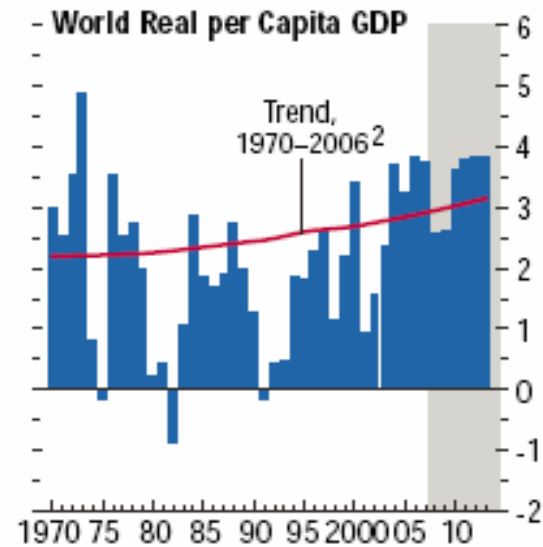


Oil price and OECD CPI



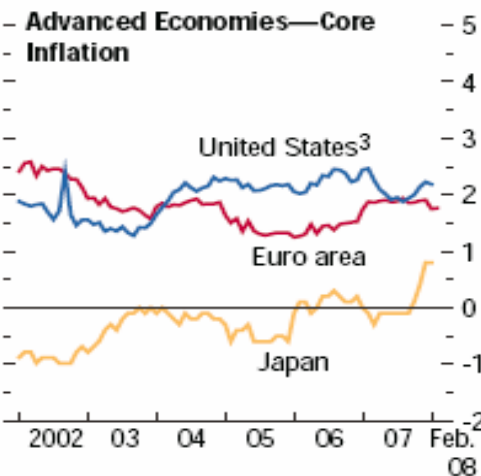
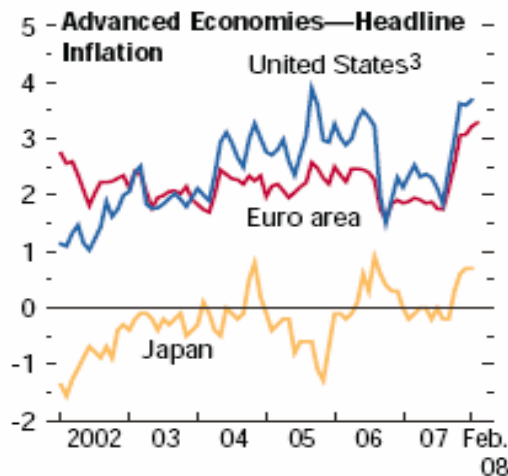
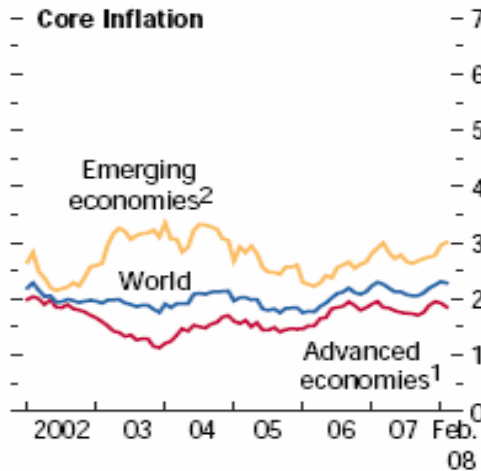
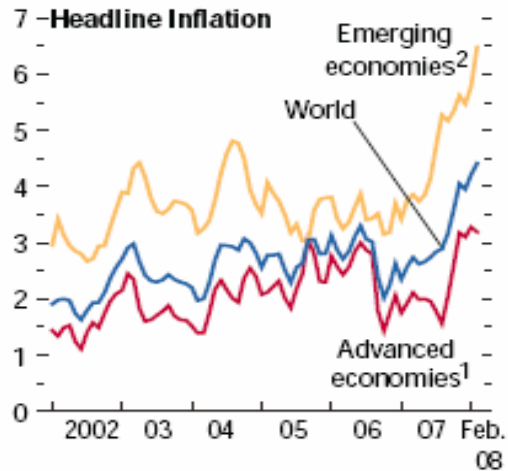
Source : Oxford Economics

Source: IMF WEO April 2008



Source: IMF WEO April 2008

Global Aggregates



Sources: Haver Analytics; and IMF staff calculations.

¹Australia, Canada, Denmark, euro area, Japan, New Zealand, Norway, Sweden, United Kingdom, and United States.

²Brazil, Bulgaria, Chile, China, Estonia, Hong Kong SAR, Hungary, India, Indonesia, Korea, Malaysia, Mexico, Poland, Singapore, South Africa, Taiwan Province of China, and Thailand.

³Personal consumption expenditure deflator.

⁴Ten-year government bond yield minus ten-year inflation-linked government bond yield.

Feedback 2: Demand and Supply Responses

- In response to high oil price
 - Investment in non-OPEC capacity would increase oil supply with a lag
 - Uncertainty about lag but not the output response
 - Backstop supplies (such as tar sands)
 - Higher oil prices would adversely affect demand growth via response to prices
 - Back end of curve should remain within certain bounds

Oil Demand Price Elasticity

- Oil demand price elasticity is close to zero in short run
- Price elasticity of demand is higher in long run due to substitution and energy conservation but elasticity still quite low
- Declining over time
 - Hughes, Knittel and Sperling (2008): US short-run price elasticity has declined
 - 0.21 to 0.34 over 1975-1980
 - 0.034 to 0.077 for 2001-2006

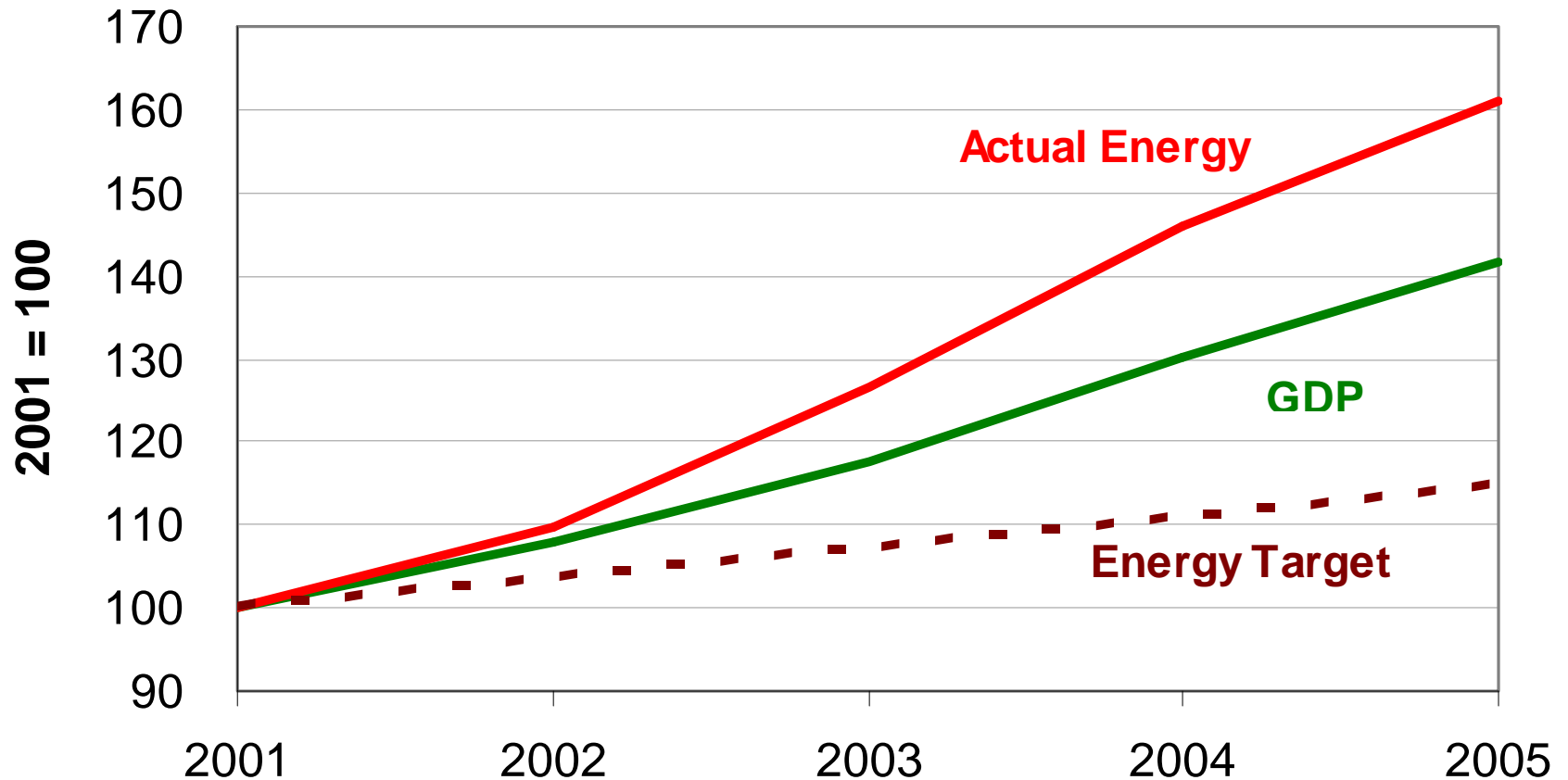
Studies	Short run	Long run	Sample
Dahl, 1993	-0.05 to -0.09	-0.13 to -0.26	Developing countries
Pesaran <i>et al.</i> , 1998	-0.03	0.0 to -0.48	Asian countries
Gately and Huntington, 2002	-0.05 -0.03	-0.64 -0.18 -0.12	OECD Non-OECD Fast growing non-OECD
Cooper, 2003	0.001 to -0.11	0.038 to -0.56	23 countries
Brook <i>et al.</i> , 2004		-0.6 -0.2 -0.2	OECD China Rest of World
Griffin and Schulman, 2005		-0.36	OECD
Krichene, 2006	-0.02 to -0.03	-0.03 to -0.08	Various countries

Oil Demand Income Elasticity

- Oil demand more responsive to income than prices
- Responsiveness of oil demand to income been declining over time in OECD
- Developing countries exhibit higher income elasticity than OECD
 - Do not expect income elasticity of oil demand to fall in developing countries very soon

Studies	Long run income elasticity	Sample
Ibrahim and Hurst, 1990	> 1.0	Developing countries
Dahl, 1993	0.79 to 1.40	Developing countries
Pesaran <i>et al.</i> , 1998	1.0 to 1.2	Asian countries
Gately and Huntington, 2002	0.56 0.53 0.95	OECD Non-OECD Fast growing non-OECD
Brook <i>et al.</i> , 2004	0.4 0.7 0.6	OECD China Rest of World
Krichene, 2006	0.54 to 0.90	Various countries

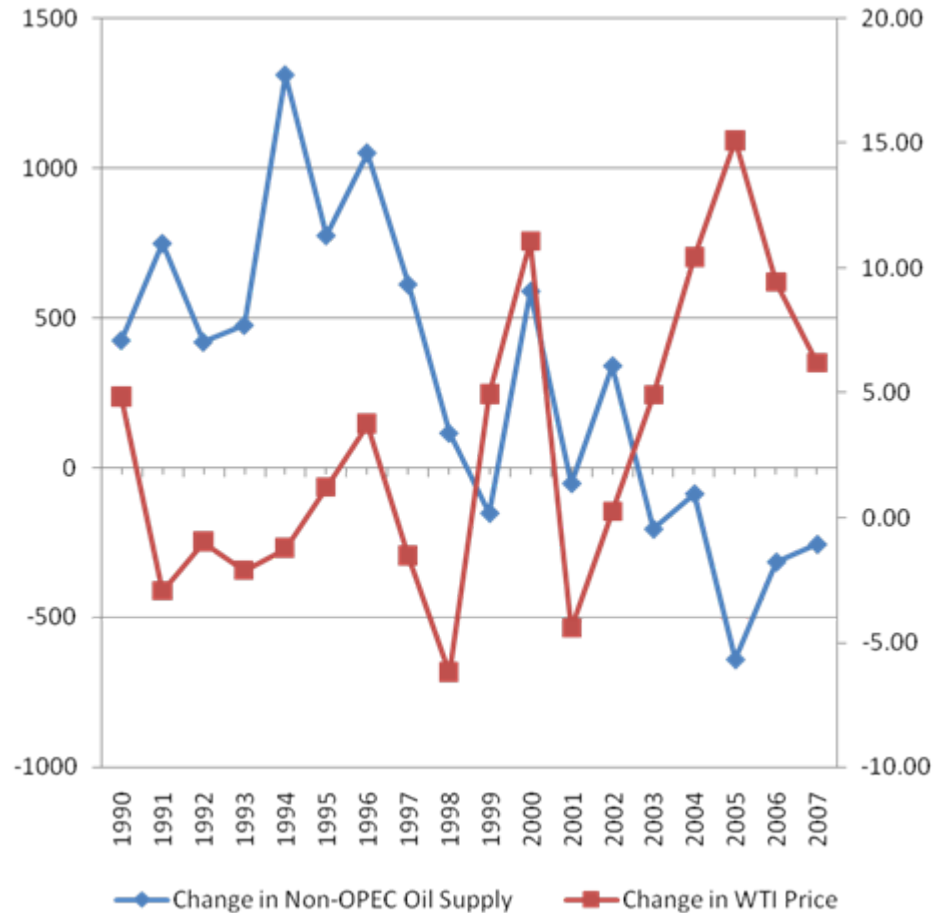
Actual Energy and GDP in China



Source: Fridley; NBS, China Statistical Yearbook, various years; China Statistical Abstract 2005; growth estimates extrapolated from mid-year production data for 2005.

Supply Response

- Response of non-OPEC production to oil prices low
 - Producers do not increase production in face of a price rise
 - A reduction in oil prices does not induce producers to reduce production
 - Krichene (2006): long run price elasticity of 0.08
 - Gately (2004) reports a wide band of price elasticity varying from 0.15 to 0.58 by 2020
- Other factors affect investment and supply
 - Sanctions (Iran, Libya, Sudan)
 - Political instability (Iraq, Nigeria)
 - Access to reserves and hardening of contractual terms (Venezuela, Algeria, Russia)
 - Uncertainty and the option to wait
 - Rising costs
 - Shortage of human capital



Implications

- Uncertainty as to where back end of curve should be
 - Will there be enough feedback from supply/demand or both to the rise in oil prices?
 - How long will adjustment to high oil prices take?
- Futures curve embodies today's expectations of where expected spot price should be
 - Current situation: expectations that not enough supply will be forthcoming to satisfy demand
 - Underlying beliefs can differ as to the causes
- Overall belief that the supply/demand balance is both tight and not responsive to price
- What would happen if the oil price were higher? Lower? The answer appears to be 'not much'

Feedback 3: OPEC and Market

- Conventional wisdom
 - OPEC put a floor on oil price
 - Cut output to defend the floor
 - OPEC puts a ceiling on oil price
 - Avoid demand destruction for its oil in the long term
 - Limit entry of substitutes, technical change, etc.
 - Reinforced by OPEC price band
 - Production adjustments if OPEC basket prices above \$28 per barrel for 20 consecutive trading days or below \$22 per barrel for 10 consecutive trading days
- Implication
 - From 1986 to 2002 back end of crude oil futures curve very rarely strayed outside the \$20 range
 - Governments and financial market thought in terms of that range

Misunderstanding the role of OPEC

- OPEC main objective is to defend oil prices from falling below some level deemed unacceptable
 - Policy tool to achieve the objective is simple
 - Cut output in face of falling demand
 - Degree of success depends on market perception
 - May implement series of cuts to convince market players
- OPEC's role is not to prevent oil prices from rising
 - Ceiling was never relevant in the band
 - But at times the perception that OPEC would respond to limit price rises has been important
- Politically very difficult for OPEC to take action to lower prices.

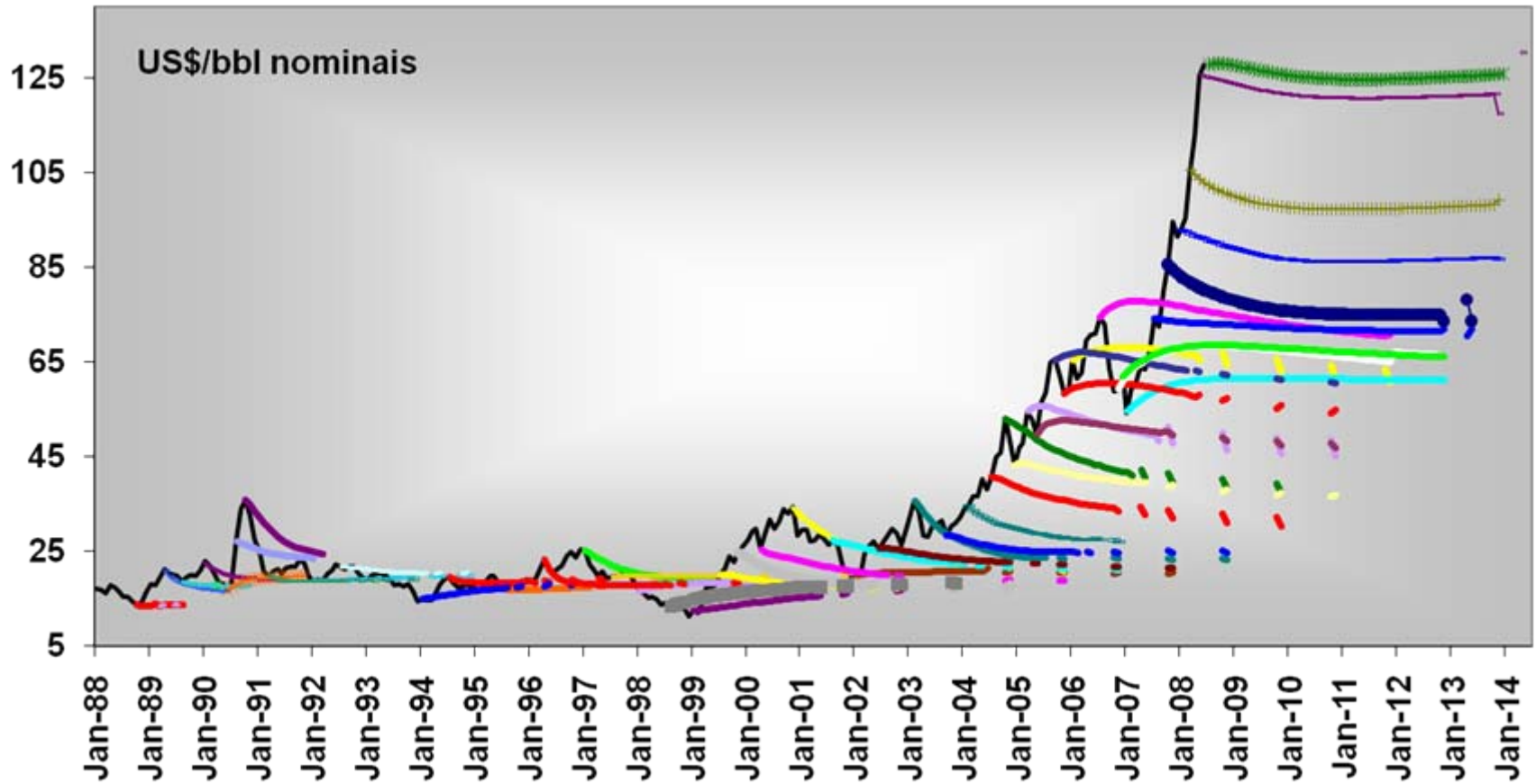
OPEC Behaviour

- Learning process
 - Increasing oil prices did not affect growth in oil demand (more price inelastic than they originally thought: world economy effects muted)
- Not concerned about long term effects on global demand for oil
 - No sign of urgent political economic response by OECD countries
 - Climate change agenda unlikely to seriously undermine demand for oil – in the absence of alternative transport fuel and likely technical and behavioural lags
- Concerned about high oil prices but it is beyond OPEC's hands
 - Market perception that OPEC spare capacity is less than announced and not the right quality
- OPEC current position:
 - Will increase output but in response to customers' requests (at current prices)
- Concerned about high oil prices and has the ability to influence oil price but
 - Politically constrained
 - Fears that any move may induce a downward spiral of oil prices.
 - Not willing to put more oil in the market (auction part of the spare capacity) or to engage in heavy discounting
- Thinks of itself as price taker in international market even though the price depends on the market's perception of OPEC behaviour
- Does OPEC behaviour validate (within a range) whatever prices happen to be established?

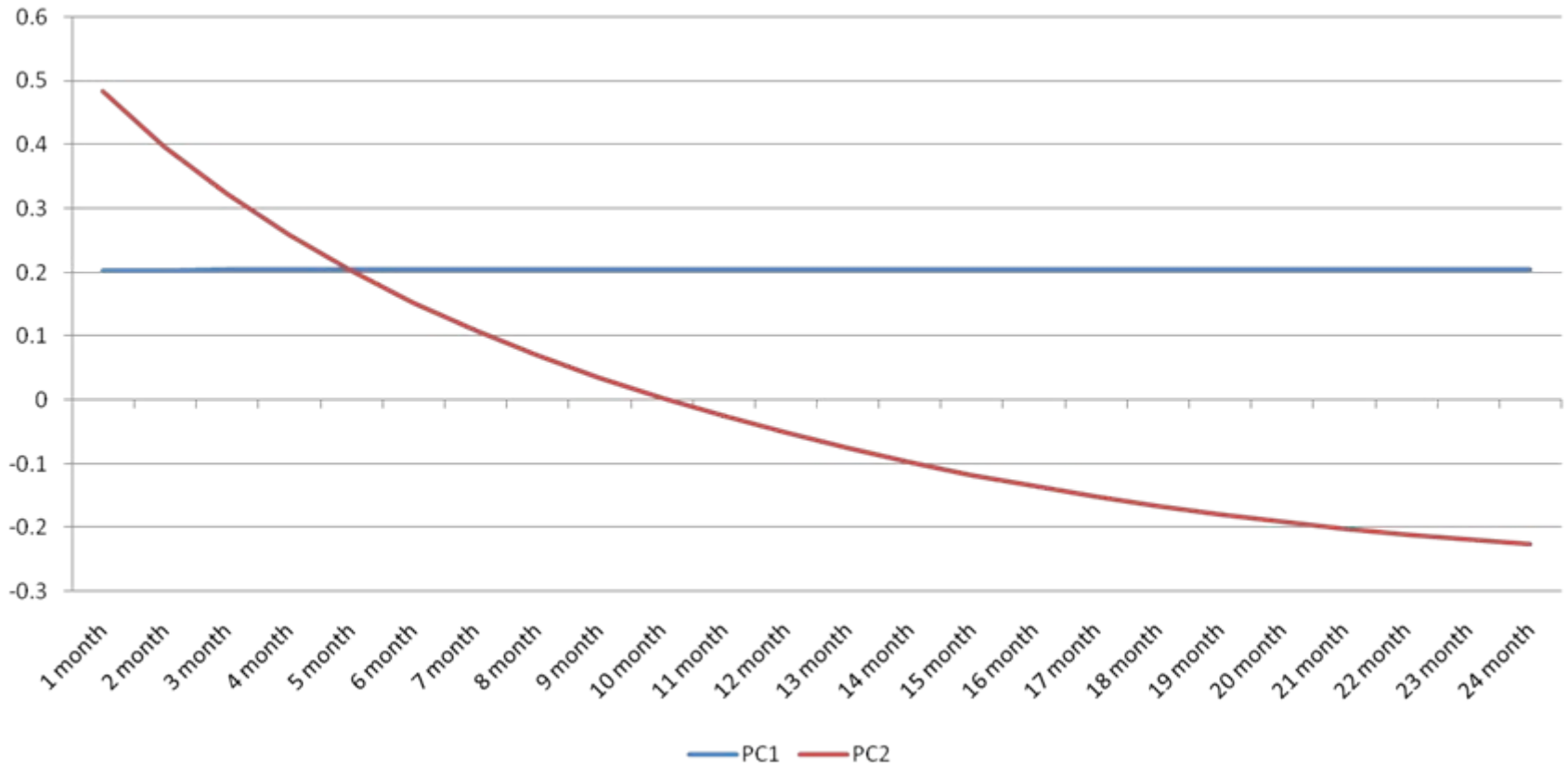
Implications

- Unlocked the back end of the curve
- Back end of the futures curve can shift upwards or downwards depending on OPEC's behaviour or financial markets' perception of OPEC behaviour, as well as perceptions of supply and demand trends
- Three phases?
 - The OPEC band
 - A quasi-equilibrium, around \$60, with market perceptions that fear of demand 'destruction', perhaps due to political change in OECD, would lead OPEC to limit the upside. (Sometimes used to explain why Saudi Arabia wanted a margin of excess capacity of about 2 million barrels per day)
 - The current perception that OPEC will not, or cannot, police the upper bound
- Key question now is what feedbacks there are that might limit the range of uncertainty about the oil price: supply, demand, OPEC behaviour, OECD policy
- Great uncertainty about the fundamentals. Range of possible prices with little effect on perceptions. Indeterminacy?

Rise in Front End and Back End



Principal component analysis



PC1 (Trend Component) explains more than 99 % of variation

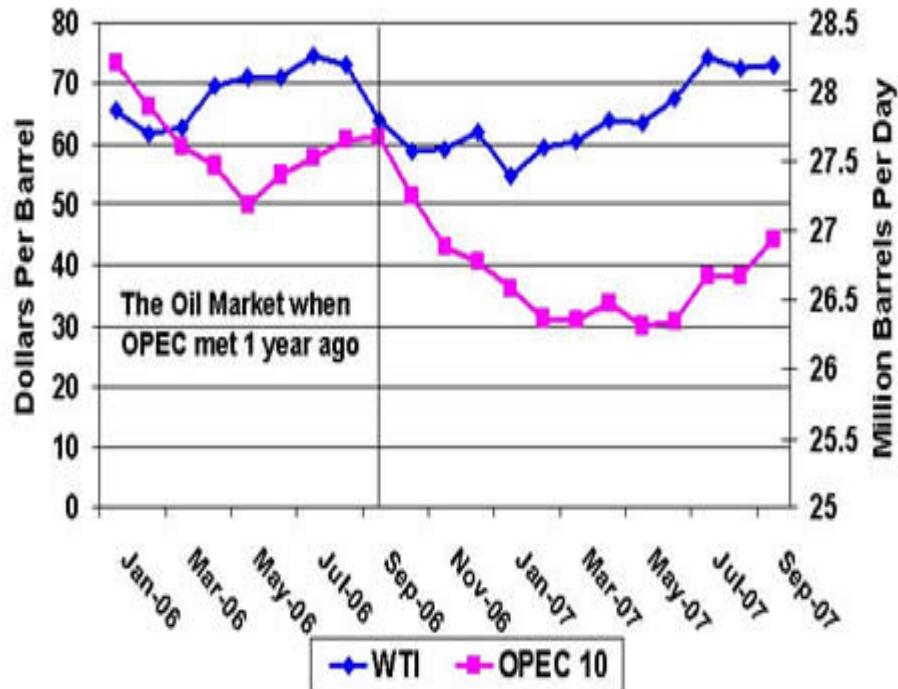
PC2 (Tilt Component) explains less than 1% of variation

OPEC and Speculators

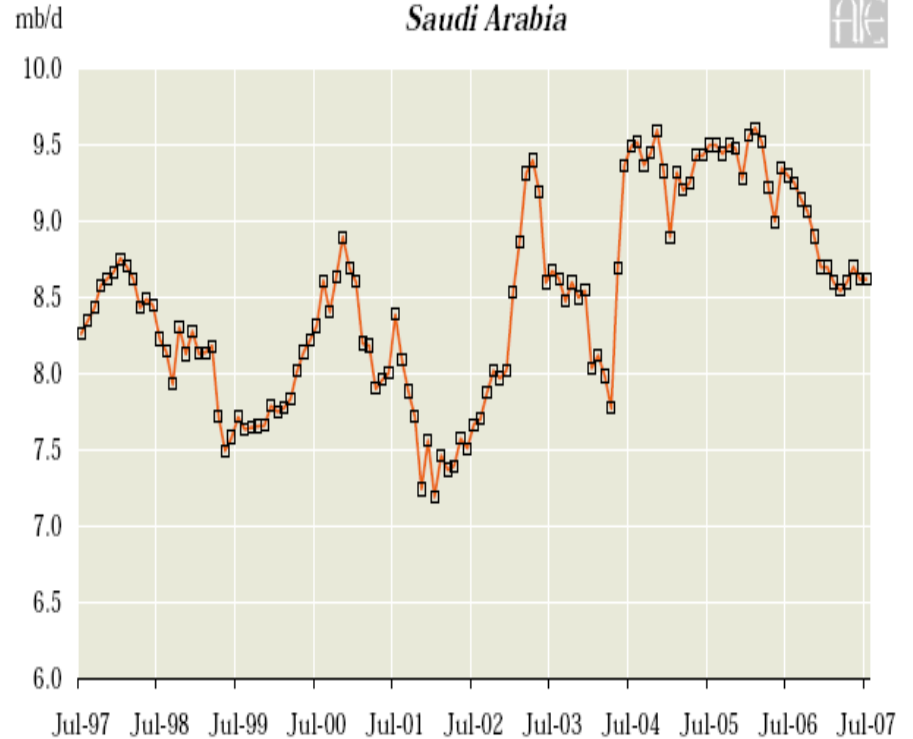
- OPEC current position:
 - Will increase output but in response to customers' requests at current prices
- Assume a self-fulfilling speculative price increase that raises the futures price but keeps the spot price fixed
 - Increased demand for spot oil resulting in continuous inventory accumulation which is not sustainable in the long run and is not desired by OPEC because of fear of sharp oil declines
 - In response OPEC can cut supplies
 - Spot price increase in response to OPEC cut
- The move from contango to backwardation

OPEC Production

OPEC 10 Crude Oil Production and WTI Oil Prices

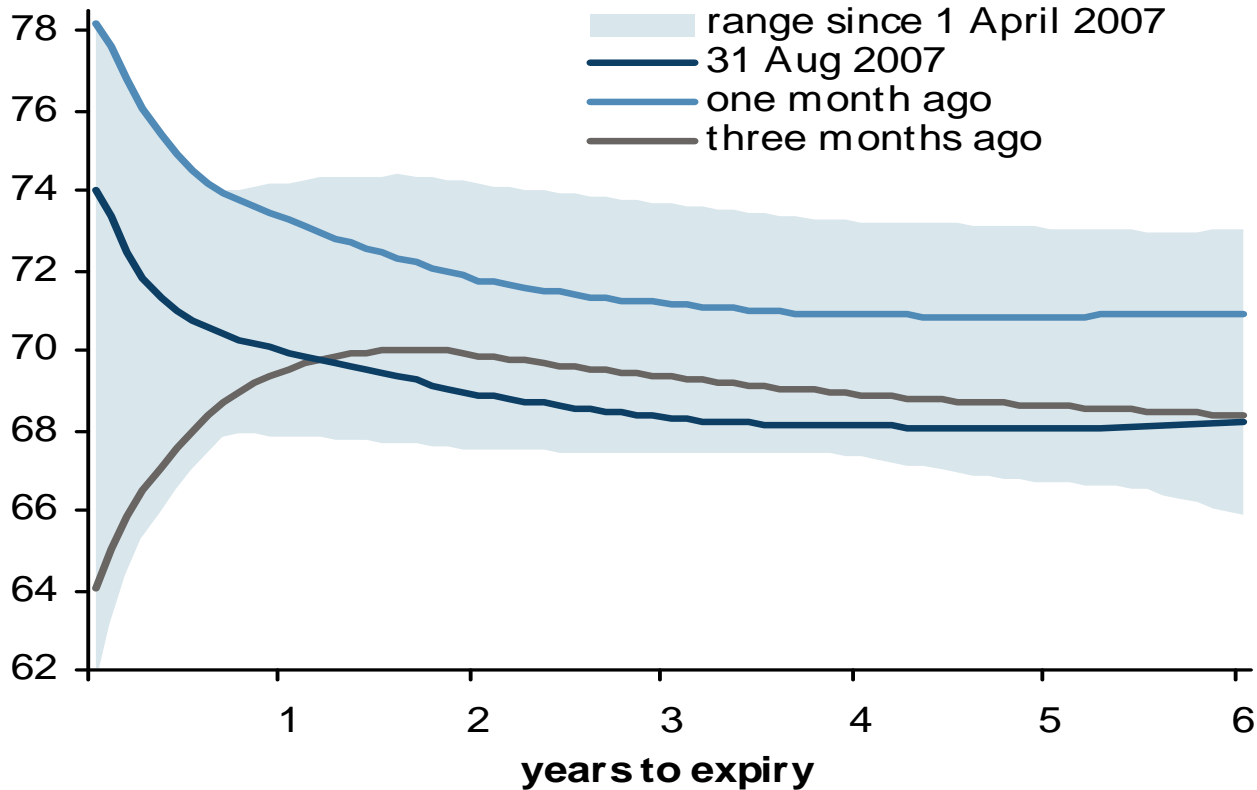


Crude Oil Supply Saudi Arabia



Shift from contango to backwardation

WTI forward curve \$/b



Source: Barclays Capital

Change in shape of the curve with the back end of the future curve remaining fixed

Implications

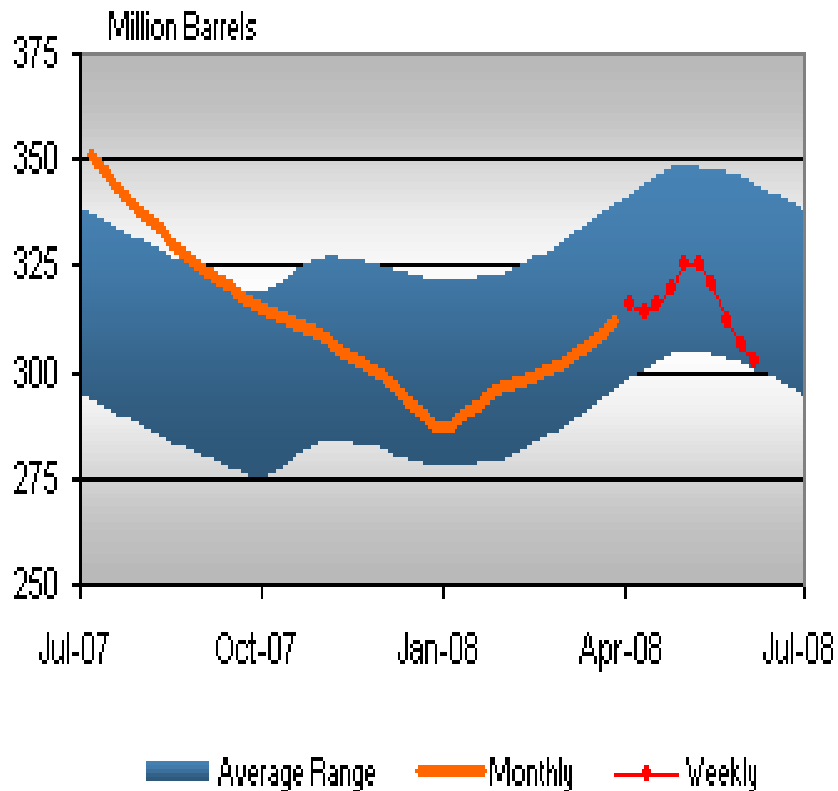
- Main impact of OPEC is on shape of curve not on back end of curve
- Who should hold the inventories: the market, or OPEC/Saudi Arabia? Market largely clears by quantity adjustments by swing producer at given market price. But quantity implications of different prices are relatively small
- Relationship between net speculative position and oil prices?
- Who is betting on what – and who are the counterparties?

Another type of speculation?

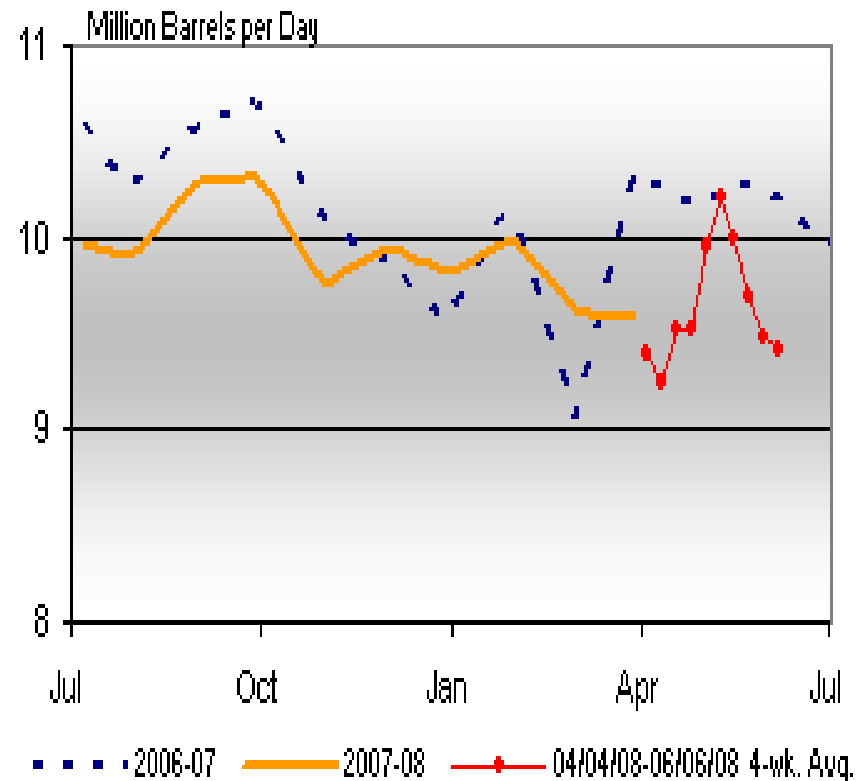
- News of declining inventories that causes spot price to go up also cause futures prices at every horizon to go up
 - Suggests that decline in inventories is seen as indicator of current shortage of supply which in turn affects expectations
 - Prevents a steepening of forward curve (i.e. curtails backwardation)
- Suppose refineries think that rise in oil price is only temporary
 - Use their own stocks or even sell them in the market
 - Should decrease spot oil price with little impact on futures price
- But suppose that spot prices keep rising anyway (e.g. speculative bubble)
 - The incentive to hold stocks decreases further (no longer profitable)
 - But excess supply does not appear – due to OPEC response
 - Process can continue until stocks reach minimum operating levels
 - What can break this?

Recent example: cut in inventories, leading to rise in prices, but lower imports and lower production by OPEC

U.S. Crude Oil Stocks



U.S. Crude Oil Imports



But what determines the price?

- News about the fundamentals really has been changing: the market is finding the new equilibrium (e.g. Paul Horsnell)
- Alternatively, there is a range of indeterminacy: e.g. the market could coordinate on high or low outcomes
- Thinking makes it so: sun spots?
- Economic outcomes are influenced by a set of beliefs
 - Each set of beliefs is “logically coherent, consistent with the known features of the economy, and borne out by subsequent events” and results in different outcomes (Morris and Shin, 2000)
- Keynes, General Theory, Chapter 12, on expectations in share markets:
 - “We have reached the third degree where we devote our intelligences to anticipating what average opinion expects average opinion to be.”
- Beliefs are correlated with fundamentals

The selection of equilibrium

- Which equilibrium will be selected?
 - Largely left unexplained
 - We have described why the price might be ‘indeterminate’, but not why it has moved
- Morris and Shin (2000) [in a different context]
 - Small amount of noise or arrival of publicly observed signals can help us select a unique equilibrium
- If there is some news about a fundamental which is publicly observed
 - Affects your own beliefs about the oil price
 - More importantly it affects your beliefs about the beliefs of the others and how they would react to the signal
 - Implication: a small amount of public news can have dramatic effect on outcomes
 - Helps to explain which of many equilibria is selected
 - And helps to explain why the adverse news flow has raised the whole curve

Concluding remarks (1)

- Expectations about the long run oil price appear to have become detached from any idea of 'normality' or fundamentals. The whole curve can move up or down.
- We have tentatively explained this in terms of reduced feedbacks, which, if they were present, would pin down the longer term anticipated price.
 - Supply prospects, including investment, seem unresponsive to price changes
 - Demand elasticities are low, and uncertain. Expectations of demand growth (depending on growth in Asia and Middle East) suggest continuing tightness in the medium term
 - Crucially, anticipations of world growth have become insensitive to oil price impacts
 - Opec has learned that high oil prices do not lead to world economy reactions and demand falls, and markets have learned that OPEC either does not want to, or cannot, limit upward movements in oil prices
- This is the kind of situation where speculative forces, drifts, and bubbles can take hold.
- OPEC policy: to supply the market at the current (future) price possibly validates whatever price is established (with little cost since there is little response of demand or supply to price).
- Speculation seems to have played a normal role along the futures curve. It remains quite difficult to explain the large rise in the oil price as due to the presence of speculators.
- This does not mean that the rise in price simply reflects news about the fundamentals (though that is one story about what has happened). The alternative hypothesis is that the price could be higher or lower with relatively little effect.

Concluding remarks (2)

- One set of questions raised is what kind of signals might lead through to a lower oil price.
 - World-wide recession
 - Sharp slowdown in China
 - Change in perception about OPEC behaviour
 - Entry of substitute, including news about costs of alternatives
 - Credible energy security or climate-change policy in OECD
- A more complex question is whether policy should seek to establish a stable medium term expectation of the oil price, e.g. via the consumer producer dialogue.
 - In the currency markets, a credible commitment to (say) an exchange rate backed up by ample reserves, alters the 'game'
 - Policy changes, e.g. from benign neglect, to public concern over (say) the balance of payments, alters expectations, introducing a feedback previously absent.
- In the case of the oil price the difficulties are great
 - Is it OPEC, or OECD who are expected to act? And with what interventions?
 - OPEC for the lower bound, OECD for the upper?
 - US fear that use of SPR would not work:
 - Saudi fear that price falls might get out of control
- Finally: how would producers and consumers agree on a 'fair' oil price and the distribution of rent between producers and consumer governments?