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The Price of Crude Oil: Speculation and Market Fundamentals

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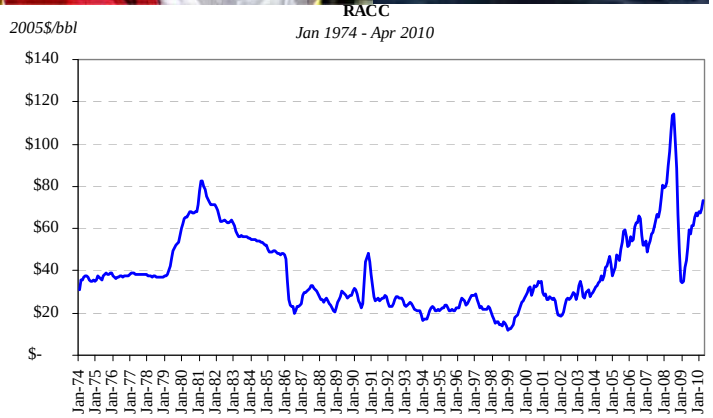
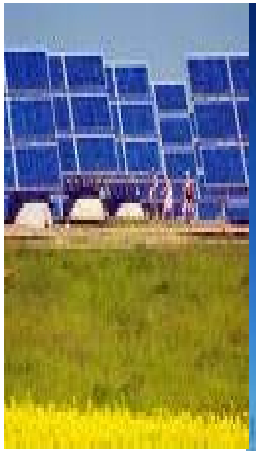
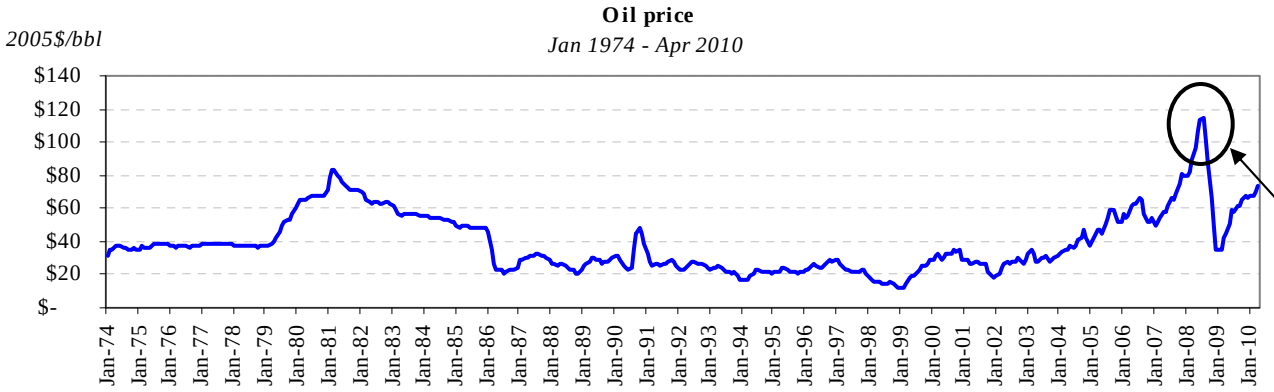




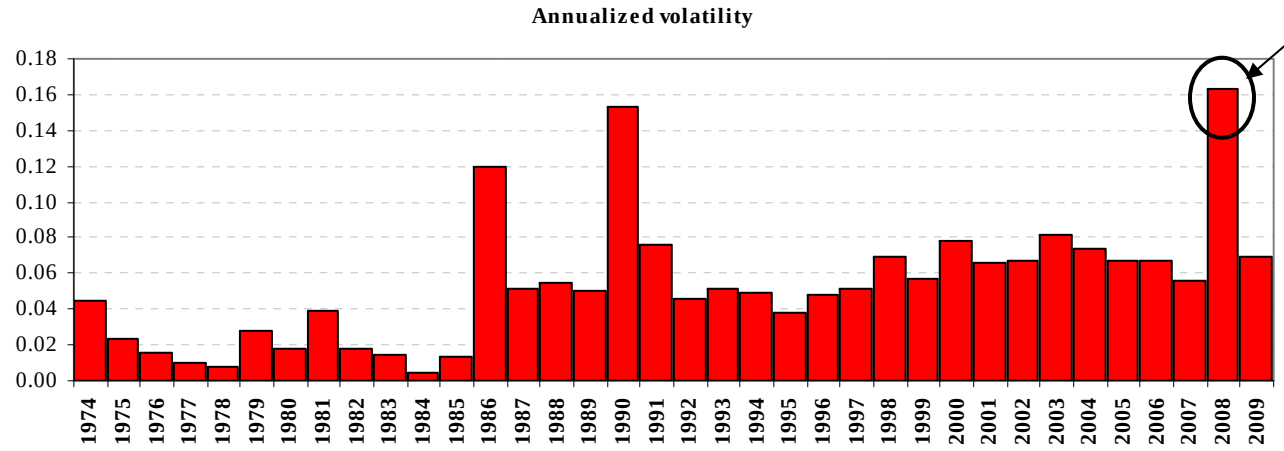
35 Years of Oil Prices

- Oil prices have generated debate, largely due to price level...



- ... and price volatility...

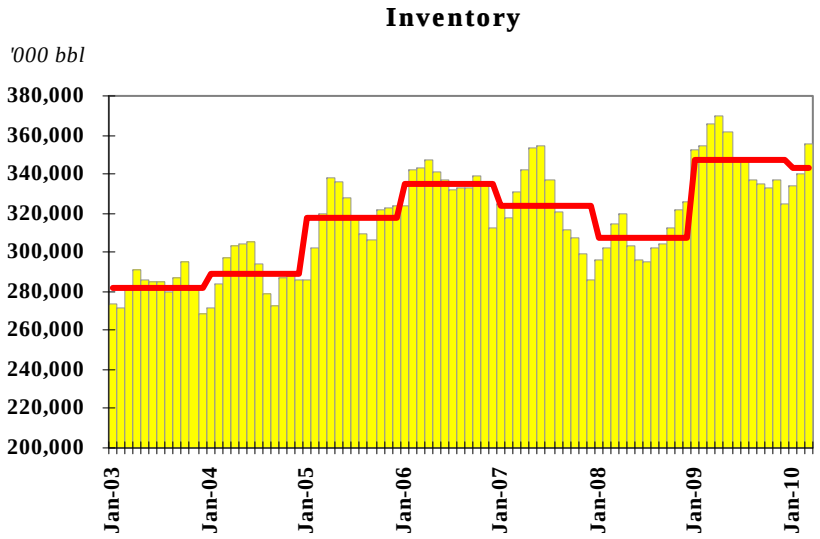
High price and High volatility

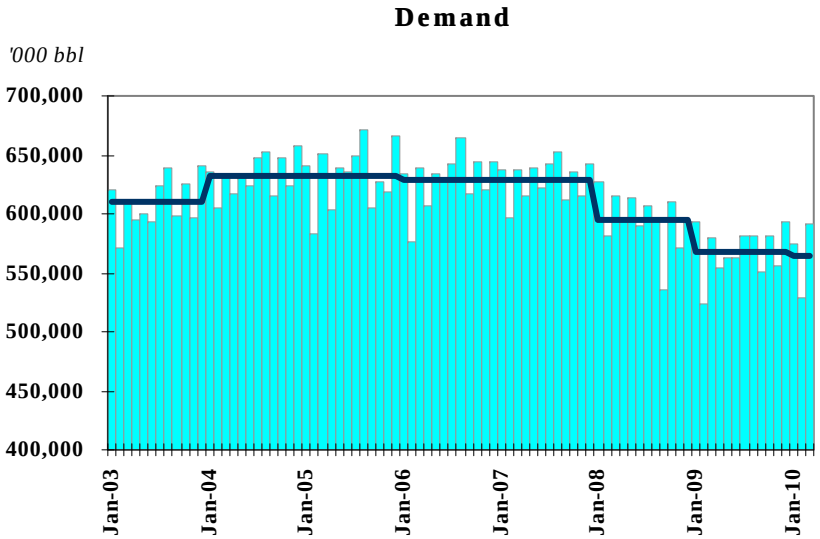


- ... leading some to question the role of speculation.

"How can speculation be destabilizing?"

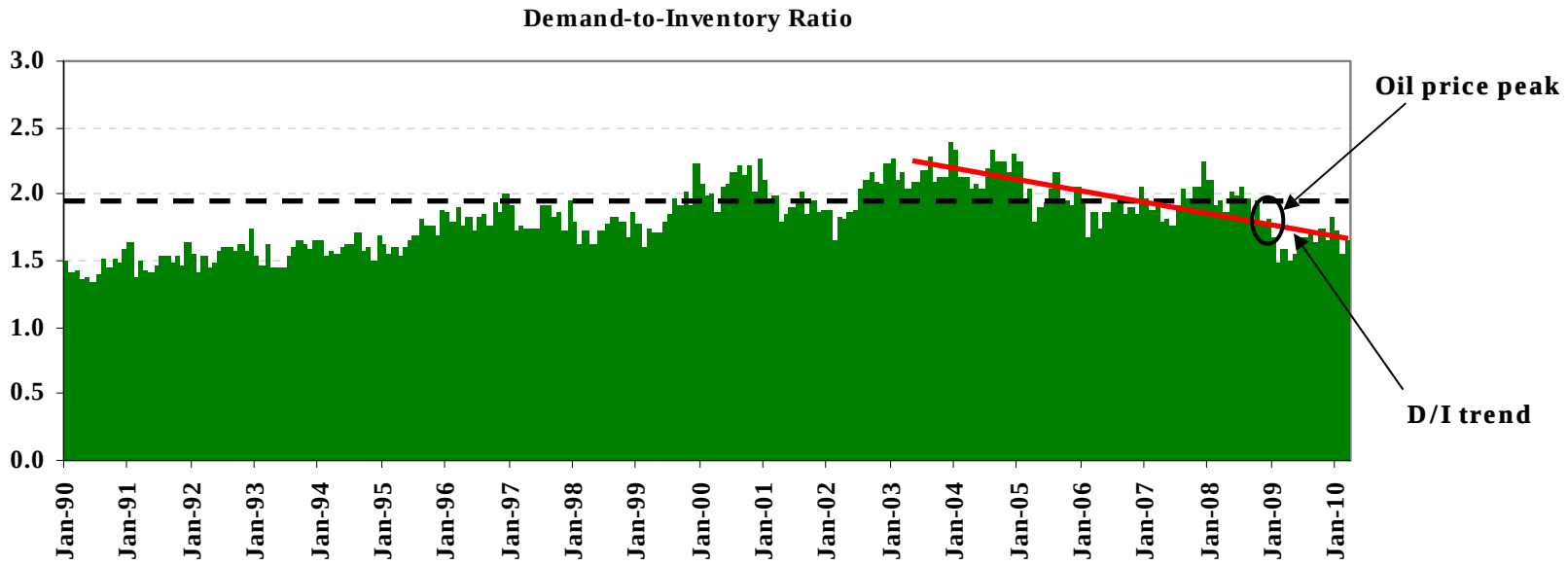
- Convention suggests that the notion that speculation can be destabilizing is nonsense.
  - Any supply-demand imbalance should be immediately corrected through an adjustment to inventory.
- We did in fact see some market response as prices increased…





Demand vs Inventory

- A relevant data series is the ratio of demand to inventory.
  - If demand rises relative to inventory, it is an indicator of scarcity.



- Given the large number of periods in which demand has been higher relative to inventory, and the fact that the ratio has been declining since 2003,something else must matter
  - **Expectations**

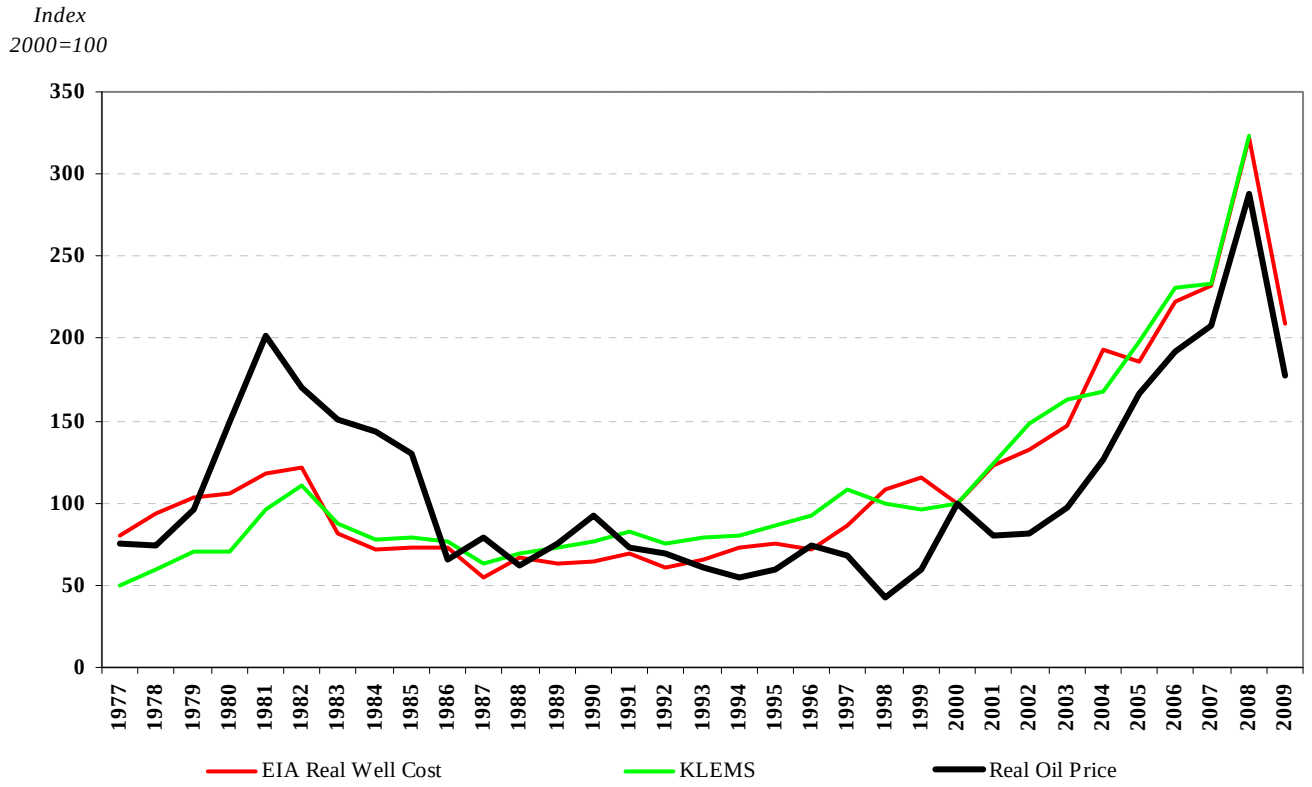
The important role of expectations…

Since 2000 many factors have been "blamed" for rising oil prices…

- "Big Oil" and lack of investment
- Rising Costs
- National Oil Companies: Increasing control of global conventional oil resources by a smaller group of countries
  - BIPP study 2007: "The Role of the National Oil Company"
- "Peak oil"
- Demand Growth in China and India
- A Weak $
- Speculation

The Effect of Rising Costs

- *Rising costs* in the face of *price uncertainty* contributed to the observed investment patterns.



- **Bottom line: Uncertainty about future costs contributes to varied views of future price going forward.**

The NOC effect…

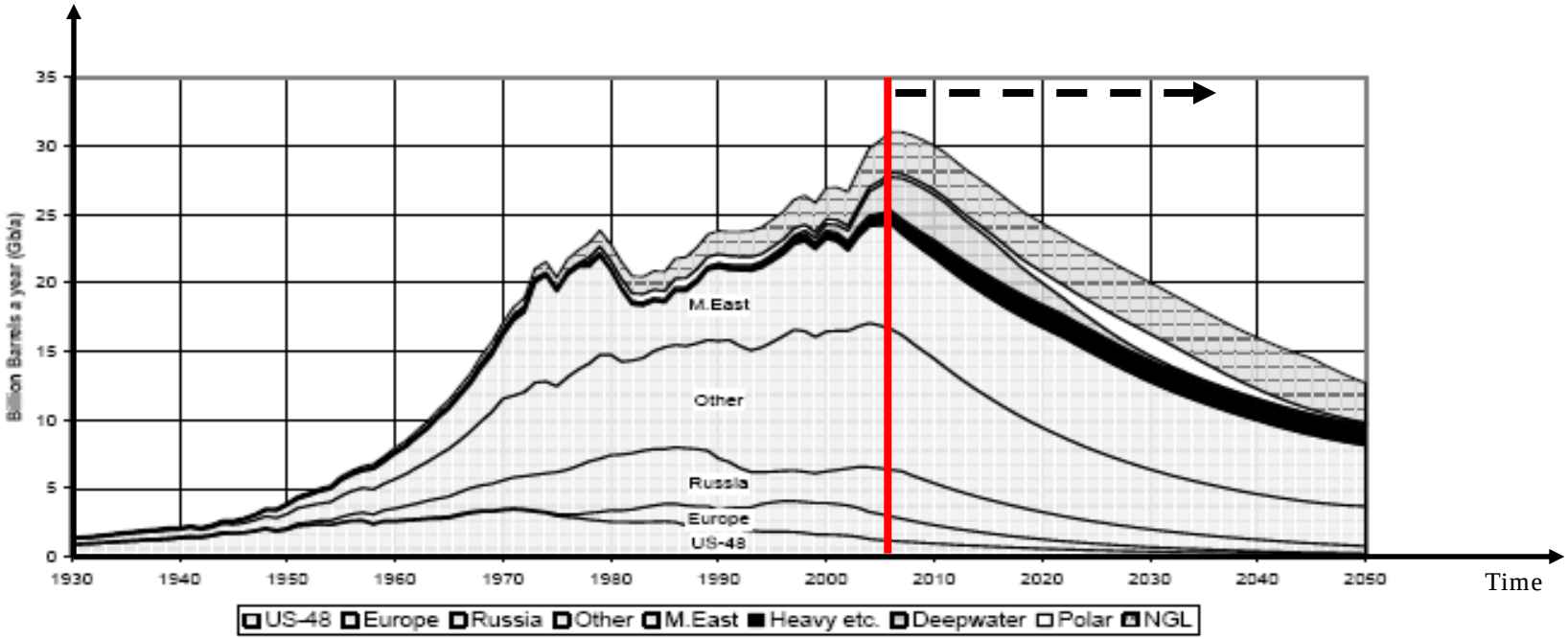
- Non-commercial objectives influence the ability of national oil companies to function as many of the international integrated oil companies.
  - The word "efficient" should be used with care. NOCs may be "economically efficient" in the sense that they are maximizing some objective. However, the NOC likely faces a different objective than an IOC.
  - Theoretical modeling indicates these objectives skew the firm's observed behavior away from the unimpeded outcome (Hartley/Medlock, "A Model of the Operation and Development of a National Oil Company," *Energy Economics*, 30(5)).
- Empirical analysis indicates the relative revenue efficiency of NOCs is lower than that of IOCs. The results are robust to methodology
  - Stochastic Frontier Analysis (SFA); Data Envelopment Analysis (DEA)
  - Eller/Hartley/Medlock, "Empirical Evidence on the Operational Efficiency of National Oil Companies," *Empirical Economics*, forthcoming

- **Implication: higher prices are needed to maintain a given supply, much less grow production.**

"Peak Oil"

- In 2007, ASPO posted a prediction of a production peak within next 5 years.
- The arguments reverberated as prices approached $100/bbl.

Global Oil Production

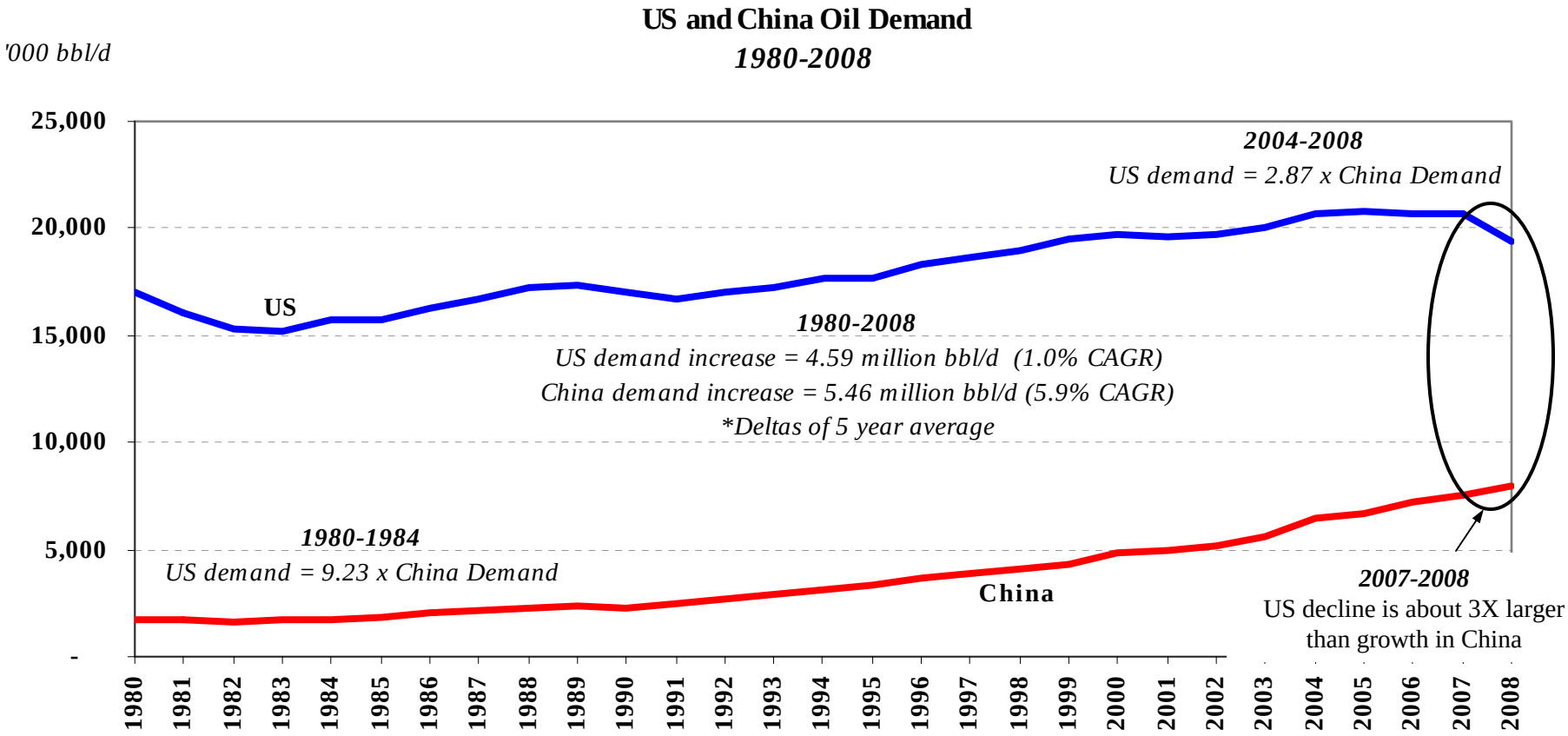


Note: Picture from the Association for the Study of Peak Oil (ASPO)

- **Bottom line: Uncertainty of future supply exerts a "precautionary motive" on the market.**

Demand Growth in a Mobilizing China

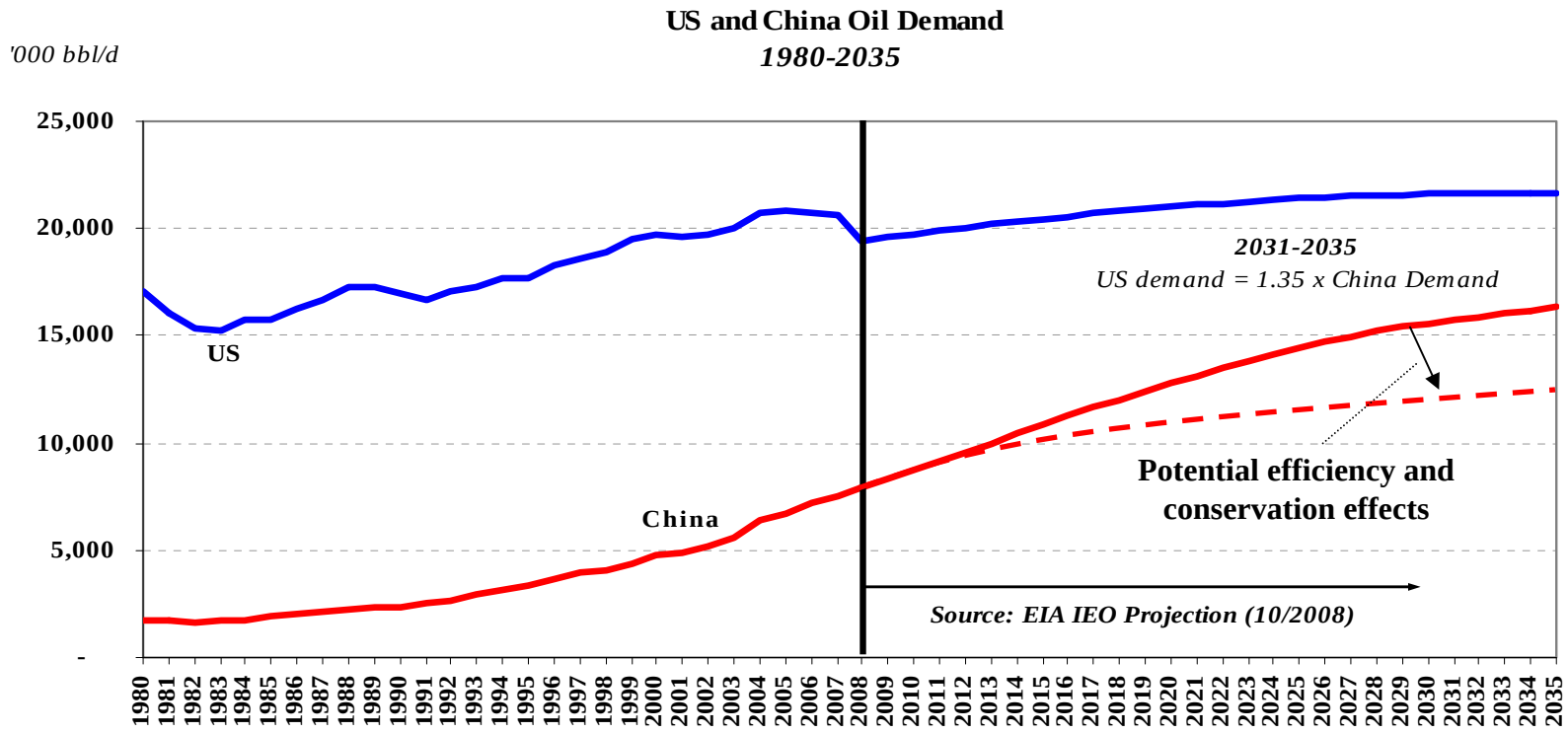
- Demand in China is growing at a rapid pace.



- Note, considering only growth rates can be misleading. We must also consider the base upon which growth is occurring. The US footprint has also grown...

Demand Growth in a Mobilizing China (cont.)

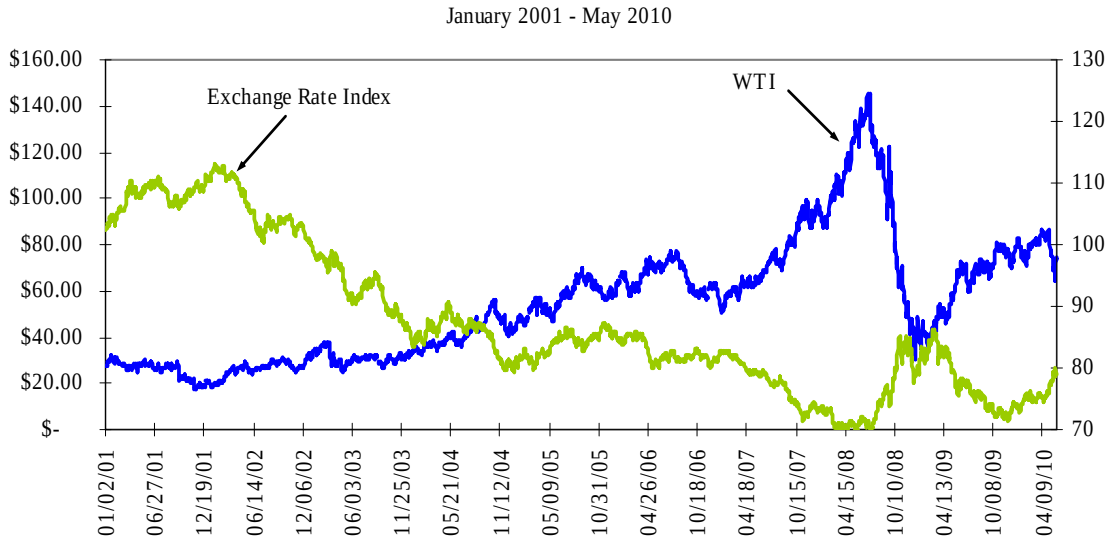
- ... but where will we be in another 28 years?
  - The forecast is credible, but we must use caution... road petroleum use in China accounts for about 1/3 of total. In US it is about 60%. The US saw flattening industrial demand, and reduced demand in all sectors except transport. Could the same thing happen in China? If so, shave the forecast by about 4.5 million bbl/d...



- **Bottom Line: How will we fuel mobilization in China?**

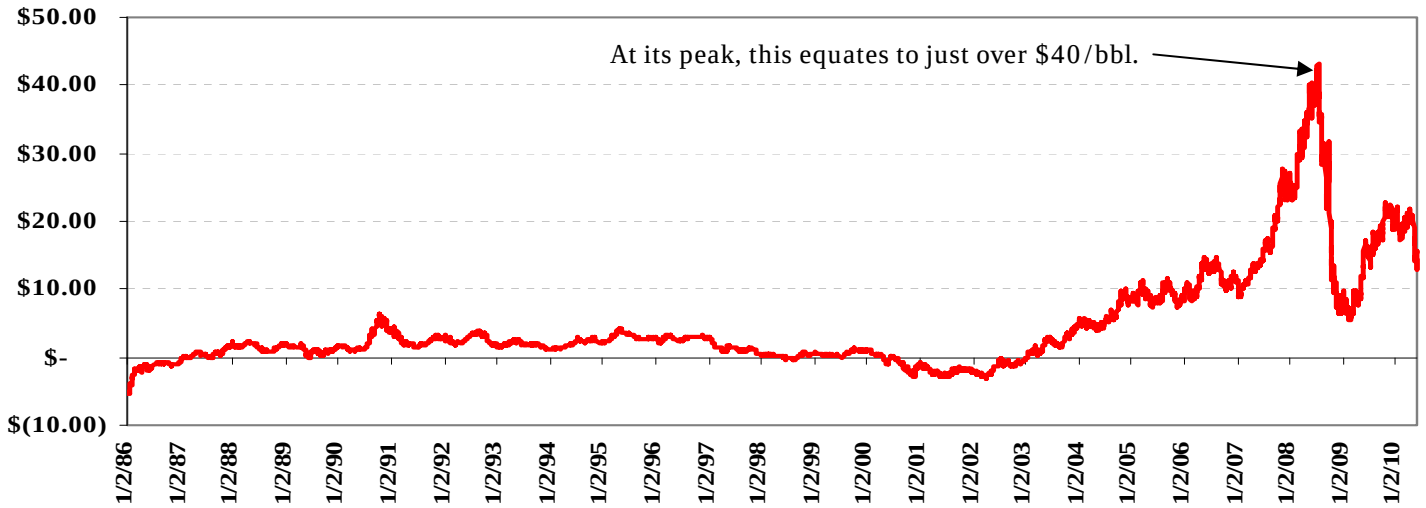
The Effect of the $

- From Jan 1986 to Jan 2001, the correlation is -0.08.
- Since Jan 2001, the correlation between the XR and the oil price is -0.83.
- Why did a strong relationship emerge for such an extended period?
  - One hypothesis asserts that it is tied to the emergence of “asset-class” investors.
  - If the concern is portfolio return, oil and the dollar can become linked via active trading.
  - Note, if true this should generally also apply to other commodities.



The Effect of the $ (cont.)

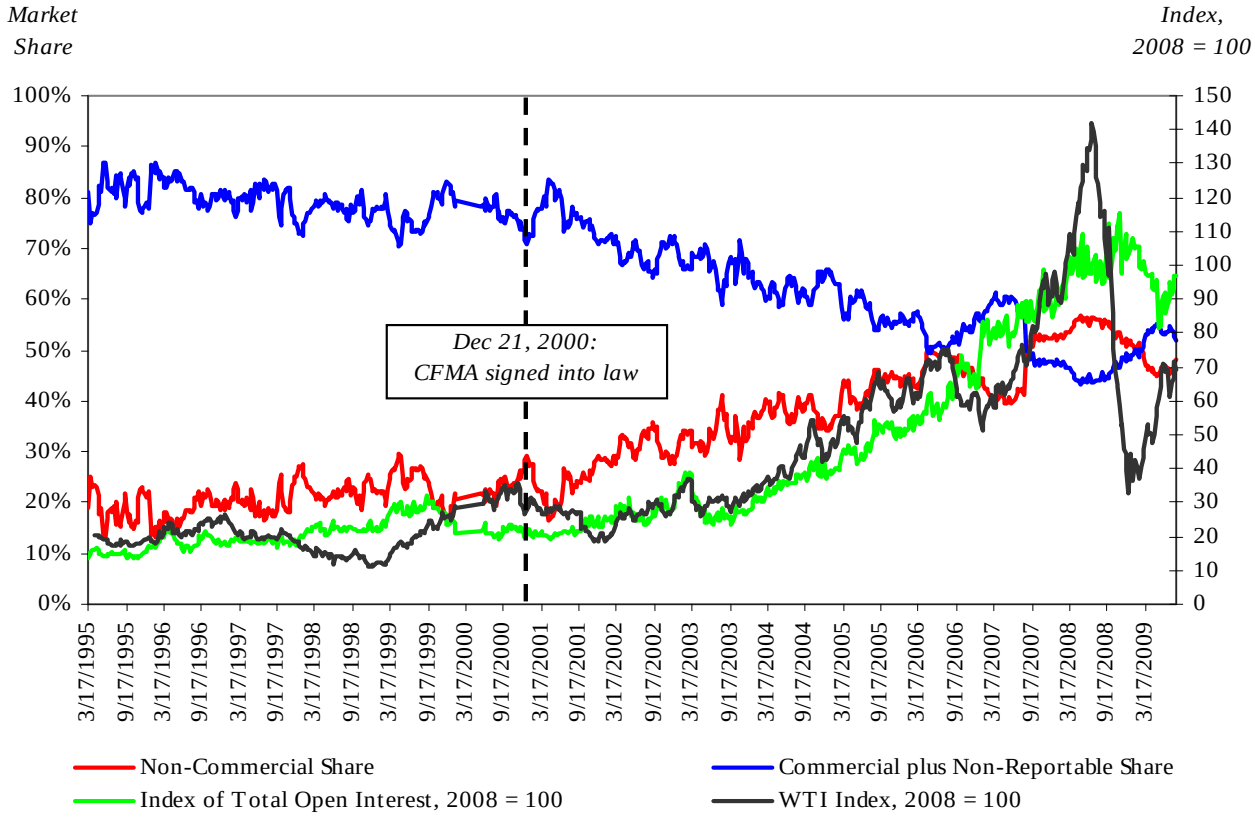
- So, how large an influence has dollar movement had on oil price?



- The graph depicts the difference between an exchange rate-normalized oil price and the actual oil price. This suggests that movements in the exchange rate explains about $40/bbl of the peak in price, although it is a *ceteris paribus* analysis.
- This can create a problem because a depreciating dollar and high oil prices lead higher trade deficits, which becomes circular. In 2008, oil imports accounted for about 49% of the US trade deficit, which is up from 18% in 2002.
- **Bottom line: Where does the value of the $ go from here?**

Speculation

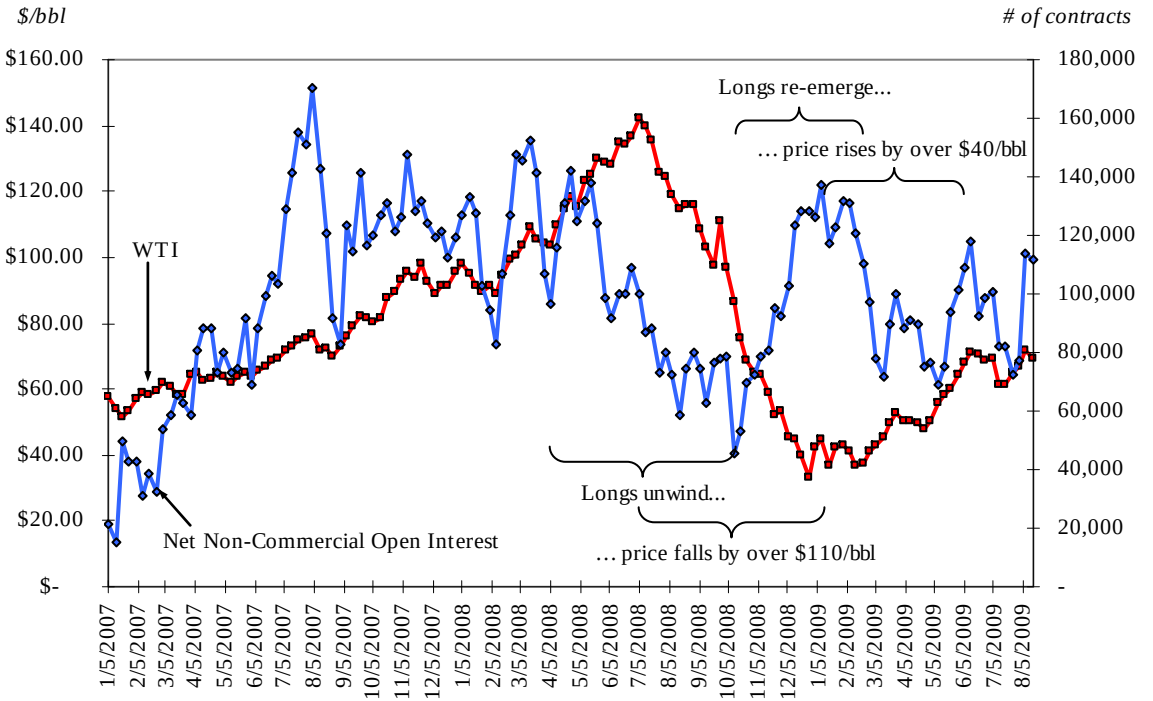
- Trading requires both speculators (demanders of risk) and hedgers (suppliers of risk).
- Market composition began to change dramatically shortly after the Commodity Futures Modernization Act was signed into law.
- Some have claimed that the increase in open interest by market players with no physical commercial position in the market pushed price higher.



Source: CFTC COT Reports – CRUDE OIL, LIGHT SWEET - NYMEX

Speculation (cont.)

- Non-commercials have been consistently net long, as a group, since 2003.
- In addition, the net long position shows evidence of leading oil price.
  - Tests of bivariate Granger causality reveal this to be the case. Omitted variables bias render this suggestive rather than definitive. For example, changes in physical market indicators could lead market positions and oil price.



Source: CFTC COT Report - 'CRUDE OIL, LIGHT SWEET' - NYMEX

- **Bottom Line: Is there an additional influence, or is it all reactionary?**

More on Speculation

- The most common argument against any effect on price from speculators, "… look what happened to the onion futures market back in the 1950s."
  - Many analysts like to bring up the example of the onion futures trading, which was banned in the 1960s. Absent trading, we indeed saw extremely volatile onion prices…
  - But, this is a nonsensical analogy. The prospect of *eliminating* oil futures trading is not on the table. These analogies are often made to make the prospect of different regulations seem unthinkably disastrous. They need not be.
  - Most understand the value of futures trading and we need to think about why the concept grew in the first place – to help markets function more smoothly. So, is that what we have today? This question must be addressed when thinking about new regulation.

More on Speculation (cont.)

- A recent analysis stated that "… government attention is being directed away from addressing the fundamental cause of increased prices. Specifically, factors such as tax policy, government intervention, access and production problems, and firm inefficiencies. The danger is that a short-run politically expedient approach will hinder lagging capacity investment."
  - It is well-researched that a lack of predictability (or uncertainty) is detrimental to long term investment activity. If we are worried about capacity expansion, price swings from $99 to $147 to $30 to $75 in 18 months do not help.
  - Many firms had to redraft strategic plans, which are usually annual exercises, 5 times in 2 years.
- So, it should be reasonable to examine this issue. The trouble is we simply do not have the market transparency to make any definitive conclusions.
  - This makes the issue hotly contested, and to both sides the answer is obvious.

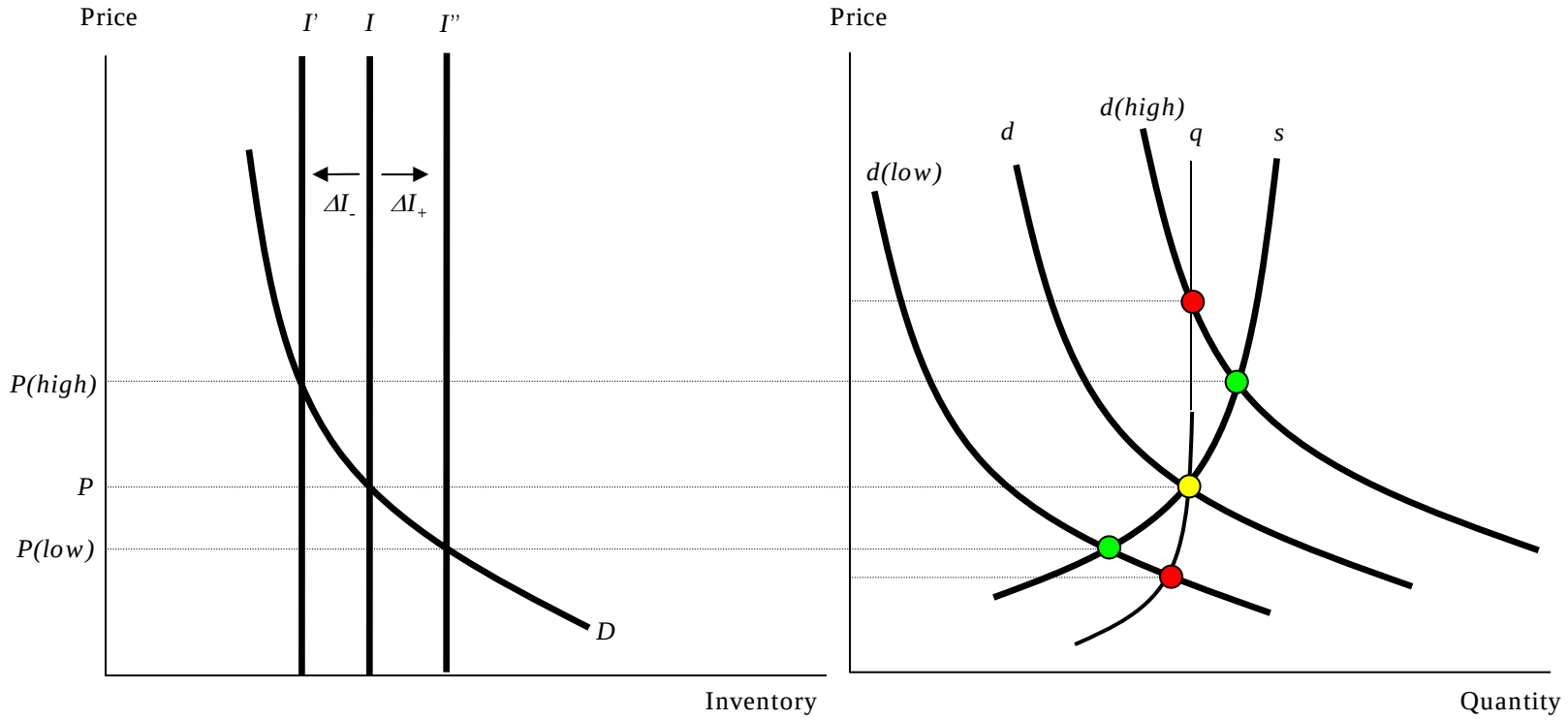
More on Speculation (cont.)

- Another dangerous misconception is that "excessive speculation is creating a bubble so vast that it has become the sole driver of oil prices."
  - This refers to the lunatic fringes of the argument.
  - A more appropriate argument is that speculation has exacerbated underlying signals in the fundamentals.
- If the story was as simple as "its all because of speculators" then it would be difficult to explain other markets, for example the natural gas market. A variety of issues must be true, which leads us to a perfect storm argument, see "Speculation: A Cause or Symptom" available at http://www.bakerinstitute.org/publications/EF-WWT-Speculation-091808.pdf.
- We need a framework for analysis.

A framework for analysis…

A Stock-Flow Model and Seasonal Demand

- Seasonal demand fluctuation leads to price variability. Variability is dampened with access to inventories.
- A standard application in a market with a storable commodity...

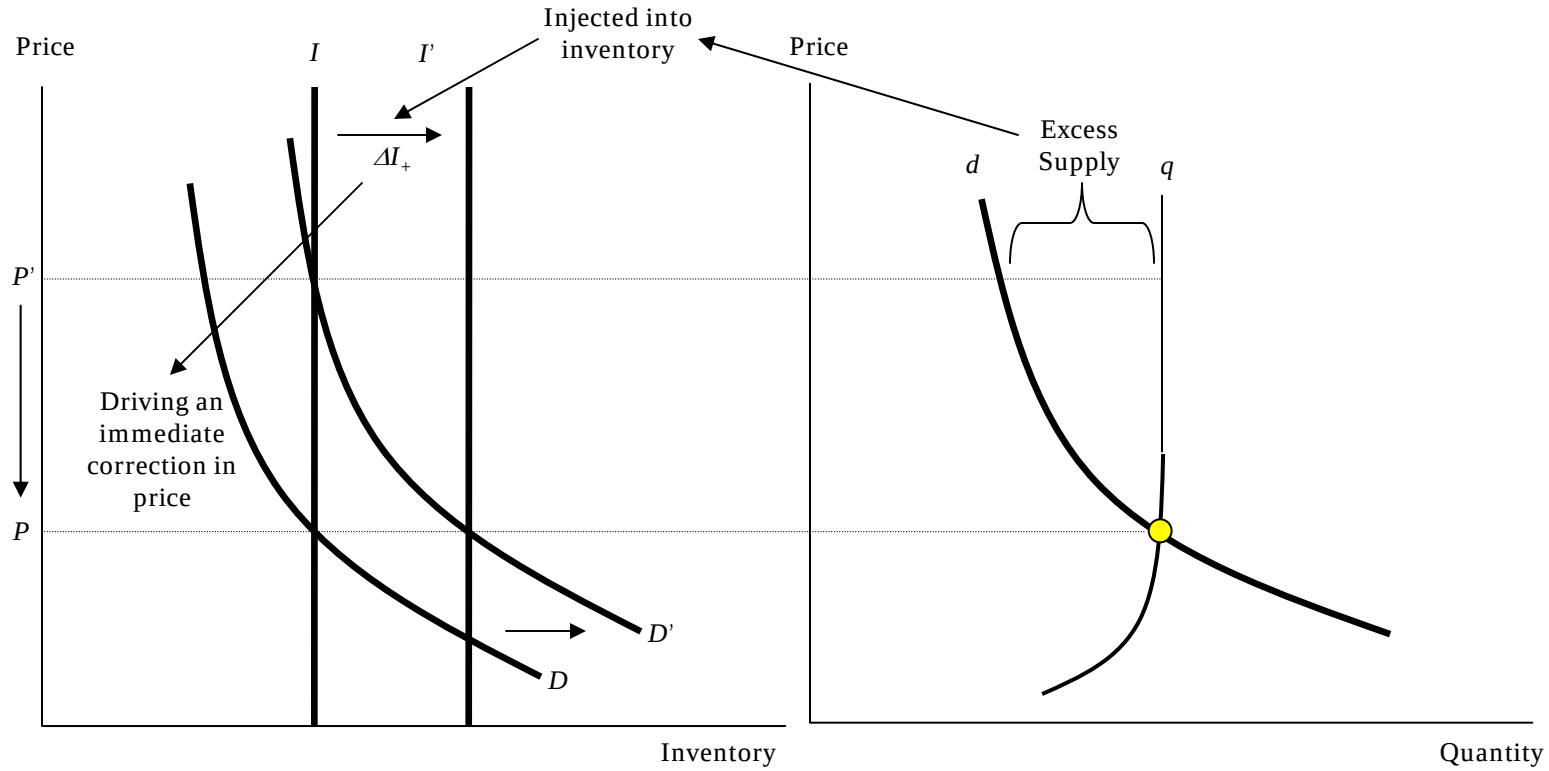


STOCK

FLOW

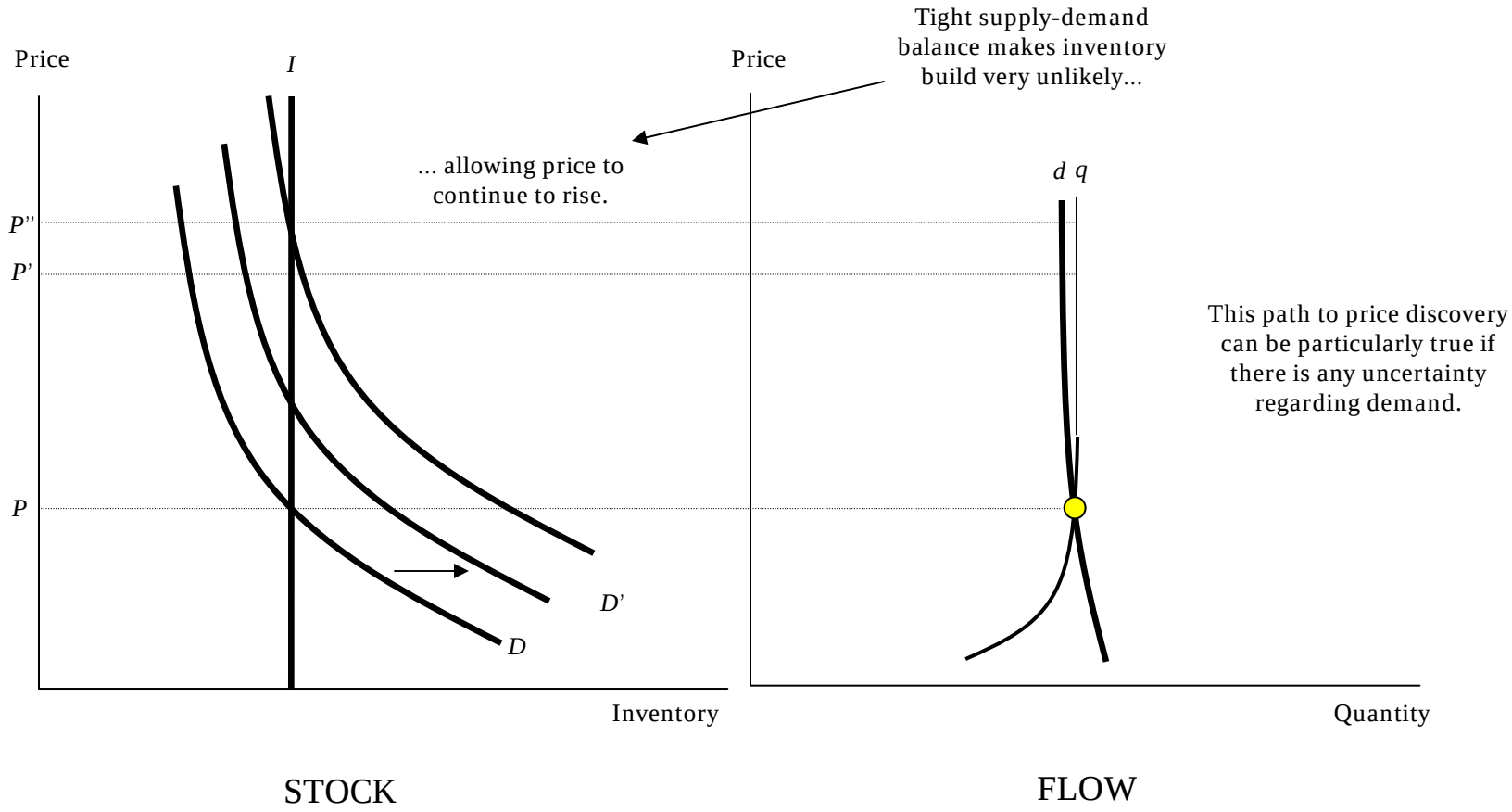
The Stock-Flow Model and Expectations

- Uncertainty about future adequacy of supplies can lead to an outward shift in the demand for inventory (a precautionary motive).
- The perception of scarcity manifests in the forward curve. Steeper contango should encourages storage build, but current price is also affected.



The Stock-Flow Model and Expectations (cont.)

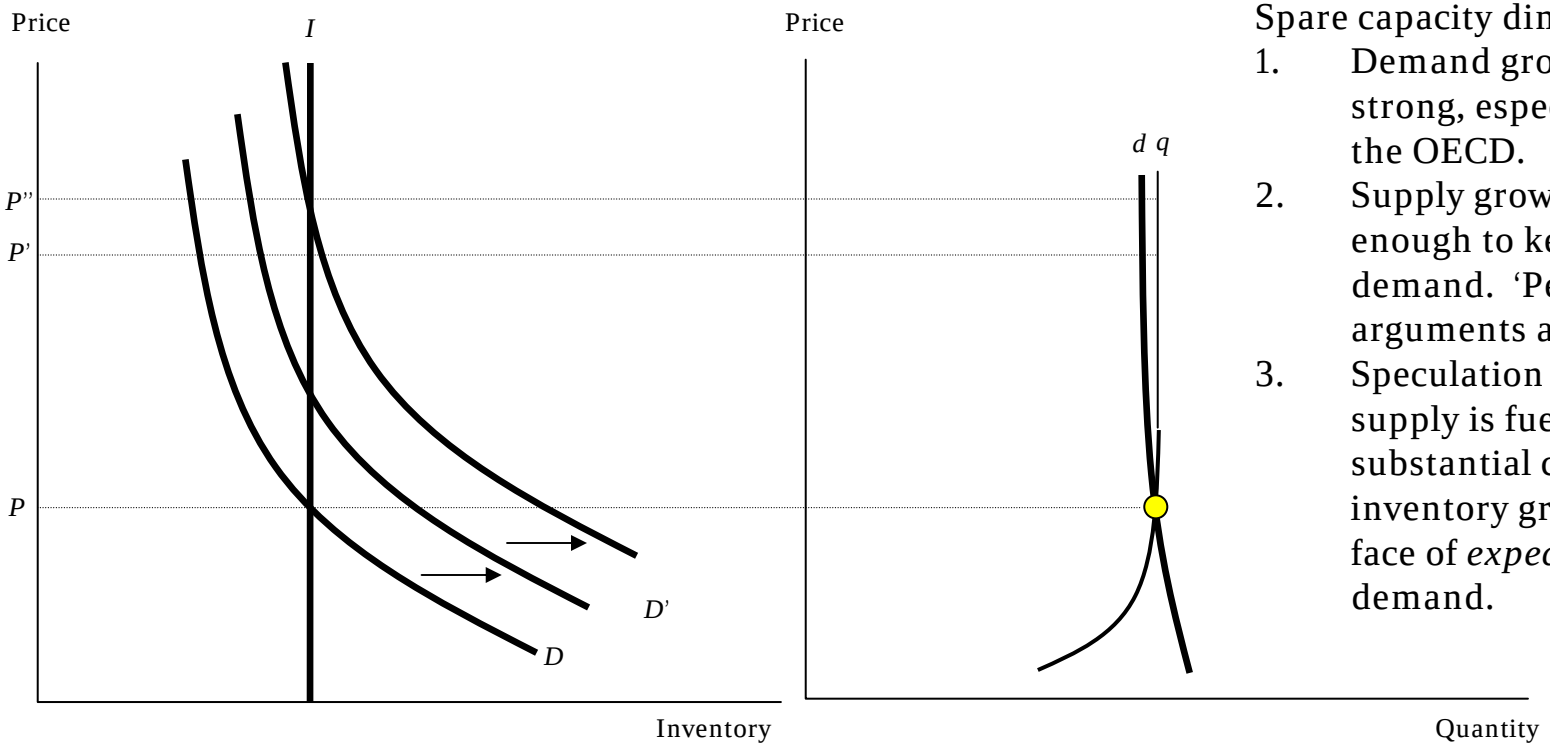
- But both *inelastic demand* and *inelastic supply* leads to an inability to build inventory. This reinforces expectations about inadequacy of future supplies, leading to additional price pressure.



The “Stock-Flow” Model applied to the Crude Oil Market

Price goes up…

- The ability to expand production, peak oil, exchange rates, and uncertainty all play a role here.
- Key point: Market fundamentals are tight, so speculation begins to exert an influence.

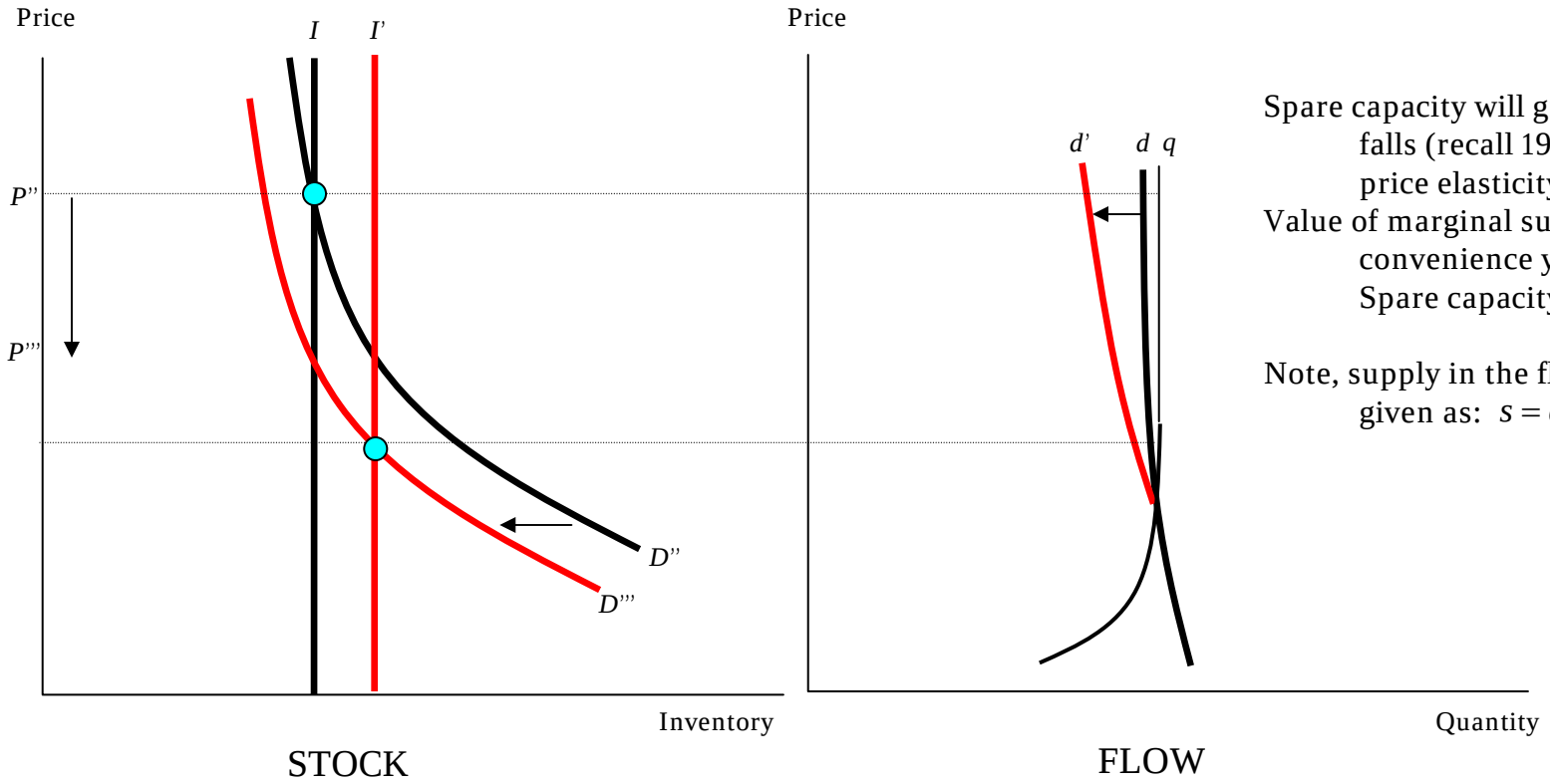


Spare capacity diminishes as:

1. Demand growth is very strong, especially outside the OECD.
2. Supply growth is not enough to keep pace with demand. 'Peak Oil' arguments abound.
3. Speculation about available supply is fueled by a lack of substantial commercial inventory growth in the face of *expected* stronger demand.

Price comes down...

- Degradation of demand and inventory build.
  - In the US alone, oil use from July 2007 to July 2008 declined by over 1.5 million b/d.
  - Olympics end and non-commercial stock (SPR injections suspended) builds end.
  - Global economic crisis and demand *forecast* revisions ⇒ lower expectations.
  - Inventories *did* build... "oil-at-sea" numbers increased.
- OPEC can support price now by holding back capacity.



Spare capacity will grow as demand falls (recall 1998)... SR vs LR price elasticity.

Value of marginal supply declines – a convenience yield argument. Spare capacity is inventory.

Note, supply in the flow market is given as: $s = q + \Delta I$

A final comment

“What’s good for the goose is good for the gander…”

So, what can we say about the divergence of gas and oil?

The Prices of Crude Oil and Natural Gas

- Historically the prices of crude oil products and natural gas tend to move together.
  - 10:1 ratio, 7:1 ratio, BTU parity, no relationship at all...
  - Recently, this ratio has even approached 25:1!
- How can this happen if speculation matters?
  - More elastic supply curves (think shale gas) will tend to force "corrections" faster. This can cause disconnects between markets when substitution opportunities are limited.