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The Financialization of Oil Markets Potential Impacts and Evidence

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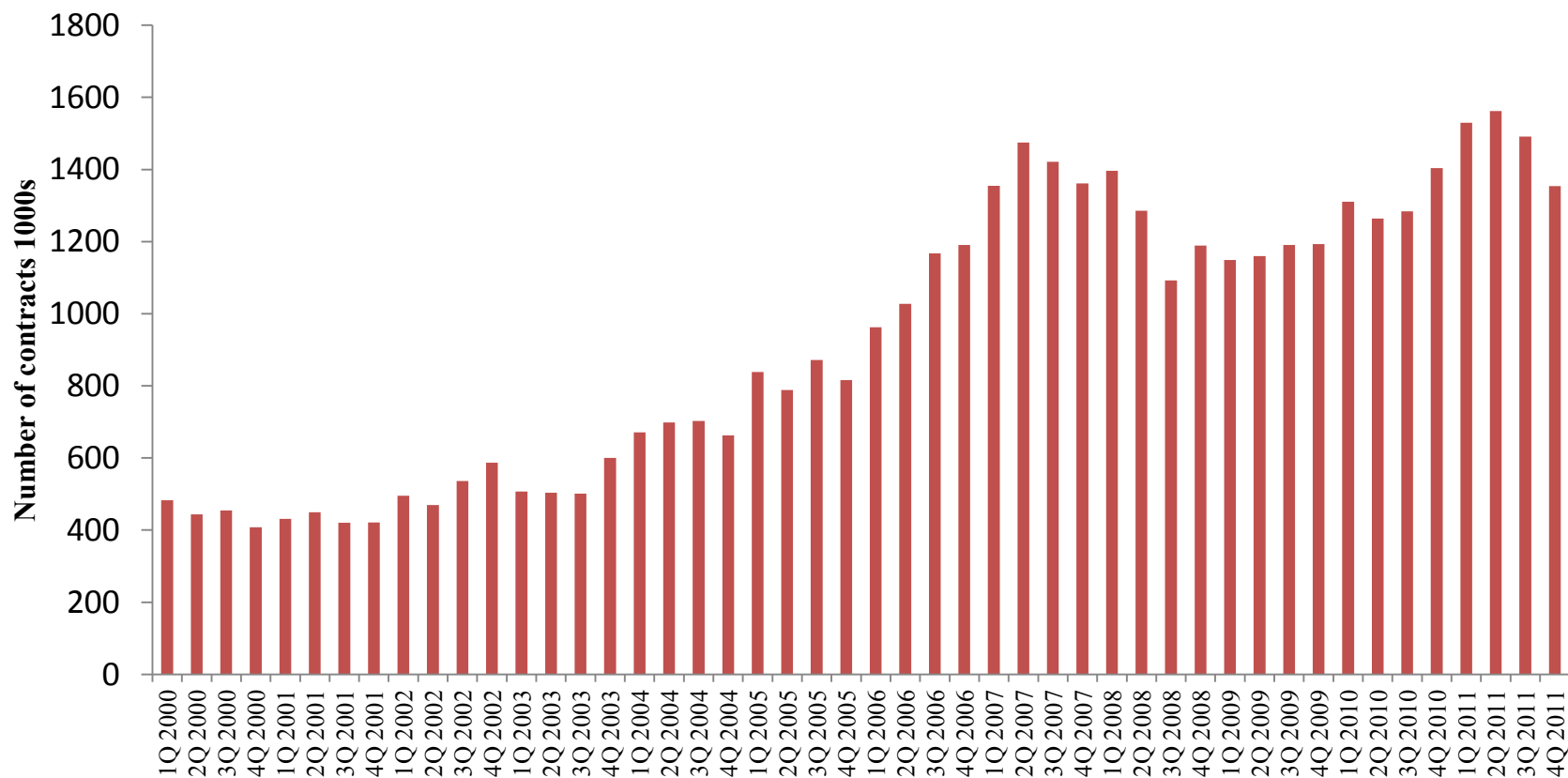
Background

- Sharp oil price cycle during 2002-2008 cycle and more recent oil price behaviour polarised debate about drivers of oil prices
 - Fundamentals and expectations about these fundamentals
 - [Financialization of oil markets](#)
 - [Speculation](#)
 - Manipulation
- [Debate been driving \(in part\) regulatory agenda by G20](#)



Rapid Growth in Open Interest on Crude Oil Futures Exchanges

Average Daily Open Interest in Crude Oil Futures in US Exchange

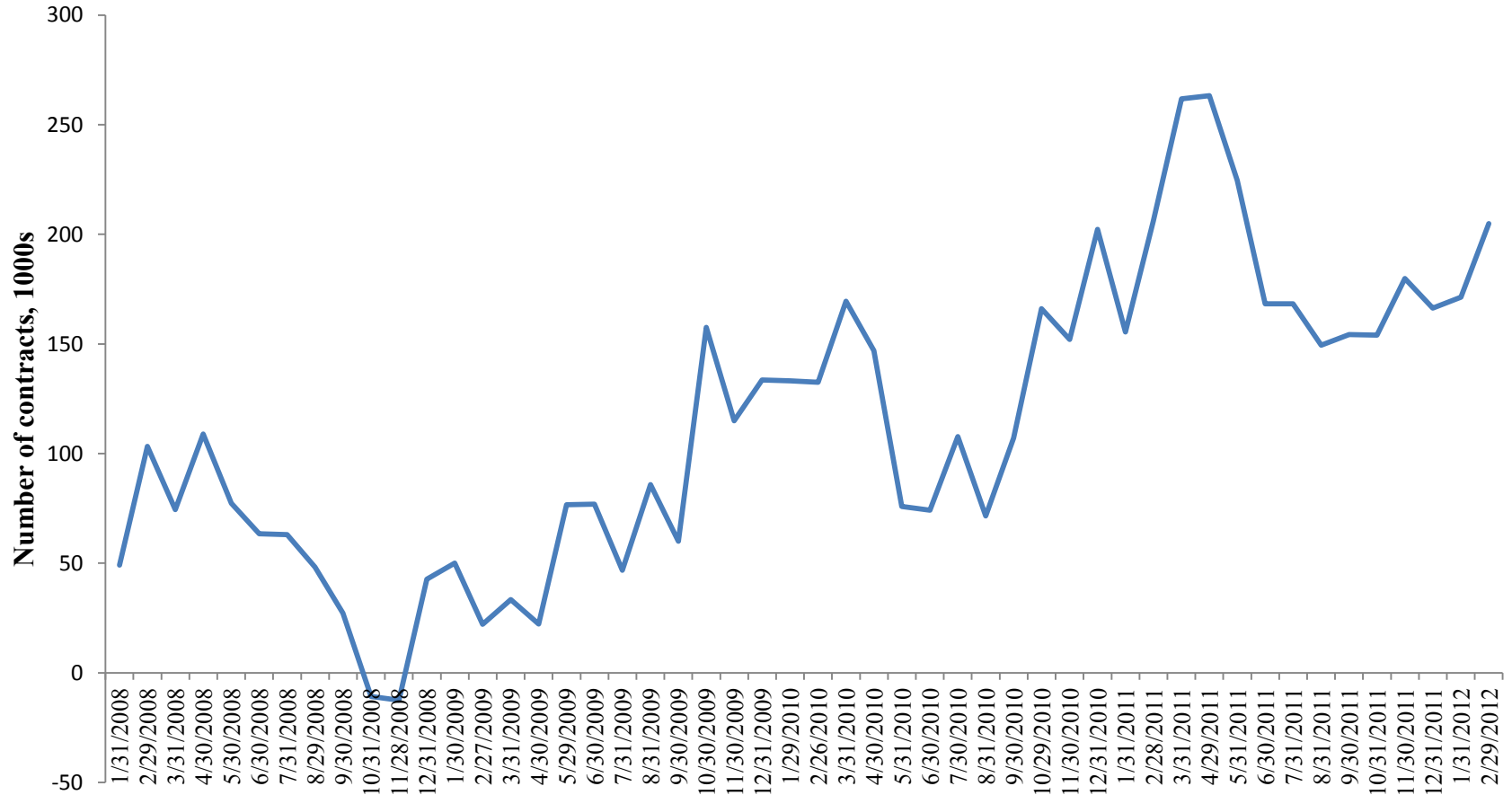


Source: EIA



Money Managers Net Long in U.S. Oil Futures Market

US Exchange Traded Futures Positions by Money Managers



Source: EIA



Structure of Presentation

- Financialization: What it means?
- The potential impacts of ‘financialization’ and speculation on oil markets
- What does the empirical evidence tell us?
- Financialization and social welfare
- Conclusions



1. Financialization

- Captures increasing exposure to commodities by a wide set of market participants such as hedge funds, pension funds, insurance companies and retail investors
- Exposure through variety of instruments: futures, options, exchange traded funds, index funds, and bespoke products
- Financial innovation provided an easy and a cheap way for various participants to gain exposure to commodities
- Motivation: Commodities as an asset class
 - Return enhancement
 - Portfolio diversification
 - Inflation hedge
 - Hedge against weak US dollar
- Increase in financialization often associated with increase in speculative activity but could also mean greater recourse to market insurance



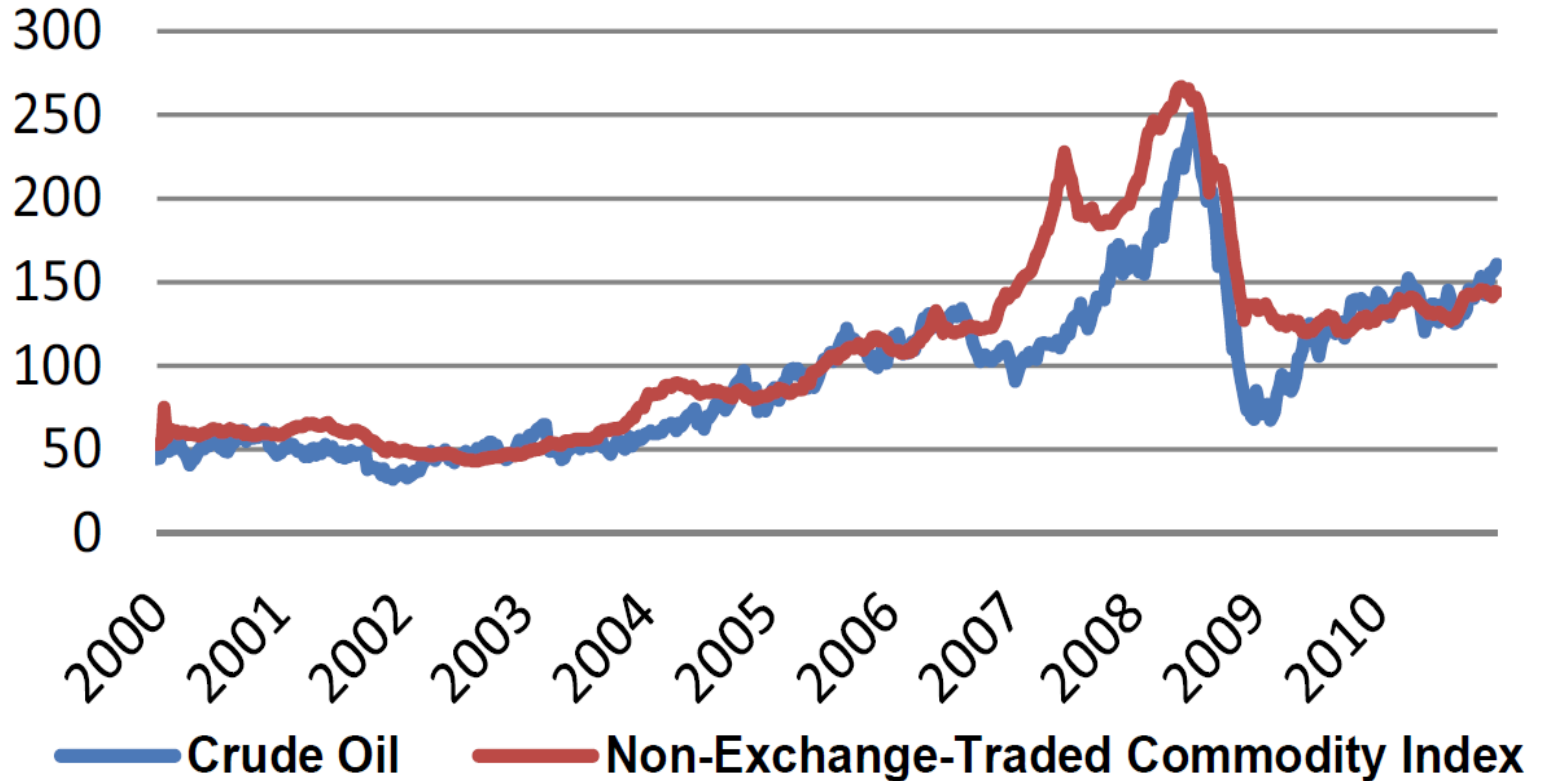
2. The Potential Impacts on Oil Markets

- Several arguments
 - Influence the oil spot price
 - Increased oil price volatility
 - Higher oil price co-movement with financial assets and other energy and non-energy commodities
 - Affect crude oil futures returns
 - Break inventory-oil price relationship
 - Encourage herding behaviour in oil markets with destabilising consequences
- Is the empirical evidence supportive of these effects?



3.1 Price Level Impacts

Figure 1: Price of Non-Exchange Traded Commodities and Price of Crude Oil

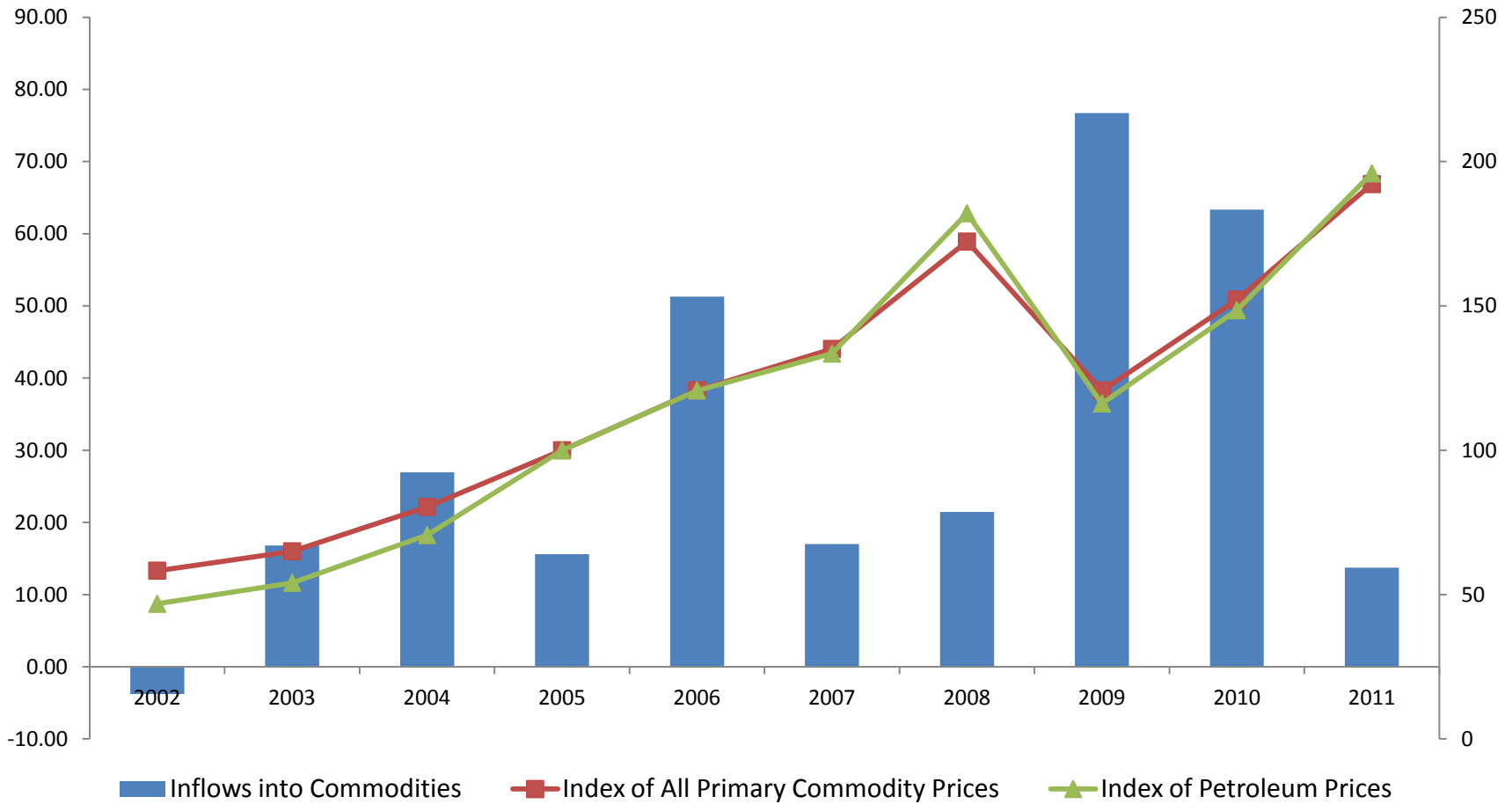


Source: IEA Oil Market Report, March 15, 2011



Investment Inflows into Commodities and Prices

Investment inflows to commodities, (Indices, ETP, MTNs, \$bn) and Commodity Price Indices



Source: Barclays Capital, IMF



‘Financialization’, Market Price of Risk

- Pirrong (2011)
 - Greater financial market integration reduces market price for risk and increases the level of inventories by reducing cost of hedging
 - Induces an increase in the spot price
 - But stabilizing: higher level for inventories reduces the chance of future price spikes
- Acharya et al (2010):
 - Pressure for hedging demand from producers and/or if speculators face capital constraints which limit their ability to take risk results in an increase in cost of hedging and affect optimal inventory decisions
 - Decision to hold/release inventories affects spot prices
 - Find evidence that changes in default risk (proxy for risk aversion) predict futures returns
- Etula (2009):
 - Risk premium depends both on systematic risk and non-marketable risk increasing in level of effective risk aversion
 - Risk-bearing capacity of brokers and dealers
 - Empirical findings: Change in risk bearing capacity of traders predicts quarterly crude oil returns
- Mou (2010)
 - Index funds have to roll their entire positions putting pressure on futures prices
 - Profitability of trading strategies to exploit this anomaly increases in index fund investment and decreases in the amount of arbitrage capital



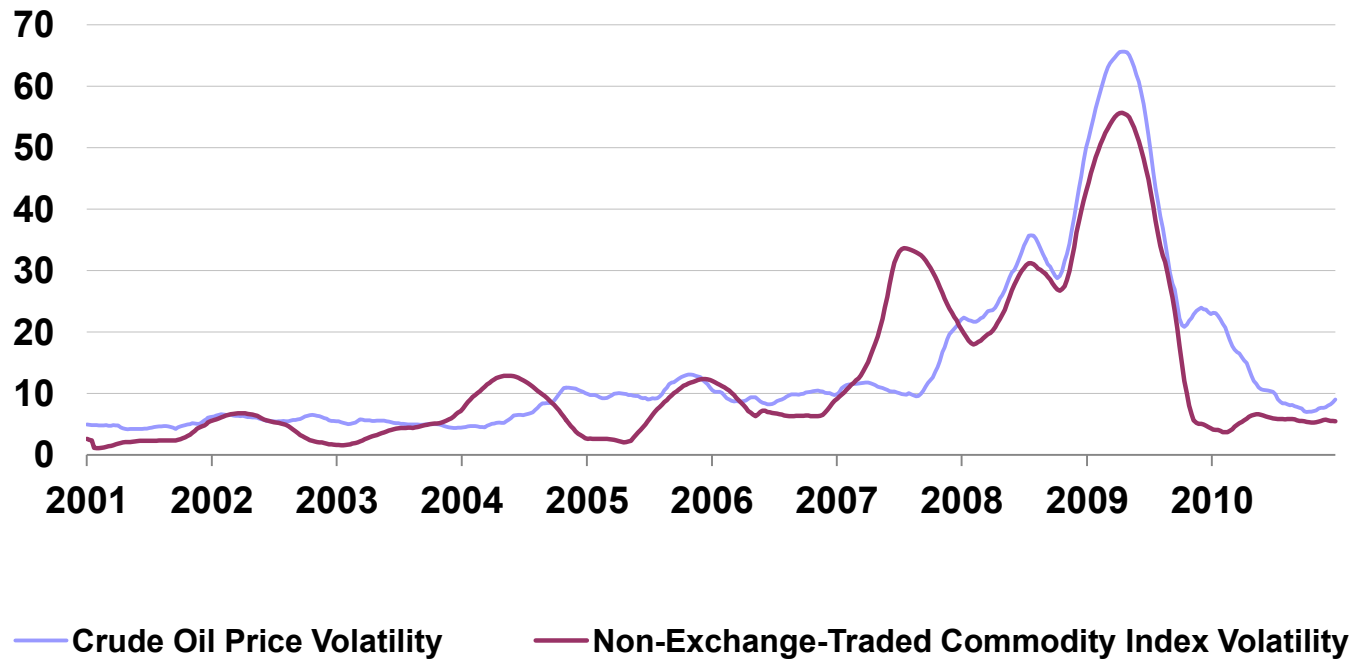
Policy Implications

- Regulatory measures matter:
 - Regulatory measures aimed at increasing cost of hedging or reduce the risk bearing capacity of ‘speculators’ have adverse consequences and should be avoided
 - Etula (2009) concludes: ‘result is central to understanding why restrictions on speculation by market makers may adversely impact the functioning of many derivatives markets’.
 - Some types of regulation are socially beneficial even though they come at a cost: Regulation needed to ensure that oil futures speculation should not involve excessive leverage or opaque instruments
- Many types of regulation: microprudential, market prudential or systemic (issues to be discussed in next session)



3.2 Oil Price Volatility

Price Volatility in Crude Oil and Non-Exchange-Traded Commodities

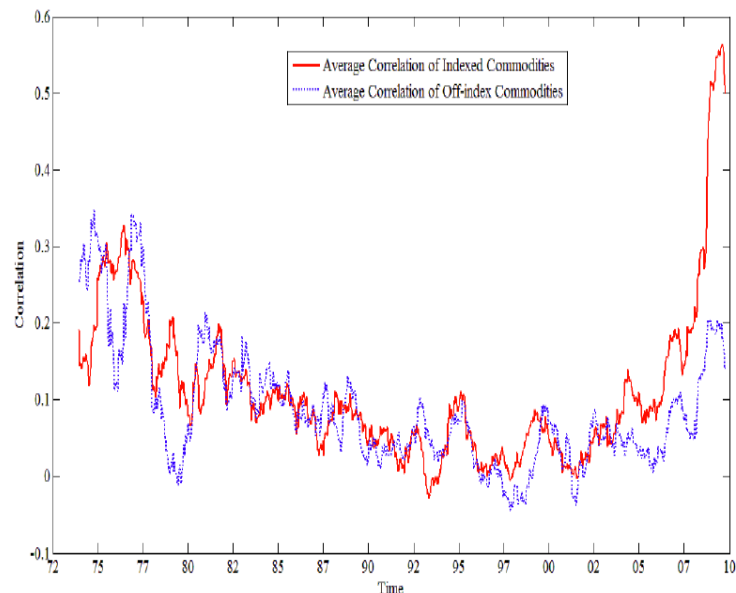
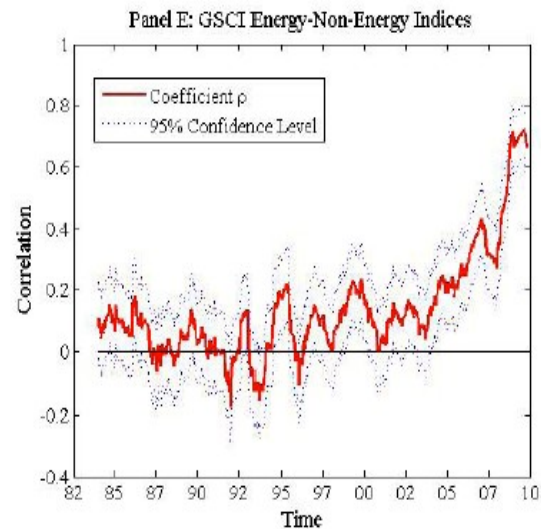


Source: IEA Oil Market Report, March 15, 2011



3.3 Increased Correlation

- Increased price co-movements between equity, bond and commodity returns
- Increased correlation between exchange rates and oil prices
- Increased price co-movements between non-energy and energy commodities' returns
- Correlation between index commodities is higher than those for commodities outside index



Source: Tang and Xiong, 2010

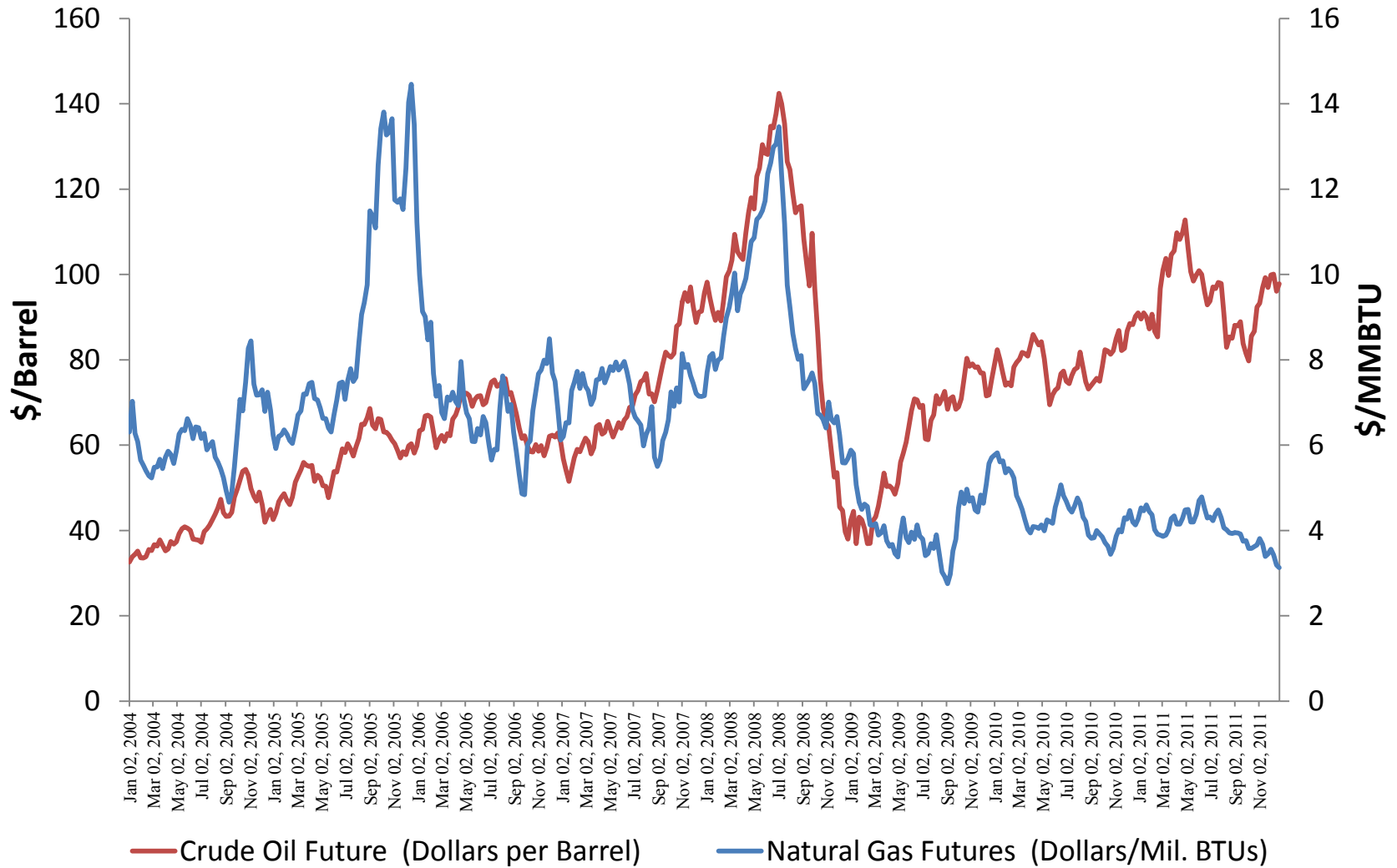


Drawbacks

- Evidence not fully supportive (Stoll and Whaley , 2010)
 - [Price of index commodities don't necessarily move together \(Oil and Gas\)](#)
- Common real macroeconomic shocks driving correlation
- Correlation not stable over time and structural break depends on frequency used (1-day, 1-hour, 5-minute, 10-second, and 1-second frequencies)
- Not clear who is driving these correlations
 - Hedge funds (Büyüksahin and Robe, 2011)
 - High frequency trading activities and algorithm strategies (Bichetti and Maystre, 2012)
 - Index investors (Masters, 2008)
- Why does all this matter? Any welfare consequences?
 - Büyüksahin and Robe (2011): “additional work is needed, if one is to ascertain whether the impact of financialization on cross-correlations represents a welcome improvement in market efficiency or, instead, is a worrisome development”



What about Oil and Gas Prices?



Source: EIA



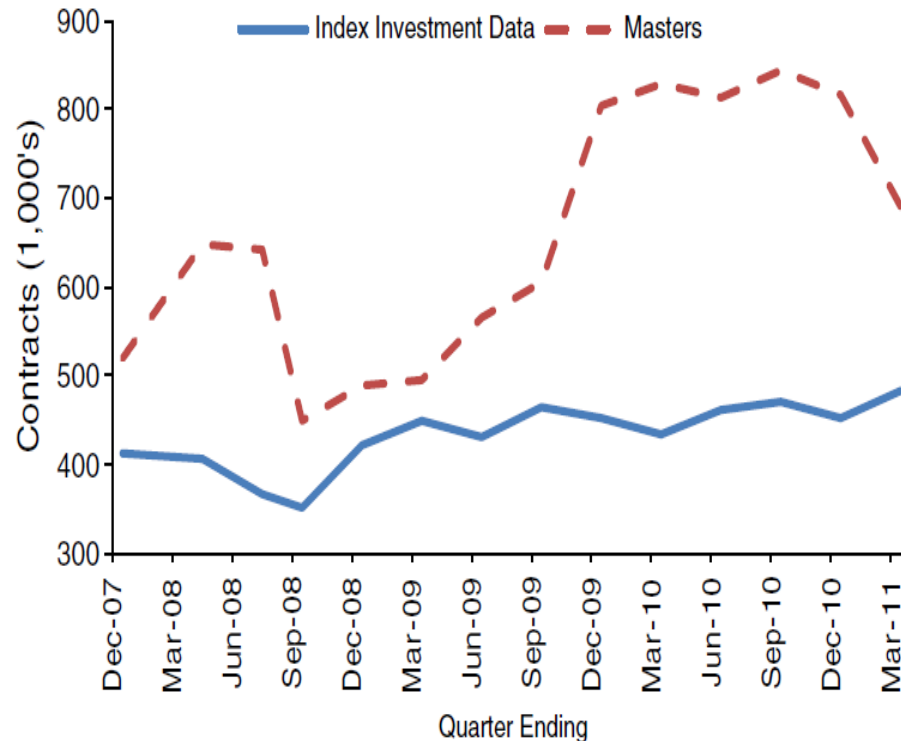
3.4 Predictability of Crude Oil Futures Returns

- Singleton (2011)
 - Empirical Result: Increases in flows into index funds predict higher subsequent futures returns
- But....
 - Based on inaccurate measure of investment flows into index funds
 - Does not imply causation
 - How to interpret such a result?



Index Investment Flows

Comparison of quarterly WTI crude oil net long index positions based on Index Investment Data (IID) and Masters Algorithm Estimates





Source: Irwin and Sanders (2011)

Irwin and Sanders (2011):

- WTI crude oil futures positions using Masters algorithm over-estimated
- Correlation between two series close to zero at quarterly horizon
- Empirical studies that use Masters Algorithm are flawed
- No statistically significant relationship between growth in contracts on one hand and returns, realised volatility and implied volatility on other hand; When relationship found, it is negative



Interpretation of Result

- Even if such an evidence holds it is not necessarily supportive of speculation
- Consistent with existence of frictions that limit participation of non-commercial traders in futures markets (Hirshleifer , 1988; 1989)
- Risk premium depends both on systematic factor and residual risk linked to hedging pressure
- Increased hedging pressures  Increase risk premium
- Increased hedging pressures  Attract more speculative positions and affect futures prices
- De Roon et al (2000):
 - Market producers hedging positions correlated with commodity futures price changes
 - Consistent with evidence of frictions in futures markets



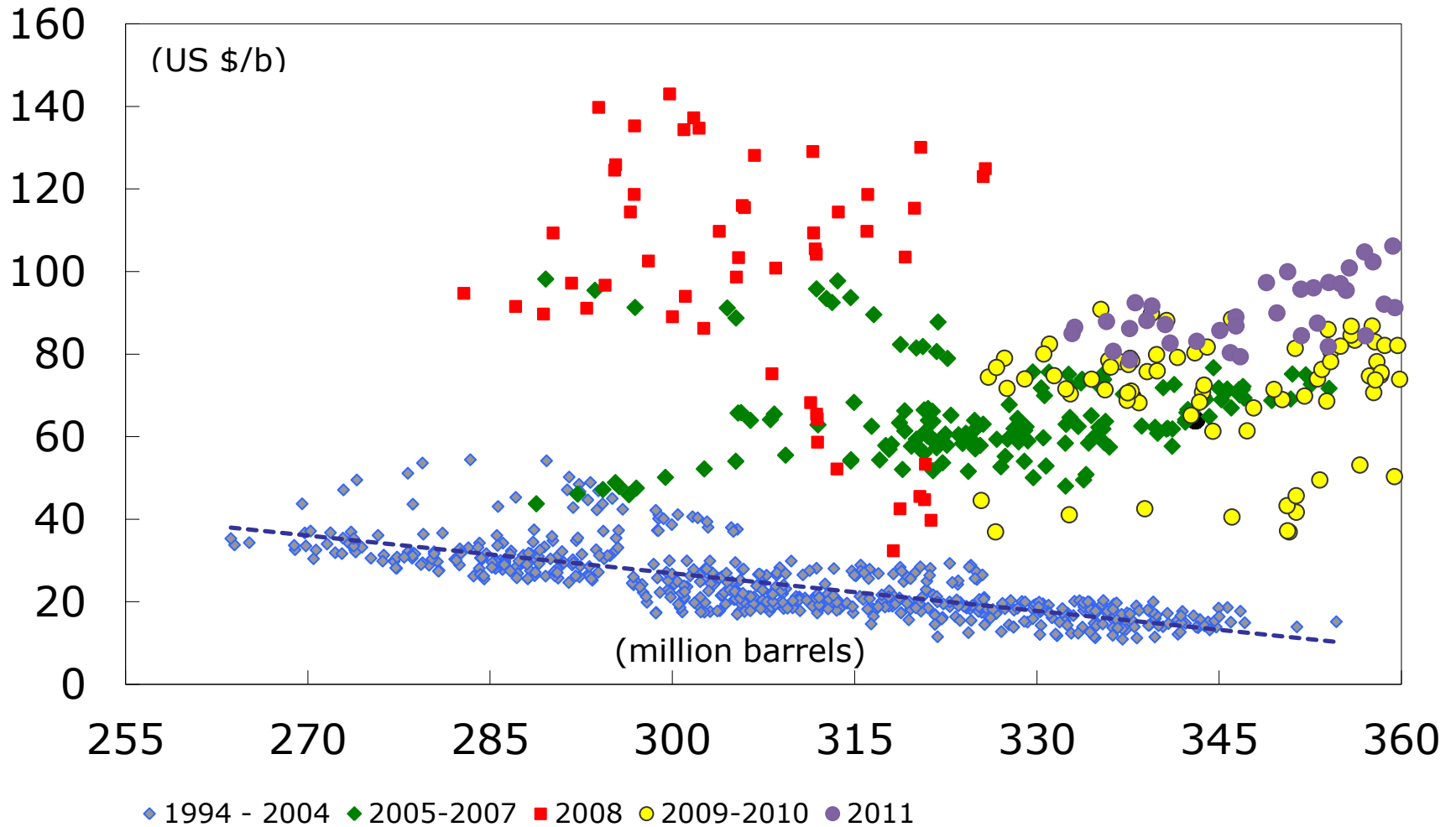
3.5 Herding Behaviour

- Herding often assumed to be detrimental to the market
 - Prices diverge from their fundamental values; lead to mispricing; impedes hedging; inefficient social outcomes
 - Can be both stabilising or destabilising
- Buyuksahin et al (2009) find evidence of herding in commodities futures
 - Herding in futures markets driven in part by mimicking behaviour and common trading strategies specifically by hedge funds and floor brokers/traders
 - But have stabilising effect on prices
- Evidence has been limited so far to this study: An area in need of further research



3.6 The Inventory-Price Relationship

US Commercial Crude Stocks vs. WTI (1994-2011)

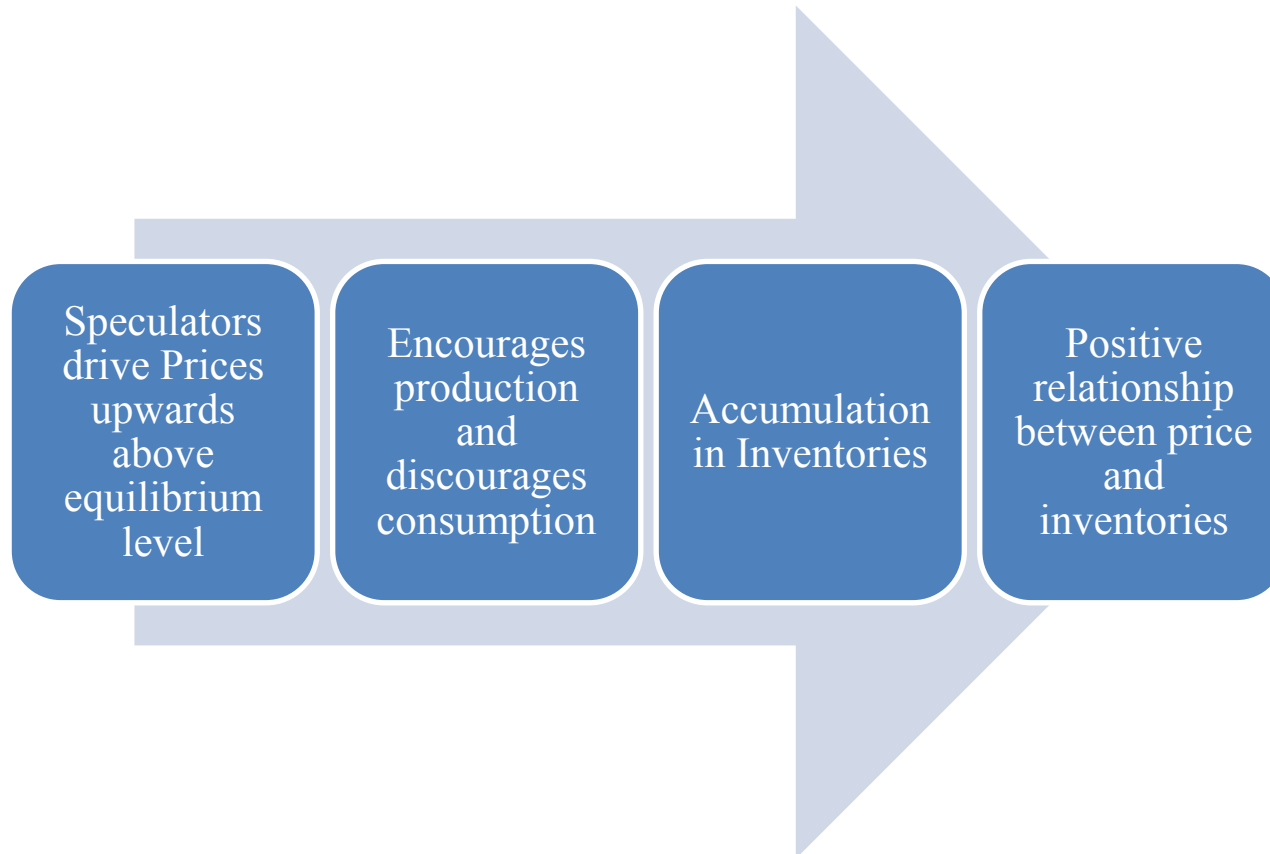


Source: OPEC



Broken Relationship

- Often claimed that relationship broken due to entry of speculators/ index investors
- Underlying static framework



Inventory-Price Relationship Much More Complex

- Relationship between two endogenous problems could be shifting in response to structural changes or changes in expectations
- Pirrong (2008): Commodity storage problem dynamic & should be analysed in dynamic rational expectation model
 - Forward looking agents respond to increase in variance of demand by increasing inventory holdings which requires prices to increase
 - If variance shocks are volatile enough, relationship between inventories and prices becomes unstable
- Dvir and Rogoff (2009):
 - Agents will increase optimal storage in expectation of higher prices in next period
 - Will lead to higher equilibrium price today when storage is positive
 - Impact of growth shock is magnified: increasing demand when it is high in preparation of higher demand in the future
 - Price volatility higher in presence of storage (contrary to the view that storage lean against the wind)
- *“Those searching for evidence of speculative excess need look elsewhere than the price-inventory relation.” (Pirrong, 2008); same conclusion reached by Singleton (2011)*



3.7 Shocks in a VAR Framework

- Distinguish between various types of shocks (Kilian and Murphy, 2010):
 - Oil supply shock; Oil demand shock; Speculative oil demand shock (Shock to demand for inventories as a result of change in expectations); Residual shock
 - Speculative demand shock played a minor role in oil price rise between 2003-2008; Oil price increase caused by shifts in demand driven by global economic expansion
- Juvenal and Patrella (2011) introduce an additional shock but with questionable identifying restrictions:
 - Financial speculative demand shock reflecting traders' activity in financial markets
 - Financial speculation shocks the second most important driver of oil prices after oil demand shocks
 - Also accounts for increased correlation between oil & other commodities
- Lombardi and Van Robyas (2011) introduce a financial speculation shock
 - Identification based on oil futures spread and the oil futures price
 - Find that destabilizing financial activity can have an important impact in the short run but limited in the long run
 - Fundamentals (and expected fundamentals) explain about 90% of oil price movements in the short run
- Comparing sign-restriction across VAR papers very difficult task.



4. Welfare Analysis Needed

- Potential negative consequences of financialization
 - ‘Spill over price volatility from outside to commodities markets and also across commodities’ (Tang and Xiong, 2010)
 - Erode the long-run diversification benefits as systematic risk dominates futures return
 - Prone to bubbles as in financial markets
- Potential positive consequences of financialization
 - More efficient derivatives pricing methods through linking futures prices at different maturities (Buyuksahin et al, 2008)
 - Helped physical crude oil markets become more integrated by reducing transaction costs and facilitate arbitrage across geographically distant markets and across crude oil of different quality (Fattouh, 2010)
 - Reduce the market price of risk with stabilising effect on the oil price (Pirrong, 2011)
- Need for studies that evaluate social welfare



5. Conclusion: What Have been Learnt So Far?

- Most evidence from VAR analysis suggests that speculation played a limited role in explaining oil price movements during the 2002-2008 oil price cycle; oil demand shocks (current and expected) can account for the oil price rise
- Price co-movement analysis adds little to our understanding of drivers of oil prices
 - What drives this co-movement?
 - Why does it matter?
- Evidence of predictability of crude oil returns based on traders' position is mixed at best and is consistent with other explanations based on market frictions
- The inventory-price relationship should not be used to analyze impact of speculation



Does not imply that entry of financial players has had no impact on oil price formation

- Change in risk aversion of financial players can have an impact on the spot price
- Changes in risk premia (Hamilton and Wu, 2011)
 - Significant changes as financial investors (index funds) have become natural counterparts to hedgers
 - Risk premia declined post 2005 and become more volatile (even negative in many instances like in 2009)
- Change in term structure of commodity futures markets (Mou, 2010)
- Increase in herding activity
- Increased correlation across various maturities but different explanations
 - Buyuksahin et al (2008): More efficient pricing methods
 - Fattouh and Scaramozzino (2011): Shift in the probability distribution of the mean reversion parameter due to change in expectations
- What remains unclear is the social welfare consequences of these changes



Financial Players and Expectations

- How does the entry of financial players affect the formation of expectations?
- Beauty contest games can arise in difference of opinion framework and heterogeneity of traders (Singleton, 2011; Allen, Morison and Shin, 2006)
 - Market participants form expectations not only in terms of expected fundamentals but also on basis of anticipations of other players' expectations
- Impact of public information or signals amplified even if do not necessarily reflect large changes in underlying fundamentals
 - Can affect my guess about other players' guesses
- Market participants tend to focus only on few signals while ignoring others as not possible to coordinate on a large number of signals
 - Inventories, weak dollar, shortages of supply, peak oil
- To what extent these features play out in commodities markets is yet not clear and is need of further research

