Notes from Financial and Physical Oil Market Linkages
August 24, 2011

Session 1: 9:30 a.m. – 11:00 a.m.
Paper Title: Does 'Paper Oil' Matter?
Presenter: Michel Robe, American University
Discussant: James Smith, Southern Methodist University

Paper Abstract

We construct a uniquely detailed, comprehensive dataset of trader positions in U.S. energy futures markets. We find considerable changes in the make-up of the open interest between 2000 and 2010 and show that these changes impact asset pricing. Specifically, dynamic conditional correlations between the rates of return on investable energy and stock market indices increase significantly amid greater activity by speculators in general and hedge funds in particular (especially funds active in both equity and energy markets). The impact of hedge fund activity is markedly lower in periods of financial market stress. Our results support the notion that the composition of trading activity in futures markets helps explain an important aspect of the distribution of energy returns, and have ramifications in the debate on the financialization of energy markets.

Presenter's Remarks

- We see more investment in commodity futures, most of which is from inflows not appreciation, what does this mean for cross market (energy/equity) linkages?
- Within the last decade, commodity assets under management (AUM) have seen more than $350 billion of inflows.
- In the past two decades, the strength of co-movements between equities and commodities has substantially fluctuated; what, and who might be causing this?
- This co-movement rapidly increased during the crash in 2008 and the subsequent market recovery in 2009. Does financial stress increase correlation of trader activity, how does stress affect joint return distributions?
- For empirical evaluation, all trader position data comes from the large trader reporting system (LTRS), which includes end of day positions for all futures and options held by every large individual trader, over 300 contracts for crude oil.
- Analysis of the data shows the importance of financial traders and the difference between groups in the near and far ends of the contract curve.
- Overall speculation and excess speculation, calculated using Working's T-statistic, commodity index trading, hedge funds and cross-market trading have all increased during the last decade.
- There has been increased trading by those who take positions in both energy and equity markets, often these are hedge funds that trade both energy and equity futures. These funds are commonly levered, enter and exit both markets more frequently and can trade across markets to exploit mispricing.

- Analysis of both energy and equity markets, and trader activity across both markets, shows that fundamental factors do matter; however, financial stress matters (times of stress increase cross-market relationships) and hedge fund positions can help explain further correlation changes in the market. Additionally, the impact of hedge fund activity on correlations is reduced during periods of elevated financial market stress.

Discussant's Remarks

1. Overview of Paper
    a Descriptive account of the extent of "financialization" of energy markets.
    b Inferences regarding impact of financial traders (hedge funds) on return correlations.
    c Unique and very rich data set (but not without limitations)
    d Much to be learned from this analysis, but some important qualifications need to be attached.
    e On balance, the descriptive portion adds as much to our knowledge as the statistical estimations and inferences, and it would be useful to expand the descriptive measures.

2. Why should we care whether "paper barrels matter"?
    a Many folks are convinced that paper barrels affect price levels, although the evidence is weak. (But that is not addressed here).
    b Not clear who should care whether energy and equity returns move together.
        i Are cross correlations good or bad? The answer is not clear.
        ii Contribution would be enhanced if the normative implications of cross correlations were better understood.
        iii Maddala's comment on Griliches' philosophy, which was whether the questions being answered were worth asking.

3. Comments on descriptive analysis
    a Data set is mixture of mandatory and voluntary position reporting, with coverage varying between 75% and 95% of total open interest.
        i What accounts for that very large swing?
        ii Is there greater voluntary reporting during certain episodes?
        iii Could the variability in coverage skew the results?
    b Data transparency
        i Although the underlying (aggregated) data are plotted, they are not available. We can see, but we cannot play.
        ii Still looking for an iphone app that will scan and tabulate.
    c Estimating the activity of index traders.
        i Activity of index traders "percolates into energy futures partly through" their interactions with swap dealers.
        ii Market share of index traders are approximated by the market share of swap dealers.
        iii But, activity of OTC commercial hedgers also percolates into energy futures through their interactions with swap dealers.

iv Can we assume, as the authors assert, that the market share of swap dealers is a consistent measure of the market share of index traders?

d Market shares versus absolute positions. Why not provide both?
   i Share of hedge funds might grow even as their absolute participation declines (as when trading by commercial traders declines).
   ii Falling share of commercial traders masks their increasing trading activity during 2000-2008.
   iii Is "market share" the correct metric when specifying the model?
   iv Tables 3B and 3C show the average market share, by type of trader over the interval 2000-2010. They do not, as claimed, show that the share of commercial traders declined over that period. (Although we know from other evidence that their share did in fact decline).

e Cross market trading activity (Table 4)
   i Data shows only the number of various types of cross market traders, not the magnitude or frequency of their trading activity.
   ii How and why does classification of "cross market traders" differ between commodity and equity markets?
   iii What do the last two columns in Table 4 represent?

f Physical market fundamentals
   i Inventories are excluded as regressors because "when changes in nearby energy futures prices mostly reflect physical inventory conditions, they are unlikely to be met by contemporaneous changes in equity valuations." Unless the inventory movements are themselves predicated on changes in macroeconomic expectations.
   ii Why exclude Saudi excess production capacity, but include all others? Many regard Saudi as the one true "swing producer" and almost everybody else as always producing to capacity. (also, the time windows in Figure 3 do not quite match the time intervals described in the text on p. 20)
   iii Why should spare capacity have a positive effect on cross market correlations? (A macro surge would drive up prices of both equities and oil if spare capacity is low: thus, lower spare capacity contributes to the correlation).

g "Excess Speculation" (Working's T-statistic) is a value-laden term that must be used cautiously and with certain qualifications—particularly in the current political and regulatory climate.
   i The concept of speculation that is "not economically necessary" (i.e., excess speculation) is problematic and easily misinterpreted.
   ii According to Working, some volume of what appears as excess speculation may be economically necessary and should be attributed in part to friction (the mis-match in timing and maturity of trading contracts).
   iii If speculators provide additional liquidity to a market, what is the impact on cost of hedging? If the cost of hedging is related to liquidity, is the speculation "excessive" in any meaningful economic sense?
   iv Do we really know, as the authors report on p. 13, that "excess speculation increased substantially during the past decade"?

4. Comments on statistical methods and inference

a Using KPSS test, authors report ability to reject null (stationarity) at 1% level, but not at 5% level! (p. 21). I could not find the test statistics to support this… must be a typo.
b Despite claim on p. 23, SHIP is not significant in Model 1 for the 1990-2000 period (see Table 5, panels a and b).
c Tables 5 and 6 offer confusing (arbitrary) mix & match of model specs. SHIP and Spare are often both significant, but never included in the same model specification. How do they interact?
d Although emphasis is placed on role of short-dated hedge fund trading on cross correlations, it appears from Table 6b that the impact of commercial traders on cross correlations might be equally important.
e Why is SPARE excluded from all Table 7 regressions?
f Too many model permutations… how do we pick and choose? Which model is free of LOV bias? On what basis are individual variables excluded?
g Model identification and endogeneity
    i Pesaran & Shin ARDL (1999) results do not apply to structural systems; i.e., models that involve more than one co-integrating relationship.
    ii Influence of volatility, physical market conditions, etc. on hedge fund activity suggests a second co-integrating relationship. Same for commercial hedging activity, etc.
    iii To identify and consistently estimate parameters in such a system requires the more complicated methods of Pesaran & Shin QMLE (2002).
    iv By analogy, the ARDL method could not be relied on to produce consistent estimates of a demand function. The estimated coefficient showing the impact of PRICE would constitute a weighted average of the demand and supply elasticities. The demand elasticity is not identified in a single equation analysis.
    v Likewise, none of the reported parameter estimates in the present paper can be assumed to be consistent.
    vi An alternative experiment:
        - Plot cross correlation of returns between equities and commodities not traded on futures exchange over the same sample space (use spot price instead of front months futures price).
        - Does the pattern of co-movement in returns persist despite the absence of financial trading?

<u>Round Table Discussion</u>

Participant – To address why we care, a slowdown in aggregate economic activity is important for petroleum markets and equities, and to that extent should see an increase in the dynamic conditional correlation (DCC) between the two. Changed economics translates to changes in price, which translates into opportunities for arbitrage. This volatility and arbitrage opportunity from news is reflected in both futures and equities. It's not the level of economic activity that should be related to DCC but the volatility and what fraction of the variance comes from economic aggregate factors which move the markets together.

Participant – Excessive speculation implies we know the optimal amount of speculation, but we can't/don't know what that level is. Perhaps it is that the optimal level is what we observe in the market, actually – more smart speculation (risk-taking) should be better for taking the other side of trades with hedgers, increasing market liquidity and reducing volatility. Additionally, the question of who is a hedger and who is a speculator is too tied to traditional definitions of physical (hedger) and financial (speculator); Current research including mine suggests that physical producers are also active speculators; there are weaknesses in the current trader category breakdown: the categories are changing and intermixing.

Participant – What does this actually mean for the price formation process? Why use the total return on GSCI as variable of interest, because it doesn't look anything like underlying spot price changes, but at the same time use the total return on equities? Who are the hedge funds that are not in equities but in energy, and vice versa? Perhaps this is not an distinction

Participant – Because all futures positions have to add up to zero, someone is on the opposite side of hedge fund positions, and this is why the activity is being driven by hedge funds or with hedge funds taking opposite position. Increases in correlation might be a function of something else, not just hedge funds, but also perhaps macro activity per Jim's comment. Look at the whole market and not just sections, and associate this with which groups are moving in the same direction of price (transmitters) vs. the opposite direction group (absorbers). Research suggests index and hedge funds on one side and commercial (including swap dealers) on the other side.

Session 2: 11:15 a.m. – 12: 45 p.m.
Paper Title: Investor Flows and the 2008 Boom/bust in Oil Prices
Presenter: Kenneth Singleton (Stanford University)
Discussant: Bahattin Buyuksahin (International Energy Agency)

Paper Abstract

This paper explores the impact of investor flows and financial market conditions on returns in crude-oil futures markets. I begin by arguing that informational frictions and the associated speculative activity may induce prices to drift away from "fundamental" values and show increased volatility. This is followed by a discussion of the interplay between imperfect information about real economic activity, including supply, demand, and inventory accumulation, and speculative activity. Then, I present new evidence that there was an economically and statistically significant effect of investor flows on futures prices, after controlling for returns in US and emerging-economy stock markets, a measure of the balance-sheet flexibility of large financial institutions, open interest, the futures/spot basis, and lagged returns on oil futures. The intermediate-term growth rates of index positions and managed-money spread positions had the largest impacts on futures prices. Moreover, my findings suggest that these effects were through risk or informational channels distinct from changes in convenience yield.

Presenter's Remarks

- In a broad sense, from a traditional finance perspective, the market is a diverse market set of players with different objectives, perspectives and information.
- Speculation plays a central role for all market participants from commercials to swap dealers.
- There is price drift away from values that cannot be accounted for with traditional limits to arbitrage.
- Investor flows are heterogeneous where the typical "dealer" doesn't represent the entire category.
- It takes models and enrichment to account for this heterogeneity and incorporate different views on fundamental economic factors.
- Papers suggest that trading patterns have changed the distribution of price returns and the relationship between futures and spot prices is influenced by a convenience yield.
- Excess returns have two components: a time varying risk premium term and a convenience yield term.
- Once you start recognizing that investors have different views of economic expectations, individuals want to know what other traders think.
- It is optimal to learn from past fundamentals and price histories and it becomes easy to see boom and bust cycles.
- What is the Master's methodology measuring? It has a tremendous amount of predictability as it provides explanatory power for excess returns.

- Some variables in the model are imputed index positions, hedge fund spread trading and average basis.
- Short term Asian equity market returns are negatively correlated, over the longer term they are positively correlated with excess commodity returns.
- Risk premiums in the spot market are affected by hedge fund spread trades and index investor flows using Master's methodology.

Discussant's Remarks

- Oil markets are tight with increasing demand from countries like China and Saudi Arabia. The economic slowdown will affect emerging markets economies more than G7 countries with respect to petroleum product consumption.
- The Libyan supply disruption increased the WTI – Brent spread.
- Not easy to model oil price formation from fundamental factors but these seem to be the main long term price drivers.
- How can we explain the peak in volatility that occurred in 2008 and 2009?
- Is it true that financialization has contributed more volatility to the markets?
- There is no optimal level of speculation in crude oil market.
- There has been an increase in cross-commodity correlation.
- Fundamental signals can be noisy and different participants can interpret these signals differently.

Round Table Discussion

Participant – The paper is only concentrated on excess returns, not volatility. Volatility is interesting and could be based on different investment opinions. I'm intrigued by using the imputed data as a sign of index trading.

Participant – If the claim is that speculation is driving prices up, how are supply and demand still in equilibrium? There ought to be details about how that could be true (production hold off, hoarding of oil).

Participant – Emphasize the same sort of conditions in terms of elasticity, a fixed supply makes price sensitive to small demand movements and leaves open the scope for speculation. The effect of demand on inventory behavior is not understood well and can result in large movement in oil prices. The usual notion of inventory optimization can be reversed in a dynamic model with higher growth along with expectations of rising prices and could be aggravating price and volatility.

Participant – I am sympathetic of the objectives of the paper and thought it was a good start to treating the influx of the index flows as an exogenous variable. What is the significance of risk aversion? Can we use long-term or short-term swap dealer positions as proxy for index investment?

Presenter – We used short-term swap dealer positions as a proxy, but we are not sure that is correct.

Participant –How do we interpret your findings? You show index flows can predict returns over the next month or so, but I would expect the direct impact of supply and demand changes on prices to occur without much of a lag at all – certainly not to take a month. An alternative interpretation of your findings is that investors in the index funds are able to anticipate future market returns, not that they cause them. How would you discuss the timing issue?

Presenter – There are challenges and we need more granular data. I used the shipping index because it has been used in other literature and I controlled for economic growth by using equity markets. It is fair to say that the index investors were not passive as they moved in and out in a large percentage way. This was not because of price falling but rather position changes. How do we translate these correlations into a model of price drift?

Participant – Interesting to see how the swap dealer time series fits in the model. I'm intrigued by the predictive power. Can we use other commodity markets in this format to see what commodities are global and which ones are more localized?

Participant – I want to add to what previous participant said. There are two ways to think about this; a representative consumer model with zero net demand and supply and a more realistic view of information and risk aversion to understand heterogeneity. How do we reconcile with the bigger picture of end use consumption of the commodity? What happens in the zero supply market and what are the right terms to build the model with? Is the predictability there because they have information or because of their beliefs?

Presenter – I used 13 weeks because hedge funds have a 13 week investment horizon based on previous trading information, but I will work on that to tease out trends.

Participant – What are the descriptive statistics on the index investor category?

Presenter – There are plusses and minuses for using different index investor data numbers. Non-exchange traded commodity funds index has a big advantage in that it is a more pure measure and won't have the recursive effect of oil.

Participant – Maybe learning models from other commodity markets are affecting the price of non-traded commodities. There could still be associations because of the lack of information.

Participant – Yes, there could be spillover but then how do we model speculation? What is the effect of the risk aversion on spot prices? What are the implications on one market versus the other?

Presenter – Futures offer predictive power on other variables. Changes in demand for petroleum products seem to be a better indicator of futures economic activity than most other data. Could it be a leading economic indicator? Has anybody put margin requirements into these models? Do exchange margins requirements make a difference on price returns when there is volatility?

Session 3: 2:00 p.m. – 3:30 p.m.
Paper Title: Do financial investors destabilize oil prices?
Presenter: Marco Lombardi (European Central Bank)
Discussant: James Hamilton (University of California, San Diego)

Paper Abstract

In this paper, we assess whether and to what extent financial activity in the oil futures markets has contributed to destabilized oil prices in recent years. We define a destabilizing financial shock as a shift in oil prices that is not related to current and expected fundamentals, and thereby distorts efficient pricing in the oil market. Using a structural vector auto regression (VAR) model identified with sign restrictions, we disentangle this non-fundamental financial shock from fundamental shocks to oil supply and demand to determine their relative importance. We find that financial investors in the futures market can destabilize oil spot prices, although only in the short run. Moreover, financial activity appears to have exacerbated the volatility in the oil market over the past decade, particularly in 2007-2008. However, shocks to oil demand and supply remain the main drivers of oil price swings.

Presenter's Remarks

- This paper investigates whether the oil price spike was due to current and expected fundamentals or whether there were financial factors behind it?
- Did financial activity drive up the price of oil? Do we need stricter regulations on trading in the oil futures market?
- Thus, there are three policy relevant questions; 1) has financialization distorted the pricing mechanism in futures markets?; 2) does this transmit to spot prices?; and 3) if so, should commodity futures markets be more regulated?
- Findings on the impact of index funds investment to the oil price are mixed and not clear. Is it due to a data issue? Overall issue suffers from a data problem with high barriers to reliable useful data.
- What happens if financial activity moves the oil price away from the no arbitrage price? It can happen when traders move the price based not on fundamentals.
- Index funds could push the price up in this manner because they receive money that must be allocated to the commodities forming the index.
- The contribution of this paper is following: 1) we evaluate the importance of financial activity in determining the spot price without explicitly using positions data; 2) we focus on shock to the futures market not linked to fundamentals, i.e., deviation from the no-arbitrage condition; and 3) we use a structural vector autoregression (VAR) model with sign restrictions for a fundamental oil supply and demand-side shock, a precautionary demand shock, and a non-fundamental financial activity shock.
- Financial activity can significantly destabilize spot prices in the short run, but relevance of destabilizing financial activity is limited.

- Oil fundamentals (supplies, demands, inventories) still explain about 90% of oil spot price movements.
- Further regulating futures markets may reduce liquidity and risk-absorbing capacity in the oil futures market.

Discussant's Remarks

- This paper is interesting and looks at the response of the futures price and spot price to different types of shocks.
- Suppose the spot price is less than the futures price with the assumption of risk free profit opportunity for anyone that could store oil. The futures price must be equal to the spot price.
- Now suppose people who play in the financial markets are risk neutral. The futures price should equal the expected value of the spot price. This implies that the spot price is higher than the futures price and the inventory should be zero. It never happens in practice because inventories are necessary for the physical product and production system.
- I prefer to think of speculation as difference between futures price and rational spot price; not a separate variable like convenience yield. Convenience yield is very dependent on the level of inventories.
- Suppose there is a temporary tight supply condition and the market has to reduce current consumption. Social planner wants to lower futures consumption too by using inventories to buffer.
- Suppose speculative investors bid up futures price. The social planner does nothing and there is a competitive response.
- The problem is that a change in the expectation of future demand yields the same result as speculation pushing up the futures price.
- Destabilizing shocks might have had an effect but it doesn't explain the big stuff, the large price movements. 2008 seems to be a period of tight supply and the 2011 inventory picture seems to be different.
- This paper gives useful tools for classifying oil events but there is a fundamental limitation of "are we smarter than the speculators and can we identify that?"

Round Table Discussion

Participant – I'm thinking about looking at hedging pressure. The slope of the futures curve could have been due to the strong desire to hedge but then in mid-2000 the net hedging demand could be positive.

Presenter – It may not possible to exploit the arbitrage opportunities just using inventories, this is why yield is also a function of expected supply and demand. I will acknowledge that the assumption that the convenience yield is changing more to market tightness is key but I'm skeptical whether inventories can respond immediately.

Participant – I like thinking about how the futures and spot prices evolve over time in response to shocks. It is important that the storage cost piece can be a big factor as contango can happen over a long period of time if there is a large storage capacity constraint. There are very different distributions of spreads across commodities such as natural gas where storage is difficult. How could these methods apply to other commodities?

Participant – I interpret the spread as that the speculator's cost of capital is an important factor. I see the initial contango in 2008 on other commodities due to banks balance sheet risks and cost of capital.

Presenter – That's why the risk-free rate appears in the model.

Participant – I recommend using the net convenience yield when describing arbitrage shocks. In your model, the convenience yield is taking on a large part of the model. One cannot assume a functional form (linear) and maybe have to identify storage costs separately which is hard to do. I did not agree with all the static results and this shows how difficult identifying financial shocks can be.

Participant – The troubling aspect is that we would see a symmetric financial effect of speculators. Economic theory predicts that smart speculators (i.e., those who survive), will make money by bearing risk and reducing market volatility, while speculators who exacerbate market volatility (except for manipulators) will lose money on average. Speculators can do more than just destabilize the market but it doesn't seem that your study is set up to identify periods when speculators mitigate volatility.

Participant – It is potentially treacherous to think about how speculators can affect the distribution of prices as a violation of a no arbitrage scenario. An analogous result can come from heterogeneousness of people's behavior which won't be a residual. People could just be doing the best they can with the information they have.

Participant – What appears as a destabilizing shock is identical to a stabilizing shock. If the speculators were causing the price to go up it might be a problem that the market is trying to solve. The market contains all the information but we do get bubbles from time to time. Have you addressed herding or bubble (too bullish or bearish)?

Participant – There is a residual problem, if you take away some of the data you can change the results with different time horizons. At CFTC, we've done some different things with herding and it turned out to be counter cyclical to hedge funds. Hedge fund positions improve the predicting power but we don't know if it's a good model or not.

Participant – There is this large body of literature to back up speculative shocks. There are always these forward looking expectations and if you have expectations in there when the people forming the expectations are looking at more broad variables there is a problem trying to split apart shocks.

Participant – If you start out with a model where a speculator pushes the wrong button, how can the rest of market not outsmart the one missed pushed button? We should be able to outsmart the uninformed.

Participant – Maybe we rely too much on people who spend money on analyzing securities. This is a very tough identification problem.

Participant – Speculation is mostly stabilizing and it is what I would expect to find. In general, this type of (destabilizing) speculation doesn't make you any money. Generally, speculators make more money than hedgers and you cannot make a case for persistently destabilizing markets and still make a profit. Expect more stabilizing speculators than destabilizing.

Participant – In your paper, you document that it takes more than 15 months for the shock to disappear. Is it reasonable?

Participant – There is a combination of shocks. It can be offset by other shocks but doesn't mean the impulse response reaction is wrong.

Participant – You said that the impact of shock was 12 months out. That is too much time for an impact, which is troubling.

Presenter – The paper is not about speculation; it is about shocks that are not based on fundamentals. Here we are trying to single out things that move away from expectations of fundamentals in the market.

Participant – If they trade on supply and demand and not on prices.

Presenter – I would call that non-fundamental. What we would like to single out is a shock that moves the futures price from a no arbitrage level. It comes from frictions or the uniformed and we would like to keep movement of linked changes to fundamentals. Another point is that how the linkages between futures and spot prices work if the physical market is standard and competitive. The only way futures can impact spot is changes in inventories. We wanted to be more agnostic than this setting that the spot prices are done by agencies which also look at futures market. In reality, there could be more nuances like signals coming from fundamentals or gloomy situations leading to bubbles.

Session 4: 3:45 – 4:45 p.m.
Format: Roundtable Discussion
Moderator: Glen Sweetnam

Moderator: I would like us to address three broad questions:

1. What's the right way to think about the effect of financial markets on oil prices and how can we define/measure the effect?
2. Can we get an estimate of the magnitude of this effect?
3. What other information (information that we don't currently have) would be useful in trying to determine the magnitude of this effect?

Participant – The right way to think of the first question is to break the question into two parts. First, do financial markets affect the mean level of oil prices by causing a secular shift (increase or decrease) in the "fundamental" oil price? Second, do financial markets affect the volatility of oil prices, and if so, do they increase or decrease the volatility of oil prices? Answering the first part of the question, I am not aware of any evidence to suggest a shift in oil prices is due to increases in financial trading. To measure, we should look to see whether inventories change with the prices? Example: do they back up index trading using physical oil, and what are the physical effects?

Moderator – The physical market can be in balance at different prices, so what determines the price? Saudi Arabia produces at a level consistent with customer demand at the expected price level. If prices are high, refiners will demand less and Saudi Arabia will produce less. The physical market will be in equilibrium. If prices are lower, refiners will demand more and Saudi Arabia will produce more. The physical market is again in equilibrium, but at a different price level. Is it possible that financial oil markets determine which these two market states we are in?

Participant – We can think of oil as a good (traded in the marketplace) or as an asset (held in the ground for future production)? These have different effects on prices; how does Saudi Arabia decide how much oil they want as a good, and how much as an asset? They should be in equilibrium simultaneously.

Participant – Do we think the price of oil is up without respect to the fundamentals? Saudi role doesn't help us understand process of setting the financial price.

Moderator – Because of increased demand and supply constraints in world production, Brent and other waterborne oil prices rose late last year and early in 2011; however, WTI did not increase as much as the waterborne crudes because there was excess supply in the Midcontinent. The price differential between Brent and WTI rose from parity all the way up to over $15, where it began to be profitable to transport to the Gulf using nonstandard means (trucks/trains).

Participant – Glen alludes to the idea that financial shocks are not fundamental. Financial fundamentals are seen across equities despite the fact that the stocks aren't related. Perhaps financial shocks are related to macroeconomic fundamentals, such as the discount rate.

Regardless, financial shocks are part of the general market risk. Additional financial concerns could be due to credit shocks, or VAR considerations, bringing about certain types of trading behavior.

Participant – Secular increase in oil prices as a consequence of financialization is one question, but not the only question, but probably the answer is no. Given changes in financial markets, can we now see more temporary drifts away from the price we would have seen without institutional change? What do new types of financial instruments do to the market? The answer is probably yes, but it is hard to verify.

Participant – After Libya, light sweet oil for Euro refineries was gone and Saudi produced a substitute for Libyan oil. However, the price tag on that oil was so high that they couldn't sell it. The Saudis also couldn't sell because European refineries were in maintenance months so demand was low. After that initial shock, Saudi reduced the supply because of lack of interest. With respect to speculators, their impacts (financial and physical markets players) are now almost the same, and you can't just separate them, e.g., some traders put oil into storage and we can use an economic model to say whether they are affecting the price, but CFTC data doesn't bear that out.

Participant – Saudi blend was also unknown so refiners didn't want it due to possible affects on refining equipment. To analyze the effects, we can look at inventory behavior and how it reflects financial markets activity. Decision of swing producer should be counted as inventory (shut-in production); inventory under the ground is similar to inventory above ground.

Participant – We need better emerging market inventory data. Saudis don't have super light sweet (Libyan) spare capacity so the price went up, demand went down and Saudi production fell due to lack of buyers. So can higher prices mean lower production?

Participant – We have poor information from Saudis and Chinese, and we need to get better data from them to improve our storage models. They argue that since the financial players are setting the price, physical data from them would be no help. We don't have the smoking gun for who is manipulating the market – regardless of the answer the question must be framed appropriately, it's impossible to say what the speculative premium is, e.g., dollar per bbl.

Participant – Market manipulation is not the right question. There is not a daily price pressure phenomenon, but we can see a phenomenon where equilibrium prices are drifting but we aren't finding a particular group that is moving the price through trading activity.

Participant – The best we might be able to do is gain a consensus amongst people who have done papers on the subject, if there is one.

Participant – One piece of data which would be very useful is marginal storage costs. These would allow for getting a better handle on convenience yield, and other inventory activity.

Participant – One fact is that as the years go by, we have less and less physical data available. Because more and more of the world's consumptions come from the emerging world, where there is delayed, or non-existent, data. The picture is becoming less clear.

Participant – The IEA, along with the IEF and their JODI project, is trying to get data from these countries which have been more opaque. The magnitude of price volatility depends on the level of market uncertainty. This has risen given the increased importance of the emerging economies in the oil market.