

Crude oil futures markets:
Does NYMEX trade and the decoupling of WTI and Brent affect ICE trade?

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Introduction

This paper examines the relations between the crude-oil futures trading activities on the New York Mercantile Exchange (NYMEX) (now part of the Chicago Mercantile Exchange (CME) Group) and the Intercontinental Exchange (ICE; of London) exchanges, placed in the context of the apparent de-linking of WTI and Brent. The paper analyses the evolution of crude oil hedgers' activities in the NYMEX- and ICE-traded derivatives and the relations with crude oil prices and speculators' activities. Derivatives traders are classified according to Commodity Futures Trading Commission (CFTC) categories. The paper analyses the activities of NYMEX crude oil traders according to their open interest positions as reported in both the Legacy Commitment of Trader (LCOT) reports and the new Disaggregated COT (DCOT); the inaugural DCOT report was published on September 4, 2009, with observations dating back to 13 June, 2006. The ICE has recently begun to report large trader commitment of trader information comparable to the DCOT for its Brent crude oil, dating from 4 January 2011.

The results of the analysis of traders' roles then informs the analysis of NYMEX and ICE trading volume and open interest activity to determine whether or not the apparent infrastructure-driven, structural change in the WTI-Brent price relations affected the trading patterns on either exchange and between the exchanges.

The motivation for this paper is to extend the literature analysing the relations between derivatives market traders and prices and to extend the understanding of the relations among the traders. A secondary motivation is to enhance the understanding of what the available data on trader activity may be able to reveal about these activities, and to some extent to identify the limitations and what they cannot say.

To accomplish these aims, the paper analyses the past ten years of trading activity and focuses on the interaction among all traders, their effect on observed prices, and the relations between the exchanges. However, the ten-year period is primarily for context with the focus on the period just before and following the apparent de-linking of WTI and Brent. It employs observations on prices and trading activity for the NYMEX and ICE crude oil futures contracts. In addition to the CFTC open interest data for large traders on the NYMEX light sweet crude oil contract, the analysis includes futures prices, trading volumes, and open interest, sourced from CRB Data, similar series for ICE Brent sourced from ICE, and ICE's recently established large trader reporting series for ICE Brent. I also use spot prices for WTI and Brent reported by the Energy Information Administration (EIA).

The primary interest of this research is to determine whether or not there have been significant changes in the trading patterns observed for the NYMEX contract following the apparent de-linking of the WTI and Brent prices, which may be attributed to the de-linking. I do not attempt to explain the causes of the de-linking, but rather simply accept the generally accepted view that this is the result of infrastructure constraints associated with pipeline capacity connecting Cushing, Oklahoma to the US Gulf Coast. Figure 1 reports the spot price series for the two crude oils over the past ten years. It is quite clear that there was a

significant change that occurred in the relations between the two series toward the end of 2010. For the purposes of the analyses to follow, I have identified 28 October 2010 as the beginning of this new phase in the relations between the prices.

Figure 1

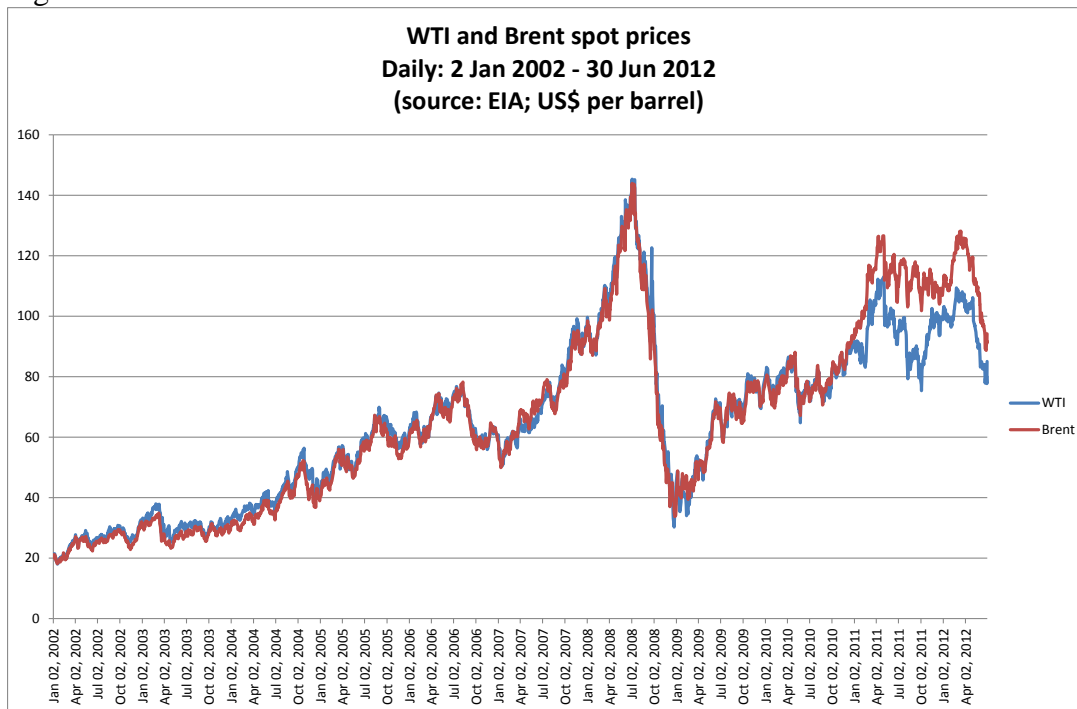
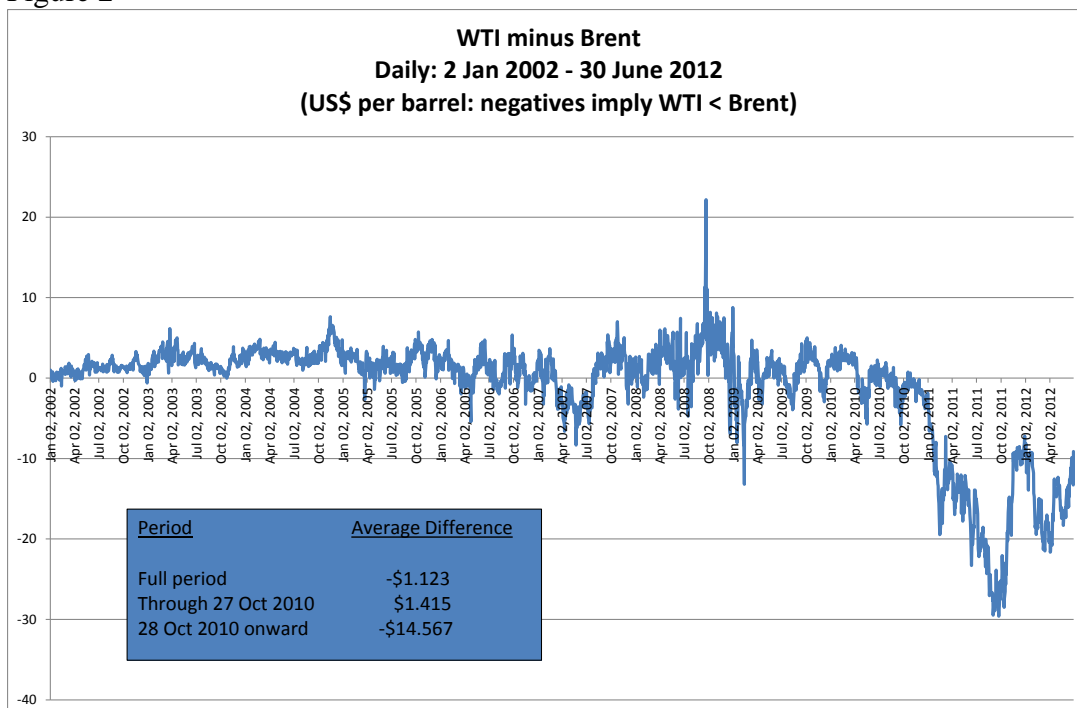


Figure 2



This is because while during the early portion of the ten-year period there were periodic reversals, see Figure 2, with regard to which crude oil garnered a premium (discount) relative to the other, from 28 October 2010 Brent shifted into a persistent premium over WTI, and this premium grew from a dollar or so per barrel to tens-of-dollars, peaking of \$29.59 on 23

September 2011; for context, this compares to a maximum differential in favor of WTI of \$22.18 on 22 September 2008, and this appears to have been an anomalously large premium in WTI's favor over the period. [Note that spot prices are employed here, rather than futures prices, because the differences in trading days between the CME/NYMEX and ICE exchanges makes matching series of futures prices is less complete. Moreover, it is typically the case the observed spot prices very closely mirror the near-month futures on the day.]

The paper continues with a discussion of the data, an analysis of the price relations, analyses of the trader positions, a discussion about excessive trading, and concludes with summary observations.

The data

As noted above, the spot price series are drawn from the EIA online database. These are daily prices, in US dollars per barrel. Additional futures price data are drawn from CRB Data for the NYMEX light sweet contract (frequently referred to as the WTI contract) and for Brent from data acquired from ICE online. In addition to the price series available from the CRB and ICE sources, observations are drawn on trading volume and open interest, with attention paid to both total trading volume and open interest and to near-month observations for each. However, since these trading variables are reported in aggregate, they cannot inform the analyst with respect to the activities of specific trader categories. To facilitate investigations about the activities of trader categories, it is necessary to make use of the CFTC data.

The LCOT classifies large traders as commercial, non-commercial, and non-reporting. Historically, commercial traders have been evaluated as representing hedging interests, while non-commercial traders, and to a lesser extent the non-reporting traders, are typically viewed as representing speculators. The DCOT aims to increase transparency particularly with respect to the non-commercial classification of large reporting traders. The trader categories for the DCOT are: (1) Producer/Merchant/Processor/User, (2) Swaps Dealers, (3) Managed Money, (4) Other Reportables, and (5) non-Reporting. Positions are broken into long, short, and spread trades; where spread trades capture predominantly calendar spreads.

It is worth noting that these trader category data also present limitations that must be understood. These data are released each week and represent the open interest positions at the close of business for each Tuesday. And, while the open interest data is segmented into broad reporting classes for the LCOT and narrower reporting classes for the DCOT, the data are aggregated over all open maturities. That is, the open interest reported is for all open contracts, which for these two contracts currently extend to December 2020 for NYMEX and December 2019 for ICE.

The key limitation is when an analysts wishes to relate these open interest data to price. Since the price that is typically employed is for a near-month contract, there is no real justification for relating this price to the CFTC reported open interest, which comprises all traded contracts, not just the near-month contract. To do so one must make at least implicit assumptions about a stable relation between the near-month contract price and the open interest positions of all open contracts.

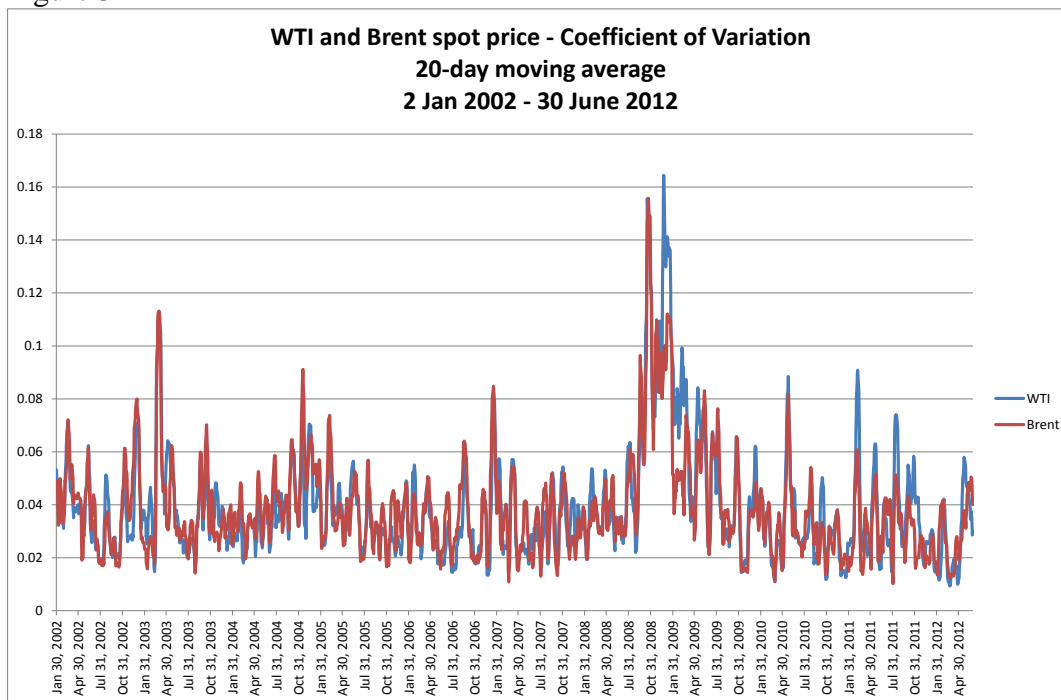
Another limitation is that we do not have observations on trading volume by trader category freely available to the public. The CFTC maintains these data, and they make use of these data, and indeed data for both disaggregated by contract maturity, but these data are not

readily available to the public. And since it does not seem to be widely understood, it must be noted that open interest and trading volume are not linked in an unambiguous one-to-one way, so knowledge about one does not provide any knowledge about the other. Any given trade may result in an increase, a decrease, or no change to open interest depending upon the specifics of the two traders involved, and no such information may be garnered from either the observations on open interest or trading volume. Unlike equities, open interest (those contracts at the end of each day that are still open for trading the next day) is not fixed or stable. Open interest occurs because traders choose to enter the market, one trader being long and the short in the contract. New contracts come into existence when two new-to-the-market traders with opposite positions come to the market. Just before a contract begins to trade open interest is zero and just after a contract reaches maturity and trading ceases open interest returns to zero. Between these two dates open interest will rise and fall based on market interest in the underlying commodity.

Price relations

Figures 1 and 2 give a preliminary view of the relations between WTI and Brent crude oils. Figure 3 provides an additional view and analysis of these price series and their relations.

Figure 3



The coefficient of variation (standard deviation divided by the mean) is a useful measure of variance/volatility when the underlying series are significantly trended or there are multiple changes in direction of trending. This is because a \$5.00 change per barrel, for example, carries much different meaning when the underlying price is \$50 as compared to when it is \$100.

A 20-day moving average of daily price observations is employed to closely relates to a monthly moving average based on trading days. The 2008 period shows considerable volatility relative to the overall 10-year pattern, but even with that spiking period the trend is slightly downward for Brent and virtually flat for WTI. We will note later that during the

time of the spike in volatility open interest was falling for WTI and relatively flat for Brent, and total trading volume was relatively unchanged. Some analysts suggest that speculators are drawn to price volatility, but that also does not appear to be born out in these data.

It is also interesting to observe the correlation relations between these two price series. For hedging correlation is arguably the most important relation to determine the effectiveness of a hedge. Moreover, the most important correlation relation is not that between price levels but rather between price changes. Indeed, it is the degree of correlation between spot price *changes* and futures price *changes* that dominates the effectiveness of a hedge. Curiously, the correlation between the price changes of spot WTI and the price changes of spot Brent increased following the apparent de-linking in late 2010. For the period up to 27 October 2010, the correlation coefficient for price changes was 0.59, but for the period after 28 October 2010 the measure rose to 0.66. This suggests that for any crude oil that may have previously employed a Brent contract for hedging purposes, WTI became a stronger alternative. So, while the price differential reversed from what had been seen as the traditional of WTI at a premium to Brent, they became closer in terms of their price movements.

Open interest by trader category

It is frequently suggested that the futures markets are dominated by speculators, but this does not seem to be born out in the data. Some of this confusion may lay in the fact that there is not a clear definition, or differentiation, between hedgers and speculators in these futures markets. Within the categories identified by the CFTC in their disaggregated data set (DCOT), there are four reporting trader groupings: Producers/merchants, swap dealers, managed money, and other reporters. The non-reporting traders are those too small to meet the reporting requirement, and for crude oil this is 350 open contracts. There is somewhat of a debate among researchers/analysts about the appropriate classification for swap dealers with respect to hedger versus speculator. According to the CFTC determinations, swap dealers fall into the hedger category, even while the CFTC no longer actually uses the term hedger in its lexicon. Nevertheless, the legacy classification of Commercial, which has historically been associated with hedgers, includes the positions of swap dealers. For a given reported week, the Commercial open interest for the LCOT report will equal the sum of the corresponding open interests for Producers/Merchants and Swap Dealers drawn from the DCOT.

The general argument against this classification is that swap dealers are exposed to market risk only because they have effectively placed themselves in harm's way by offering to provide a service whereby portfolio investors may gain market exposure to commodities. In the process of providing this service the swap dealer becomes exposed to market price risk which may be hedged via futures trade. However, this is no different, economically, than what a refiner does. A refiner, who most analysts will happily regard as being a hedger when s/he enters into a futures contract, is only exposed to market risk because s/he chose to undertake this business activity. From a purely economic view, each activity provides a service (one a refined product and one a financial product) and each seeks market risk mitigation through financially opposite positions in futures markets.

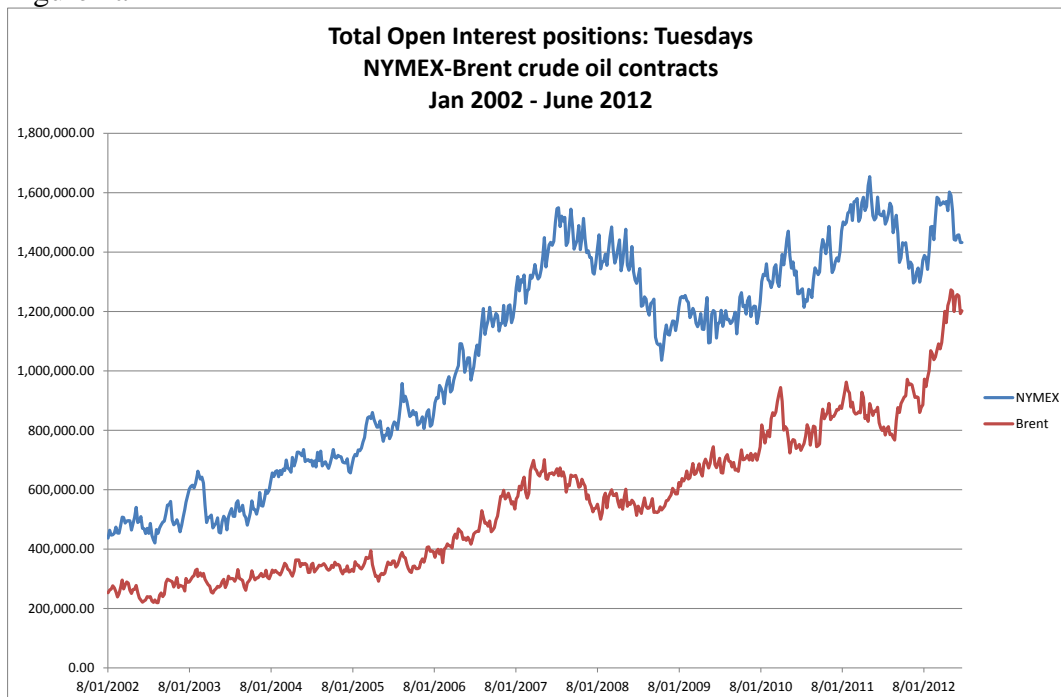
What has occurred in the open interest positions, which is typically viewed as an indication of market depth or liquidity, following the de-linking? Figure 4a reports the total open interest for each contract on Tuesday of each week; this simplifies the issue of dealing with different daily observations when trading days differ between the two exchanges, and it is aligned with

the CFTC reporting. When a Tuesday is missing, it is replaced with a Wednesday observation, if available, and Monday if the Wednesday is missing.

Following 28 October 2010, the NYMEX contract open interest continued to increase until it reached an all-time maximum of 1,653,799 contracts on 10 May 2011, at which time the ICE Brent contract shows open interest of 889,817 contracts. The NYMEX contract then fell, in an uneven but relatively steady fashion to 1,295,618 on 22 November 2011. During this time the Brent contract fell to 774,962 before recovering to 932,943 contracts. So during this six-month period, the open interest for the NYMEX contract fell 24%, and that for Brent increased by 4.7%, but only after first experiencing a 14% fall.

On 28 October 2010, Brent sold at a premium of \$0.77 per barrel. By 10 May 2011, the premium had reached \$14.43, but it had reached \$19.46 during this period while NYMEX open interest continued to climb. Even while the Brent premium was growing during this period, the NYMEX contract open interest grew by 24% while the Brent open interest grew by just 5%, and this was on a much smaller base. The largest Brent premium occurred on 23 September 2011, in the midst of this six month period, but by the end of the period on 22 November 2011 the premium had fallen to \$10.01; the average during these six months was \$20.59. When the Brent contract open interest fell to 774,962 the Brent premium had expanded to \$25.00 from the \$14.43 at the beginning of the six-month period. As a result, there appears to be very little relation between the changes in open interest for either contract and the price differential during this time.

Figure 4a

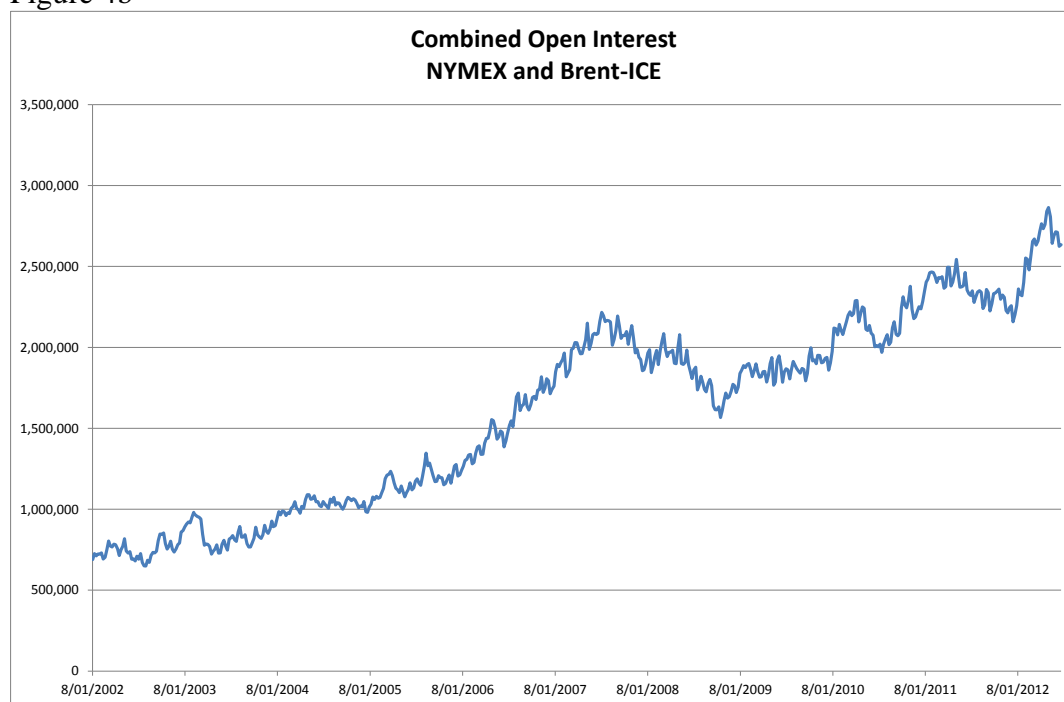


Correlation analyses may shed further light on the very limited relations between the open interest positions of the two contracts and the changes in the price differentials, as well as between the two contracts. Employing changes in Tuesday observations over the period, the correlation coefficient between changes in WTI and Brent open interest positions was just 0.32. The correlation between changes in WTI open interest and changes in the price differential was -0.11 and between changes in Brent open interest and changes in the price

differential is was -0.08. Since the analyses are conducted on differences there should be no problem with unit root processes leading to spurious correlations. [Since the relations between these variables is so weak, it is unlikely that any discernible direction of causality will be found, but this analysis will be undertaken at a later date.]

Figure 4b shows the combined open interest positions for the two contracts. This shows that while there have been occasional dips in the open interest, there has been a relatively steady climb in open interest, suggesting that the futures markets are playing a larger role in the global crude oil price determination and risk mitigation. We will see below, however, that this has not been due to a surge in speculator activity, as is frequently claimed.

Figure 4b



The information contained in Figures 5 and 6 shows that when the large drop in NYMEX open interest occurred during 2008, it was not due to speculators abandoning the market place, as has been frequently suggested. Indeed, the bulk of the decline (as well as the initial rapid increase) came directly from the producer/merchant trader category. While this pre-dates the period of specific interest to this paper, it is well worth noting that the pundits and market watchers seem too often to make claims that sound good but are not supported by the data.

In Figure 5, the Commercials are represented by the red line, which plunges beginning as early as 10 July 2007, while the blue line, representing the Non-commercial (frequently referred to as speculators) continued a relatively steady climb throughout the period, but a climb that never exceeds that open interest of the Commercials. The volatility experienced during the 2008 period is frequently blamed on speculators first rushing into the market and then rapidly abandoning the market after unilaterally driving the price of crude oil to its maximum. Again, this is not born out in the data.

Figure 5

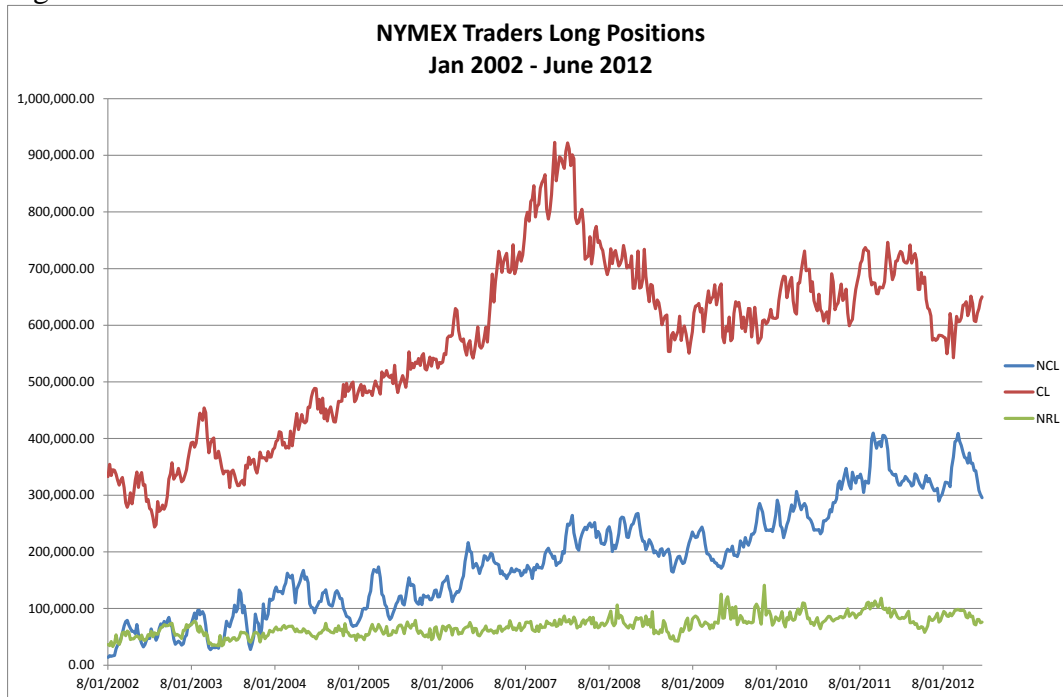


Figure 6

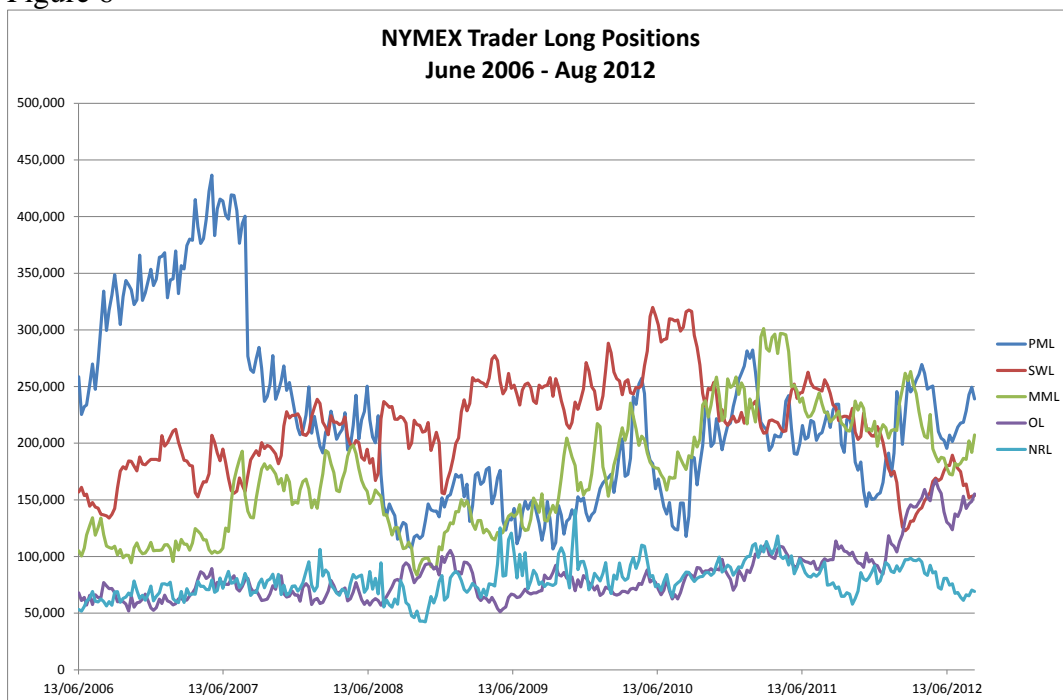
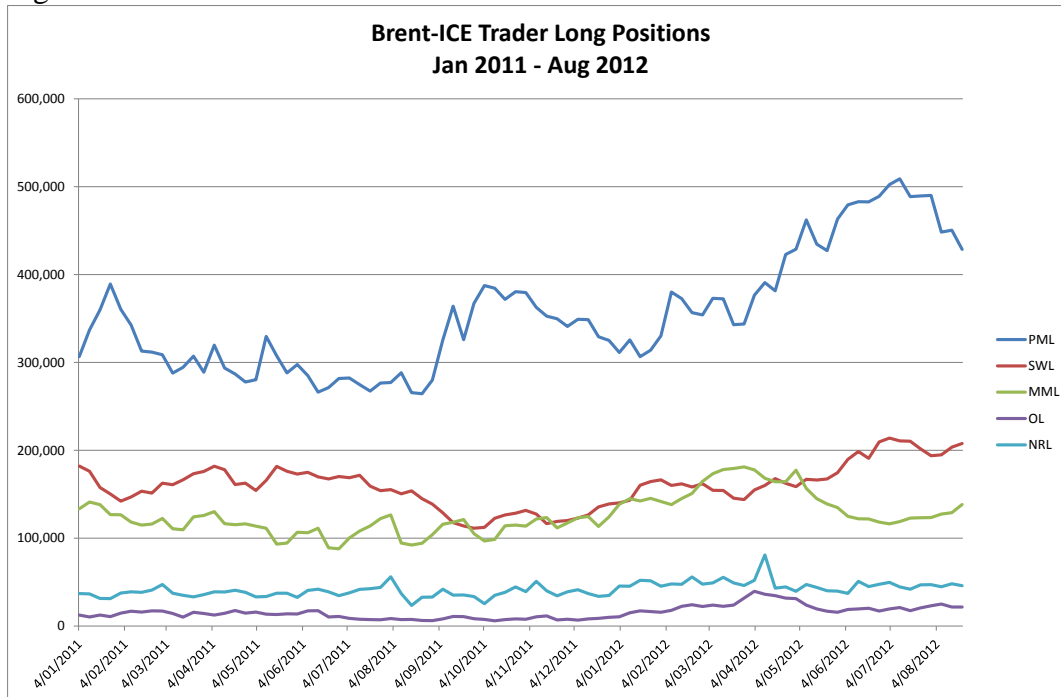


Figure 6 reports the NYMEX DCOT data, which disaggregates the Commercial traders into the Producers/Merchants and Swap Dealers. It is clear that the Producers/Merchants, represented by the darker blue line, which is initially on top, were responsible for both the significant rise and then drop in open interest. All other trader categories maintained relatively stable long open interest positions during the period of significant price run up and decline. This observation is consistent with research conducted by the CFTC that found that Non-commercial traders tended to hold their positions longer than did the Commercials; that

is, in the loser terms of the *street*, speculators maintained steadier longer-held positions than did the hedgers. (See Haigh, et al. (2005).)

Figures 7 and 8 provide a comparison of the open interest positions of the traders in the two contracts for the period for which such observations are available to the Brent contract: January 2011 through August 2012. Because the Brent data are not available for the earlier period, it is not possible to compare trader position characteristics before and after the WTI-Brent price de-linking.

Figure 7

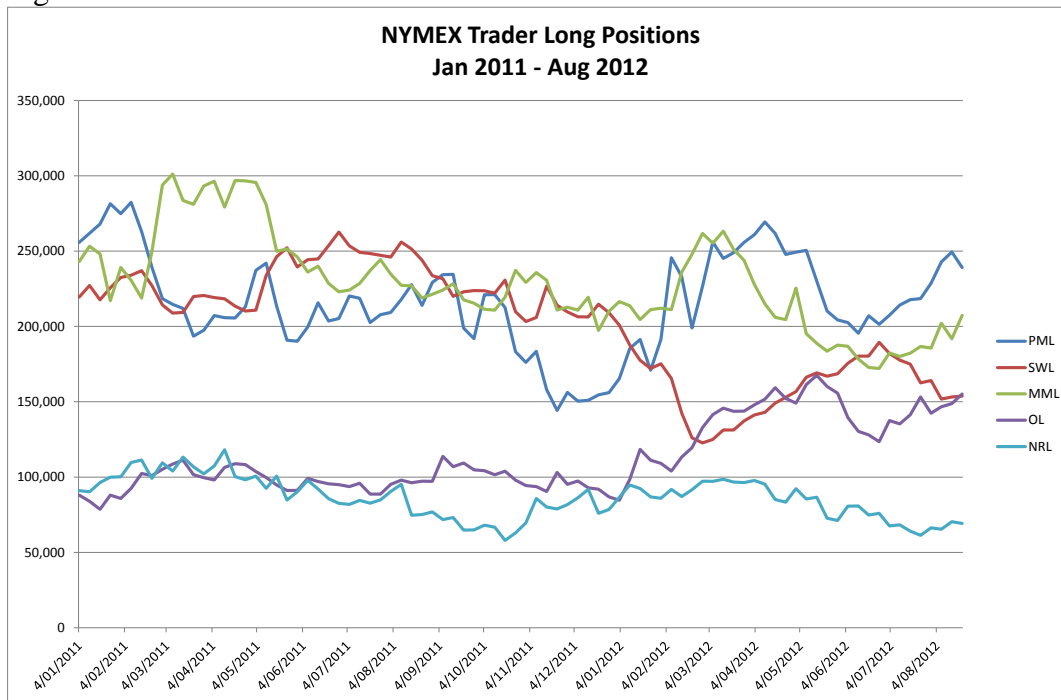


In Figure 7, it is clear that the Producer/Merchant trader category dominates over the year and a half, while Swap Dealers and Manage Money traders are quite similar in their positions. Again, the combination of Producer/Merchant and Swap Dealers (the Commercials/hedgers) dominates the contract open interest. Moreover, the growth in overall open interest is due primarily to growth in the Producer/Merchant trader activity. This seems to have occurred while the price differential favoring Brent was declining from the \$20.00-plus range at the end of 2011.

Figure 8 shows a somewhat *messier* picture, with no clear dominating trader category. Nevertheless, from a combined perspective, the Commercials (Producers/Merchants plus Swap Dealers) clearly dominate those traders that may be associated with speculation. By the end of the period, the Producer/Merchant category had regained its dominant position.

Neither the overall open interest positions for either contract, nor the positions of specific trader categories appear to have been significantly influenced by the observed price differential transitions that have been the most obvious indicator of the so-called de-linking of the WTI and Brent crude oil prices.

Figure 8



What is excessive trading?

Finally, a note on the existence of excessive trading through the futures markets for crude oil. There is no unambiguous definition for excessive trading. Yet, many analysts, academics, policy makers, and market commentators claim that there is excessive trading in the derivatives markets, often with a specific focus on futures markets. It is usually accepted that in a market the more trading or the more liquidity the more efficient the market price determination will be. More liquidity is also typically associated with lower transaction costs, and it facilitates market risk mitigation due to increased ease of market entry and exit. It is probably worth emphasizing that the ability to exit easily is probably at least as important to market efficiency as is ease of entry; this is one of the primary characteristics of an organized futures exchange that is preferable to an over-the-counter forward market.

It has been claimed that futures trading in energy commodities like crude oil is excessive. Some have claimed that the notional volumes traded in crude oil and natural gas exceeds physical consumption by vast multiples ranging as high as 30 times. Ripple (2008b) has demonstrated that such multiples are the result of a miscalculation that leads to an apples-to-oranges comparison. The only way such multiples can be produced from the data is to compare the notional volume of “paper” trades over the entire forward curve (for crude oil this would currently include crude oil for delivery through December, 2020) to the physical usage of a single day. Such numbers clearly have no meaningful economic content, and they cannot be useful to inform policy decisions.

An appropriate apples-to-apples comparison may be made by evaluating the average trading volume for the near-month contract and allocating this average over the number of days in the delivery month; for a complete discussion of this methodology see Ripple (2008b). Employing this approach, it is found that the notional volumes amount to a fraction of the

physical market not a greater-than-one multiple. For the time period and for the two crude oil contracts under study, the average daily trading volume on the NYMEX amounted to 34% of the average daily physical usage and for the Brent contract the average daily trading volume amounted to 16% (here I used 18 million barrels per day). The *appropriate* physical usage number for this measure is somewhat ambiguous. The 18 million barrel value relates to the volumes of crude oil consumed in the US. However, since the NYMEX contract can and is employed to hedge crude oil streams outside the US, the 18 million barrel value is likely too low, implying that that fraction represented by the notional volumes traded on the exchange is smaller yet. For Brent, I used the 18 million value for a straight across comparison to the NYMEX contract, but since it is being claimed even more in recent time that Brent is the premier contract for hedging globally, the base physical volume should reflect a much larger number associated with global daily physical usage; again this implies a much smaller fraction.

There has been an increase in the size of this fraction over the period under study. In 2002 for NYMEX the fraction was 14%, and this grew to 60% in 2011. For the Brent contract, the fraction in 2002 was 6%, increasing to 32% in 2011. The increase may be explained by increased sophistication on the part of market participants who grew more comfortable with the use of futures markets to mitigate the risk inherent and perceived over this period. Nonetheless, even at the end of the period, there is no evidence of the vast multiples of futures contract trading activity that is widely commented upon. The miscalculation seems to be rooted in a misunderstanding of what futures market variables actually represent.

Summary

The apparent de-linking of WTI and Brent does not appear to have had discernible impacts on the relative trading activity between the two contracts. It also does not appear to have played a significant role in how the different trader categories have traded through the period. What changes have occurred will have to be explained by other drivers, perhaps more related to more general macroeconomic variables and the on-and-off economic recovery, and the disparity of the recovery in different parts of the world.

The analysis has also shown that there is little evidence to support the frequent claims of excessive trading activity on the crude oil futures markets, whether it be within the US on the CME/NYMEX or on the ICE for the Brent contract.

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