



New York
Mercantile Exchange

**A REVIEW OF RECENT
HEDGE FUND PARTICIPATION IN
NYMEX NATURAL GAS
AND CRUDE OIL FUTURES MARKETS**

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Introduction

In recent months, there has been an increasing focus in the business press on participation by hedge funds in commodity markets, particularly including energy markets. Media attention developed due to complaints from a small number of companies who have expressed concern about substantial price volatility for energy commodities, such as natural gas. These companies have suggested this result is somehow attributable to the trading activity of hedge funds in energy markets. These assertions have been forwarded to the public arena without analysis or facts to support such claims.

The New York Mercantile Exchange (“NYMEX” or the “Exchange”) believes strongly in vigorous and spirited discussion and debate on important public policy issues. However, we also believe that such discussions need to be grounded in facts and in thoughtful analysis and that confused or inaccurate assertions can do harm to the public dialogue on the issues of the day. Accordingly, we analyzed the level and impact of hedge funds in two of our largest futures contracts.

As a note, the exact parameters of the entities who might fall within the general term “hedge fund” for purposes of trading on futures markets are not susceptible to precise determination. This term is neither defined by the Commodity Exchange Act nor by NYMEX’s rules . It is our sense that this term is commonly understood to refer to private investment funds or pools that trade and invest in various assets on behalf of their clients, who are typically high net-worth individuals. However, we note that commodity pool operators, which are subject to CFTC regulation, may also operate hedge funds.

In this study, the Exchange determined to use an extremely broad scope of reference in analyzing trading activity in our markets. Specifically, the trading activity reviewed in this study not only includes activity by investment funds generally, including private funds as well as more public commodity pools, but indeed even includes as well activity directed by commodity trading advisors. Consequently, this study sets forth the term “Hedge Fund” as a capitalized term in an effort to highlight the fact that the scope that we attribute to this term is being used for the limited purpose of, and thus is only relevant to, this particular study.

NYMEX is a for-profit corporation organized under the laws of the state of Delaware and has been in continuous operation as a commodity exchange for more than 130 years. It currently serves the marketplace as a regulated designated contract market under the regulation of the Commodity Futures Trading Commission for the trading of numerous commodity futures and commodity futures option contracts and as a regulated derivatives clearing organization for the clearing of various products. NYMEX is the largest exchange in the world for the trading of futures and option contracts based on physical commodities. In 2004, total volume at the Exchange, including overall clearing volume, was approximately 169 million contracts. Public investors in our markets include institutional and commercial producers, processors, marketers, hedge funds and users of energy and metals products.

Executive Summary

NYMEX staff analyzed market data related to Hedge Funds for specified periods in 2004 for the Exchange's benchmark crude oil and natural gas futures contracts. These data were available to the Exchange through a reporting system that constitutes one of NYMEX's most important tools for conducting market surveillance. Staff reviewed Hedge Fund activity as reflected in trading volume as well as in open interest. Based upon these available data, this review generated the following conclusions:

- **Hedge Fund trading activity comprised a modest share of trading volume in both crude oil and natural gas futures markets.**

In crude oil, Hedge Funds constituted only 2.69% of trading volume while in natural gas Hedge Funds constituted 9.05% of trading volume during the review period.

- **Hedge Fund activity comprised a relatively modest share of open interest in both crude oil and natural gas futures markets.**

As a percentage of open interest, Hedge Funds constituted 13.4% in the crude oil market and 20.4% in the natural gas market during the review period.

- **Hedge Funds hold positions significantly longer than the rest of the market, which supports the conclusion that Hedge Funds are a non-disruptive source of liquidity to the market.**
- **With regard to price volatility in natural gas futures, when Hedge Fund activity alone is evaluated, the data strongly indicate that changes in Hedge Fund participation result in *decreases* in price volatility.**
- **Even when Hedge Fund activity in natural gas futures is considered in connection with changes in inventory, the data indicate that changes in Hedge Fund participation appear to *decrease* price volatility.**
- **These statistical results are consistent with a positive role provided by Hedge Funds to futures markets.**

On a general level, the trading volume that is provided by Hedge Funds, though incremental, contributes to the overall liquidity of the markets traded and so improves the efficiency of these markets. More specifically, trading by commercial firms emphasizes (but is not necessarily limited to) hedging activity. At any one point in time when a commercial firm submits an order to a futures market, there may or may not be other commercials submitting orders for the other side of the market. Accordingly, similar to floor traders, who are in the business of providing short-term liquidity to a market, Hedge Funds can serve to bridge the gap in liquidity at a point in time that may exist in the

market between commercial participants who wish to buy and those who wish to sell. This intertemporal or “interstitial” liquidity is critically important to any futures market.

NYMEX staff also considered changes in the market fundamentals for the natural gas market. This market has experienced significant shifts and changes in the balance of supply and demand in recent years. In particular, dramatic increases in demand have been the driving force in eroding excess productive capacity. These changes can be cited as clear contributors to the price levels and volatility observed in this market at various points in the last several years.

In conclusion, as noted, Hedge Funds can play a valuable role in futures markets in providing additional liquidity to the market, which benefits all market participants. Moreover, the data from this study indicate that Hedge Funds appear to reduce rather than to increase price volatility in the futures markets that were analyzed. In short, it appears that Hedge Funds have been unfairly maligned by certain quarters who are seeking simple answers to the problem of substantial price volatility in energy markets, simple answers that are not supported by the available evidence.

Participation in Market

Measurement

There are two basic measures of participation in futures markets: trading and open interest. Trading consists of buying (going long) or selling (going short) and Exchanges keep track of the number of contracts traded over different time periods, such as day, week or month. Open interest refers to the number of outstanding obligations in a futures contract at a given point in time. In other words, open interest can be described as the total number of futures contracts (long or short in a contract month of a listed futures contract) that have been entered into and that have not yet been liquidated by an offsetting transaction or fulfilled by delivery. Open interest is typically measured as of the end of a trading day. Consequently, the level of participation in a futures market by a group of participants can be measured as either trading volume over a specific time period or as open interest as of the end of a specific trading day. Below, each of these measures is provided for the applicable review periods.

Background: Physical Delivery Contracts and Market Theory of Price Impact of Non-Commercial Market Participants

Contractual Obligation

Futures contracts for crude oil and natural gas at the New York Mercantile Exchange entail obligations to make delivery (sellers) or take delivery (buyers) of the underlying physical commodity. In practice, most participants in these markets, including companies engaging in hedging, do not, in the end, perform these obligations because they choose to liquidate their outstanding positions in the market before the delivery obligations must be performed. Indeed, only a very small fraction of contracts executed on a futures exchange will result in physical delivery of the cash commodity for a

physically settled contract. Nonetheless, the contracts call for delivery and any participants who do not otherwise liquidate a position take on active delivery obligations.

The ability to perform delivery is one of the boundaries that distinguish commercial participants from non-commercial participants and also distinguish prospective hedgers from speculators. The delivery obligation also imposes on non-commercial participants an unambiguous obligation with respect to trading futures; any outstanding positions in a specific contract must be liquidated before trading in the contract expires. In other words, trading by non-commercials that establish initial outstanding positions in the futures market must eventually be offset by reversing the trade that establishes the position.

Potential Price Influence

This requirement, that non-commercials must engage in offsetting trades before contract termination of the listed contract month for the applicable futures contract, has equally strong implications as to price impacts. If one chooses to accept the logic that, *all other things being equal*, initiation of positions in the market by non-commercials exerts a price influence—*i.e.*, initiating a purchase raises the price from what it otherwise would have been or initiating a sale lowers the price similarly, then one must equally accept the notion that the action of liquidating the position, which must eventually be performed by all non-commercials, exerts the reverse price influence. The unavoidable conclusion of non-commercials being unable to perform delivery is that the net impact of their trading should be neutral with respect to influencing price. Any other conclusion requires a contrivance in logic.

None of this is to say that price influences simply reduce to initiation of purchases or sales without any regard for the complex fabric of transactions that comprise energy markets at large, including futures, cash and over-the-counter financially-settled markets for similar and related products that are sometimes cleared simultaneously and other times cleared sequentially. However, the point does intend to illustrate that it is axiomatic that any influence on price that one wishes to argue somehow emanates from non-commercial participation must be equal and opposite to other price influences that unavoidably emanate from the same non-commercials.

However, the same chain of logic that demonstrates there is no net impact on price by non-commercial participation raises the possibility that increases in non-commercial participation may cause increases in price fluctuations or *price volatility*. This theoretical possibility is considered further below.

Price Volatility

In both the NYMEX crude oil futures market and the NYMEX natural gas futures market, the contracts for the month nearest to termination—commonly referred to as the *spot* month-- are the ones that experience the highest levels of price volatility. There are rarely exceptions to this market experience.

Methodology

Exchange staff has performed several different analyses to evaluate influences on price volatility in NYMEX markets. These analyses have been performed for two periods of time. First, the Exchange collected information on Hedge Fund participation in its crude oil and natural gas markets, measured with respect to trading volume and to open interest, for the time period January 2004 through August 2004.

By comparing the relative percentages of specified non-commercial participation in trading volume versus open interest as well as in the spot month versus other months, it is possible to draw inferences on potential impacts on price volatility. The second period of time analyzed is January 2004 through early November 2004. This analysis is based on open interest alone and compares the influence of Hedge Fund market participation versus other factors on price volatility in the natural gas market. The results from these analyses are reviewed and discussed below.

Data

The open interest information was collected for each day using the Exchange's "Large Trader Surveillance System ("LTRS") and averaged over each of the two periods in terms of percentage of market share.¹ There was no distinction made for long positions versus short positions.

Combined long and short positions were aggregated for "Hedge Funds" and "Investors"² and divided by the sum of total long and short positions in the underlying market. Open interest or Large Trader data is only collected for accounts that hold *reportable* levels of contracts, as defined by regulation. As a practical matter, the reportable level of open interest in NYMEX crude oil and natural gas futures contracts is typically 85-90% of total open interest and, for purposes of this evaluation, is considered reflective of the entire open interest.

Trading information for all contract months was collected for Hedge Funds over the January through August time period. In addition it was collected for each month during the period and it was collected for the spot month contract alone. All of the information is expressed as percent of the entire market. (Aggregation of trading data is more complex than aggregation of open interest data, and the Exchange has not performed the aggregation of "Investor" trading. It was determined to include "Investor" open interest nonetheless to be as informative as possible, and it is generally accepted that "Investors" and "Hedge Funds" are similar in terms of their overall roles as non-commercial participants.)

¹ At the end of every trading day, NYMEX electronically collects from its clearing members and carrying brokers the identities and position levels for those with reportable positions. In general, for purposes of this system, a large trader may be understood to be a trader who holds or controls a position in any one future (or in any one option expiration series) that is equal to or greater than an exchange or CFTC-specified reporting level.

² A category used internally by NYMEX staff for certain purposes to refer to non-member speculators and speculative trading proprietary trading groups.

The evaluation did not include in the Hedge Fund or Investor categories any entities that do participate in crude oil or natural gas deliveries. Those entities are considered energy companies.

Analysis 1

The percentage share of open interest and percentage share of trading are compared to make some initial analytical observations. The percentage of spot market trading volume to trading volume in all months is also compared as the basis for analyzing impact on price volatility. Implicit in this comparison is the generally accepted view in the futures industry that, not only is the spot contract the contract month that experiences the highest level of price volatility, but it also has a higher impact on overall price volatility than any other contract month.

Results

Crude Oil

From January through August 2004, Hedge Fund trading constituted 2.69% overall of NYMEX crude oil futures trading. As a percentage of open interest, Hedge Funds constituted 13.4%. In addition, Investors constituted 8.3% of open interest. Hedge Funds' spot trading constituted 58% of their overall trading. For the entire crude oil market over the time period evaluated, the relative trading volume of spot to all months was almost 44%.

The implications of these results are as follows:

- Hedge Funds hold positions, once established, significantly longer than the rest of the market. Constituting only 2.69% of trading while constituting 13.4% of open interest, all other things equal, implies transmitting a minimal impact on volatility. Hedge Funds (and presumably Investors as well) are a non-disruptive source of liquidity to the market.
- Hedge Funds participate to a greater extent in spot month trading than other participants. Because of their relatively higher level of participation in spot, we conclude:
 - It further reinforces the conclusion that their overall influence on price levels is negligible because they must liquidate any outstanding positions during the spot month. Clearly, some of the positions are initiated during the spot month.
 - There could be some impact on price volatility, but it would be negligible because of the overall low percentage of trading attributable to the Hedge Funds—still less than 4% of spot market trading in crude oil.

Natural Gas

From January through August 2004, Hedge Fund trading constituted 9.05% overall of NYMEX natural gas futures trading. As a percentage of open interest, Hedge Funds

constituted 20.4%. In addition, Investors constituted 3.8% of open interest. Hedge Funds' spot trading constituted 44.3% of their overall trading. For the entire natural gas market over the time period evaluated, the relative trading volume of spot to all months was almost 45.9%.

The implications of these results are as follows:

- Hedge Funds hold their positions a significantly longer period of time than other market participants as a whole. Similar to crude oil, this means their participation, in spite of being larger, results in non-disruptive supply of liquidity to the market.
- It appears that investment in natural gas futures is satisfied to a greater relative degree by Hedge Funds than investors acting on their own versus the crude oil market. The total open interest for the two groups, though larger for natural gas than crude oil, is relatively close—24.2% versus 21.7%.
- Hedge Funds participate slightly less in spot market trading, as a percentage of overall trading, than other market participants. The implication of this point is that, all other things being equal, their trading style has a slightly less relative impact on spot market volatility than other participants. Given that their overall trading in the spot market is still about 9% of overall spot trading, we can conclude they could have a modest impact on volatility.

Extension of Trading Data

Subsequently, we calculated the percentage of trading due to Hedge Funds for calendar year 2004 for the Exchange's crude oil and natural gas futures contracts. The levels were: crude oil—3.07%; natural gas—11.13%. Each of these numbers is greater than the corresponding percentages for the January through August 2004 calculations, but neither implies a dramatic increase in participation or change to any conclusion.

Analysis 2

Because of the conclusion that Hedge Funds possibly may have a modest impact on spot price volatility in natural gas markets, we have performed additional analyses on the influences on natural gas price volatility. Price volatility, defined for purposes of this study as the standard deviation of natural gas *spot* futures settlement prices, was calculated by Exchange staff.

In general, two separate influences on price volatility are evaluated and compared—Hedge Fund participation in the market and fundamental market information. The fundamental market information consists of changes in natural gas inventory publicly reported on a weekly basis by the U. S. Department of Energy, Energy Information Administration (EIA). With the exception of weeks in which there are federal holidays, the information is generally released on Thursday mornings. (During exception weeks, the information is released in accordance with a defined schedule that is publicly available.)

Hedge Fund participation was measured by open interest; in particular, by measurement of any change in open interest. Open interest was used, rather than trading volume, because changes in open interest represent unambiguous measures of increases or decreases in market participation. By contrast, trading volume increases or decreases could be associated with either increases in open interest or decreases in open interest, which leads to ambiguity in evaluating influence. The question directly evaluated here is: do changes in Hedge Fund open interest cause changes in price volatility? The review undertaken here also considered whether changes in inventory levels cause changes in price volatility.

To accommodate within this study the fact that inventory data are provided on a weekly basis, the measurements for price volatility and Hedge Fund participation--standard deviations and open interest, respectively—similarly were measured on a weekly basis.

Results

Regression analysis was performed based on data for the period January 9, 2004 through November 5, 2004. Two regressions were performed that examined changes in the standard deviation in the *spot* natural gas contract settlement price versus the changes in Hedge Fund open interest and changes in weekly inventories as announced by EIA. The first regression identified the influence of Hedge Fund open interest alone. The second regression identified the combined influence of Hedge Fund open interest and weekly inventories. The results from the regressions follow below. Note that the standard measurement for evaluating the strength of influence in regressions is expressed in terms of *confidence level* percentages. A traditional convention in statistical analyses governing the use of confidence levels is to associate statistical significance with levels 90% and greater.

- When the impact of changes in Hedge Fund participation is evaluated alone, it indeed does have an influence on price volatility that is statistically significant—a confidence level of over 91%. Interestingly, the influence is *negative*. This means that increases in open interest by Hedge Funds cause decreases in price volatility—i.e., Hedge Fund participation seems to apply a brake to price volatility. However, when Hedge Fund participation is the only influence considered, the resulting regression equation explains a modest portion of price volatility—i.e., the equation correlation is only .27 ($R^2=.07$)³. This means, though Hedge Fund participation, evaluated alone, has a statistically significant impact on price volatility, it does not explain much of the overall price volatility.

³ Regression equations are lines, constructed from the statistical dispersion of the actual observations, presented in a graph, that intend to fit the dispersion of the observations as closely as possible. The most commonly used measurements as to the snugness of the fit are the equation correlation and its mathematical square, R^2 . The correlation and its square can range from a low of 0 to a high of 1. The higher the number, the snugger the fit.

- To account for additional explanation of price volatility, a regression was estimated evaluating the combined influence of changes in Hedge Fund participation and changes in inventory. This regression continues to show changes in Hedge Fund participation having a negative influence on price volatility—*i.e.*, increases in Hedge Fund participation cause decreases in price volatility—but does so with a confidence level of 85%, which is lower than the statistically significant levels associated with traditional convention. The formal phrasing of this result is to note that changes in Hedge Fund participation *appear* to have negative influence on price volatility when taking into account the influence of changes in inventory.
- Changes in inventory have statistically significant influence on price volatility. The relationship is positive—*i.e.*, increased changes in inventories result in higher levels of price volatility. The confidence level is greater than 99%.
- The most recent previous level of price volatility was statistically significant in explaining current levels of price volatility. The confidence level is greater than 99%.
- Overall, these three variables explain only a portion of price volatility, but a significantly larger portion than changes in Hedge Fund participation alone. The equation correlation is .54 with an R^2 equal to .30. Thus, a substantive amount of explanation is provided, but there remains a substantive amount to explain as well.

Interpretation

The regression results indicate that, if anything, increased participation by Hedge Funds diminishes volatility. This result, though not axiomatic, is not surprising. To summarize previous observations, over time, non-commercial trading must, by definition, result in offsetting impacts on prices because non-commercials can not participate in delivery. This leaves open the theoretical possibility that non-commercial trading could result in increasing price volatility. However, as the above statistical results indicate, this is not the case and, if anything, the reverse holds.⁴

These statistical results are not surprising because any construction of hypothetical market dynamics and circumstances that would support Hedge Funds participation causing market volatility inherently suffers from assumptions that are not reasonable. To illustrate this point, if increases in Hedge Funds open interest were to cause increases in volatility, logically, it would be because purchases increase price (from what it would otherwise be) and sales decrease price (from what it would otherwise

⁴ The Exchange also performed an intermediate analysis before performing the regression analyses. This consisted of a statistical *Granger Causality* test evaluating whether changes in Hedge Fund participation lead to changes in price volatility or whether changes in price volatility lead to changes in Hedge Fund participation. The period examined was January 2004 through August 2004. The results revealed that there is a 91% likelihood that price volatility leads to Hedge Fund participation — *i.e.*, increased price volatility leads to increased hedge fund participation; furthermore, there is a 86% likelihood that Hedge Fund participation does not lead to price volatility. These results are consistent with the results provided here.

be). To be profitable with such dynamics, it would need to be the case that, somehow, Hedge Funds' purchases are followed by purchases by others that result in prices increasing even more (from what they otherwise would be) and then selling at the higher price; and *vice versa* with respect to sales. Otherwise, it would not be profitable.

For this to succeed, Hedge Funds, in effect, must rely on someone else to trade unprofitably, but who is it that would fall into this category? There are three other fundamental classes of market participant to consider in asking this question: commercial natural gas industry participants; non-commercial participants that specialize in providing liquidity; and other non-commercial participants (*i.e.*, Hedge Funds or entities with similar trading orientations to Hedge Funds). Below, each of these groups is considered.

1. *Commercial Participants*: In fact, they would be expected to be the best informed of any group as to supply and demand of natural gas, cash-market prices and OTC transaction prices. It is not reasonable to argue that the best informed class of market participant would consistently trade so naively.

2. *Non-Commercial Liquidity-Providers*: In fact, their trading practice generally is to bridge the gap in liquidity that exists in the market between commercial participants who wish to buy and those who wish to sell. If commercial orders were always in balance between these two groups, this class of participant would not exist, but, in practice, they are critical to the functioning of the market. Typically, they operate by competing with commercial participants to *improve* the bid-ask spread—*i.e.*, narrow the spread between commercial offers to sell and commercials bids to buy. Rather than follow other participants lead to make purchases, they would be more inclined to compete with someone that wanted to buy and, through that competition, make the bid price higher and, consequently, closer to the ask price. This is significantly different.

3. *Other Non-Commercials* —*i.e.*, Hedge Funds and non-hedge funds that behave like Hedge Funds. In theory, the answer could be yes, but this means that, to be profitable, Hedge Funds must consistently rely on the naiveté of a group of non-commercial investors that continue to participate even though they are consistently unprofitable.

The conclusion from this is that one must rely on unreasonable assumptions as to some participants' behavior to support an assertion that Hedge Funds participation results in a secular rise in price volatility. As the data indicate, this is not the case. In fact, it is much more reasonable to suggest that Hedge Funds' trading strategies involve *responding* to market volatility—*i.e.*, higher volatility attracts Hedge Funds—and, accordingly, their participation tends to *diminish* volatility. The statistical evidence supports this view with a few minor qualifications. The first qualification is that, if one is taking into account only changes in Hedge Fund participation as an

influence, then the effect is statistically significant but only explains a modest level of volatility. The second qualification is that, if one is taking changes in inventory into account as well, the overall influence, though substantive, incorporates estimated influence from changes in Hedge Fund participation that is less statistically significant.

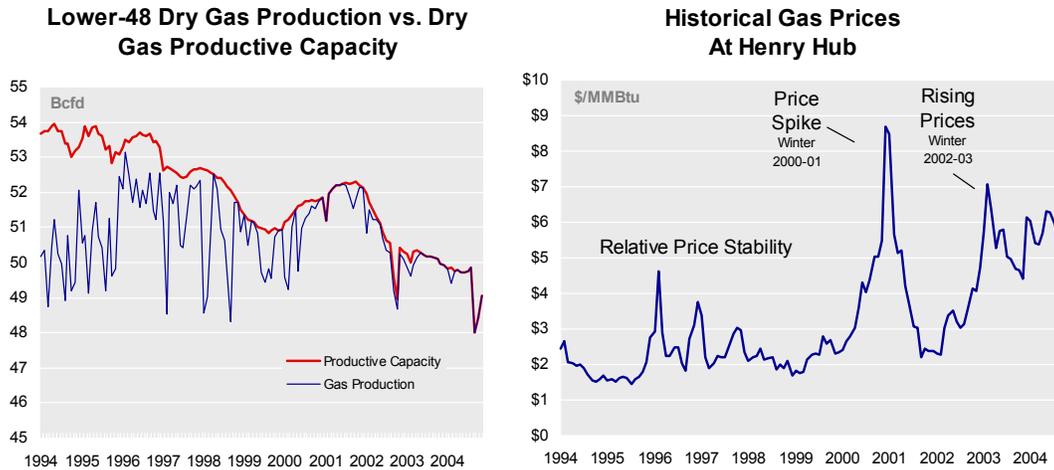
FUNDAMENTAL ANALYSIS

In the past five years, few economic factors have been spared from volatility, which in competitive markets is caused by uncertainty. The natural gas market is no different and significant shifts and changes in the balance of supply and demand can be cited as clear contributors to the price levels and volatility to which participants in this market have been exposed. In fact, as natural gas has re-emerged as a critical and growing component in the nation's energy resource mix since deregulation, dramatic increases in demand have been the driving force in eroding excess productive capacity. The attached charts, which were done by Kevin Petak, an economist with Energy and Environmental Analysis, Inc., show that the timing of relatively high volatility in the natural gas markets coincides with the period that has seen actual gas production levels reach declining productive capacity levels.⁵

In simple terms, it means that producers no longer have an ability to turn the spigot further because production has been flowing at its maximum level for quite some time. The result is that the U.S. resource base of reserves has diminished.

⁵ These charts were contained in a number of recent industry presentations, including a November 16, 2004 presentation entitled "Gas-Based Power Generation: Can We Do Without It?" that was delivered at the national convention for the National Association of Regulatory Utility Commissioners ("NARUC"). These charts are included in this NYMEX research paper with the permission of Mr. Petak.

The Changing Gas Balance



Divergent trends in gas supply and demand have led to the tight balance between supply and demand, higher gas prices, and increased price volatility.

TIGHT BALANCE EXPECTED TO CONTINUE

In other words, production has not been able to keep pace with demand. As reflected in these charts, the period of this process of elimination of the excess productive capacity has coincided closely with the period of more volatile prices in natural gas markets.

It is not immediately apparent how long this situation will continue. However, high prices have persisted and have attracted substantial investment in productive capacity with domestic exploration and production companies drilling at unprecedented levels, the Alaskan pipeline (and similar significant projects) coming closer to reality and liquefied natural gas firms constructing new liquefaction (overseas) and gasification (domestic) capacity.