

INSIDEADVANTAGE

# ENERGY PERSPECTIVES

Special Report  
by Blu Putnam  
Chief Economist  
CME Group

INSIDEADVANTAGE SUMMER 2012

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SUMMER 2012

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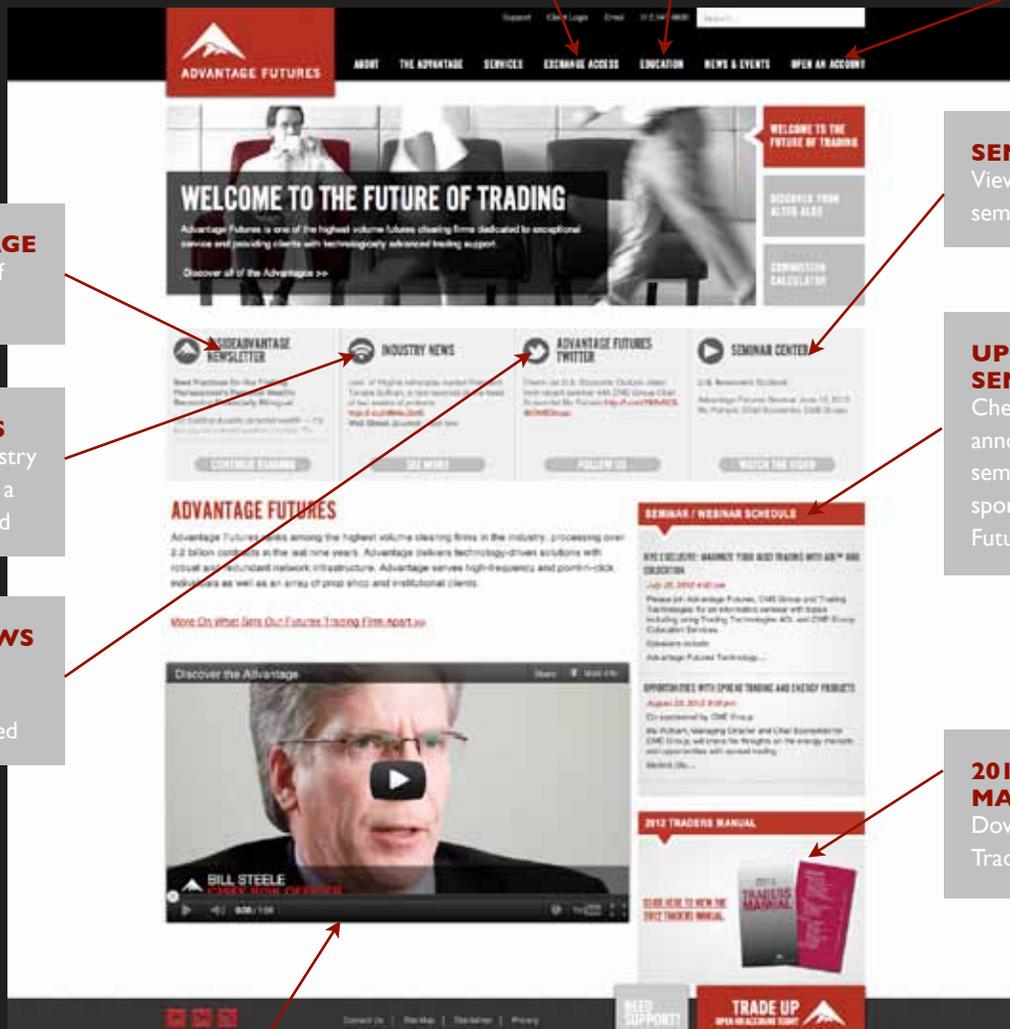
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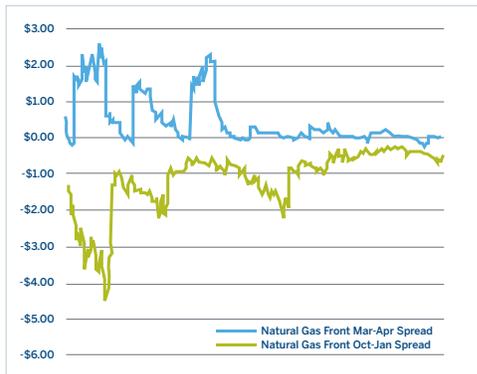
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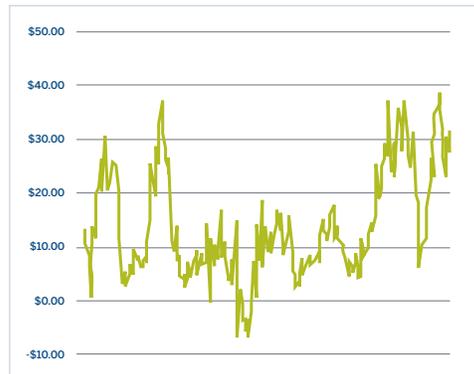
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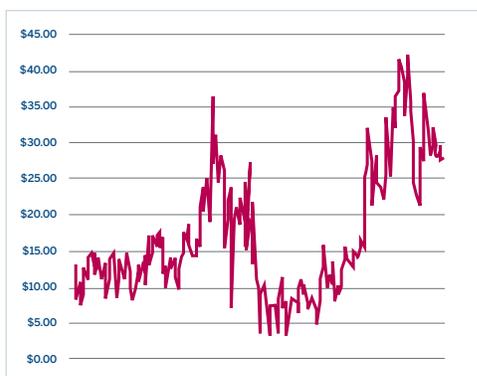
NATURAL GAS CALENDAR SPREAD (USD/MMBtu)



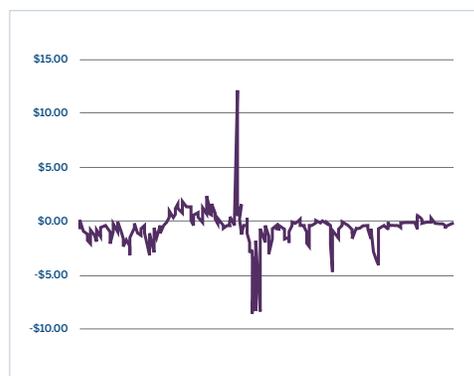
FRONT MONTH ROBO CRACK SPREAD (USD/BARREL)



FRONT MONTH HEATING OIL CRACK SPREAD (USD/BARREL)



WTI FRONT AND 2ND MONTH SPREAD (USD/BARREL)



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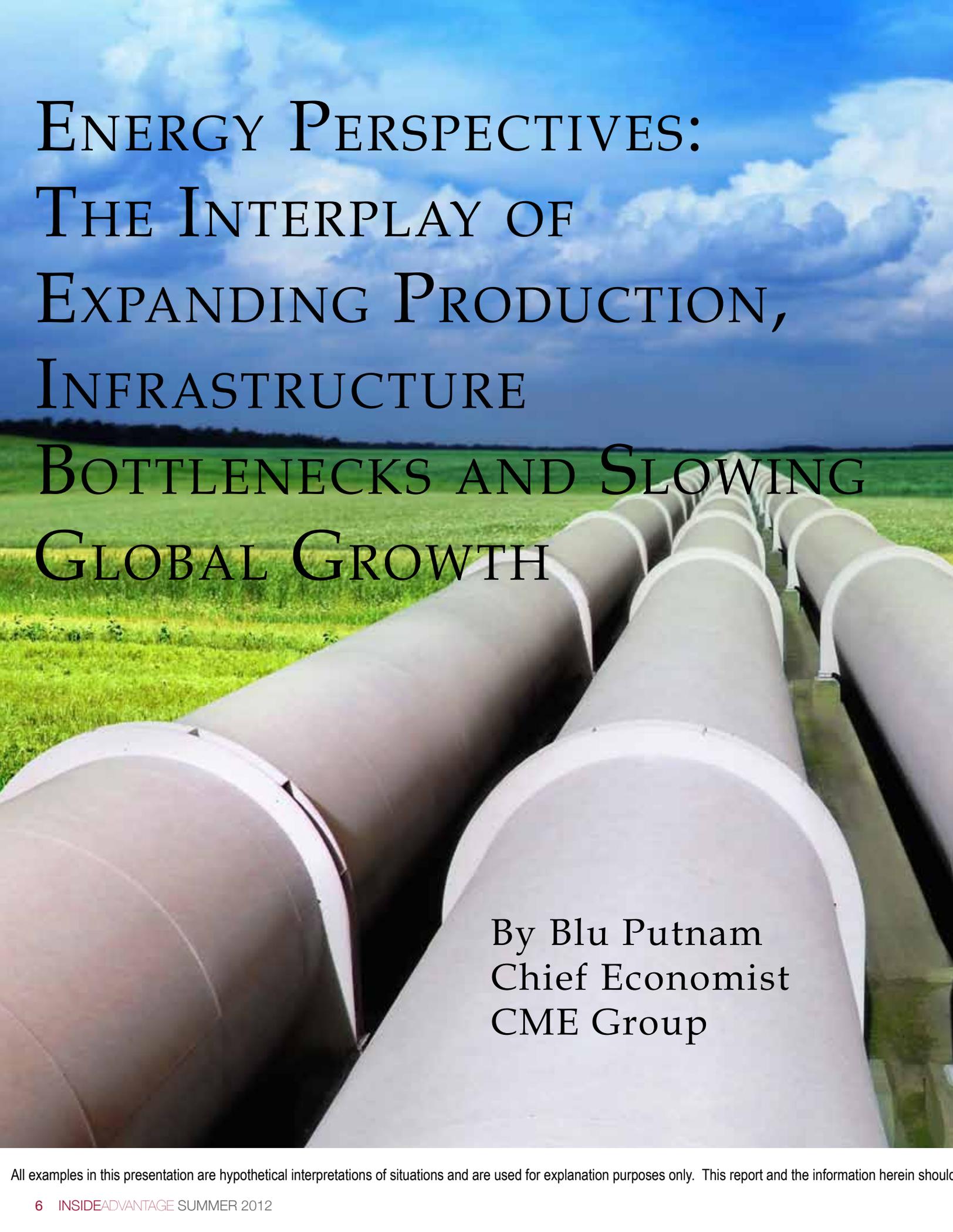
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ENERGY PERSPECTIVES:  
THE INTERPLAY OF  
EXPANDING PRODUCTION,  
INFRASTRUCTURE  
BOTTLENECKS AND SLOWING  
GLOBAL GROWTH

By Blu Putnam  
Chief Economist  
CME Group

All examples in this presentation are hypothetical interpretations of situations and are used for explanation purposes only. This report and the information herein should



***The interplay of expanding production, infrastructure bottlenecks and slowing global economic growth are probably nowhere more complex than in the energy sector.***

Our current perspective includes several key observations:

- For producers and consumers, we may be at the beginning stages of a long-term narrowing phase of the BTU per dollar price spread between crude oil and natural gas.
- For hedgers and investors, we may see increased activity in the price spread relationships between different combinations of energy products.
- For the portfolio managers there are opportunities for diversification away from “beta” returns where directional risks may be rising in the crude oil sector with more emphasis on “alpha” or spread trading possibilities.

## **MARKET DYNAMICS**

At the 10,000 foot level, the key medium to long-term theme of increasing energy supply is colliding with the shorter-term theme of slowing demand. At ground level, there is the short and medium-term theme of how to manage the risks associated with delivery bottlenecks and refining capacity. The fact that these themes are in play simultaneously is a much more severe complication for analyzing energy markets than casual observers might assume.

The medium and the longer-term theme of increasing supply is due to a variety of sources. In North Dakota and Montana, the Bakkan Formation is now considered the largest source of oil in the United States, with production climbing from next to nothing in 2000 to about 500 million barrels per day from the region by the end of 2011. Canadian tar sands reserves are also booming with expanded production, from 600,000 barrels per day in 2000 to 1.6 million barrels per day in 2011. Libyan oil is coming back online faster than many thought was feasible given the political instability in the country, and Iraq is also pumping increasing amounts of oil. And, of course, it is not all about crude oil. Benefitting from new fracking technologies and sideways drilling, natural gas production is increasing as well in the U.S., with production up a little less than 20% over the decade and with the rate of growth increasing in recent years.

At the same time as we are witnessing a literal revolution in fossil fuel supply, the shorter-term theme on the demand side has to do with the fact that Europe is stagnating and the economic booms in the emerging markets are decelerating rapidly. Emerging market countries are especially important to the demand for energy, because they tend to grow their demand at a faster pace than their real GDP growth, which is not true for the mature industrial countries. Thus, when the emerging market countries see a simultaneous slowing of economic growth, the impact on energy demand is even greater.

The price implications of the evolving trend toward rising supply and decelerating demand growth was hijacked in February 2012 by the rising tensions associated with Iran's perceived or potential nuclear ambitions which put upward pressure on crude oil prices as investors' fears were stoked higher. We wrote back in March 2012 [See "Oil Market Dynamics and the Fear Factor", [www.cmegroup.com/education/featured-reports/oil-market-dynamics-and-fear-factor.html](http://www.cmegroup.com/education/featured-reports/oil-market-dynamics-and-fear-factor.html)] that geo-political tensions can and do trump supply-demand fundamentals in the short-run; however, our view then was that the price disruption would be short-lived. We took the contrarian stance (at the time) that refined product, such as gasoline prices at the pump in the U.S., would probably be declining ahead of the summer driving and vacation season, which has proven to be the case.

Now at the beginning of June 2012, the geo-political tensions have clearly eased, and if anything, economic growth is decelerating more rapidly in emerging market countries from China to India to Brazil than the consensus view was back at the end of 2011. China's 2012 real GDP growth may be around 7.5%, which is down from its 20-year average of +10%, and the long-term rate may be more like 6.5% average annual real GDP. India is decelerating abruptly toward 4% real GDP growth in 2012, from the 7% to 9% range of recent past. Brazil may grow only 1% to 2% in real GDP terms in the first half of 2012. And all the while, the Euro sovereign

debt crisis has halted economic growth in Europe as well as raising investor fears of global financial instability. That is, as the fundamentals of supply and demand reassert themselves, demand deceleration is even more emphasized, while supply expansion continues unabated.

## POSSIBLE PATHS TO THE LONG RUN

Energy sector analysis also has to come to terms with the price dynamics of different sources, and of course, crude oil and natural gas are in the glare of the headlights. On an energy content basis, a barrel of crude oil would trade at roughly a 6:1 ratio to a million BTU's of natural gas, or crude oil priced at \$100/barrel would imply that natural gas would be \$17 per million BTU's for energy equivalence. Or put another way, natural gas trading at \$3 per million BTU's implies crude oil at \$17.40 per barrel. While this energy content per dollar comparison highlights a massive price discrepancy [See Figure 1], they do not tell one anything about which prices might bear the burden of adjustment or even if we are moving in the direction of shrinking the energy content price spread between relatively expensive crude oil and relatively cheap natural gas.

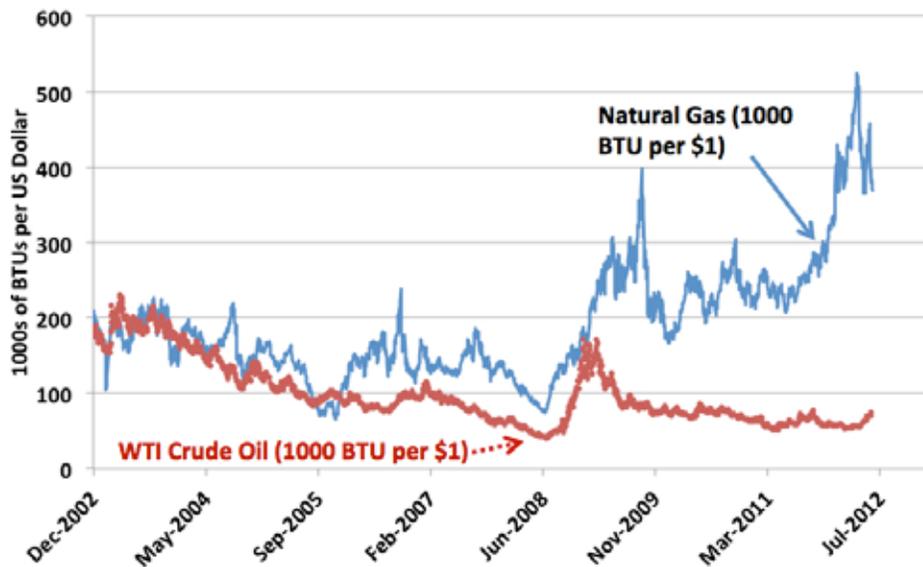
The problem is that infrastructure bottlenecks have arrived hand-in-glove with the expansion of production, especially in the U.S.. Moreover, all of the actions by the production, distribution, refining and consumption segments of the energy complex that would work toward pushing the market prices in the direction of energy equivalence involve billions of dollars of investment, huge time horizon price risks and substantial regulatory challenges. Given these real world constraints, it would be almost pure luck for market prices to stabilize around energy equivalence even for a short period of time. Nevertheless, we can analyze fundamental developments as well as futures prices and their behavior to gain an understanding of whether market prices are moving in the direction of energy equivalence or moving further away from it.

In the distribution sector, we are seeing a number of key developments. Regarding crude oil, the Seaway pipeline from Oklahoma to the Gulf of Mexico has been reversed and will provide a faster and cheaper way of getting inland excess crude oil to refineries on the Gulf Coast. The Enbridge Line 9 pipeline in Canada is expected to be reversed in early 2013. There is a rapid increase (and probably underappreciation) in expanding rail delivery capability that will allow North Dakota and Canadian crude oil to move more easily to east or west coast refineries. Rail capacity at the end of 2011 was estimated at approximately 200 million barrels per day, but rail expansion may more than double to over 550 million barrels per day by the end of 2012.



Figure 1.

### Energy Content Pricing Differentials



Source: Data from Bloomberg for Nearby NYMEX Natural Gas and WTI Crude Oil Prices. Oil to BTU conversion by CME Economic Research.

With regard to natural gas, the difficulties in being able to export natural gas are the key driver of the price to energy content differential with respect to crude oil. Some coastline facilities built originally for importing natural gas will be converting to export facilities; but all this takes time and money, and probably some delays related to regulatory issues that may arise in the process.

In the refining sector, there are plants being readied or expanded to convert natural gas to diesel fuel. We would note that the ability of refiners to take the risk that billions spent building a natural gas to diesel conversion plant will be profitable depends either on their confidence that a sufficient price spread will remain in place for 5 to 10 years after the plant is built or on their ability to hedge some of these risks in long-dated swaps or futures contracts. The existence of futures markets to price the time horizon risks are integral to the ability of the actors in the energy sector to close the BTU pricing gap over time.

And in the consumption sector, more electrical power plants are switching from coal to natural gas and more intra-city transit fleets are acquiring buses that can use natural gas. Both of these substitutions also involve time risks, although not necessarily quite so large as those in the refinery conversion arena.

With all of these developments involving enormous time horizon risk, the pricing of long-dated futures contracts provides considerable information about how the

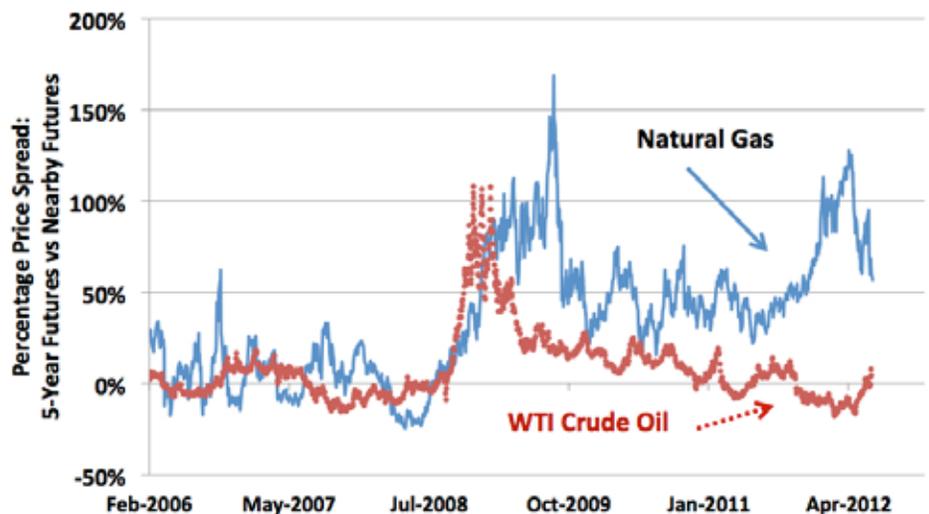
market views these trends and which sectors will bear more of the burden of convergence toward energy content equivalence, if such convergence even occurs. Figure 2 shows the spread between the 5-year out futures price and the nearby month futures price. A positive spread, for example, as is currently occurring in natural gas, indicates that the market consensus is expecting rising natural gas prices.

As the summer of 2012 begins, the spread between the nearby natural gas futures contract price and the contract price for 5-years out was over 50%, while in the WTI crude oil sector, the similar 5-year maturity spread was close to flat. That is, the long-dated 5-year futures contracts are implying an expectation of movement in the direction

of energy content equivalence and that natural gas prices will do most of the adjusting. Our perspective based on the adjustment factors cited earlier and already in progress is that, if anything, the market may be underestimating the demand slowdown being caused by the decelerating economic growth in emerging markets while at the same time not fully appreciating that an inflection point has been reached regarding the resolution of infrastructure bottlenecks and that process is now moving rapidly to take advantage of the BTU/\$ price spread opportunities. Hypothetically speaking, both of these observations would work together, should they come about, to suggest that the burden of adjustment may be split much more evenly between crude oil prices falling and natural gas prices rising.

Figure 2.

### NYMEX Natural Gas and WTI Crude Oil Calendar Price Spreads



Source: Nearby and 60 month out Futures Prices from NYMEX through the Bloomberg Professional.

There are caveats, however, as only time will tell. In the energy sector, the politics can be brutal, there is heavy regulatory scrutiny of every project and there are often trade restrictions or other impediments to consider over the long run.

## PORTFOLIO MANAGEMENT CHALLENGES

From a portfolio management perspective, we want to examine volatility and correlation patterns for key energy products as well as certain product price spread and calendar price spread relationships. Our observations strongly suggest current volatility patterns are probably not stable, that recent correlation patterns may also enter new phases and that the dynamics of product price spread relationships offer interesting risk-return opportunities over time to diversify crude oil directional risk or global macro equity risk.

**Volatility Dynamics.** Starting with volatility, in Table 1, we present the annualized standard deviations of daily price changes for three distinct time periods: 2012 to date, the height of the financial panic from September 2008 into March 2009 and a pre-crisis sample from the year 2006. The table is ordered with the current highest volatilities on top.

For 2012, the highest volatility is occurring in the natural gas sector. Volatilities are currently running around 50% for nearby natural gas futures. By contrast, crude oil nearby futures (ICE Brent or NYMEX WTI) has settled into the 20% volatility territory in 2012, although historically they have been higher. We do not view the recent volatility patterns for crude oil as sustainable. Of course, history may not be an appropriate guide, but in the current case we would not ignore it.

Table 1.

Standard Deviation Annualized from Daily Data	2012, Jan-May	15 Sept 2008 - 13 Mar 2009	2006
WTI-Natural Gas Nearby Futures	57.38%	96.60%	67.25%
Natural Gas-Heating Oil Nearby Futures	56.01%	67.99%	68.02%
Natural Gas Nearby Futures	52.44%	54.29%	68.63%
Natural Gas Nearby to 36-Month Futures	43.35%	41.41%	66.36%
Gasoline Nearby Futures	24.67%	81.36%	39.48%
WTI-Gasoline nearby Futures	22.48%	70.75%	28.21%
WTI Crude Nearby Futures	21.08%	96.31%	27.72%
Natural Gas 36-Month Futures	19.78%	20.55%	31.24%
Brent Crude Nearby Futures	19.45%	78.67%	26.05%
Heating Oil Nearby Futures	17.69%	62.69%	31.08%
Heating Oil 18-Month Futures	16.77%	49.11%	20.95%
Gasoline 18-Month Futures	15.38%	56.24%	NA
WTI Nearby to 36-Month Futures	14.58%	45.95%	15.09%
Brent-WTI Nearby Futures	14.02%	57.26%	13.60%
WTI Crude 36-Month Futures	13.06%	46.99%	17.71%
Brent Nearby to 36-Month Futures	12.69%	45.31%	17.81%
Brent Crude 36-Month Futures	12.67%	44.40%	18.73%
S&P500 Index (Spot)	11.34%	57.93%	10.02%
US 10-Year Treasury (Cash Market)	5.10%	12.33%	4.12%
Federal Funds Rate (Cash Market)	0.00%	0.04%	0.01%

Source: Data from Bloomberg Professionals, Calculations by CME Economic Research.

Infrastructure bottlenecks have been playing a very large role in the inability of markets to move toward energy content pricing equivalence in the face of large production increases. These bottlenecks have been very severe in the U.S. As we have seen, they have served to produce a very wide energy equivalence pricing gap between crude oil and natural gas. The energy content pricing gap means that crude oil is likely to bear the brunt of global macroeconomic demand impulses. However, as the pricing gap starts to narrow as infrastructure bottlenecks are slowly resolved, we think there is the possibility that volatility may move from natural gas to crude oil. That is, we see the possibility of the following implications:

- More of the current price volatility from natural gas will impact crude oil possibly raising crude oil price volatility as natural gas volatility declines, and
- Crude oil is currently more susceptible to economic demand factors than natural gas, although this may change in the next few years.

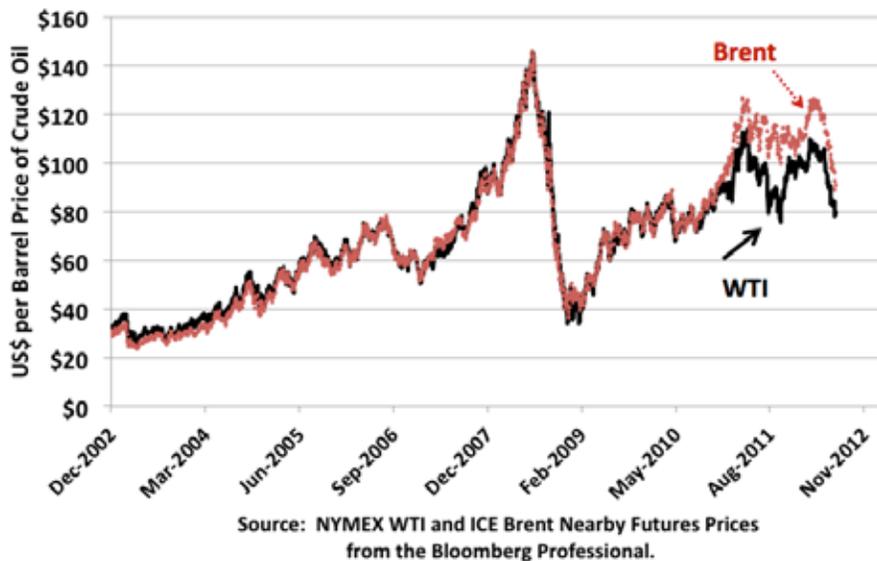
**Spread Relationships.** An important spread relationship that was hit by U.S. infrastructure bottlenecks was the WTI crude oil price compared to North Sea Brent. The inability to get expanded North American Mid-continent oil production (WTI pricing) to the East, West, or Gulf Coast efficiently by pipe or train is often blamed for the partial breakdown of the price relationship with North Sea crude oil. We see this story as a good deal more complex.

As noted earlier in our general discussion of supply trends, for more than a decade Canada and the U.S. have been significantly increasing their crude oil production. This has come at the same time that North Sea oil production has been experiencing a serious decline. The comparative difference in the supply situation has put pressure on the relative prices between oil delivered in the U.S. Mid-continent and the North Sea; however, the price relationship between these two locations has been impacted by other factors as well.

There have been logistical bottlenecks in the U.S. and Canada, which are now being relieved by the marketplace, with reversal of pipelines and added rail capacity, as we discussed earlier. In addition, there have been important increases in storage capacity: storage capacity at Cushing, OK, has nearly doubled over the past five years and is currently at 70 million barrels (and growing).

Figure 3.

### NYMEX WTI Crude Oil and ICE Brent Nearby Futures Prices



Then, there is also the problem of getting a handle on North Sea oil pricing in the first place, since “Brent” is actually based on the arbitrary combination of the four streams of oil. Moreover, these four streams are not necessarily fungible. The four streams are Forties, Brent, Oseberg and Ekofisk, of which Forties is considered the least valuable of the four streams. Since cash market and forward market contracts confer the choice of delivered crude stream on the seller, it is Forties that has consistently priced what is referred to as Brent or North Sea oil for about the past decade. One of the problems for analyzing the pricing for Forties is that it suffers chronic disruptions from unscheduled interruptions in its production and loading schedules. Moreover, because there is anticipation of disruptions (even though they are unplanned), there is belief by some analysts that Forties and, therefore, headline North Sea Oil prices reflect a premium to compensate for an undependable delivery mechanism, not market fundamentals.

All of these special factors for WTI and Brent have come to a head in the past two years and have combined to make the WTI-Brent price relationship extremely complex. There are plenty of signs, however, that market forces are at work to correct fundamental price discrepancies, even if that takes time and money and involves some risk.

Importantly though, whether Brent or WTI, crude oil is much more exposed than natural gas to the global macroeconomic implications of the deceleration of growth in China, India, and Brazil, as well as the economic stagnation in Europe. And, markets appear to have persistently underestimated the economic growth slowdown in emerging markets, although we presented a different and more pessimistic perspective

back in December 2011 for China, specifically. [See “China: Slower Export Growth, End of the Infrastructure Boom Years”, [www.cmegroup.com/education/featured-reports/china-slower-export-growth-end-of-the-infrastructure-boom-years.html](http://www.cmegroup.com/education/featured-reports/china-slower-export-growth-end-of-the-infrastructure-boom-years.html)] The global macroeconomic developments are pointing to downward pressure on crude oil prices as well as heightened price volatility.

**Diversification Potential.** Our final set of observations focuses on the overall diversification potential of the energy sector to mitigate risks in either a global macro portfolio or an equity portfolio. To examine diversification potential, we focus on correlations and present in Table 2 a summary of the correlations between different energy products and spread

relationships to the U.S. S&P500 Index. As in the case of volatilities, we present three distinct time periods: 2012 to date, the height of the financial panic from September 2008 into March 2009 and a pre-crisis sample from the year 2006. The table is ordered with the current lowest correlations on top.

What stands out in the correlation analysis is the exceptionally low correlations to equities from the natural gas sector and related spreads. By contrast, with its directional risk more tightly linked to global macroeconomic conditions, crude oil does not provide nearly the same degree of diversification. The implications for global macro portfolio management are as follows:

- There are exceptional diversification opportunities with natural gas and natural gas spread relationships compared to crude oil.
- Energy spread relationships, in general, whether calendar spreads or product spreads, offer diversification potential with their decreased emphasis on “beta” or directional developments.

*Continued on Page 15*





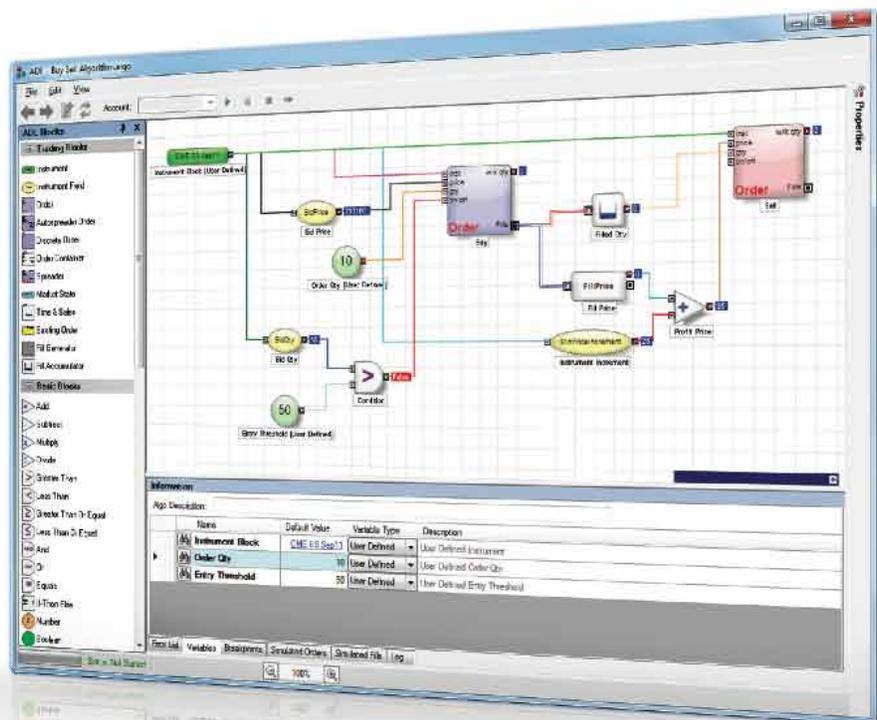
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### Featured Speakers:

- Gary Chen, Vice President, Product Management, Fixed Income Clearing Corporation (DTCC)
- Harvey Flax, Vice President & GCF Repo Business Manager, NYSE Liffe U.S.

### Summary of Program:

- Key aspects of the Repo and Financing markets in the U.S.
- Beyond Fed Funds futures: DTCC GCF Repo Index as a new Benchmark for U.S. interest rate traders
- Trading and Clearing GCF Repo Index futures on NYSE Liffe U.S. and New York Portfolio Clearing (NYPC)
- Incentive Programs and capital efficiencies for U.S. futures traders

## USING TRADING TECHNOLOGIES NEW ADL™ TO TRANSFORM YOUR TRADING

Co-Sponsored by AlgoLinX, LLC  
May 30, 2012

### Featured Speakers:

- Ken Alpart, Founder and Principal AlgoLinX, LLC
- Conan McGinley, Design Consultant and Programmer, AlgoLinX, LLC
- Dan Portillo, Design Consultant & Programmer, AlgoLinX, LLC
- Jeff Walden, Algorithmic Trading Strategy Specialist, Trading Technologies

Both simple and advanced design concepts were presented for Trading Technologies' incredible new addition, ADL (Algo Design Lab). Several algorithms were demonstrated followed by a question and answer session.

## DOES INTERNATIONAL ORDER FLOW CONTRIBUTE TO PRICE DISCOVERY IN STOCK INDEX FUTURES MARKETS

Co-Sponsored by CME Group  
June 6, 2012

### Featured Speaker:

- Dr. Alex Frino, Chief Executive Officer of the Capital Markets Cooperative Research Centre Limited (CMCRC)

Dr. Alex Frino discussed the latest research produced by his Centre, specifically his work on the importance of Chicago-based order flow for market centres in order time zones, as well as his latest cutting-edge research on high-frequency trading.

## U.S. ECONOMIC OUTLOOK

Co-Sponsored by CME Group  
June 13, 2012

### Featured Speaker:

- Blu Putnam, Chief Economist, CME Group

Blu Putnam shared his outlook on the U.S. Economy which included comments on the Fed and fiscal policy for 2013.

### Discussion included:

- Forecasted global economic growth
- Perspective on employment, population dynamics and Central Bank policy for Brazil, China and Europe
- Politics of Greece leaving the Euro
- U.S. fiscal policy challenges in 2013

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Taken as a whole, for those with the expertise to study and appreciate these markets, the energy sector presents important opportunities to diversify a global macro portfolio or to mitigate equity risk. To manage the risks in the global macroeconomic environment, a greater emphasis on natural gas and on spread relationships may well pay large dividends, especially relative to long-only commodity portfolios with a greater share of risk coming from crude oil directional movements.

Table 2.

<b>Correlation to S&amp;P500 From Daily Percentage Change in Prices</b>	<b>2012, Jan-May</b>	<b>15 Sept 2008 - 13 Mar 2009</b>	<b>2006</b>
US 10-Year Treasury (Cash Market)	-0.51	-0.50	0.12
Natural Gas-Heating Oil Nearby Futures	-0.19	-0.25	0.07
Brent-WTI Nearby Futures	-0.09	-0.00	0.04
Natural Gas 36-Month Futures	-0.05	0.30	0.02
Federal Funds Rate (Cash Market)	-0.05	0.17	-0.01
Natural Gas Nearby Futures	-0.04	0.21	0.08
Natural Gas Nearby to 36-Month Futures	-0.02	0.13	0.07
WTI-Gasoline Nearby Futures	0.12	-0.02	-0.12
Heating Oil 18-Month Futures	0.18	0.46	0.01
WTI-Natural Gas Nearby Futures	0.24	0.21	-0.08
WTI Nearby to 36-Month Futures	0.29	0.26	0.02
Brent Nearby to 36-Month Futures	0.34	0.33	0.05
Gasoline Nearby Futures	0.37	0.41	0.09
Gasoline 18-Month Futures	0.47	0.45	NA
WTI Crude 36-Month Futures	0.49	0.42	-0.05
Brent Crude 36-Month Futures	0.50	0.39	-0.01
Heating Oil Nearby Futures	0.51	0.46	0.02
Brent Crude Nearby Futures	0.54	0.41	0.03
WTI Crude Nearby Futures	0.56	0.33	0.01
S&P500 Index (Spot)	1.00	1.00	1.00

**Source: Data from Bloomberg Professionals, Calculations by CME Economic Research.**

\*\*\*\*\*  
**Risk Disclosure.** Futures trading is not suitable for all investors, and involves the risk of loss. Futures are a leveraged investment and, because only a percentage of a contract's value is required to trade, it is possible to lose more than the amount of money deposited for a futures position. Therefore, traders should only use funds that they can afford to lose without affecting their lifestyles. And only a portion of those funds should be devoted to any one trade because they cannot expect to profit on every trade.  
 \*\*\*\*\*



Bluford (Blu) Putnam has served as Managing Director and Chief Economist of CME Group since May 2011. He is responsible for leading economic analysis on global financial markets by identifying emerging trends, evaluating economic factors and forecasting their impact on CME Group and the company's business strategy. He also serves as CME Group's spokesperson on global economic conditions and manages external research initiatives.

## UPCOMING EVENTS

where should you be?

### ADVANTAGE FUTURES SEMINAR SERIES

#### **NYC Exclusive: Maximize Your Algo Trading with ADL™ and Colocation**

Co-Sponsored by Trading Technologies and CME Group  
 July 26, 2012 4:00 pm ET  
 CME Group NYMEX Building NYCE  
 One North End Avenue, 10th Floor  
 New York, NY 10282  
 A cocktail reception will follow the seminar.

#### **Opportunities with Spread Trading and Energy Products**

Co-Sponsored by CME Group  
 August 23, 2012 3:00 pm CT  
 CBOT Building  
 5th Floor Visitors Center  
 141 W. Jackson Blvd.  
 Chicago, IL 60604

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