Challenges in Commodities Risk Management

The recent out-performance of commodities versus equities has caused a positive re-evaluation of commodities by both retail and institutional investors.

By **HILARY TILL & JOSEPH EAGLEEYE,** Co-Founders of Premia Capital Management, LLC.

SINCE DECEMBER 2001, the annualised performance of commodities as represented by the Goldman Sachs Commodity Index (GSCI) has been + 26.2% while the annualised performance of equities as represented by the S&P 500 equity index has been +3.8% (Figure 1).

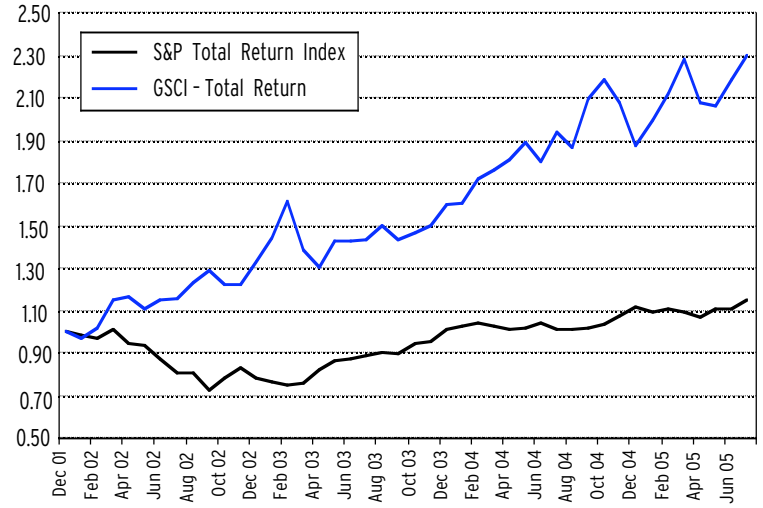
The positive performance of the GSCI has largely been due to the following two factors:

1) Adverse supply shocks resulting from the ageing energy infrastructure in the US and Europe.
2) Expanding demand, particularly from China. These factors may well continue to boost the returns from investing in a commodity futures programme.

> ... recent out-performance of commodities has caused a positive re-evaluation by investors <

Figure 1. Cumulative Value of Investing in Commodities vs Equities

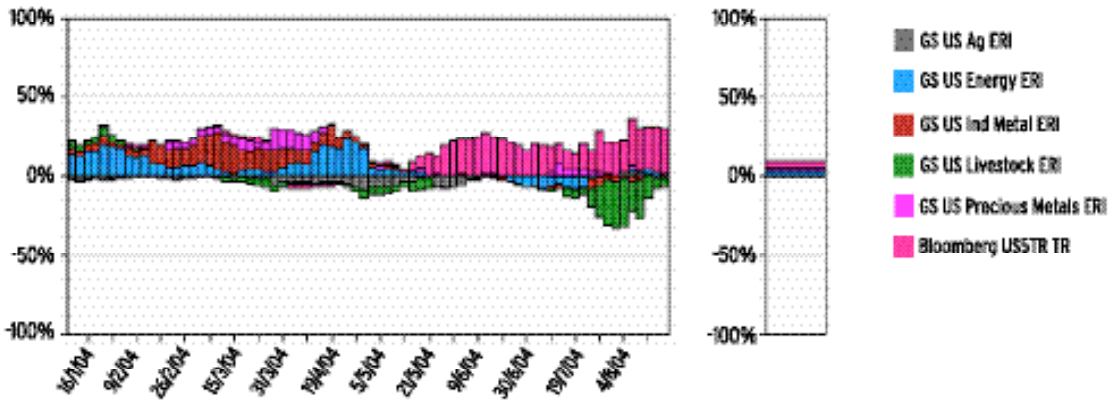
Cumulative Investment Value Starting with $1, December 2001 – July 2005



Source: Bloomberg

As discussed in *Till and Gunzberg* (2005), if an investor elects to invest in a commodity index product, then that investor realises that they will earn the inherent return of the asset class, will be able to do so cheaply, but will not be provided with any downside risk protection. It will be the responsibility of the investor to either time their investments in commodity indices, or create a properly balanced overall portfolio, so as to avoid downside risk. If instead the investor chooses an actively managed commodity programme, then that investor expects the potential downside of this investment to be carefully managed.

Figure 2. Exposures to Time-Varying Risk Premia in Commodity Markets

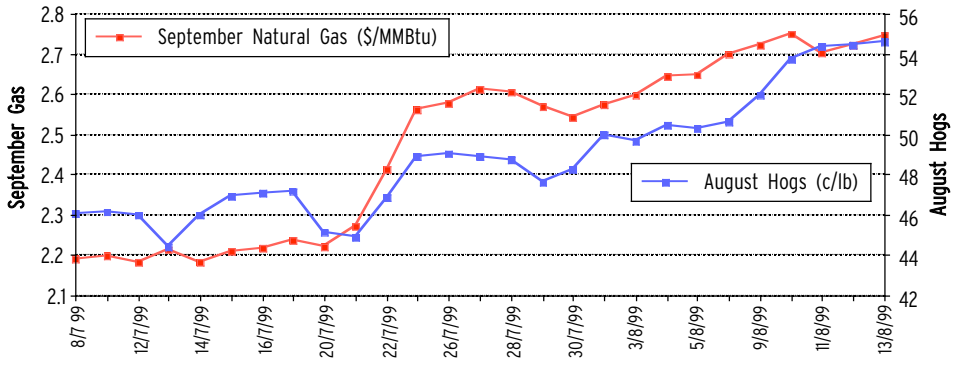


This graph illustrates Premia Capital's rolling exposures in energies, metals, US fixed income, livestock and agriculture during the first eight months of 2004. More technically, the graph shows the conventional benchmarks that were most effective in jointly explaining Premia's daily return variance using an advanced returns-based-analysis technique.
The benchmarks are the Goldman Sachs (GS) Commodity sector excess return (ER) indices and a Bloomberg US fixed-income index. The graph's y-axis is the fraction of R^2 that can be attributed to a benchmark exposure. This is also known as the benchmark's variance component. The middle chart shows each benchmark's contribution to R^2 over the whole history. Source: PRISM ANALYTICS, www.prismanalytics.com

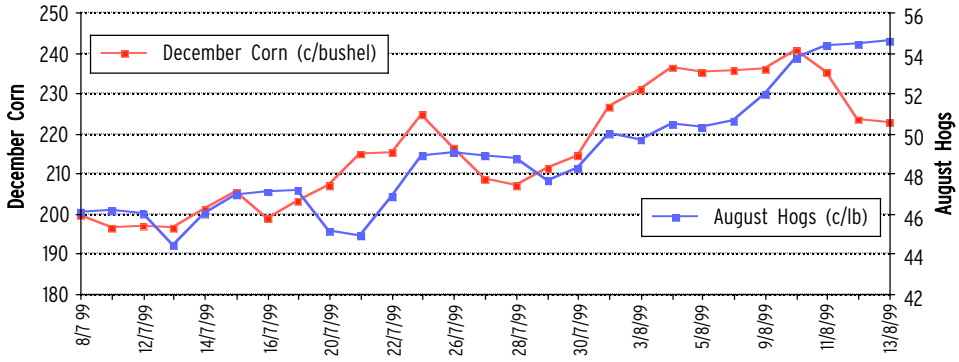
Source: Till, 2005

Figure 3. Hog, Natural Gas & Corn Correlations

PANEL A:
Daily August Lean Hog Futures & September Natural Gas Futures Prices
(7/8/99 – 8/10/99)



PANEL B:
Daily August Hog Futures & December Corn Futures Prices
(7/8/99 – 8/10/99)



Source: Bloomberg

Risk Premia Strategies

Some active programmes obtain their returns through the careful exploitation of time-varying risk premia in the commodity markets. For example, Figure 2 illustrates an active portfolio's exposure to various commodity sectors and fixed income during the first eight months of 2004.

We have found that the most important element in an investment programme that exploits the risk premia available in the commodity futures markets is its risk management methodology. In the interests of brevity, we will focus on only one aspect of risk management: ***the avoidance of inadvertent concentration risk.***

Avoidance of Inadvertent Concentration Risk

Ideally a commodity portfolio manager will attempt to create a portfolio of diversified commodity strategies in order to dampen risk. According to hedge fund manager Paul Touradji, "One of the best things about being a commodity manager is the natural internal diversification."

"While even unrelated equities have a beta to the overall market, many commodities– such as sugar and aluminum – traditionally have no correlation at all," according to Teague (2004) in his interview with Touradji.

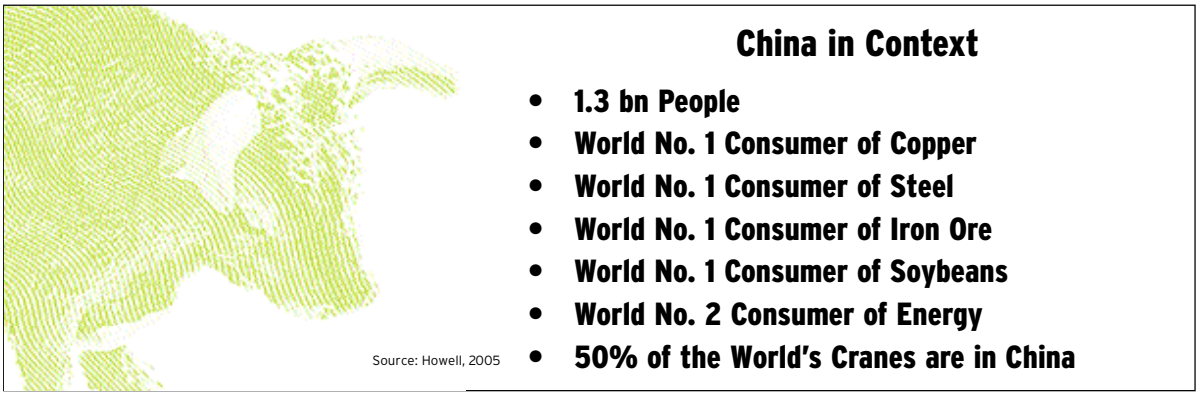
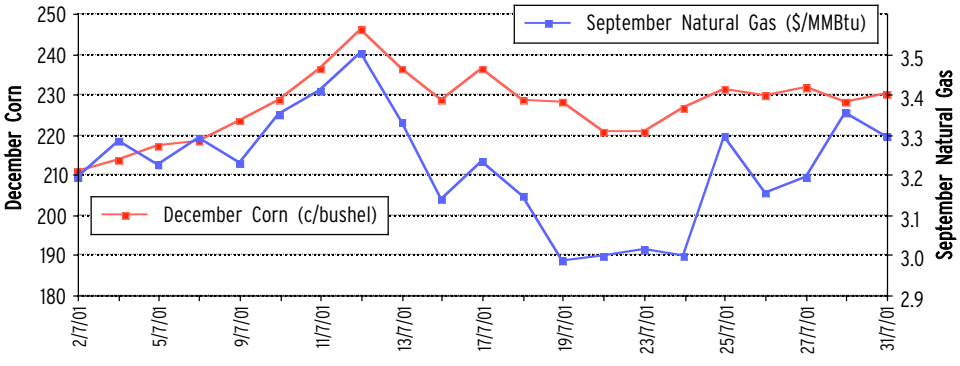


Figure 4. December Corn Futures Prices & September Natural Gas Prices

(7/2/01 – 7/31/01)



Source: Bloomberg

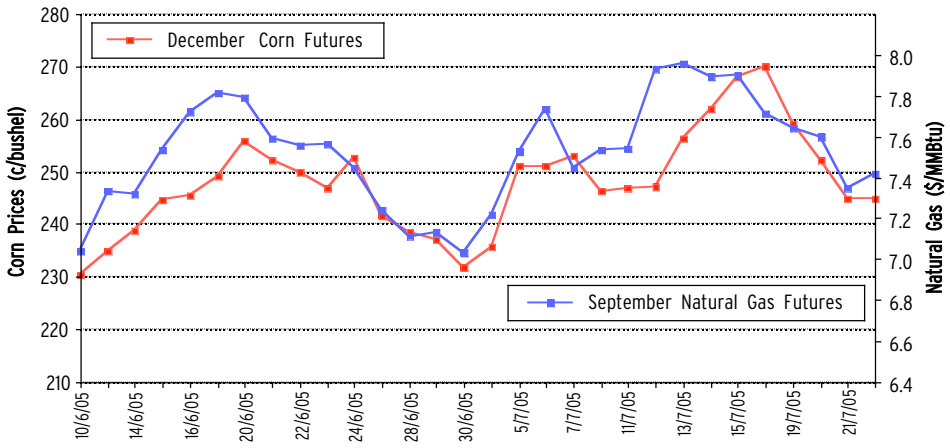
Seasonally Varying Correlations Due to the Weather

One might expect that the price of natural gas should ***not*** be correlated to the prices of either corn or hogs. But in reviewing Figures 3, 4 and 5 from the summers of 1999, 2001 and 2005, one might question that expectation.

It turns out that the prices of natural gas, corn and hogs all depend on the outcome of weather in the US Midwest

Figure 5. Prices of Corn & Natural Gas Futures Prices

(6/10/05 - 7/22/05)



Source: Bloomberg

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during the summer. An exceptional heatwave in the Midwest can impair corn pollination prospects as well as stress the delivery of adequate natural gas supplies for peak air conditioning demand. Also, the delivery of hogs to market can be curtailed during heatwaves because the animals may get too stressed during transit. Because each of these commodity markets have common reactions to the possibility of extreme heat, their prices tend to wax and wane at similar times during the summer.

If a commodity portfolio manager does not want to own too much risk to the outcome of summer Midwest weather, then it would be prudent for the manager to examine how the portfolio would do during times of both extreme and normal weather during the US summer, especially if the portfolio includes natural gas, corn and hogs.

Seasonally Varying Correlations Due to Chinese Holidays

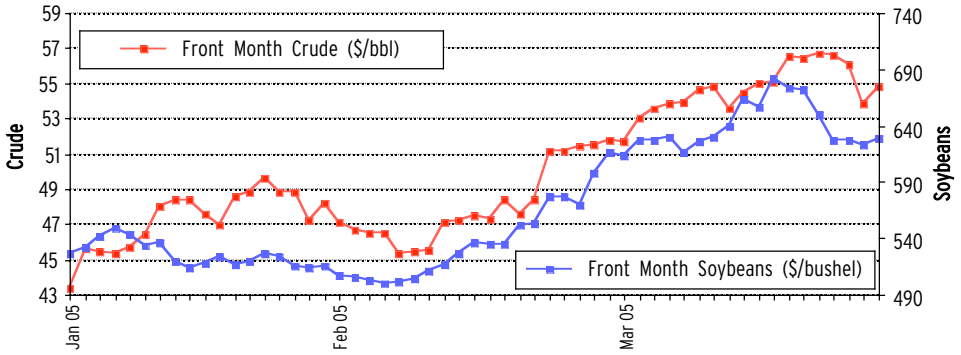
One might expect that the price of crude oil should not be correlated to the prices of either soybeans or copper. But in reviewing Figures 6 and 7 from this past spring, one might question that expectation.

What might explain the common waxing and waning of prices in crude oil, soybeans and copper during this past spring? China is now the number 1 or 2 consumer in a number of major commodities. When one re-examines Figures 6 and 7 in light of the Chinese holiday calendar, one notes that the lulls in each commodity's bull market have occurred around the time of Chinese holidays in February and May of this year, presumably when Chinese demand was absent.

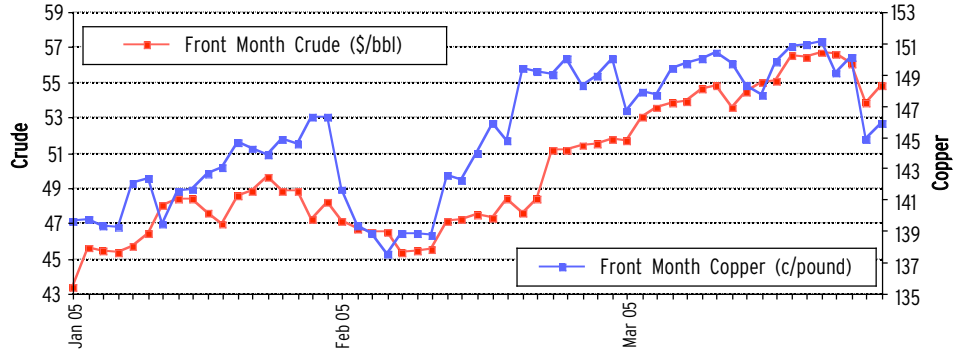
If a commodity portfolio manager does not want to

Figure 6. Crude, Soybeans & Copper Correlations

PANEL A:
Crude Oil & Soybean Futures Prices
(1/5/05 - 3/24/05)

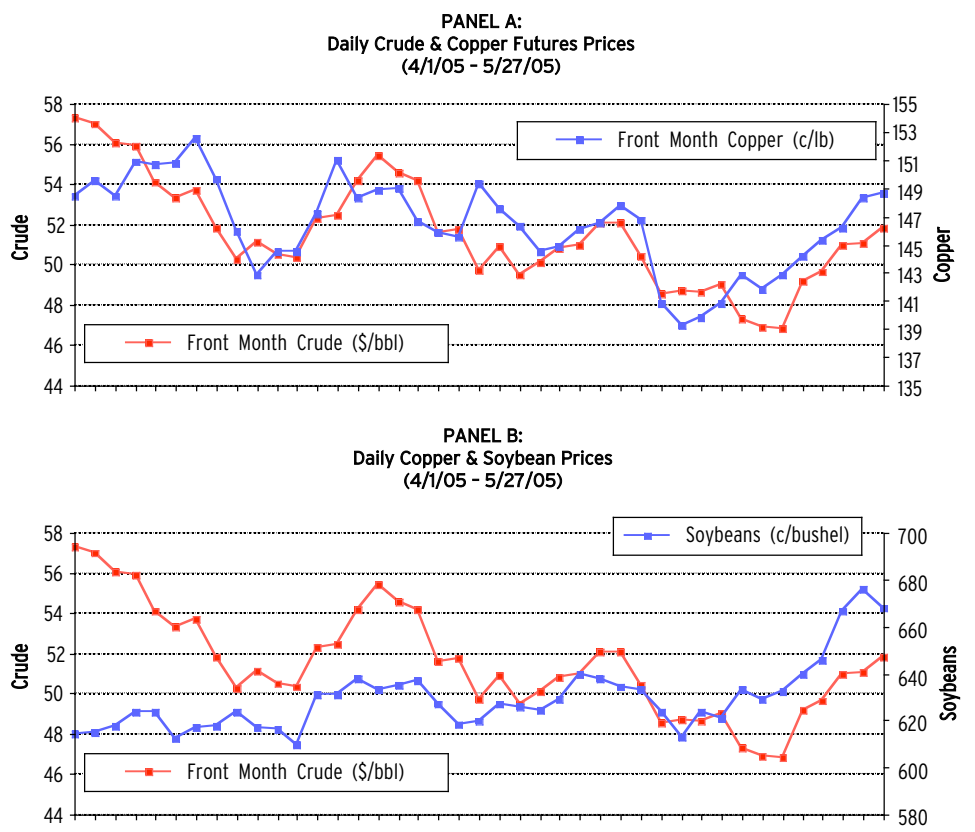


PANEL B:
Daily Crude & Copper Futures Prices
(1/5/05 - 3/24/05)



Data: Bloomberg, Source: Till (2005)

Figure 7. Crude, Soybeans & Copper Correlations



Source: Bloomberg

Copper and platinum became the same trade during the latter half of April of 2004. If a manager had both of these trades in their portfolio, then that manager may have inadvertently doubled up on risk to China's intensive economic development.

The entrance of China as a dominant

own too much risk to fluctuating Chinese demand, then it would be prudent for the manager to be careful in his or her risk capital allocation to the petroleum complex, industrial metals and soybeans.

> China's dominance ... has a number of implications for active risk management & portfolio construction methodologies <

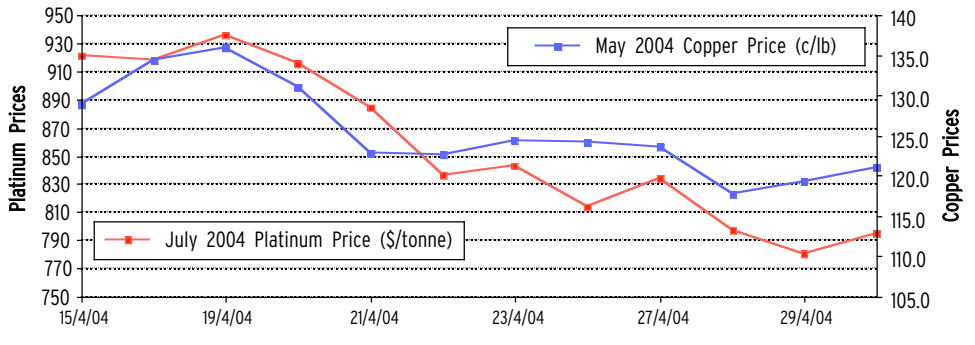
Cautionary Note on Chinese Demand

In April 2004, following reports of a more stringent official policy towards industrial loans in China, both copper and platinum prices declined precipitously, as shown in Figure 8.

force in the commodity markets obviously has a number of implications for an active manager's risk management and portfolio construction methodologies. One consequence may be to view the world in terms of internationally traded commodities versus purely domestically traded commodities. A basket of internationally traded commodities includes, for example, crude, copper, and soybeans while the diversifying basket of (US) domestically traded commodities includes livestock and natural gas. The 'domestic' basket would be expected to perform independently of the 'international' basket, and presumably the performance of the 'domestic' basket would not be impaired by a Chinese economic hard-landing. In that scenario, we might expect the 'international' basket to potentially perform poorly as its components have thus far benefited from strong Chinese demand.

Figure 8. Platinum & Copper Futures Prices

(4/15/04 - 4/30/04)



Data Source: Bloomberg, Source: Till and Eagleeye (2005).

That said, taking into consideration the risk of a Chinese hard-landing is not meant to invalidate the case for commodity investing. We are only recognising that the history of developing economies is one of violent, unpredictable fluctuations around a long-term growth trend (such as in the US during the 19th Century) so one might expect similar patterns during the ongoing development of China.

Conclusion

We conclude by noting that while the commodity markets provide a manager with ample opportunities for creating portfolios of diverse strategies, there are a number of challenges in doing so. In this article, we provide two examples of those challenges:

> China's entrance ... in commodity markets has created new correlation footprints <

1) The correlations amongst commodities vary seasonally due to meaningful weather events.
2) China's entrance as a dominant force in commodity markets has created new correlation footprints.

The main implication of these observations is that risk management is a *very* dynamic process ■

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Chicago-based Premia Capital employs statistical techniques to detect opportunities in derivatives markets across asset classes. Premia Capital's focus, though, is on the (natural resources) commodity futures markets. The principals of Premia Capital also advise large investment firms on sophisticated risk-management techniques in periodic consulting engagements.
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