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Passive Strategies in the Commodity Futures Markets

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Since the Goldman Sachs Commodity Index (GSCI) was launched in 1992, the arguments for why a basket of long commodity futures contracts should have positive returns have been well chronicled. What has not been very well publicized is that there are additional, unrelated return opportunities in the commodity futures markets, which can be discovered empirically and understood theoretically.

This article will begin by discussing which particular commodity futures contracts one can expect systematic positive returns from a passive *long* investment. The article will then discuss return opportunities in other commodity futures markets whereby one *shorts* systematically overvalued futures contracts. The article will conclude by noting that the lack of correlation among these strategies means that one can set up surprisingly low-risk portfolios of futures strategies.

Passive Long Commodity Futures Program

The explanation for there being returns in a passive long commodity futures program usually starts with Keynes' A Treatise on Money. Keynes [1935] wrote that spot commodity prices are so volatile that a producer will sacrifice returns in order to hedge himself against the:

> "risk of price fluctuations during his production period. Thus in normal conditions the spot price exceeds the forward price, i.e., there is *backwardation*. In other words, the normal supply price on the spot [market] includes the remuneration for the risk of price fluctuations during the period of production, whilst the forward price excludes this." [italics added]

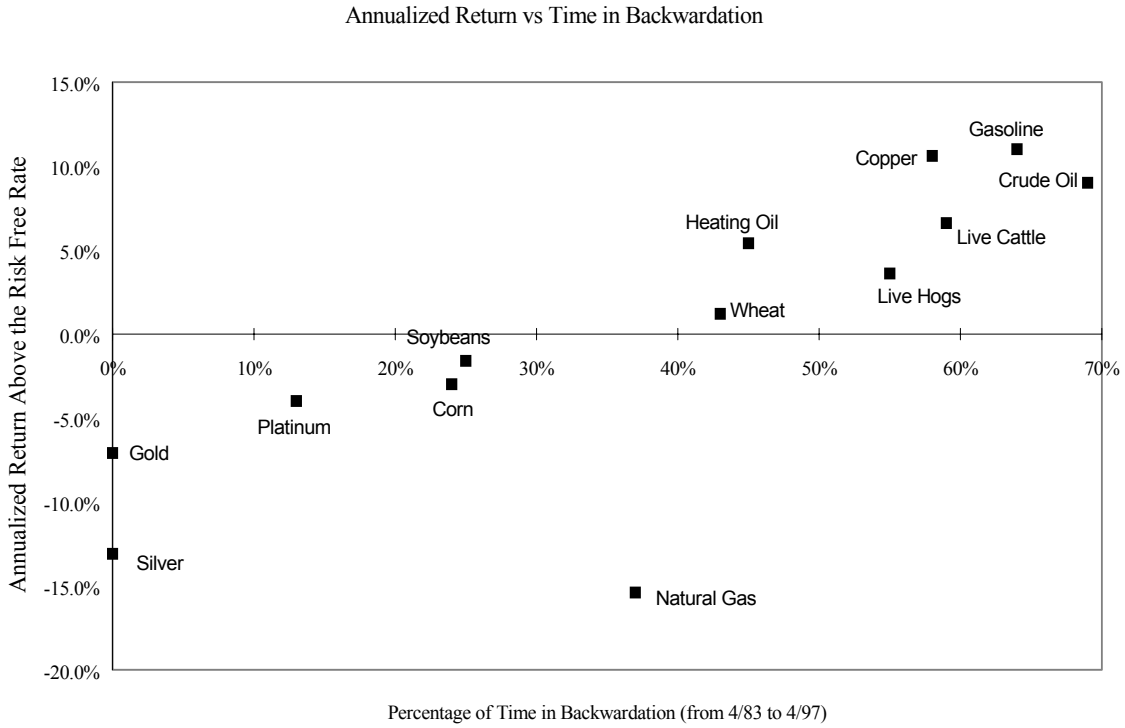
The Keynes hypothesis holds that substantial producer hedging pressure causes the forward price of certain commodity futures contracts to fall to a discount to the spot commodity price. One implication of this hypothesis is that an investor who buys discounted commodity futures contracts may expect to earn a return due to taking on price risk that inventory holders wish to lay off.

The careful reader of the Keynes hypothesis may wonder whether the suggested return opportunities are limited to commodity futures contracts which normally trade in *backwardation*. To review commodity-specific terminology, a commodity futures curve

is in "backwardation" if either the commodity's spot price is trading at a premium to its futures contracts or if a near-month commodity futures contract is trading at a premium to deferred futures contracts.

Based on recent historical data, Nash [1997] confirms that positive return opportunities are confined to commodity futures contracts which normally trade in backwardation:

Figure 1



This graph is based on one contained in the draft version of Nash [1997]. It shows that commodity futures contracts whose normal curve shape is backwardation offer the highest returns.

Note: Gasoline data is since 1/85 and Natural Gas data is since 4/90.

Nash [1997] notes that the chart illustrates a further point:

> "The return on a commodity index is proportional to the amount of time the commodity is in backwardation."

From both Keynes' hypothesis and Nash's empirical study, it seems clear that one should confine their passive long investments to those commodity futures contracts which typically trade in backwardation. These are the contracts for which one is paid to take on

volatile price risk. Given the lack of returns in the other contracts, it does not appear that an investor is serving an economic purpose by being passively long non-backwardated futures contracts.

Passive Short Commodity Futures Program

We have found that a careful empirical study of commodity futures price patterns can reveal systematic return opportunities among a number of commodity futures contracts that are not normally backwardated. Moreover, one earns these returns by systematically shorting these contracts during well-defined times of the year.

In order to discover this class of trades, we had to first have a framework for understanding the economic function of commodity futures markets. Having access to substantial computing power was not enough to make this discovery. Mehta [2000] quotes the co-founder of the Prediction Company, Doyne Farmer, about the difficulties in relying solely on quantitative techniques to discover investment opportunities:

> "'We started out assuming that simply using sophisticated time-series techniques would give us a clear advantage that would allow to make profits,'" Farmer says now. 'But we found there were no magic bullets. We had to think harder about how the markets worked and structure our models to make the data to speak to us. The data didn't speak to us automatically.'"

In our case, we examined whether weather-sensitive commodity futures contracts exhibit any detectable empirical regularities around key weather events. We found that they did, and that they are systematically overvalued at particular times of the year. This means that an investor has been able to earn statistically significant profits by being short these commodities preceding and during key weather events for these commodities. The weather-sensitive contracts for which such return opportunities are available include the grains, cotton, coffee, and natural gas futures markets.

In another article (Till [2000]), we called this class of trades, "the weather fear premium" strategy:

> "A futures price will sometimes embed a fear premium due to upcoming, meaningful weather events. One cannot predict the weather, but one can predict how people will systematically respond to upcoming weather uncertainty.
>
> In this class of trades, a futures price is systematically too high, reflecting the uncertainty of an upcoming weather event. We say the price is too high when an analysis of historical data shows that one can make statistically significant profits from being short the commodity futures contract during the relevant time period. And further that the systematic profits from the strategy are sufficiently high that they compensate for the infrequent large losses that occur when the feared, extreme weather event does in fact occur."

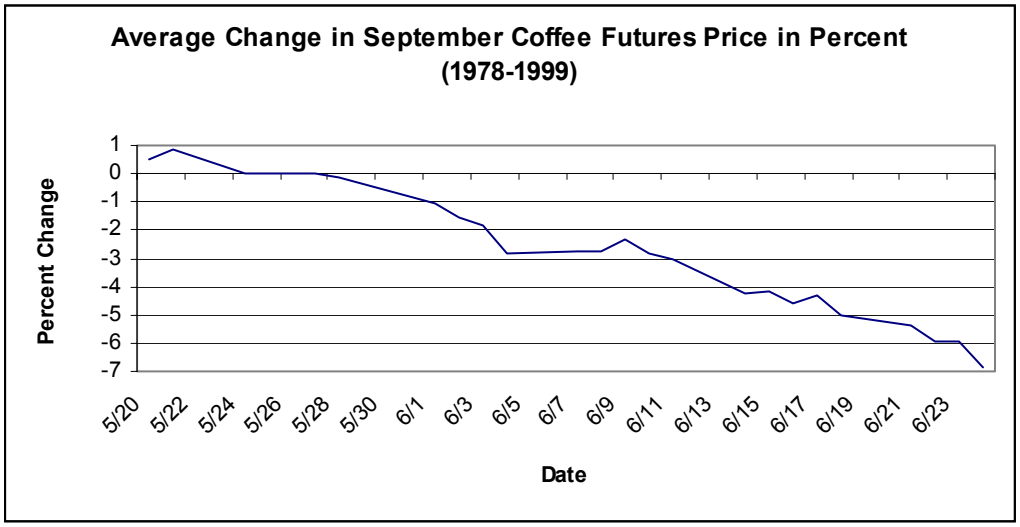
Our hypothesis for why these empirical regularities exist is as follows. Particularly for the grain and natural gas markets, the economy cannot tolerate threats to either the food or energy supply, so the market adds a premium to the futures price around the time of potential weather shocks to ration demand. Further, the commercial commodity trade can be well aware of this return opportunity with no danger of it disappearing. This is because in order to take advantage of these positive expected-value opportunities, they would have to absorb volatile price risk that would impair their ability to carry out essential business planning.

The following will discuss several examples of weather-premium trades.

Coffee

Starting about May, there are fears of a frost in Brazil, which would adversely affect coffee production. A systematic trade is to short coffee futures from late May to late June. The historical likelihood of a frost increases from late June. This trade has been very consistent historically, indicating that its historical profitability is unlikely due to randomness. And in fact, we believe that its consistent profitability is due to the weather fear premium being embedded in the futures contract, which erodes day by day as the feared weather event does not occur.

Figure 2



Average Returns = -6.86%
Z-Statistic = -2.58
Year 2000 Outcome = -10.80%

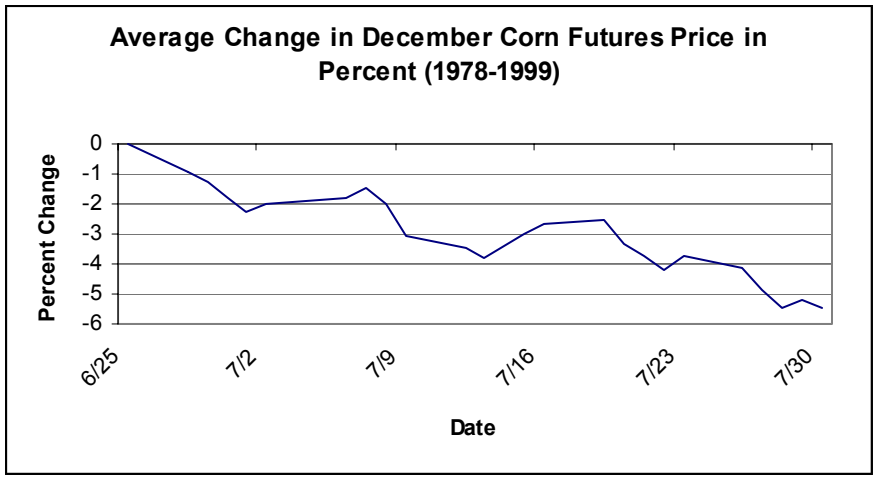
Data source: Bloomberg

Corn

A second example is corn. Its key pollination period is about the middle of July. If there is adverse weather during this time, new-crop corn yields will be adversely affected. This means that the new-crop supply would be substantially lessened, dramatically increasing prices.

A systematic trade is to short corn futures from June through July. There is systematically too high a premium embedded in corn futures contracts during the pre-pollination time period.

Figure 3



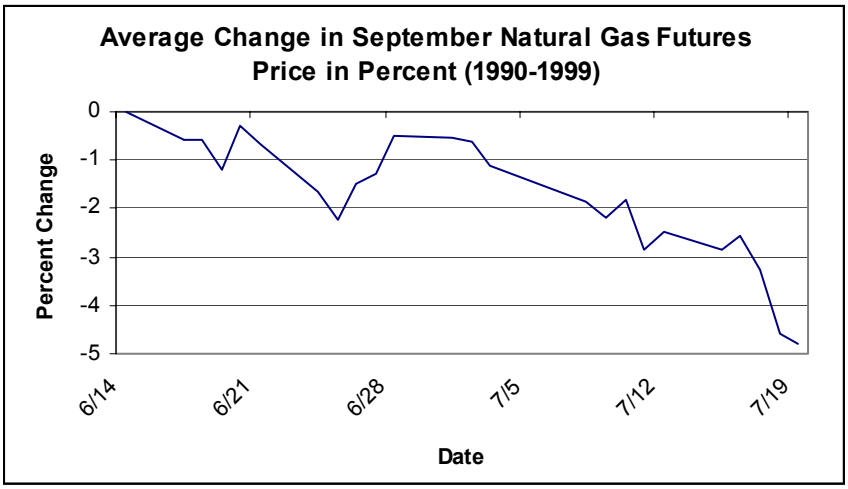
Average Returns = -5.48%
Z-Statistic = -2.72
Year 2000 Outcome = -10.59%

Data source: Bloomberg

Natural Gas

A third example is natural gas. In July, there is fear of adverse hot weather in the US Northeast and Midwest. Air conditioning demand can skyrocket then. From June to mid-July, a systematic trade is to short natural gas futures contracts at the height of a potential weather scare.

Figure 4



Average Returns = -4.81%
Z-Statistic = -2.23
Year 2000 Outcome = -7.69%

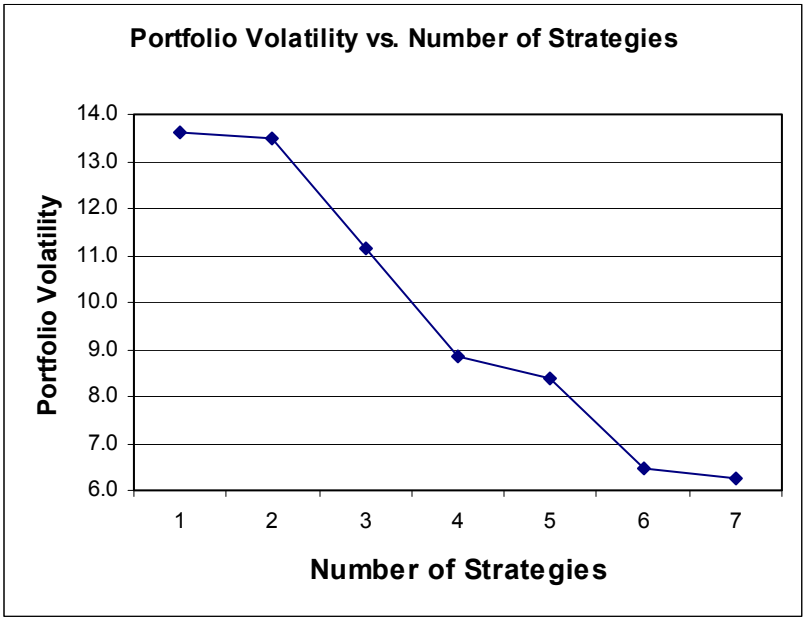
Data source: Bloomberg

Portfolio of Unrelated Commodity Strategies

An investor can potentially take advantage of these opportunities because of the portfolio effect of combining many unrelated risks. Conversely, an undiversified, commercial commodity entity that is solely exposed to the riskiness of an individual commodity market probably cannot take full advantage of this type of trade.

A recent commodity portfolio from June of this year, which combined long, hedge-pressure trades with short, weather-fear-premium trades, illustrates the effect of incrementally adding these unrelated trades on portfolio volatility:

Figure 5



This graph shows annualized portfolio volatility versus number of commodity investment strategies during June, 2000.

Conclusion

As in all strategies that exploit structural phenomena, one can certainly choose to passively invest in the weather-premium strategy, expecting to earn a positive return over time. Alternatively, one can also create quantitative models, incorporating fundamental and technical data, so that one can judge if weather-sensitive futures contracts are especially over-valued, if at all, in a particular year. One would certainly do this in an actively managed commodity futures program.

We conclude by noting that we believe that there are undoubtedly other systematic return opportunities in the commodity futures markets, waiting to be identified, classified, and, of course, monetized. The contribution of this article is to identify one additional source of systematic return besides what has been well documented by proponents of passive investments in long commodity futures contracts.

Bibliography

Keynes, John Maynard, A Treatise on Money: The Applied Theory of Money, Vol. II, Macmillan and Company Limited, 1935, p. 143.

Mehta, Nina, "Doyne Farmer Looks Back," *Derivatives Strategy*, January, 2000.

Nash, Daniel, "Feature: Long-Term Investing in Commodities," Morgan Stanley Dean Witter, Global Equity and Derivatives Markets, 12/9/97, pp. 28-29.

Till, Hilary, "Active Commodity-Based Investing," *The Journal of Alternative Investments*, Summer, 2000, pp. 70-80.