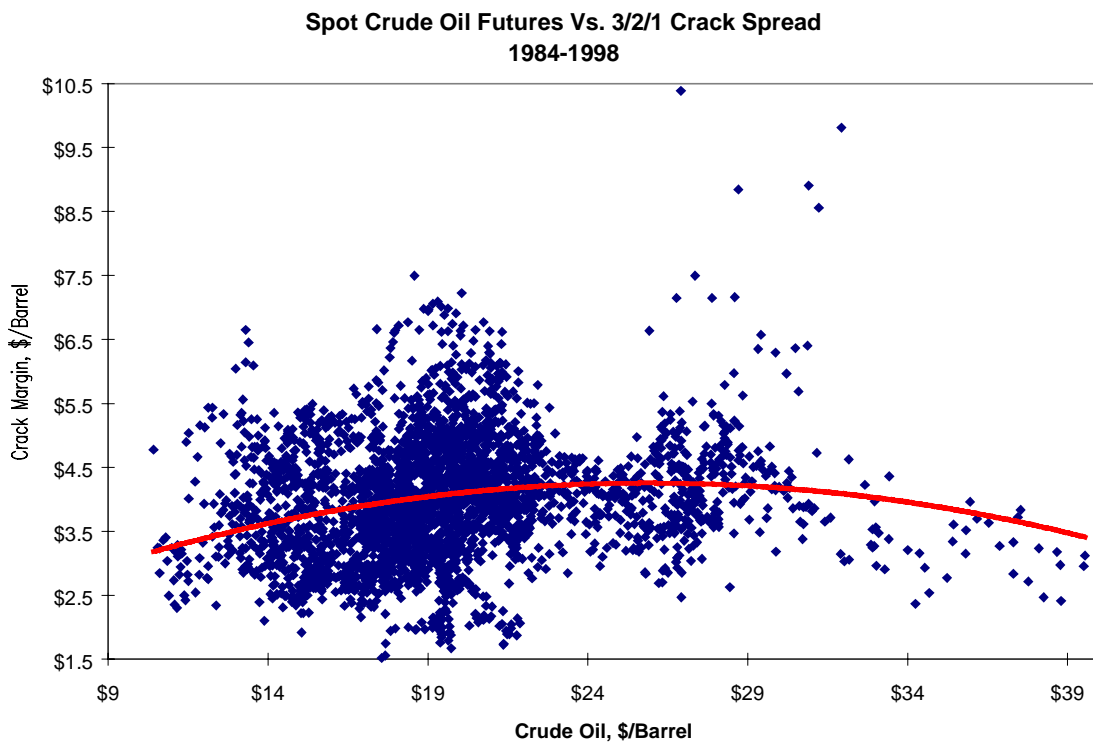


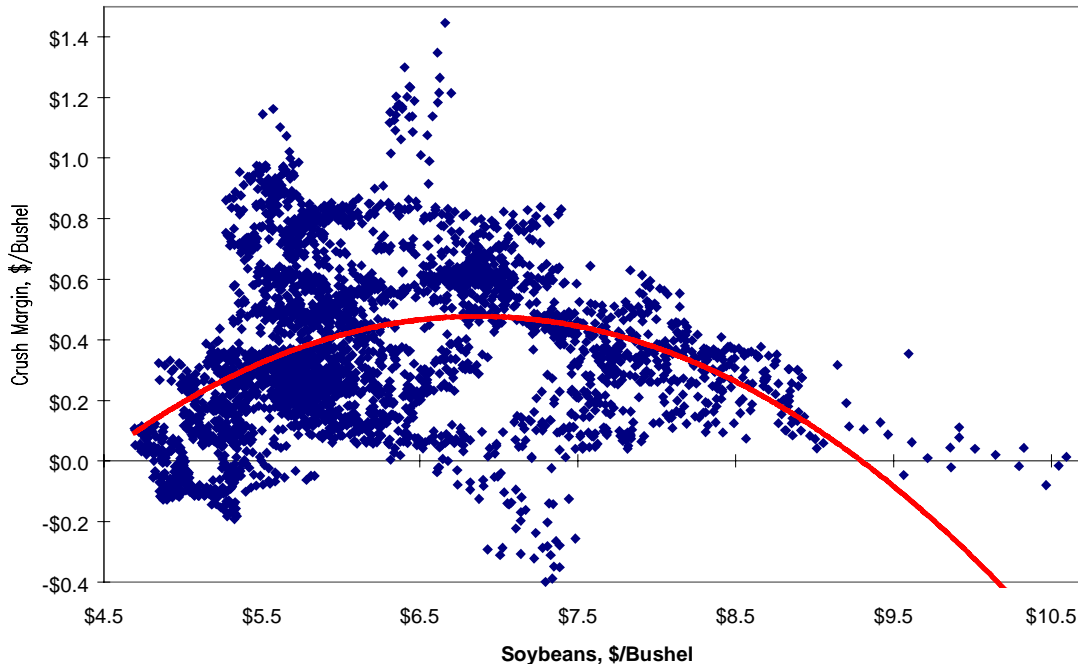
No Margin For Error

No force on earth can withstand the power of a bad idea, especially if that misguided notion becomes the centerpiece of a corporate policy. Take the concept of margin hedging, as illustrated by such common trades as the crude oil crack and the soybean hedge, for example. Managements tend to focus on the spread itself, and often fail to recognize the relatively small movement of the spread in relation to the movement on the legs.

The disproportionate relationship between the two tradable concepts, the spread and the legs, is illustrated below for both the 3/2/1 crude oil crack, (two contracts of gasoline and one contract of heating oil against three contracts of crude oil, divided by three) and the soybean crush. At its historic extremes over the 1984-1998 period, the crack has a range of \$9 per barrel, while the underlying crude oil contract itself has a range of over \$30 per barrel; similar figures for the crush are \$1.80 and \$6.00 per bushel.



Spot Soybean Futures Vs. Crush
1984-1998



The most compelling argument for focusing on the legs and not on the spread, however, is that an identical processing margin can exist over a wide range of prices for the feedstock. In fact, in both of the graphs above, the quadratic trend line indicates stability in the processing margin prevailing over the largest segment of the feedstock price spectrum, with declining margins at both historically high and low prices. Simply put, a refiner is just as likely to realize \$3.50 per barrel at a \$15 crude oil cost as he is at a \$20 crude oil cost – except that he just paid \$5 per barrel more for his feedstock. Given the division of trading responsibilities at most refiners, one person may be responsible for trading crude oil and another may be responsible for trading crack spreads, and they frequently operate independently from one another. An unstoppable bad idea.

A Case Study

Since the ultimate outcome of either a soybean crush or a crude oil crack is determined in part by the spread between soymeal and beanoil or between heating oil and gasoline, respectively, a margin trade can become surprisingly complex rather quickly. We can simplify the illustration by using a single spread, the heating oil crack. Using data from the close of business on December 14, 1998, the following situation obtains: March crude settled at \$12.08, April crude at \$12.37, and March heating oil at \$0.3452.

The classic approach to this trading problem would be to calculate the March heating oil crack, $[(42 * .3452) - 12.08]$, or \$2.42 per barrel, and then try to determine whether this particular margin is worth protecting by selling the heating oil futures and buying the crude oil futures. Since this particular margin happens to be low by historical standards, especially for a late winter month, most refiners would simply choose to remain unhedged on the margin and treat the price of their crude oil feedstock as a separate problem.

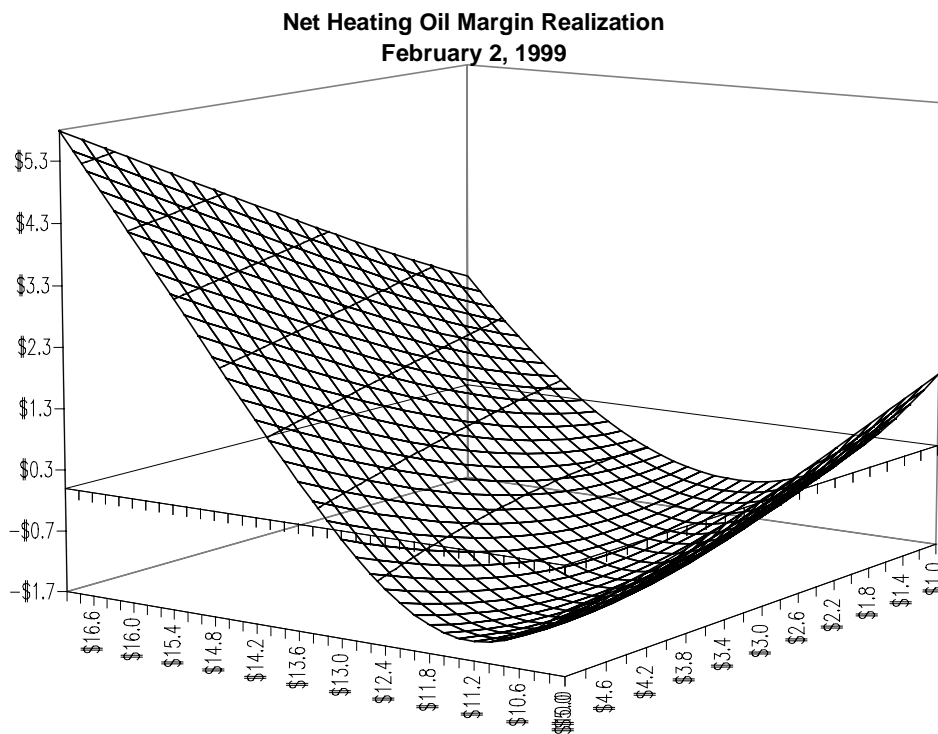
This approach is both inefficient in its inability to capture any of the movement on the two legs of the trade, and unnecessarily risky in its unhedged treatment of the spread. These opportunity gains and losses on the two legs dwarf the potential gains and losses on the spread itself. While we cannot capture these gains with futures, we can capture them with options. This converts a speculative trade on the margin into a combination of a cap on the feedstock costs plus a floor on

the product prices. Thus a refiner could protect his margin by buying crude oil call options and refined product put options, while a soybean crusher could buy soybean call options and put options on soy meal and bean oil. These option trades can be optimized through the Dynamic Option Selection System (DOSS, see <http://www.futuresmag.com/industry/references/references.html>). The recommended DOSS trade for hedging 10,000 barrels of the March heating oil crack is:

[Buy March crude] Buy 25 March \$11.50 calls at \$1.31 and sell 10 April \$12.00 calls at \$1.31

[Sell March heating oil] Buy 16 March \$0.38 puts at \$0.049

Since the crude oil trade involves the March/April spread, we will make a further simplifying assumption of a constant \$0.29 per barrel spread for the purposes of illustration. We can then depict the outcome of the option spread plus the cash market gains and losses for the refiner fifteen days prior to the expiration of the March \$11.50 calls on February 17, 1998 across a range of crude oil prices and heating oil cracks.



The most interesting feature of this resulting profit profile is the location of the low point. We would have to see another \$0.80 per barrel drop in crude oil prices accompanied by a \$0.04 per gallon increase in heating oil prices to reach the net loss of \$1.65 per barrel shown. While it is certainly possible for this to occur, the long-term strongly positive correlation between crude oil and heating oil prices makes this a highly unlikely combination. The net margin realization starts to become strongly positive at both higher crude oil prices, especially with a stronger heating oil crack, and at lower crude oil prices, especially with a weak heating oil crack.

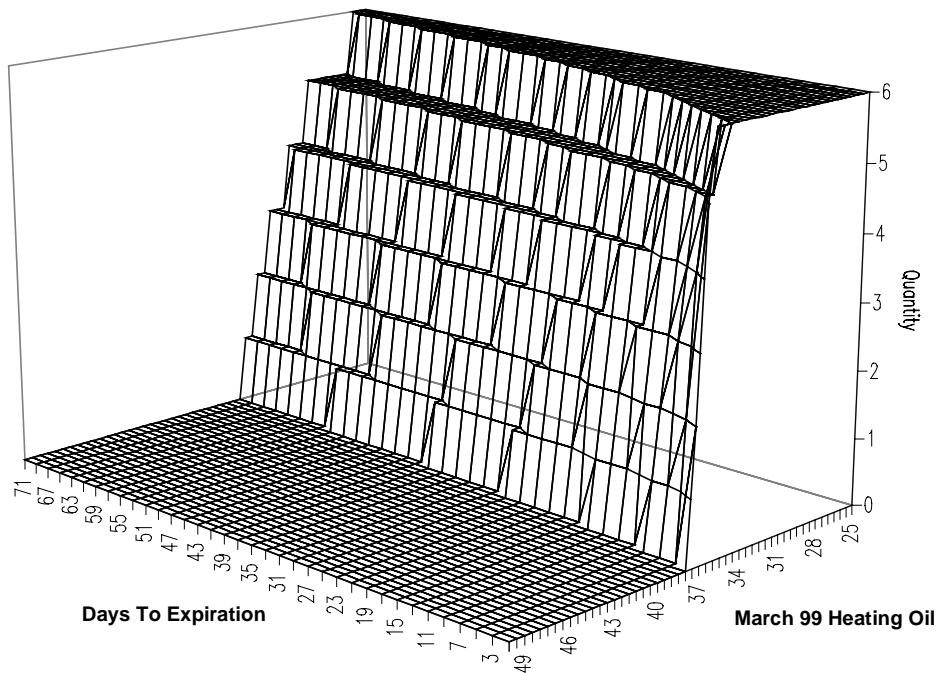
Position Management

The combined feedstock cap / product floor offers an important feature not contained in the classic margin hedge, the ability to capture interim profits via a mechanical system of position management. Let's assume, in a burst of wishful thinking, that the combination of warm weather and weak prices extant at the mid-December 1998 time of this writing continues, and that heating oil prices collapse to \$0.30 per gallon by the end of December. At this point, the total delta of our

16 March \$0.38 puts would no longer be the equivalent of 10 short futures, but rather 14.25 futures. At the new delta, we can sell at least four – technically, 4.77 – of these puts, whose price, at constant volatility, should have expanded from \$0.049 to \$0.082. We can thus take a profit of $4 \times 42000 \times (\$0.082 - \$0.049)$, or \$5,544. Moreover, we are still fully hedged on our entire margin.

If we ignore the potential to re-optimize our hedge positions for the purposes of illustration, the sale of excess delta is bounded by two numbers, zero and six. Since we need to remain short the equivalent of ten futures, and since the delta of a long put can only approach -1.00, we cannot sell more than six of our original 16 puts and still remain hedged. Conversely, if heating oil rallies, we will never get to sell any of the \$0.38 puts; we may, however, be in a position to sell excess call delta back to the market. The map of where we can sell put delta back to the market across the dimensions of price and time is shown below.

Position Management: Sale Of Excess Delta



The use of options as an instrument of spread trading in general, and of margin hedging in particular, opens up additional dimensions for traders. Not only do we have the far greater profit potential and position management opportunities, as seen above, but we now have the additional dimensions of intermonth spreads, as employed in the crude oil cap, and of volatility to trade.