Why Johnny Can't Hedge

The Greek Cynic and philosopher Diogenes wandered the ancient world with a lantern in search of an honest man. You can duplicate both his quest and his purported lack of success by searching for the mythical **True Hedger**.

The very word "hedging" has a positive connotation. It says that we have taken positive, proactive measures to protect underlying economics and to reduce risk. It is a verbal shield before the Court of Inquisition: "Hey, I was hedging!"

Let us condemn these misguided souls, for despite their best intentions they are – dare we say -- speculating! A postulate is offered:

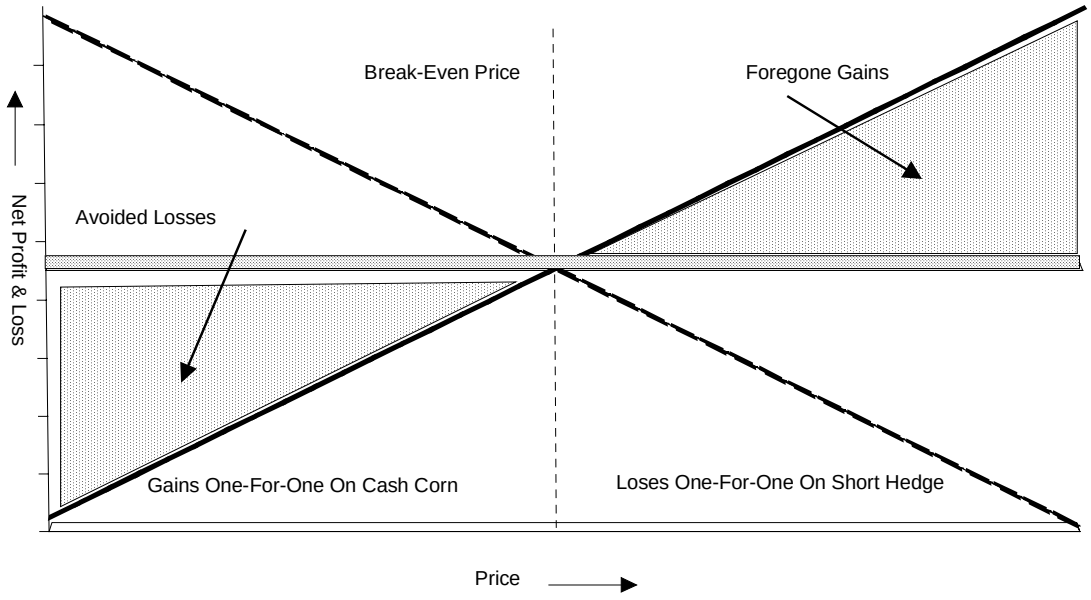
> **The expected gains and losses produced by a series of trading decisions reproduce the linear profit profile of an unhedged position.**

Consider the case of Farmer Brown, who over the years has appeared in more commodities literature than he has in traveling salesman jokes. Let's assume that Brown knows all of his production and marketing costs, etc. Let's also assume that the basis (cash - futures) is now and will be both fair and perfect. Therefore, he will know what his unhedged profits and losses will be at any price level simply by reading the upward-sloping line on the graph below. This profit profile against price is quite clearly linear.

Now let's say that Brown wishes to sell futures forward against all or some of his crop to either "lock-in" profits at some price greater than the break-even or to avoid further losses at some price below the break-even. If Brown sells, he must think that prices will not rise further, and if he does not sell, he must think that prices will not fall further. He rightfully considers himself to be an accurate and unbiased forecaster (if he doesn't think this, then he shouldn't be in the market!).

[NOTE: The mode line of the density and the break-even price lines should line up in the two graphs below.]

Farmer Brown's Excellent Adventure

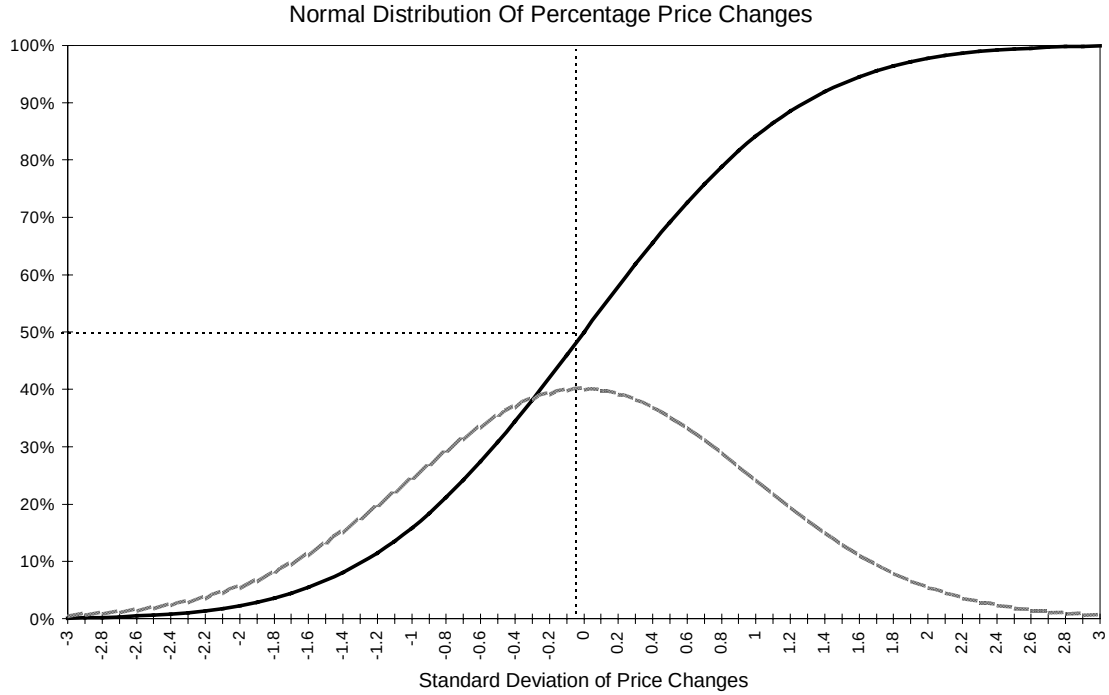


The probability distribution of percentage price changes from the break-even price is given by the bell curve below; the cumulative distribution is shown by the S-shaped curve. The implications of

these curves and their relationship to the "Excellent Adventure" graph are significant. As the market moves up from the break-even price, the temptation to sell becomes greater and greater. Even though there is a probability of higher price movement, Brown knows – quickly -- that he is pressing his luck by not selling: when the cumulative distribution line hits 80%, only .9 σ, the odds become 4 : 1 against further increases. So he begins a program of scale-up selling. As the market moves ever higher, Brown has less and less to sell; this is the cruel reality behind the cumulative distribution curve. Meanwhile, his counterpart at the feedlot has been hoping and praying for lower prices. Finally, when there's little left to buy, he capitulates and prices soar in an upside blowoff.

It works on the other side as well. At first, Brown is understandably hesitant to sell at any price below break-even. As prices move downward, however, he is faced with increasingly grim prospects. He knows that the odds at 20% cumulative distribution, only -.8 σ, are 4 : 1 against further increases. So he waits, hoping and praying for higher prices. Finally, when there's still too much to sell, he capitulates, and prices plunge.

This saga has been going on so long that there are probably undiscovered cave paintings in southern France depicting stunned mastodon traders after a market crash.



The market is thoughtful enough to provide us with an implied volatility measure that can be used to create a price dispersion forecast. The range of a lognormal distribution over time can be determined by using the formula

Range = Price * exp(±Volatility * Z * √t/365),

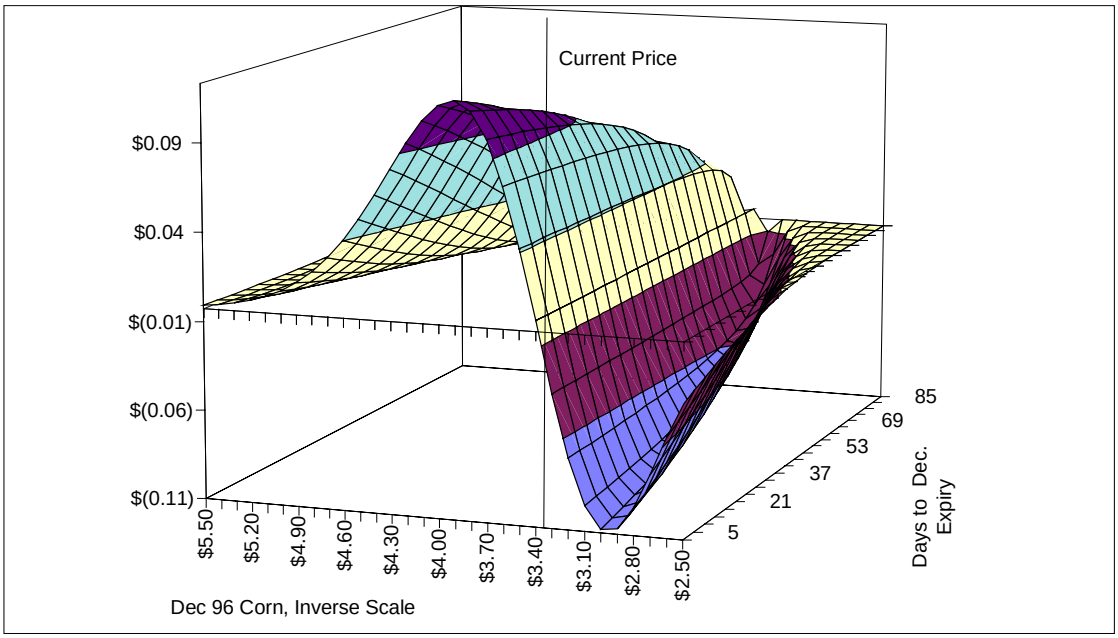
where **Z** is the number of standard deviations required for a given probability level, and **t** is the number of days in the forecast. Since we wish to determine the probability of a given price being reached, we need to rearrange this equation to solve for **Z**

Z = log(P'/Price) / (±Volatility * √t/365),

where **P'** is a given price along the spectrum. **Z** can then be inverted to produce a probability, which can be multiplied against the quantity **(P' - Price)** to produce an expected gain. Even with

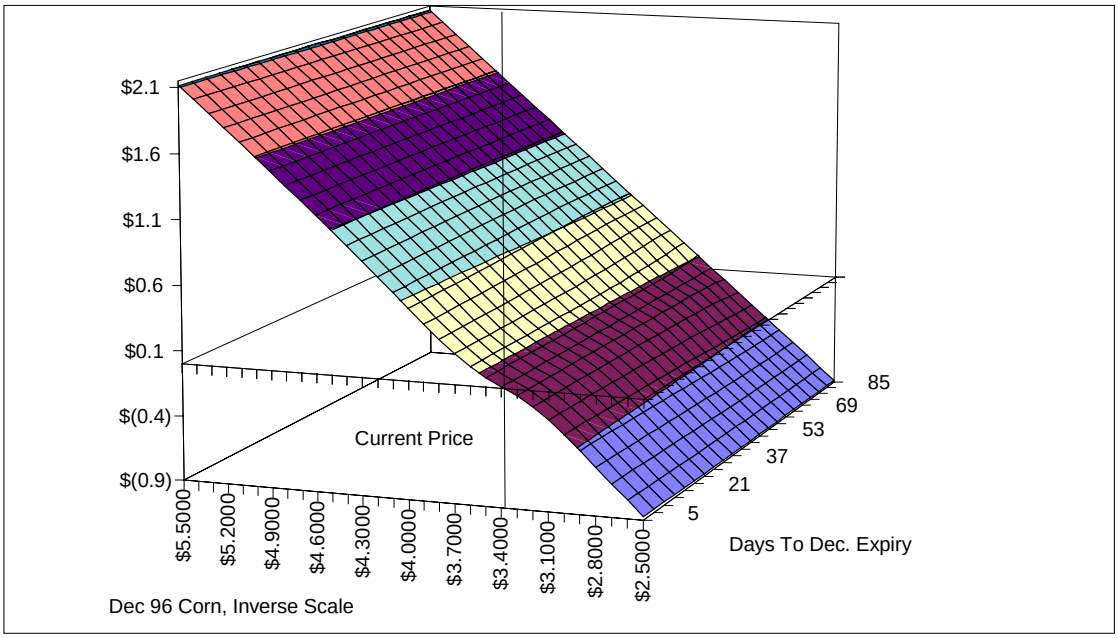
the 28.8% volatility in corn on August 22, the expected gain and loss numbers for any given price are quite low, as shown below.

Expected Gain On Cash Corn Position



Like the bell curve, these expected gains and losses for any given price are a density function, the height of the curve. The surface in the graph above expands as delivery approaches since the greater passage of time has increased the probability of larger price moves occurring. If we take the cumulative area of this surface, we find it to be linear across time. These results are independent of time, interest rates, volatility, or underlying prices.

Cumulative Expected Gain On Corn Position



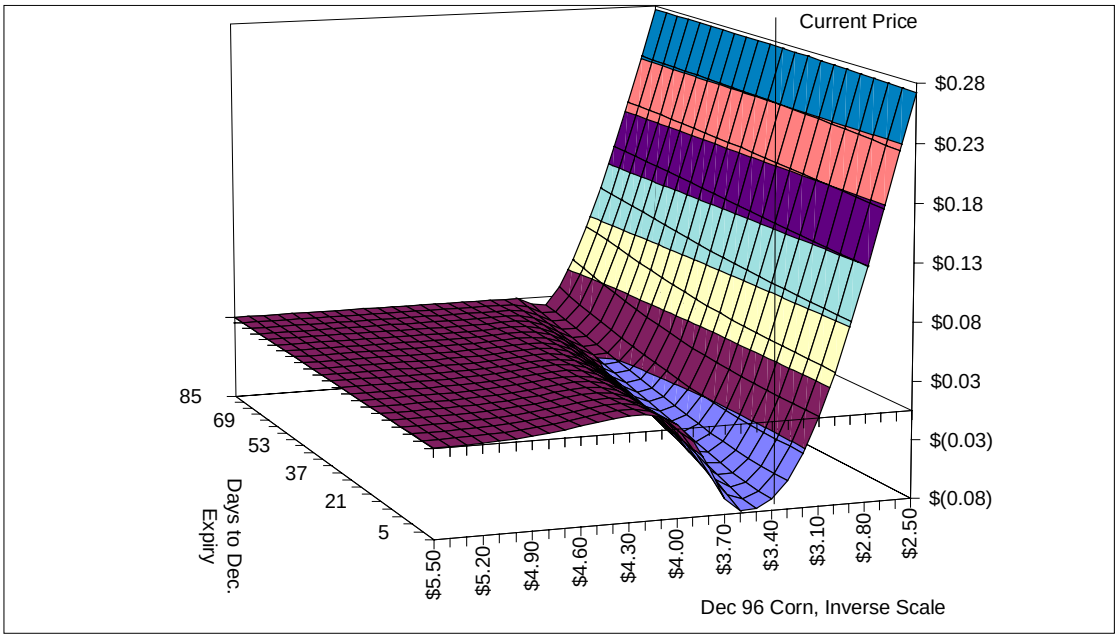
The tyranny of the normal distribution and the immutability of human nature combine to produce the economic behavior that we traders know and love. Technical analysis is based upon these two factors. Without them, all we would have is fundamental analysis, a sobering thought indeed.

A second postulate is offered:

> **The goal of risk management is the conversion of the linear profit profile of an underlying position to the truncated profit profile of a synthetic option.**

Since an open underlying position has a linear, speculative profit profile, we should hedge it as soon as it is recognized [message to accountants: opportunity gains and losses have real economic consequences to the firm, even if they don't show up on a balance sheet). In Farmer Brown's case, this means employing the optimal hedge from the Dynamic Option Selection System (DOSS, see "Using Options The Spec Way," *Futures*, July 1994), a December $3.70 synthetic put consisting of selling 1.45 December futures at $3.385 and buying 1.45 December $3.70 calls at $0.0875 for every 5,000 bushels of corn. The incremental, probability-weighted, cumulative profit profile of this position relative to the short future is shown below. The very same graph depicts the expected net basis gain of the hedge as well.

Expected DOSS Advantage To Short Future



By employing option-based methodologies, the trader simultaneously manages the price risk and avoids taking on the decision risk of when and at what price to hedge.