

## Managing Short Term Energy Risk

### Using Trade Risk Management Techniques to Control Cash Market Risk

Managing risk in the cash markets does not have to mean hedging your exposure, crossing your fingers and hoping. Cynthia Kase, CMT shows how taking a more considered approach could minimize risk.

For many participants in the energy market, derivatives may be unfamiliar. So it is hardly surprising that a lot of energy hedgers are wary of using them, preferring instead to stick with plain vanilla swaps or just embedding hedge strategies in cash market deals. But what they fail to recognize is that most cash market participants- be they producers, consumers or marketing companies- have for many years taken enormous risks in trading short-term cash market commodities.

For example, producers or royalty owners will often think of their oil or gas as being sold at a Platts assessment, Inside FERC© index or NYMEX settlement price. But at the same time, these same producers allow marketers to sell their product at any time, and fail to consider any negative difference between the sales price and the NYMEX settlement should be treated as a speculative loss. Unfortunately, many producers are not aware of this loss; as they do not track cash market marketing (speculative) losses or the performance statistics of those who are tasked with selling their product.

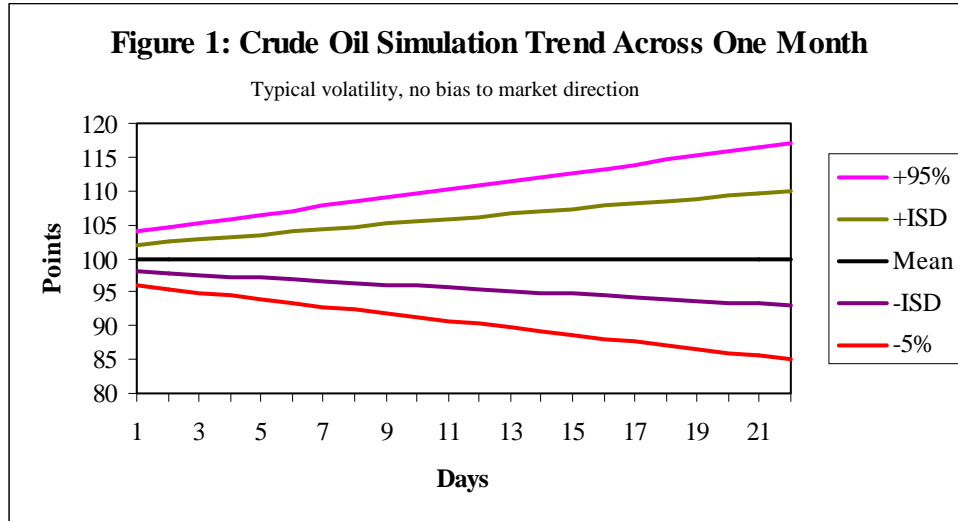
Most cash market participants do not regard their activities as risky because they are used to this form of speculation; also, mark-to-market reporting is not necessary in the cash markets and there are no margin calls. The downside is that losses relative to a default base case are hidden from management and can therefore go unrecognized. For more info on establishing a base case, [click here](#).

The level of risk in executing a given month's exposure anytime during the month instead of either on a monthly average for oil or at settlement or during bid-week for gas can easily run at about 15% of the underlying crude oil price and 25% of the underlying natural gas price, even in non-trending, sideways markets.

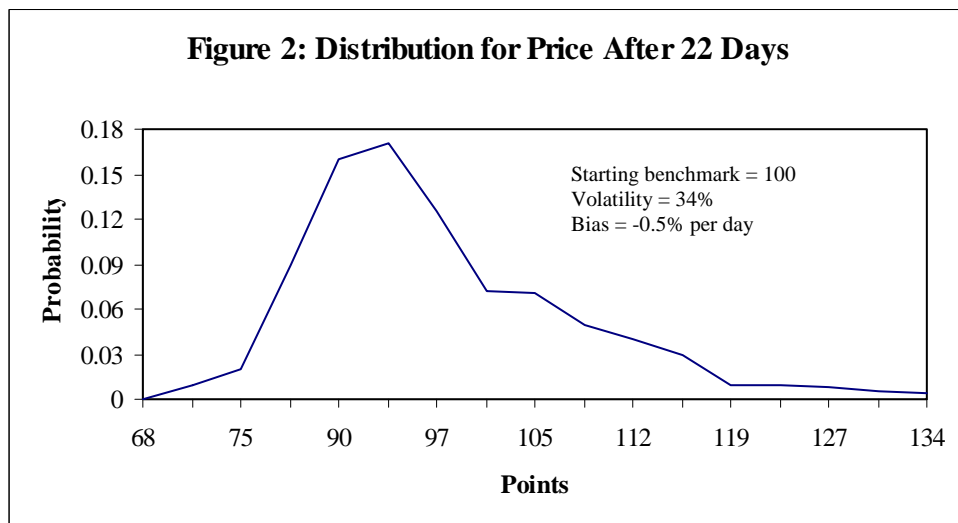
Risk and its relative volatility are proportional to the square root of time. This is because volatility is a measure of the standard deviation of price changes (actually, the logarithmic rate of change), and standard deviation is the square root of variance. Thus, the risk in one month is not  $1/12^{\text{th}}$  of the risk in a year but  $1/\sqrt{12}$ . So for a particular market, such as West Texas Intermediate (WTI), which might have typical first nearby volatility of 34%, one standard deviation of risk over a month is  $34/3.46$ , or about 9.8%.

The standard measure of risk, Value-at-Risk, calculates how much could be lost over a particular time period. For example, if a producer, which to evaluate the amount all of a loss such that 95% of possible outcomes had been considered or in other words, a point at which there was 5% chance of worse prices, a level that is 1.65 standard deviations above mean would be used. Consumers would use 1.65 standard deviations below the mean. In either case, the amount of the loss is the same. Thus,  $1.65 \times 9.8$  results in a 95% confidence level of a 16% move in WTI. In this event, a crude oil producer, assuming a nominal crude price of \$60 a barrel (bbl), may be taking as much as a \$9.60/bbl risk by allowing its marketers to sell that crude at anything other than the benchmark.

This scenario can be illustrated by running a Monte Carlo simulation with which many producers are familiar in the context of exploration probabilities. A Monte Carlo simulation uses a random number generator and, given certain probability criteria, generates empirical results. Assuming an average daily rate of change of zero and annualized volatility of 34%, a simulation, for example, running 500 times over a typical 22-day trading month give the results shown in figure 1.-



This scenario is based on an unbiased non-trending market. If the market were trending upward, the losses from selling early would be even greater. Assuming the same volatility as in figure 1, but with a downward bias of 0.5% per day, figure 2 examines the expectation for price after one month (as opposed to over one month), that is, a detail of day 22. In this simulation, the risk of a loss is more than 22% (as opposed to 16%) or, on the \$60/bbl crude price, \$13.20/bbl from the beginning of the month.



Another example of risk-taking in the cash market is the risk associated with trying to make an outright profit or to beat a benchmark price. Pure marketing and trading companies often buy or sell oil and gas to make a profit, either on basis or an outright (often called flat) price changes.

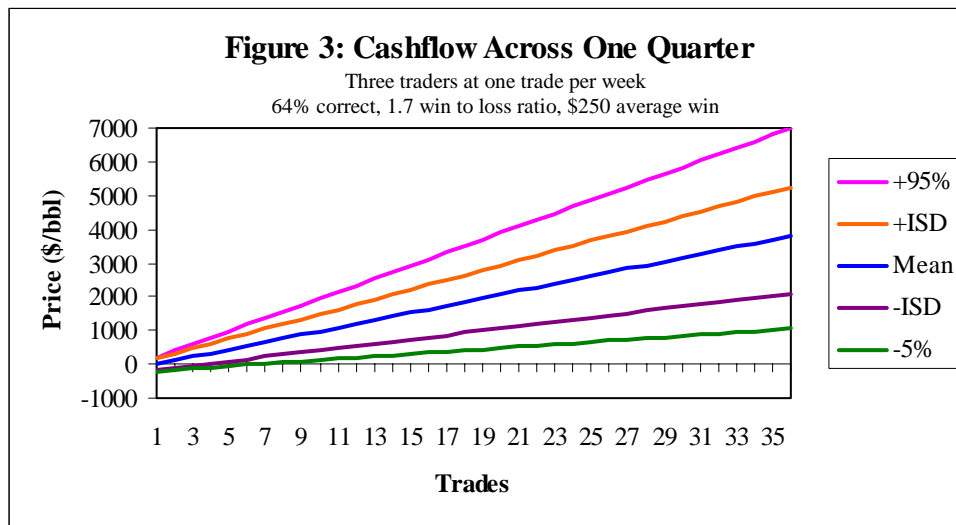
Many utilities are now becoming involved in incentive programs and are hoping to buy fuel in such a way as to average below the benchmark price.

Although some firms have profit targets or know the margin by which they hope to beat a benchmark, they assign trader volume limits that are based on instinct and hoping for the best. But they know neither what the odds are of meeting these targets nor what risk is associated with the trading or hedging activity. In reality, the ability to meet a profit target is related directly to the frequency with which one trades, individual trader performance and trade volume. These are, in turn, tied to the amount of capital at risk. In other words, probability cannot be ignored.

Assuming it has successful traders, a firm which can afford to take a 1% chance of losing \$1 million will have a better chance of making a given profit target than one which can take only a 1% chance of losing \$10,000. However, it is important for any organization to take a considered approach to its management of trade risk. The methodology it applies in doing so can either work forward from a goal, which must be met, or backward from a risk limit.

Working forward, for example, a crude producer of 4,000 barrels per day might set a profit target of enhancing its crude oil price by \$0.50 per barrel, settling its books and starting fresh with its goals on a quarterly basis. So he is targeting to make a profit of \$168,000 per quarter (4,000 barrels per day \* 7 days/week \* 12 weeks/quarter \* \$0.50/bbl.)

Now imagine that the producer has three traders, each of which take an average of four trades a month, or 36 trades per quarter among them. They are, overall, 64% accurate (i.e., they make money 64% of the time, so lose 36% of the time), have an average gain of 25 cents/bbl and an average loss of 15 cents/bbl.



For the sake of a realistic simulation, also assume a standard deviation of about 15 cents around both wins and losses, and a lognormal, rather than a normal distribution on losses. Losses, for example, may spike to the upside. The average amount at risk on each individual trade is \$6,750 (15 cents /bbl \* 1000 barrels/contract \* 45 contracts), and the largest loss, at the 95% confidence level, is about \$18,000 (15 cent average loss plus 15 cent standard deviation \* 1.65, or roughly 40 cents per barrel \* 1000 barrels/contract \* 45 contracts).

For the purposes of the Monte Carlo simulation of 500 iterations, assume that the skew of the loss distribution curve is such that the maximum loss is actually 1.5 times that which would be assumed under a normal distribution. The simulation finds that, after the 36 trades, the producer has an average expectation of making about \$3,800 for every 1,000-barrel contract traded (figure 3). As a result, this trader would have to trade about 45 futures contracts (168,000/3800), or 45,000 barrels of oil per trade.

Having identified the average trade size of 45 contracts, the next step is to determine how much money is at risk based on the application of a standard “risk-of-ruin” calculation, as follows:

$$\text{Capital at risk} = (\text{volume traded} * \text{average loss} * \ln [\% \text{ chance of losing total funds}]) / \ln (\% \text{ loss} * \text{loss amount}) - \ln (\% \text{ win} * \text{win amount}).$$

With this calculation, at a 1% probability of losing the entire amount and given the criteria above, the capital at risk is calculated to be about \$28,600. The amounts at risk at various other probabilities of loss are as shown below.

Capital at risk \$	Probability of Loss
42,927	0.1
32,926	0.5
28,618	1
14,309	10
10,002	20
4,307	50
1,788	75
95	81.9
6	99.9

The same math can be worked backwards, starting with the amount one is willing to risk and then estimating the potential profit based on that risk. If there is not a match between one’s profit objectives and the risk necessitated by that profit target in combination with the performance record on the traders, then its best not to trade or to modify objectives.

With the math set forth, a firm that is allowing its marketers or buyers to exercise discretion can evaluate both whether it can afford to trade the volume required to meet the profit target it has set, and whether the risks involved are within its tolerance parameters. If the risks identified are lower than the firm first thought, it might wish to raise its target; if they are larger, it might choose to reduce its target. However, all the wishful thinking in the world, given the assumptions in the simulation, will not change the probabilities involved. For help with any of these issues, call us at 505-237-1600 or contact [kase@kaseco.com](mailto:kase@kaseco.com).