

## **Energy Risk Management Checklist**

### Hedging Natural Gas, Oil and other Energy Commodities

It's never a good idea to base an energy hedging program on a speculative price forecast. While it is possible to forecast short-term price activity (meaning one week to perhaps a few months), it is neither feasible to forecast events further out, nor rational to rely on such forecasts for strategically hedging corporate exposures. The reason for this is that very minor changes in initial conditions cause large differences in outcomes over time. This is sometimes called the "butterfly effect" – the saying goes that a butterfly flapping its wings today as it flies across the Pacific may cause a hurricane in a few months or even a year later in the Pacific that hits the US Gulf Coast.

It's not a good idea to employ trading skills for hedging. Many companies, which do not trade oil or gas, are instead in the business of either finding or producing it, or of using it to supply customers with heat and light or for manufacturing. They do not have the tools to properly estimate hedging points. In this "post Enron" world most companies that actively traded energy on a spec basis no longer do so. And even if a firm still has traders, no matter how astute they, no group of fallible persons can accurately and consistently take into consideration all the factors that can impact the market longer term.

Many would-be hedgers claim that they use "fundamentals" in order to do "non-speculative" forecasting and hedge planning. The problem with this contention is that instead of really using fundamentals (an analysis of what exists) most of these forecasters speculate on what future fundamentals will be and then further speculate on how prices will react to those estimations. One of this writer's favorite sayings is that in order to be a true fundamentalist, one must have the mind of God.

Thus we reject hedging programs based on speculation and claim that a logical, strategic hedge plan should be supported by an analytic, statistical approach. A statistical approach must either be based on objective analysis over more than 30 years of data, or adjust a wide range of variables within a rule set over at least 10 years of data with acceptable results over a large number of settings.

A major challenge many companies face, though, is maintaining discipline necessary to stick with a logical approach. In these cases, a risk management checklist can be useful in maintaining quantitative discipline. Kase recommends the checklist be comprised of three parts: 1) a determination of exposures and risk appetite relative to those exposures; 2) setting up a passive mechanical approach to hedging using statistics and probability theory; 3) selecting reasonable instruments in order to execute hedges properly.

#### **List One: Determining Exposures and Risk Appetite**

The first list is designed to help one pin down the specific exposures, in terms of volumes, commodity, and pricing basis to be included in an energy hedging plan. The need for commodity and volume definition may be obvious – one cannot hedge more than one's exposure, that is, the amount of a particular commodity, such as natural gas or jet fuel that one must buy or sell. Hedge instruments must correlate with underlying exposures to satisfy hedge accounting and tax guidelines, thus the need to define actual pricing bases used.

#### What Are Your Volumes?

- ✓ Itemize volumes to be bought or sold by month for at least the next 18 months. If volumes are seasonal, then itemize by month. Volumes should be no more than those that are "assured" – that have a high probability of actually coming into existence.

- ✓ Classify each month's volumes by the index or price publication that represents its basis point, for example Houston Ship Channel gas, Northern California gas, or WTI, ANS, Brent. Also if there is a particular publication associated with the exposure, such as Platts Oilgram, or ClearPort<sub>(sm)</sub>, note that as well.
- ✓ Net out any offsetting volumes, for example if one's firm processes natural gas to produce gas liquids, part of one's exposure is to the "frac" spread or differential between natural gas and propane, butane, etc.

#### Defining a Default Case

- ✓ Set up "rules" for how volumes will be bought or sold that *do not* fall under the hedge program.
- ✓ Similarly, set up rules for volumes that occur during periods when hedging is not called for such as extreme adverse conditions during which some volumes are yet to be hedged.
- ✓ Also set up rules for how volumes that are earmarked to be hedged will be handled during neutral conditions of neither high nor low price during which the hedge program calls for nothing to be done.

The key here is that regardless of whether one is hedging, there must be rules set forth for how volumes are to be bought or sold. For example, if the "default" case is not to hedge, then the executor (trader/buyer/seller) may not be allowed to buy or sell other than as strictly defined, such as based on an index or published price. If any discretion to execute other than on the "default" case is exercised, then risk limits must be in place, and the performance results of each party having authority to deviate from the base case monitored. Such activity most likely will not have to be considered "speculation" from a legal/accounting standpoint, but from a conceptual standpoint is speculation and thus must be controlled. For more information on how to set trader risk limits see the article "Managing Trade Risk" Trader's Catalog and Resource Guide July 1999.

#### Correlation Issues

- ✓ Determine the extent to which one's specific exposure points correlate with exchange denominated settlement types. For example, how if one is purchasing jet fuel basis a major oil company posting at Logan Airport, the degree to which it correlates with the NYMEX heating oil contract.
- ✓ Determine the extent to which the same exposures correlate with major published prices. As in the example above, jet fuel at Logan with New York Harbor #2 Oil Barge prices as published by Platts.

For an adequate analysis we recommend evaluating the basis (the differential between the exposure and the hedge instrument) over the past seven years. Statistics that should be assessed are the raw basis values, change per month, and a statistical analysis (average, median, standard deviation and percentile ranking), slope and regression analysis (R and R<sup>2</sup>) over twelve- and thirty-month lookback periods, and F-stat or T-stat (tests of statistical significance) of those values. If such analysis appears daunting, Kase offers both standard and customized energy market analysis. For more information, see [http://www.kaseco.com/products\\_services/custom\\_risk.htm](http://www.kaseco.com/products_services/custom_risk.htm).

#### Reduce Risk by Diversification

- ✓ Evaluate ways to reduce the risk inherent in the exposure portfolio through diversification, using different settlement types, such as a mix of NYMEX heating oil and a Platts assessment.

- ✓ Mix the hedging strategy by devoting a portion of the portfolio to a volume cost averaging program.
- ✓ Mix settlement ranges, if possible. For example a portion of the hedge may be settled on a monthly average price, a portion on a last trading day (NYMEX) price, etc. This is possible as long as the correlations hold up with the alternate settlement periods.

### **List Two: Developing a Mechanical Approach, Using Statistics**

A successful hedge program must goals (what the hedger is trying to accomplish) with actions (how the hedgers are placed). List Two is designed to help the hedger identify goals, understand tradeoffs among those goals and to match a mechanical set of hedging rules to the goals desired.

#### Determining How Much to Hedge

- ✓ First one must define how much is practical to hedge. After defining exposure volumes in making “List One”, take those values and multiply by the percentage of that volume that is “assured”, using 80% as a default. The reason for using 80% is that one does not want to exceed the actual exposures. Using 80% allows for a reasonable margin for operational tolerances. Companies, which have a closer operational tolerance, may choose a higher percentage, and vice versa.
- ✓ Next one must assess whether the company is comfortable “emotionally” with the volumes set for in the “practical to hedge” calculation. If not reduce the volume accordingly. Kase’s suggestion for a pilot program is no less than 10 percent of maximum volume and for a standard program, no less than 30 percent.
- ✓ Adjusting for any external issues that have to be addressed may be necessary. For example bank covenants may require volumes less or greater than those set internally to be hedged.
- ✓ Adjustments to volumes may be also driven by considerations relating to the degree of reporting and sensitivity to stockholders or regulators.
- ✓ Theoretically hedge gains or losses balance equal and opposite gains or losses on the physical side. However, during the life of the hedge, temporary losses pose a credit risk to the counterparty with whom one has placed the hedge, or call for equivalent margins to be made with the exchange. Thus, it is necessary to assess the potential margin or credit required to hold the hedge for its expected maturity. For more information on how to assess your potential credit risk see the article “Hedging Made Easy: A Guide for the Do-It-Yourselfer.” NYMEX Energy in the News Winter 1991/1992.
- ✓ Liquidity issues may drive extremely large hedgers, having to hedge such high volumes that execution impacts the market. This is rare, but should be a consideration for any entity hedging more than 100 contract equivalents per day.

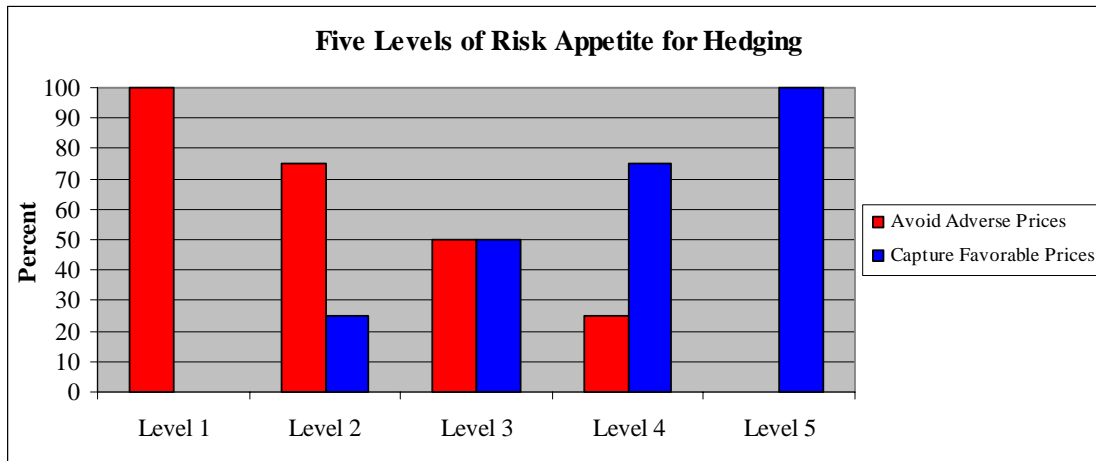
#### Risk Appetite and Tradeoffs

One major reason hedge programs fail is hedgers want simultaneously to protect budget – avoid adverse pricing and to beat market – achieve attractive pricing. These are two competing extremes that can rarely be achieved, even when speculatively trading. If one hedges very aggressively in placing hedges in order to protect budget, it could turn out that better prices could have been achieved by waiting for a more attractive price environment. If one holds back and waits for very attractive prices before hedging, it could be that is unhedged as the market could move in a highly adverse direction.

So, the hedger has to decide where the balance lies in terms of avoiding adverse pricing versus capturing attractive pricing. Decisions must be made such as to how aggressively to protect a

particular budget or *acceptable price* versus *capturing opportunities* and possibly suffering through adverse periods when a hedge is missed.

The chart below illustrates a way of thinking about risk appetite. It shows five levels of hedgers and can be used to assist in the determination of risk appetite.



One can, of course, become more nuanced with the risk appetite definition. For example a hedger may be more comfortable buying options which have limited cost and unlimited potential and so be a Level 1 on buying puts or calls and be much more concerned about “leaving money on the table” in a favorable market and thus be a Level 4 on strategies that involve fixing prices. So, it is important to choose:

- ✓ Risk tolerance for buying options
- ✓ Risk tolerance for fixing forward

### When to Hedge

“When” is never a good question in that the only good time to hedge is when market structure and associated prices so justify. That said, once the forward curve for the energy market in question is in a statistical zone that calls for hedging, the “when” question is answered by risk appetite. The more budget driven, the sooner and faster hedges are placed. There are many articles available by request that discuss Kase’s approach to using computer models to hedge available at [http://www.kaseco.com/articles\\_etc/articles.htm](http://www.kaseco.com/articles_etc/articles.htm).

### At What Price

A statistically based model can be used to identify the price at which to hedge. When prices are at a statistically attractive level and probabilities are favorable, one will then hedge to assure desirable prices. Definitions of “statistically attractive” can vary. For energy consumers, who are buyers, using either a percentile definition such as prices are below the 10<sup>th</sup> percentile can work, as well as statistical definitions, such as prices are below 1.5 standard deviations below the mean. One benefit consumers have is that low prices are found in “territory” that has already been covered by previous market activity. For energy producers the definition of high price can be more challenging because new market highs can form. Thus, producers are better served using standard deviation definitions as opposed to percentiles. In this way a price definition, such as two standard deviations over the mean can actually set hedge targets above the market potentially at levels that have never yet been traded.

Along similar lines, hedging energy using price protection (options or over-the-counter equivalents) becomes appropriate as prices move towards price ranges considered statistically unattractive. For consumers, this point may be at or above the market average and vice versa for producers. More aggressive hedgers will use less extreme definitions of adverse price ranges. For example, a producer that is highly risk adverse might use the mean or average of prices over a given time frame, while one that is less so might start buying options at one-half standard deviation below the mean. At Kase, we have developed a number of models that use variable time frames to set hedge price zones. Producers are encouraged to see the information about the Kase Hedge Model, and consumers are referred to information both on the Hedge Model (larger consumers) or our easy to use hedging tool Kase ezHedge that is suitable for energy hedgers of all sizes. For more information about Kase HedgeModel visit [http://www.kaseco.com/products\\_services/hedge\\_overview.htm](http://www.kaseco.com/products_services/hedge_overview.htm) and for information about Kase ezHedge visit [http://www.kaseco.com/products\\_services/ezhedge.htm](http://www.kaseco.com/products_services/ezhedge.htm).

### **List Three: Selecting Reasonable Instruments**

To actually execute a solid energy risk management program, it's important to understand how various derivative instruments, such as options, collars, swaps and the like work, and which are best suited for particular price environments. For example, for producers in the recent very strong bull market, for much of the life of the bullish trend, option-related strategies were superior to fixing prices. The same was true for consumers in the bear market of 2001. Additionally, one's choice of instrument may help to diversify the risk in the hedge portfolio. The checklist below covers many issues relating to instrument choice.

- ✓ Select exchange based or index based instruments
- ✓ Select option type
  - American
  - European
  - Asian
- ✓ Evaluate how closely the option settlement type matches one's exposure
- ✓ Is it appropriate to buy options whenever a statistical trigger takes place, or to set a maximum budget amount allotted to options purchases
- ✓ How far out of the money can options be purchased if a particular budget must be met
- ✓ Ensure that an options pricing program is available to evaluate the cost versus protection aspects of the options under evaluation
- ✓ What are the trade offs for one's firm in cost savings versus complexity relative to using sophisticated derivatives such as three-way collars or swaptions
- ✓ What other instruments, such as collars, will be included in the program

Often superficial choices pose more costs to a hedge program because of short run thinking, as opposed to an objective, longer view. For example, an at-the-money option, while more expensive, has a greater probability of exercise than an inexpensive deep out-of-the-money option. For information on education on these topics see the article "Hedging Without Futures." National Petroleum News October 1993.

When capturing attractive prices, options can also be used to ensure those prices while leaving room for them to continue to become more favorable, but alternatively fixing price by the use of swaps or collars may be justified. Remember collars are fixed price mechanisms, even though they are made up of options, they form a fixed price range and are not solely protective as options are. When fixing prices are called for we can begin with options and then as prices become more attractive switch to wide collars, move to more narrow collars, and end with swaps as the market becomes

increasingly favorable and thus less likely to generate losses with fixed positions. Becoming familiar with how derivatives work, and ways in which the functionality of derivatives may be modified, is important for a rigorous risk management program.

**Recap**

Because its not possible to forecast market activity further out than a few months at best, it makes sense to use Kase's Energy Risk Management Checklist as a first step towards developing a sound, strategic hedge program. Remember: determine exposures and related risk appetite, develop a structured approach using statistics, and choose reasonable instruments with which to execute the program. For help with any of these issues, call us at 505-237-1600 or contact [kase@kaseco.com](mailto:kase@kaseco.com).