Everybody's Got To Swing

Bread without butter, bacon without eggs, Siegfried without Roy, price without quantity. All of these would qualify as the sound of one hand clapping, but only the last pair affects us as traders.

Most industries have the luxury of dealing with known quantities. A flourmill can cap its cost for a fixed quantity of wheat, and if demand falls short, it can either discount or store the remaining quantity of its production. A refiner does not commit to an unknown quantity of crude oil, nor does a soybean crusher begin a purchase negotiation by saying, "Give me whatever you've got."

Natural gas and electricity markets, however, have almost no certainty of demand. An electric utility in the summer months has to surf the temperature and humidity curves, not to mention plan for how these curves intersect the much more predictable time-of-day and day-of-week functions. A utility can store power forward by proxy by making claims on generation elsewhere within its grid, (see "What's The Buzz," *Futures*, July 1996) which involves a further set of uncertainties as to what the marginal costs of electricity generation and incremental demand therefor will be. The planning problems produced by this set of uncertainties are so extreme intraday volatility of electricity prices can reach 200%. Small wonder electricity futures not only have failed, but never even had a realistic chance of success (see "Lightning In A Bottle," *Futures*, August 1998).

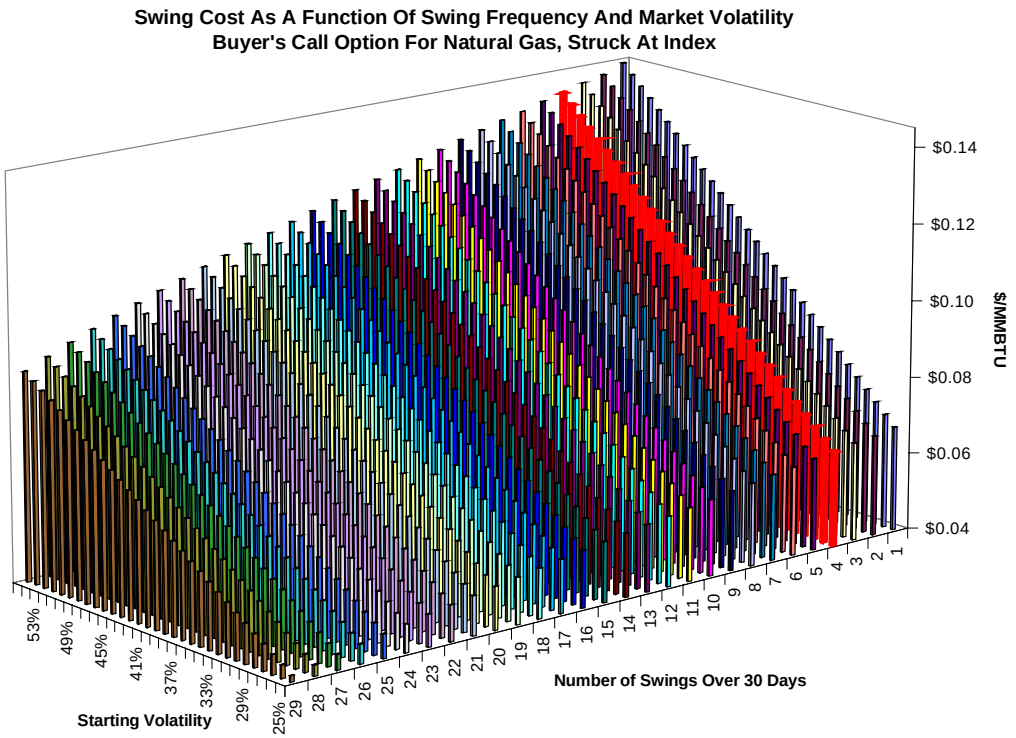
Swing Contracts

A swing contract, also known as a variable or base load factor contract, is nothing more than a commitment to make or take delivery of an initial nominated quantity and purchase the right to make or take a stipulated number of additional fixed quantities on a maximum number of days over the period. For example, a natural gas pipeline could commit to taking delivery of 10,000 MMBTU (one NYMEX contract) per day over the next month, and buy a swing contract to take up to another 10,000 MMBTU on a maximum of five other days at a stipulated constant price.

The most common swing option is for a strike price at an index to be determined, such as the *Gas Daily* Henry Hub index. A buyer whose price floats at this index is economically short in the sense he is exposed to higher prices. Of course, since financial engineers are involved, variations on this theme abound. For example, some contracts call for the firm commitment quantity to jump up to the initial plus swing quantity once the swing is exercised. Many swing contracts provide for penalties for either non-performance or excess performance; these will not be considered below.

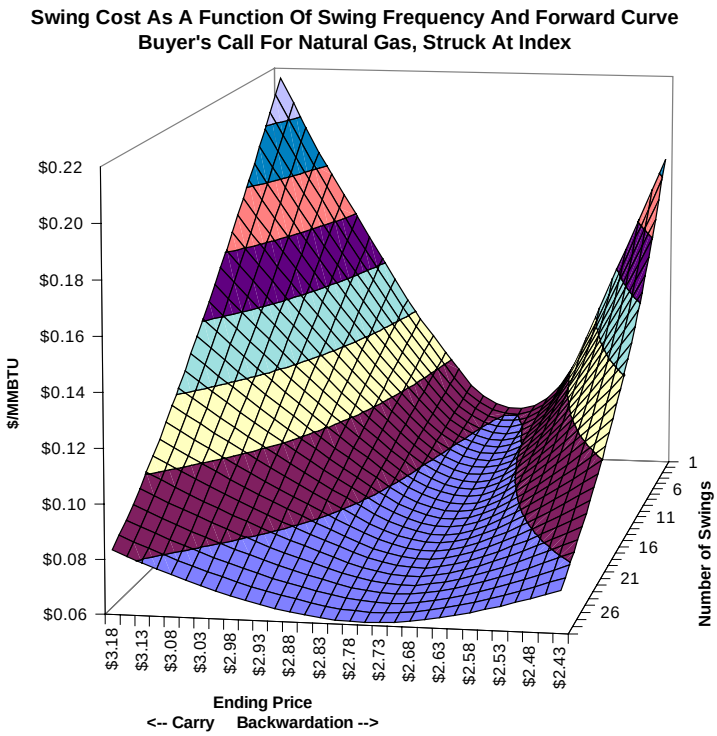
The price of these options, unsurprisingly, increases with uncertainty. As volatility increases, the price for a buyer's call option increases in a linear fashion as it does for any plain vanilla option. If we increase the number of swings allowed during a period, the uncertainty level decreases. In the chart below, we can see how the price per MMBTU decreases as the number of swing days approaches the number of days in the month.

The early exercise feature of swing contracts should remind us of Bermuda options, (see "The Mid-Ocean Club," Futures, June 2000). Bermuda options are European in character up to an early exercise date, after which the holder may elect early exercise, and this describes the nature of swing contracts. A swing contract can be evaluated across an array of price and demand by solving for the Bermuda option at each combination of price and quantity. This is a mesh-based, or "finite difference" approach better suited to to unbounded conditions of early exercise than simulation processes such as Monte Carlo. This process needs to be repeated for each swing right in the contract. The net value of the swing contract will be the value of the Bermuda option at the last swing date.

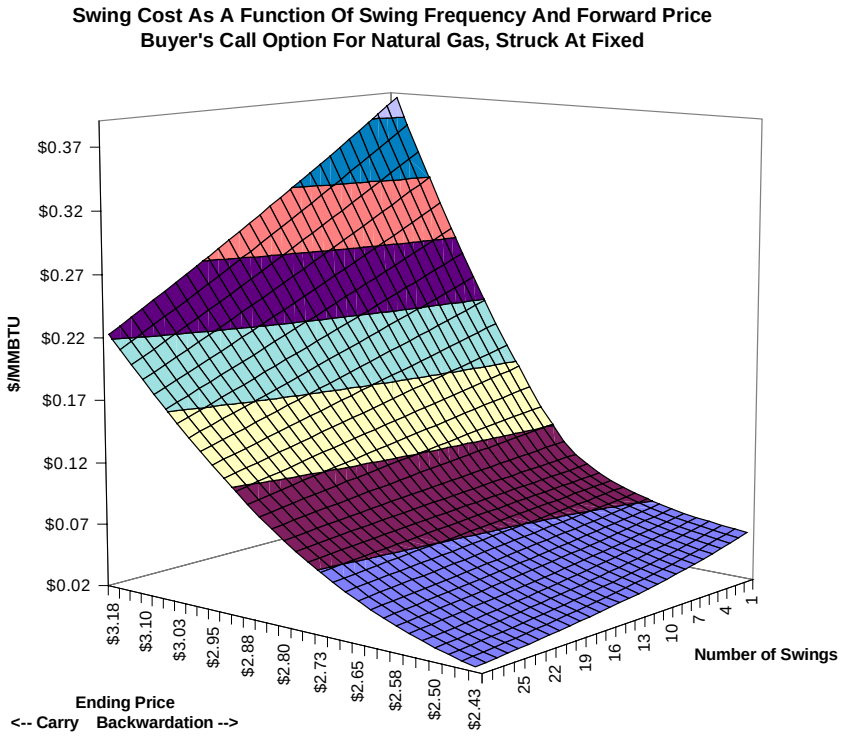


Looking Forward

Energy markets are characterized by pronounced forward curves, ranging from extreme backwardation for heating oil and natural gas in winter to deep carries in the autumn as inventories are being built. The intermonth spread over the swing period is critical in determining the option's price. A curve in a deep carry or contango, which generally occurs during either a weak market or just prior to seasonal strength, may be more likely to witness increasing demands during the month than a market in extreme backwardation. However, since backwardation frequently is accompanied by tightness of supply, it too may see a large number of swings called. If we take a starting price for natural gas of $2.794, we can see how the price of a buyer's call option will increase at during both deep carries and strong backwardation. Economically, the addition of this call option to the short cash market position produces a straddle-like profile. As before, the unit cost of the swing call will decrease as the number of swing days increases.



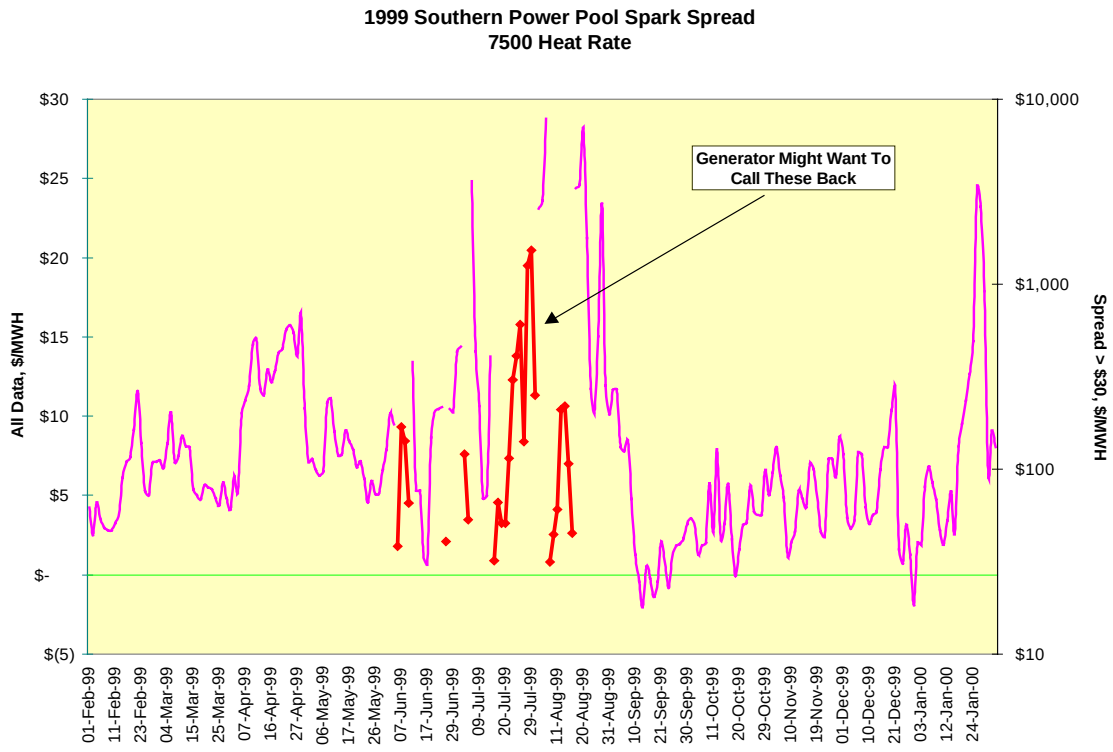
While the swing option struck at index is the more common form, swing options can be struck at a fixed price over the delivery month. A buyer who has fixed his price is now economically long, helped by higher prices and hurt by lower prices, so this profile will resemble a call option at the fixed strike, $2.80 per MMBTU below.



Swing And Strip

Swing options frequently are traded against strips, or contracts committing to making or taking a fixed volume over a period. Let's continue with our example of a pipeline buying 10,000 MMBTU per day of natural gas at a fixed strike of $2.80/MBTU over the next month. The pipeline can lower its purchase costs -- and jeopardize its security of supply -- by selling swing options back to the producer. This trade is attractive to the producer in an environment where prices for natural gas may spike for just a few days. The pipeline is now long the strip but short the swing. Of course, a pipeline should be judicious in the number of swing call options it sells back to the producer, and it should have sufficient gas in storage to meet its own commercial commitments. A pipeline short the swing for any number of days against its long strip is economically short a put option at the swing strike for those days.

The notion of a producer interested in the right to buy back what he has just sold might seem odd in most markets, it can make a great deal of sense in the world of electricity. Last summer's distribution of spark spreads (the margin between natural gas fuel costs and electricity prices) in the Southern Power Pool (SPP, mostly Kansas and Oklahoma), is representative of just how dislocated the big jumps in electricity prices can be. We can isolate the few high demand days, those with spark spreads greater than $30, on the right-hand scale and compare them to the majority of normal days with spark spreads under $30. The underlying economics are fairly simple: Once electricity demand surges in the SPP to the grid's production capacity, the utilities find themselves short call options to their customers. Whatever price they might have to pay ahead of time for swing call options probably will be cheaper than buying power in the open market on high-demand days. Nothing magical here, it's just insurance at its finest.



Own The Decision Points

Markets exist to equilibrate economic interests, which is a fancy way of saying buyers need sellers, and vice versa. One economic role is not superior in any way to the other. However, markets reward those who have managed their risks prudently, for these actors now control their own destiny. The beloved principle of taking care of the downside and letting the upside take care of itself is honored.

Nowhere can this be seen better than the difference between the prices in the swing option market of short calls and short puts, the former being an obligation to make delivery, and the latter an obligation to take delivery. Not only does volatility surge in power markets during demand peaks, but generators are obliged to bring their highest cost, least efficient units on-line to meet these demands. The obligation to take delivery, on the other hand, involves lower volatility and shutting in higher cost production.

One of the assumptions behind the original Black-Scholes model was constant volatility, but we now know this simplifying assumption is honored more in the breach than in reality. Stock volatility surges in market downturns, (see "Nothing To Fear," *Futures*, May 1999) while volatility for most physical markets surges when prices jump. One way to accommodate this reality discussed so far in this series is compound options (see "Compounding The Problem," Futures, May 2000). Another way to own the decision point in advance is barrier options, and that is where we will turn our attention next.