Compounding The Problem

Editor's note: Cash market derivatives, including so-called exotic options, already dominate risk management in a number of markets. Traders of these instruments use exchange-traded contracts to manage residual risks in their portfolio. Given the size of their trades and the correlation of many large fund positions, these activities can produce outsized effects in exchange-traded markets. This article is the third in a series explaining various types of cash-market derivatives.

It's always an electrifying moment in those old *Kojak* reruns: You have the right to remain silent. You have the right to an attorney. You have the right, but not the obligation, to acquire another right – without another obligation. If you can't afford another right, the court will appoint one for you…

What!? Relax, and welcome to the world of compound options, options whose underlying asset is another option. A compound option has two maturity dates. The first date is when the decision to exercise and acquire the underlying option is made, and the second date is when the underlying option itself expires. Two premia are involved as well on a compound option, one for the first part, the option-on-option, and one for the underlying option, if exercised.

While there are sixteen different potential combinations of long and short puts and calls on these two-part options, we will simplify matters by restricting the enumeration to these four:

- Long call on a long call: The right, but not the obligation, to own the right to buy at a later point in time;
- Long call on a long put: The right, but not the obligation, to own the right to sell at a later point in time;
- Long put on a long put: The right, but not the obligation, to sell the right to sell at a later point in time; and
- Long put on a long call: The right, but not the obligation, to sell the right to buy at a later point in time

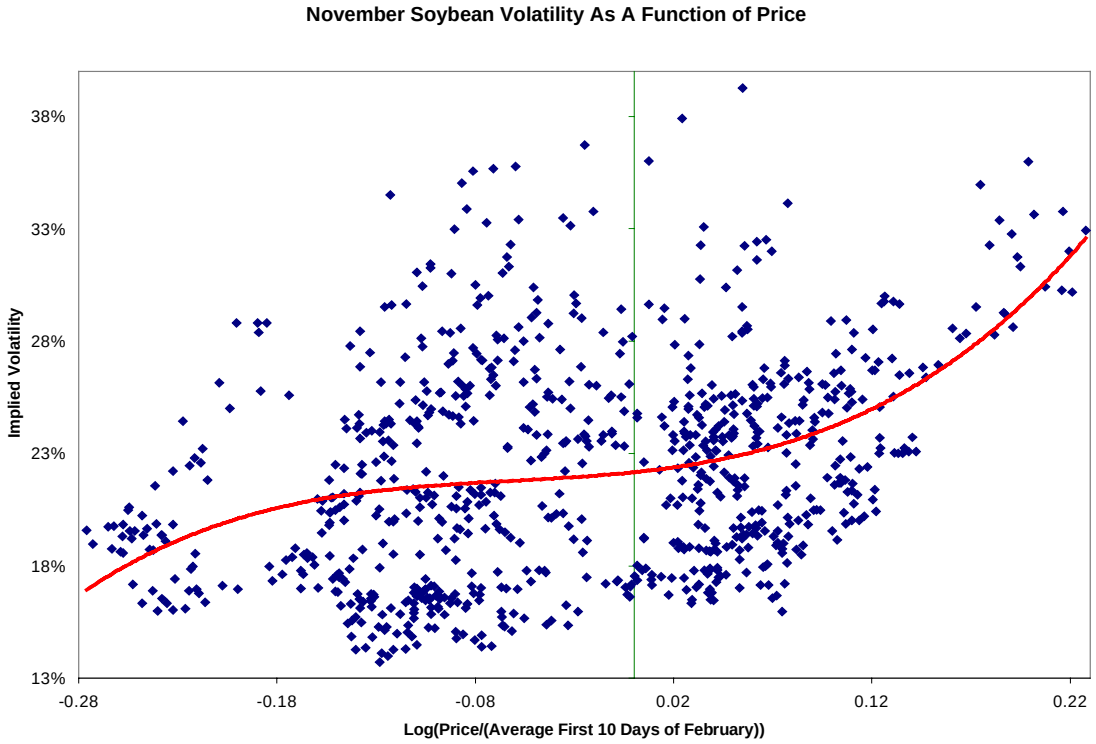
Many Are Called, Few Are Put

As is the case with the other exotic options we have discussed to-date in this series, lookbacks and choosers, compound options describe a large number of both commercial and speculative trading situations rather well. Want to be able to buy a put option on the S&P 500 during a selloff without paying for the huge jump in volatility normally associated with such moves (see "Nothing To Fear," *Futures*, May 1999)? That describes a long call on a long put. Want to be able to capture that surge in volatility for yourself on the way down? That describes a long put on a long put. Think of any trading situation beginning with "It would be nice to be able to…," and chances are you can satisfy your urges with a compound option. Want to get really fancy and put yourself in the position of a livestock feeder who knows if the price of corn rises to a certain level and the corn curve inverts, herds will be liquidated and the both the price and inversion will break suddenly, as happened in August-September 1996? Then buy a long call on a long put for corn and sell a long call on a long call for cattle or hogs.

The list goes on indefinitely. Let's take, for a relatively straightforward example, the case of a soybean crusher trying to protect his cost of new crop (November 2000) soybeans. We know the typical seasonal pattern of a northern hemisphere new crop soybean rally is for them to start rather early in the year, pause, and then take off again once a weather market is established (see "The Joy Of SX," *Futures*, February 1997). If the crusher caps his costs early in the year, he is paying an enormous time premium, and if he waits until the weather market, he is paying an enormous premium both in terms of price and volatility.

This is a critical consideration. Soybean volatility will not remain flat at the 27.2% level in a rising market. Soybeans have a demand skew, meaning volatility rises along with price as anxious buyers seek protection, as seen below. The crusher can protect himself from both higher prices and higher volatility

before they happen with a compound call-on-a-call option; what he needs is the right to acquire the right to acquire protection from higher prices at a later date more than he needs the immediate protection itself.



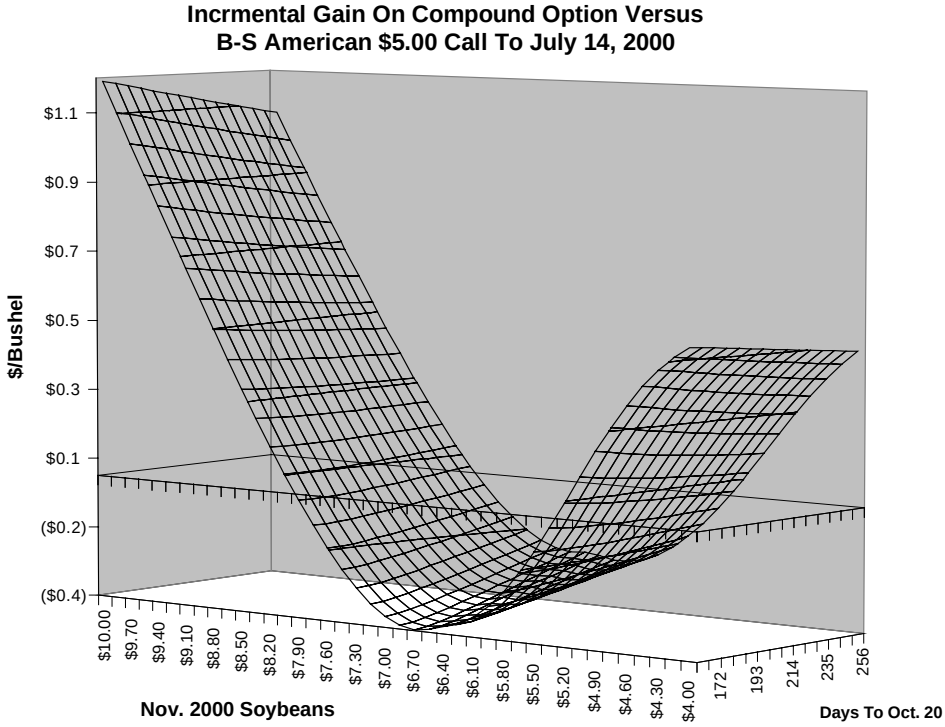
At the February 7, 2000 date of this writing, November soybeans are trading at $5.35, and a November $5.00 call, the optimal strike selected by DOSS, (The Dynamic Option Selection System, see "In The Library" below) is valued at $0.615. The delta of this option is .633, which would place the total capping cost at ($0.615/.633), or $0.9725. The effective price cap on November soybeans is ($5.00 + $0.9725), or $5.9725.

What would a compound call on a call with a strike of $6.00, to use the nearest strike to this cap, cost, and how would it behave? First, we have to specify the two maturity dates for the compound option. Let's use July 14, 2000, the expiration date of the July futures for the first date, and October 20, 2000, the expiration day of the exchange-traded option, as the second date. Second, we need to estimate what the price of a Black-Scholes American November $6.00 call will be on July 14. Using current prices, an interest rate of 5.7%, and volatility of 27.2%, this estimate is $0.09375. Using these data, the price of the first option, the call on a $6.00 November call, should be $0.19. The delta of the compound option is .449, which would place the total cost of the first option at ($0.19/.449), or $0.42375. The prospective total cost of the underlying option, the November $6.00 call itself, is ($.09375/.449), or $0.21.

Let's verbalize: We can pay a total of $0.42375 on February 7, 2000 to buy the right to pay another $0.21 on July 14, 2000 for a November $6.00 soybean call. This will place our price cap at ($6.00 + $0.42375 + $0.21), or $6.63375. This is $0.69125 higher than our $5.975 cap from the plain vanilla $5.00 call. Let's verbalize again: We have given up $0.69125 in our cap in exchange for $0.30875 in lower premium costs. Was this a good idea?

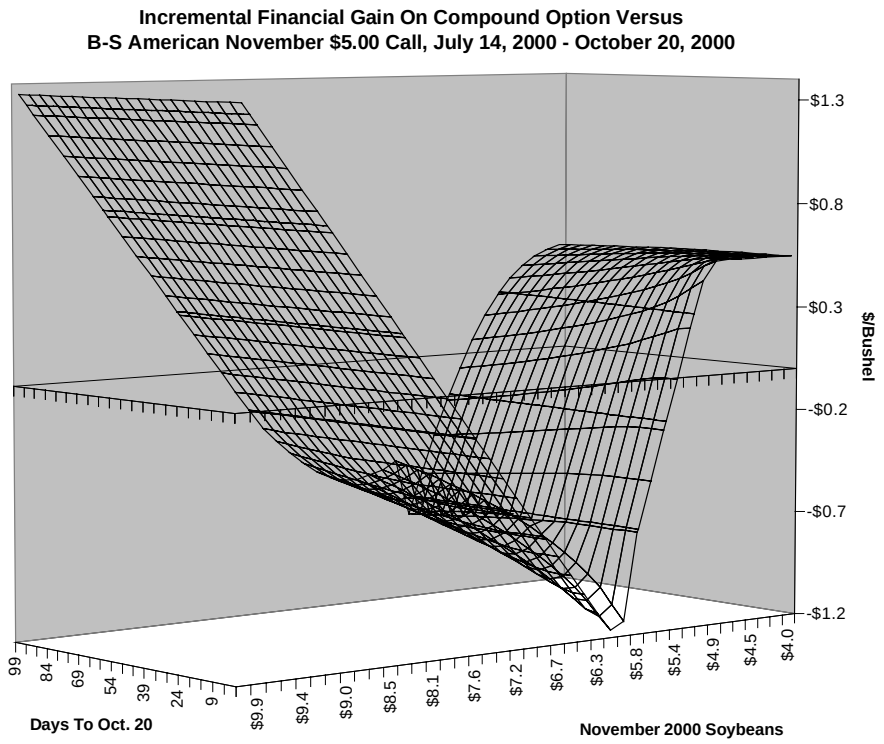
Compound Comparisons

In a static market, the compound call-on-call suffers in comparison to its base case, simply buying a Black-Scholes American November $5.00 call, as seen below. On July 14, the breakeven point between the two trades is right at current price levels, and our original plain vanilla November $5.00 call would still in place. What will the comparison between the two alternatives look like between July 14 and October 20?



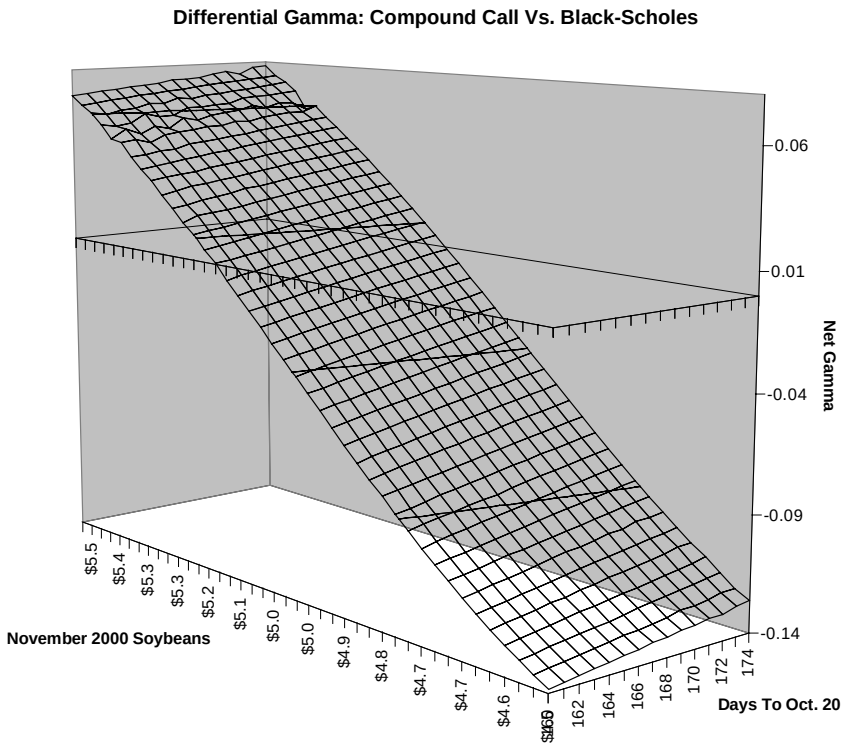
Our breakeven point in the November futures for acquiring the underlying option, the November $6.00 call at $0.09375 on July 14, is ($6.00 - $0.21), or $5.79. We must assume we would be able to get a $6.00 call option position for less if the futures price is lower on July 14. We can compare, therefore, the November $5.00 call against the option-on-option only at or below $5.79, and against the fully-exercised compound option at higher prices. The graph below assumes no exercise at or below the breakeven price.

The key to our exercise decision, obviously, is our price and volatility forecast. If we're in a 1999-type market, with low prices and abundant supplies, the decision to use a compound call option and not exercise the underlying $6.00 call is an easy one. If we're in a strong soybean market with the potential for a huge late-season surge, such as 1983's market, the decision to exercise and enjoy the benefits of our greater leverage and lower capital outlay on the compound call is a comfortable, albeit risky, one to make as well. The worst case, in every sense of the concept, is a static market.



Gamma Jamming

Since we have been comparing a $5.00 American call against a compound call on a $6.00 call, we naturally have been benefiting from the much higher gamma associated with the shorter-dated option-on-option and with the higher strike. As prices move toward the $6.00 strike, and as we approach the July 14 exercise date, both the gamma of the option and its rate of change should surge higher (see "The Color Of Money," *Futures*, January 1996). We don't need the benefit of a higher strike, however, to experience the higher gamma associated with higher prices. As we exceed a common strike, $5.00 in the chart below, the gamma of the compound option will exceed that of the Black-Scholes option, with the degree of excess decreasing with time.



The need to make a decision when our true underlying asset, November soybeans, are still three months away from expiration on vanilla options and four months away from expiration on futures creates a tense trading situation near the strike: Do we engage in a trade that could be nothing more than throwing good money after bad, not as if any of us have ever done that before? This early decision is incorporated into a wide variety of options, including forward starts and Bermuda options. These will be examined next month.