All In All, Another Trick With A Call

"We don't need no backwardation, we don't need no contango ... "

Deep in the misty past of the futures industry is the simple, stout yeoman farmer capable of shoveling things other than money to politicians supportive of agribusiness subsidies. The advent of futures markets provided this virtuous tiller of the soil with the opportunity to hedge price risk, resulting in a fun-filled 150 years of grain trading and questions on the Series 3 exam actually capable of giving you fond memories of the SAT once your head stops hurting.

As we often remind ourselves, futures markets do serve a number of legitimate economic functions. Among the most basic of these is clearing the market for storage of the physical commodity. The concept behind this is straightforward: futures markets allow producers to avoid selling during periods of abundant supply – right after a harvest, for example – and to postpone these sales until a later time of their choosing. The model for describing this "carry" market is quite simple:

$Month_2$ = $Month_1$ + Physical Storage Costs + Costs of Capital

Restated in terms of the $Month_2$ - $Month_1$ spread, the model becomes

[$Month_2$ - $Month_1$] = Physical Storage Costs + $Month_1$ * $(1 + r)^{days/360}$,

where r is the cost of short-term capital financing. This model requires that $Month_1$ trade at a sufficient discount to $Month_2$ so that we can enjoy riskless and effortless arbitrage profits without breaking a sweat.

This, of course, is the civics text version of what we find in the real world. A combination of price expectations, supply variations, incrementally different storage costs, and speculative pressures conspire to distort intermonth spreads away from full carry level. A smaller-than-required intermonth spread removes the cash-and-carry arbitrage from the arsenal of most traders. A market in backwardation -- one where the distant months are trading at a lower price than the spot month -- is considered preclusive to cash-and-carry trades.

Markets enter backwardation when

- there is a spot shortage, or
- buyers postpone purchases for as long as possible, or
- producers are anxious to sell forward

The first two conditions reward those capable of delivering prompt inventories to anxious buyers. This distribution of this reward over time is equivalent to the profit profile of a call option: a few defined losses, a large number of nondescript returns, and a couple of reminders of just why you got into this business anyway. This call option character is so strong that a defined relationship between intermonth spreads and second nearby call options exists (see "Backwardation Has Its Price," Futures, June 1994).

Until such time as the meek inherit the earth and those guys in the sugar pit give you the best fills out of sheer gratitude for your past patronage, is there any way for us to aggressively seize this trade in a backwardated market?

Defined-Risk Storage

The answer lies in the calculated acceptance of risk, which automatically removes this strategy out of the realm of true arbitrage. The trade illustrated below is based upon the structure of the crude oil market at the close of business on March 8, 1996. The spot month, April, is trading at a $0.74 premium to May. Since the cost of capital for carrying crude oil forward for one month is at least $0.10, and the physical costs of storage are at least $0.12, for a full carry discount of $0.22, the current intermonth spread would appear to be [$0.22 + $0.74], or $0.96, away from a feasible storage solution.

Indeed, if we were to buy spot crude at the April price less the cost of capital [$19.51 - $0.10], or $19.51, and sell it forward to May while paying $0.12 storage costs [$18.87 - $0.12], or $18.75, we would lose [$19.51 - $18.75], or $0.76. Not a good trade.

However, if we to reconstitute the sale of May futures into another set of instruments, we might be able to open up some new possibilities. Recall the synthetic future identity:

$$\text{Short Future}_T = \text{Long Put}_{T,S} + \text{Short Call}_{T,S},$$

where T and S represent the expiration month and strike, respectively. By splitting the months and strikes used through the Dynamic Option Selection System, (DOSS, see "Using Options The Spec Way, Futures, July 1994) we can accept some risk across the dimensions of price and intermonth spread. In the example below, we convert the short May future into a short May $17 call and a long April $19 put for a credit of [$2.05 - $0.19], or $1.86.

Let us assume some negative movements in the crude oil market -- a drop in the April price of $1.00 per barrel, and a complete collapse of the intermonth spread to April trading at $0.20 below May. The step-by-step mechanics of the trade are:

1. Buy spot cash crude at $19.51. A cash-and-carry trade requires a cash market position.
2. Sell April crude and buy May crude at $0.74. This converts the long April cash position into a long May futures position and neutralizes the intermonth spread risk.
3. Buy an April $19 put and sell a May $17 call at a $1.86 credit. This hedges the long May future down to [$18.87 - $2.05], or $16.82, and creates a short April position below [$19.00 - $0.19], or $18.81.
4. On the March 15 expiration date of the April $19 put, sell it for its intrinsic value if April crude is below $19.00. In the example below, the put is sold at $0.42, a gain of $0.23. The price of the put with one day remaining is $0.03 higher than intrinsic value, which reflects the price of the $19 call with futures at $18.61.
5. On the March 20 expiration date of the April futures, unwind the April/May spread at a gain of [$0.74 + $0.20], or $0.94. Buy back the May $17 call at a gain of [$2.05 - $1.93], or $0.12. These steps leave a net position of long cash April crude in storage.
6. Sell May futures at [$18.87 - $1.00 + $0.94], or $18.81, against the cash crude.

The net result is ownership of hedged crude oil in inventory at a gross gain of $0.45. This position has call option characteristics: should the cash market strengthen against May futures in the pipeline scheduling days after April futures expire, you are in a position to sell the cash crude and buy the May futures back at an open-ended profit. If the market does not strengthen, then you simply hold the cash crude in storage for delivery against your short May futures. This is illustrated in the table and graph below:

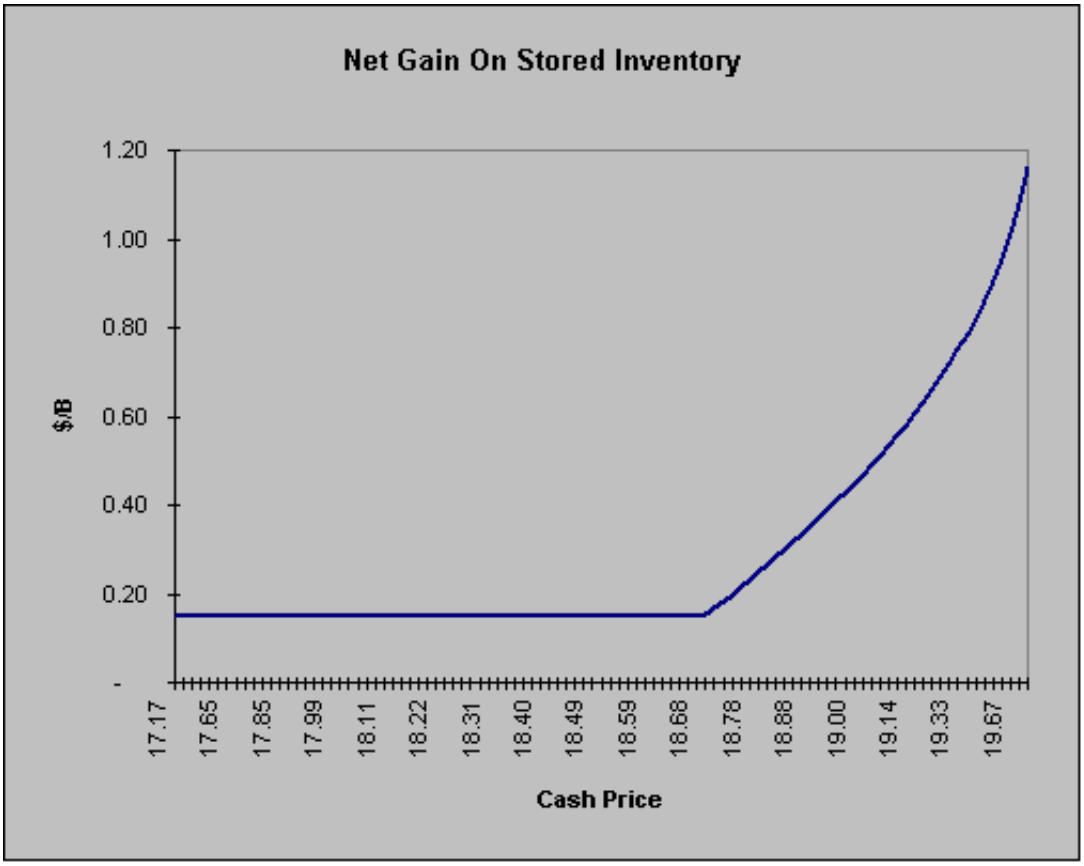
A probability table of where expected price range over the three-day pipeline scheduling period given the current volatility is constructed using the formula

Range = Price * exp(+/- Volatility * Z * sqrt(3/365)),

where Z is the number of standard deviations required for a given probability level. The resulting price for that probability is shown, as is the expected net gain for the strategy, which is

max([$18.88 - $18.51 - $0.22], expected price - $18.51)

If the cash market declines, your profit is the short May ($18.88) minus the cash price ($18.51) minus the carrying costs ($0.22). If the market increases, the profit becomes the current price minus $18.51. This profile is identical to a call option.



Expected	Net	
Prob	Price	Gain
10%	17.76	0.15
20%	18.01	0.15
30%	18.20	0.15
40%	18.36	0.15
50%	18.51	0.15
60%	18.66	0.15
70%	18.83	0.28

80%	19.02	0.47		
90%	19.29	0.72		
99%	19.96	1.16		
			Spot	Nearby
			NYMEX	NYMEX
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Pay crude price:			$19.61	$18.87
Cost of Capital:			$0.10	
Pipeline Acquisition Cost:			$19.26	
Actual Short Call Option Price:				$2.05
Actual Long Put Option Price:			$0.19	
Volatility			37.5%	35.7%
Call Gain / Loss:				($0.12)
Put Gain / Loss:			$0.23	
Interest Gain:				$0.01
MEMO: Strike Price			$19.00	$17.00
Spot Cash Gain:			($0.65)	
Month_1 Gain (short future):			$1.00	
Month_2 Gain (long future + Sprd.):			($0.06)	
Short Call Gain:			$0.12	
Long Put Gain:			$0.23	
Interest Gain:			$0.01	
Gain Before Selling Month_2:			$0.65	
Less: Capital Costs to Month_2:			$0.08	
Less: Tankage Costs:			$0.12	
Net Gain:			$0.45	

The example above illustrates the return on just one set of circumstances, a $1.00 drop in April and a $0.06 drop in May. The graph below illustrates how the expected gain of this trade would look on March 20 over a range of price and intermonth spread. The worst-case scenario occurs in a region of lower price and higher backwardation, generally a less-likely scenario.

Enhanced Storage Strategy Gain / Loss Contingency