Posting Up

Trading probably wouldn't be as much fun if there weren't so many ways to lose money in a short period of time. Like auto racing, the entertainment value (at least for the outsider observer) is in the crashes, spinouts and pileups - the more spectacular, the better.

We can understand losses caused by bad bets on market direction, but those have surprisingly limited potential for disaster: Barring a Kidder Peabody or Barings-like breakdown in controls, (or someone willing and able to meet a margin call greater than the firm's capitalization) there's a limit to just how wrong your clearing firm will allow you to be.

Instruments like collateralized mortgage obligations (CMOs, the exploding cigars of the financial world) allowed David Askin to lose a cool $600 million in a matter of days, but are so obscure and complex that spectators have to be told that a wreck just occurred.

Timing Risk

On the other hand, mismatched timing risks, which arise from decisions involving opposite price risk common to many hedging strategies, look safe to corporate controllers and clearing firm risk managers and thus have an insidious ability to sneak up on people before producing a breathtaking financial fireball: Metallgesellschaft's (MG) U.S. refining and marketing arm lost over $1 billion in what looked like a fairly safe swap-hedging strategy, and, to add insult to injury, got fined by the CFTC for lax internal controls a year and a half after the fact.

Ultimately, given the growing chains of long-dated price exposures, the markets may face greater dangers from the mismatching of price risks over time than from any player or group of players getting on the wrong side of a major price move.

Oil Hedge

This discussion presents a simple case from the U.S. oil pipeline market for West Texas Intermediate (WTI) crude oil, where the price risks, that is, the contracts, are separated by only one month. The structure of this analysis, however, is applicable to much more elaborate and longer-dated pricing exposures.

The delivery point for the New York Mercantile Exchange (NYMEX) light sweet crude oil contract is the pipeline and terminal center of Cushing, Oklahoma. The terms of the NYMEX contract specify ratable delivery of crude oil over the delivery month. For example, 30 contracts of September crude oil would be delivered at 1,000 barrels per day over the month of September at the price paid for the NYMEX contract. As a result, the buyer of NYMEX crude oil is at risk to lower prices.

An alternative method of acquiring the same amount of crude oil over the same delivery period would be to purchase the crude oil at the spot price "posted" each day in September. This posting price will, in practice, be based on the then-front NYMEX month, October, and will generally reflect a discount for transportation to Cushing of $1.25 per barrel, "plus" a premium or discount whose origins and function are discussed next. Because this October NYMEX price is unknown to the buyer at present, the buyer is subject to the risk of higher prices.

The buyer must choose between:

1. Buying now, and risking lower prices, *or*
2. Buying in the future, and risking higher prices

Complicating the issue is the intermonth spread between September and October prices, which can swing between: 1) discounts (contango, when the front month trades at a discount to the back months) that allow riskless cash-and-carry arbitrage (take delivery of September crude, store it, and deliver it against the October contract) and; 2) premiums (backwardation, the normal condition of the crude oil market) that can reach several dollars and are theoretically unlimited.

If there are no price expectations in the market, the intermonth spread should be no more than the physical and financial costs of storage, and the posting premium would constantly be $1.25 - capital costs - storage costs, making September and October crude oil equivalent assets.

In practice, of course, markets exist to express price expectations, and the actual premium fluctuates far more than can be accounted for by fluctuations in capital and storage costs alone.

To account for the premium, you can use an arbitrage strategy employing an option pricing model to compare opposite pricing risks over time on an equal-risk basis. This is achieved by converting both purchasing alternatives into synthetic options who relative prices can be determined by the put-call parity relationship of the option pricing model: The price of a put can be derived when the price of a call is known, and vice-versa (see No. 3 below). The equilibrium posting premium is the number required to bring the synthetic call into line with the synthetic put.

There are three relationships to keep in mind:

1. Long future or forward + long put = synthetic call
2. Short future or forward + long call = synthetic put
3. Call - put = present value (future - strike)

The concept of delta, or the expected change in an option's price given a change in the price of the underlying future, is important. To hedge the underlying future, you need 1/delta number of options.

Finally, because options are wasting assets, the concept of time decay is important as well. The expected cost of an option hedge, with everything else held equal, can be determined in advance. This allows the comparison of two option-based instruments at any point in the future.

In the table "Posting Plus: A Case Study," the reference date chosen, August 24, represents the last possible date to buy September crude oil on NYMEX. Options will suffer 23 days of time decay between the evaluation date the reference date.

Evaluation Date	Jul. 31, 1995		Date of Economic Evaluation
Expiration Date	Sep. 15, 1995	47	Expiration Date of Oct. Options, #Days Left
Reference Date Month_1	Aug 24, 199	23	Expiration Date of Sep. Futures, #Days Left
Cost of Capital	5.35%		Treasury Bill Rate

	Spot NYMEX	Nearby NYMEX	
Pay crude price:	$17.56	$17.34	September & October Futures, Respectively
Pay Posting Premium:		$0.00	Seller's Premium
Posting Basis:	$0.00	($1.25)	Pipeline Cost
Net Cost:	$17.56	$16.09	
Volatility:	22.22%	22.31%	Implied Volatility of Crude Oil Options (Calculated)
Actual Call Option Price:		$0.73	Cost Of Oct.17 Call
Divided By Delta:		0.61	Expected Movement In Option Vs. Future
= Total Call Option Cost:		$1.20	Purchase 1/Delta Calls At Total Cost
Actual Put Option Price:	$0.39		Cost of $17.00 put
Divided By Delta:	(0.38)		Expected Movement In Option Vs. Future
= Total Put Option Cost	$1.01		Purchase 1/delta puts at total cost
Call Time Differential:		($0.25)	Expected Time Loss On Options To Aug. 24
Put Time Differential:	(0.40)		Expected Time Loss On Options To Aug. 24
Expected Insured Cost:	$18.18	$17.84	Delivered Cost = Pipeline Cost + Option Cost
Less: Strike Price:	$17.00	$17.00	Strike Price
Synthetic Call (SC) Cost:	$1.18		Crude Cost Plus Put Option Costs = Synthetic Call
Synthetic Put (SP) Cost:		$0.84	Crude Cost Plus Call Option Costs = Synthetic Put
Put-Call Parity		$0.34	Difference Between Oct. WTI and $17 at $17.34
Parity-Adjusted Synthetic Option Cost:	$1.16	$1.17	Parity-Adjusted Synthetic Option Costs
SP Advantage To WTI SC		$0.00	

The table shows that NYMEX September crude oil futures can be purchased for $17.56. This can be hedged completely by using October $17.00 puts, priced at $0.39. Because the delta on these puts is -.38, a complete put inventory will costs $1.01 ($0.39/-.38) for a combined synthetic call cost of $18.58. Because of time decay, this position should lose $0.40 over 23 days, bringing the expected cost of the synthetic call to $18.18. Less the $17.00 strike, the expected synthetic call cost is $1.18.

The posting-plus column can be constructed in the same way. Including the line entry for seller's premium, which can be entered through a check of the cash market or my iterative trial, and assuming a $1.25 discount to the October contract for the posting expected to prevail in September, we can add a full call option position to the forward purchase for $1.20 ($0.73/.61). This position is expected to lose $0.25 to time decay, producing an expected synthetic put cost of $17.84, or $0.84 less the $17.00 strike.

This would indicate that the synthetic call costs $0.34 more ($1.18 - $0.84) than the synthetic put. However, it should cost $0.34 more using put-call parity. If this $0.34 is added back to the synthetic put cost, then the $0.80 seller's premium is completely fair because it eliminates any advantage between purchasing crude oil through either method.

The use of this option-based arbitrage analysis is not restricted to the simple two-choice, one-month ahead example. It can be stretched over years, and is just as applicable to financial instruments with different yields (like Eurodollars) as it is to physical commodities.

Its application for the long-dated risk management market lies in the fat that it not only allows for protection against ordinal price risk, or the market moving up and down, but it can be used for hedging timing risk as well.