All's Fair In Love And Hogs

"I got this pig for Hillary!"
"Good trade, Sir!"

Don't walk 'em, and don't give 'em anything to hit! This timeless piece of advice given to struggling pitchers surely ranks right up there with employee empowerment and mission statements in the banality department. But how different is this undefined task from the problem of analyzing the intermonth spreads in the livestock complex: Can we determine whether a spread is at fair value if we have no clear idea of what fair value should be? Moreover, why is fair value important for traders and market analysts?

The standard cost-of-carry model holds that a distant month should be priced at the spot market price plus the physical and financial costs of maintaining inventory over the holding period. This model works quite well for financial futures, such as stocks and bonds, whose carrying costs can be hedged with a great deal of precision, or for physical markets with large visible supplies and low storage costs, such as gold. The model breaks down for financial markets, either singly such as the eurodollar, or in pairs, such as any currency cross-rate, where the carrying cost is influenced by the future value of the underlying commodity; the forward carrying cost of the eurodollar will be influenced by the future eurodollar rate. The model also breaks down for physical markets with large visible supplies, less-definite storage costs, and uncertain supply/demand balances, such as grains and energy; these markets are subject to the vagaries of backwardation and contango.

Livestock Tension
These problems have been addressed with tension indices (see "Measuring Market Tension," *Futures*, February 1996, for the physical markets, and "Great Expectations," *Futures*, April 1997, for the financial markets). The Market Tension Index (MTI) and EuroTension Index (ETI), respectively, capture the three dimensions in which markets trade:

1. **Trend**, or the measure of continuity of price over time;
2. **Volatility**, or the measure of uncertainty in the market; and
3. **Intermonth spread**, or the measure of price expectation over and above normal carrying cost.

The first two components of the MTI and the ETI, trend and excess volatility, are identical. Trend is defined as:

$$Trend \equiv \frac{\left(\frac{(P - MA)}{Vol}\right)}{P}$$, where MA is the N-Day Adaptive Moving Average, where N is the

number of days between 4 and 29 that minimizes the function:

$$\frac{1}{N} * \sum_{i=1}^{N} \frac{N}{Vol^2} * |(P - MA)| * |\Delta MA| ,$$

and Vol is the N-day high/low/close volatility, defined as:

$$\sum_{i=1}^{N} \left[\frac{\left[.5 * \left(\ln\left(\frac{\max(H, C_{t-1})}{\min(L, C_{t-1})} \right) \right)^2 - .39 * \left(\ln\left(\frac{C}{C_{t-1}} \right) \right)^2 \right] * 260}{N} \right]^{1/2}$$

where H, L, and C are high, low, and close, respectively. Once the Adaptive Moving Average is calculated, the trend is defined as the volatility-adjusted oscillator around this central tendency. In the construction of the index, the trend's "zero point" occurs when the price and the Adaptive Moving Average are equal.

The volatility component used in index construction is the ratio of implied volatility to the measure above; this provides us with a reading on the strength of the market's anxiety level. For the purposes of index construction, the "zero point" occurs when the market's implied volatility level is equal to the high/low/close volatility level.

It is for the third component of the tension index, the intermonth spread, that we need a determination of fair value. For the MTI, we could define fair value as a convenience yield of zero, or:

$$\left[1+\frac{(M_2 - M_1 - Carry)}{M_1}\right]^{\frac{360}{d}} - 1 = 0,$$

where M_1 and M_2 are the first and second month futures, respectively, and Carry is the total costs of storage. For the ETI, we could define fair value anywhere along the forward yield curve by equating the forward rate between to points on the curve to the longer of the two maturities; using 90-day and 180-day rates, this would be:

$$[\frac{(1+r_{180})^2}{(1+r_{90})} - 1] = r_{180}$$

A Floating Anchor

The lack of any sort of storage market in livestock deprives this complex of a meaningful "zero-point;" even if we could determine the complete cost picture for holding live cattle in the feedlot for another two months, no one would keep the cattle, or hogs, in the feedlot for that period of time, anyway. While convenience yields and forward rates, two absolute measures, are unavailable to us in determining fair value, we do have a relative measure, the expected rate of time decay on an equivalent option position.

Intermonth spreads on hedged physical commodities exhibit the attributes of call options (see "Backwardation Has Its Price," *Futures*, June 1994, or "All In All, Another Trick With A Call," *Futures*, May 1996). This attribute derives from the ability of the physical commodity owner to sell inventory into the cash market and buy the short future in the forward month at a substantial premium, one limited only by processing margins (see "If The Sky's Not The Limit, What Is?," *Futures*, May 1998). Since markets do not provide anyone with a cheaper trading alternative on a risk-adjusted basis – that would be a free arbitrage opportunity – then the cost of owning the spread between the first two months, (M_1-M_2) must be equivalent to the cost of its option alternative, owning a call option on the third month, which will be the second active option month when the first month futures expire.

We can demonstrate this equivalency in the live cattle market by using data from the close of business on July 9, 1999. The prices and expiration dates for the first three months of cattle futures along with the price, delta, and volatility of the Dynamic Option Selection System's call option for bullish purposes (see "You And Your Strike," *Futures*, March 1999) are shown. We will need to buy (1/.76) calls for a total cost of $0.05625 in order to have the equivalent of one future. The question now becomes whether the expected time decay on these December $0.62 calls between July 9 and the expiration of August futures on August 29 will be equal, within the bounds of transaction costs, to the $0.01525 spread between August and October. An equivalency, should it exist, would be the "zero-point" of this component of the Livestock Tension Index.

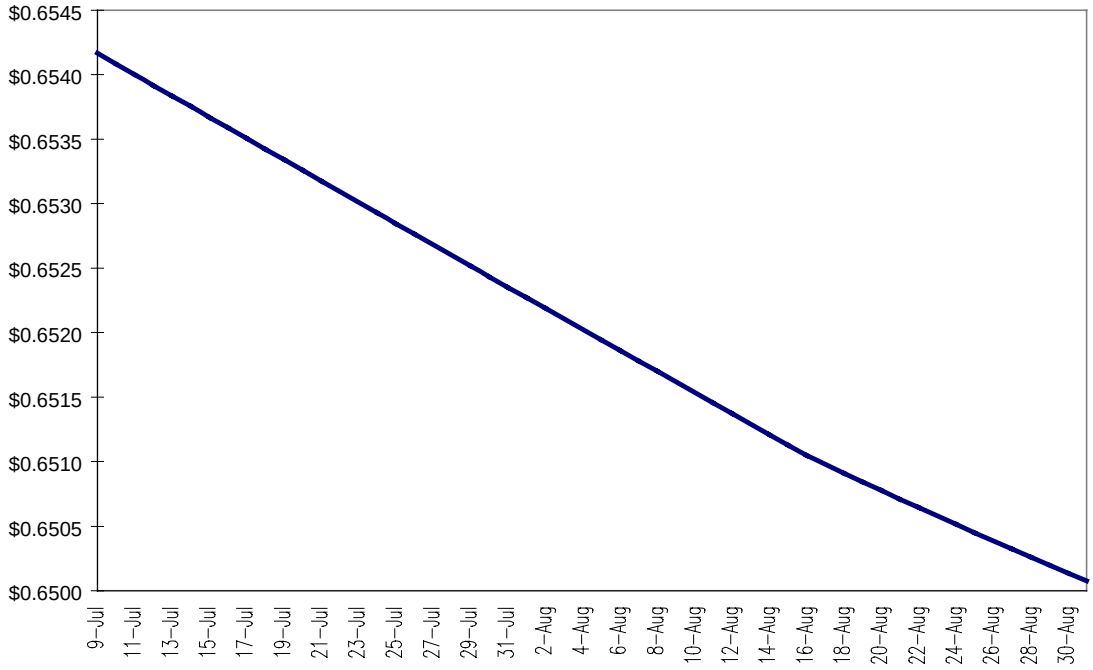
Situation On July 9, 1999

	Price	M1 - M2	Expiration
Aug. LC	$0.62825		29-Aug
Oct. LC	$0.64350	-$0.01525	31-Oct
Dec. LC	$0.65425	-$0.01075	31-Dec

				Delta	Vol.
Dec. $0.62 call	$0.04275		3-Dec	0.76	11.79%

We simply could calculate the expected time decay cost of our $0.62 call over this period, which would be $0.00505 per option, or $0.0067 per future-equivalent, but that would ignore both the shape of the forward curve in the cattle market and the expected seasonality of the October/December spread. We can account for the expected increase in the cattle carry over this time period by converging the October/December carry to the August/October carry over this time frame, and we can account for the expected seasonal strengthening of the October/December cattle spread at this time of year by applying the appropriate X-11 adjustment factor. The effect of these two adjustments is shown below.

Adjusted Price Of December LC Futures



Wag The Hog

We now can calculate the expected time decay on our $0.62 call option position at the adjusted price of just over $0.65, a drop of $0.00425 since our start date. This number is $0.0114, which is still less than our $0.01525 spread in the futures, which suggests the August/October spread is deeper, and cheaper, than the expected time decay on the $0.62 call. These two numbers can be converted into an annualized rate of return, as shown below:

$$[1+(-.01525+.0114)/.62825]^{6}-1, \text{ or -3.62\%}$$

Two interpretations are possible. First, we can conclude that the August/October is in a too-deep carry, and should start to close. Our second possible conclusion is that the depth of the August/October carry conveys some very strong fundamental information regarding the cattle market, information that either cannot be reflected in the December option price or would be arbitraged out of the option price even if reflected initially (see “A Risk Is Not A Risk, A Buy Is Not A Buy,” *Futures*, February 1998).

In application, the second interpretation is preferable; indeed, it is absolutely analogous to the common trend-following strategy of buying strength and selling weakness. The August/October spread is weakening, and probably weakening for very good reasons; for us to buy August and sell October would be to place our floating anchor, option time-decay, in an unwarranted position of primacy. Claiming to be right when the market is wrong is seldom a profitable trading strategy, which is a shame, considering how often most of us employ it.