Ag Decision Maker

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Understanding Livestock Basis

Basis is the difference between cash price and futures price. More specifically, it is the difference between today's local cash price and today's futures price of the futures contract with maturity closest to the present time.

Livestock basis is computed by subtracting the futures price from the cash price:
Local cash price - futures price = basis

For example, assume the cash hog price is $72.50 and the Lean Hog futures price is $73.

The basis is	-$.50
Cash hog price	$72.50
Live hog futures price	73.00
Basis	- $ .50

A negative (-) sign before the basis number means that the futures price is higher than the cash price. A positive sign (+) means that the cash price is higher.

Historic basis

Hog and cattle basis tables are shown in *Information File* **Lean Hog Basis** and *Information File* **Live Cattle Basis**. The basis data are aggregated by approximately two-week periods.

Cash prices used to compute the live cattle basis are prices at Iowa and Southern Minnesota points for 1,100 to 1,300 pound Choice steers. Hog basis is calculated using the the Western Combelt price for 51 to 52 percent lean 185 pound carcass.

The futures contract delivery month used to compute the basis during each period is shown in column 2 of the basis tables in *Information File* **Lean Hog Basis** and *Information File* **Live Cattle Basis**. Two criteria are used in choosing the futures contract delivery month. The delivery month must be actively traded during the time when the livestock are marketed.

Trading of a delivery month for cattle futures ceases at the end of the futures delivery month. Lean hog futures trade until the 10th business day of the month. Also, the delivery month used is the one with delivery closest to the time when the livestock are marketed.

Basis tables often report the average or expected basis and some measure of basis risk. For example, one of the columns in each table in *Information File* **Lean Hog Basis** and *Information File* **Live Cattle Basis** is titled 3-year average basis. The column on the far right in the table is the standard deviation calculated daily for the two week period over the three years that make up the average basis. The standard deviation is a measure of variability. The actual basis is expected to fall in a range from one standard deviation above and one below the average approximately two-thirds of the time. Put another way, the actual basis is expected to be one standard deviation below the average only one sixth (about 16%) of the time.

What affects basis

Basis is less variable than price (cash or futures price). Basis levels remain relatively constant because the cash and futures prices react to similar conditions. If hog supplies decline relative to demand, both cash and futures prices tend to rise. If supplies increase, both cash and futures prices tend to fall.

Similar but different

The two markets - cash and futures are similar but not identical. The cash market is a current market reflecting today's supply and demand conditions. Conversely, the futures market is an anticipatory market reflecting expectations of future supply and demand conditions. For example, at contract maturity, basis during early March reflects the difference between the cash price during early March and the

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April futures contract price with delivery during April. The two markets do not react exactly the same way to market factors. This difference leads to changing basis levels.

Basis variability due to comparing current market conditions with future conditions disappears during contract maturity. For example, at contract maturity both the cash market and the April live cattle futures contract represent market conditions during the April 1 to 20 period. Here the futures market becomes a current market like the cash market. The only difference is the futures price represents delivery of a specific type of cattle to a delivery point whereas the cash market might be cattle delivered to a specific packing plant or a local auction.

The lean hog futures uses cash settlement rather than live delivery (see *Information File* **Lean Hog Basis**). The basis is expected to be less variable and trading should be more orderly at the end of the contract.

Seasonal hog price patterns
Seasonal hog price patterns affect hog basis because the two markets reflect supply and demand conditions during two different time periods as discussed above. During a period of increasing supplies, prices are expected to decline. The cash market reflects today's supply conditions and price. However, the futures market reflects upcoming conditions of expected larger supplies and lower prices. So, basis may be very narrow or cash price may actually be above futures price. Typical periods of narrow basis are from mid-August to mid-September.

The opposite is true during periods of decreasing supply and increasing price. A typical period is from late December and early January against the February futures. This is a seasonal price period of relatively large supplies and low cash prices, but the February futures contract reflects a delivery period of expected smaller supplies and higher prices. So, low cash prices and high futures prices translate into a wide basis.

Seasonal hog and cattle price patterns are discussed in files *Information File* **Seasonal Hog Price Patterns** and *Information File* **Seasonality of Cattle Prices**.

Threat of delivery
Another factor that binds the cash and live cattle futures market together during certain periods of the year is the threat of delivery. During the contract delivery month, hedgers can deliver fed cattle on a futures contract.

If enough producers deliver on futures contracts, cash prices will tend to move up relative to futures. So, the threat of delivery tends to limit how wide the basis will be during the delivery period. As a result, the variation in basis during delivery periods tends to be less than during periods with no delivery option.

The cash settlement index is a weighted average price of hog carcasses and feeder cattle that meet contract specifications. Delivery is not an alternative, but the settlement price of these two are tied directly to the cash market.

How to use basis
Basis can be used in hedging and for analyzing forward contracts with packers and others. In a hedging program, basis information can be used to estimate the price received from a hedge and to determine the best time to lift a hedge.

Placing a hedge
When placing a hedge, a producer must estimate the basis that will exist when the hedge is lifted. The estimated basis is used to estimate a net selling price.

The estimated net selling price or hedge price is computed by adding the estimated basis to the futures price. For example, assume that during October a producer is considering hedging cattle that will be ready for market in late January. The February futures contract is currently trading for $70. Assume the average basis during the latter half of January has historically been -$1.50. The estimated net price from hedging (disregarding transaction fee and interest on margin money) is $68.50 ($70 + (-$1.50) = $68.50).

Using a basis estimate other than the average should be considered for the reasons discussed previously. A more conservative basis is the average minus one standard deviation. Assume the historic average basis is -$.97 and the standard deviation is 1.78. Then a conservative basis is (-.97-1.78) basis is -$2.75. The estimated net price from hedging would be $67.25 ($70 + (-2.75)). So, based on history, there is one chance in six that the actual price received when the hedge is lifted will be less than $67.25 (disregarding transaction fee and interest on margin money).

Lifting a hedge

When placing a hedge, an estimate is made of what the basis will be when the hedge is lifted. If the actual basis when the hedge is lifted is different than the estimate (i.e., less negative), the actual net price received by the producer will be different (i.e., higher).

From the example above, the hedge is $68.50 ($70 -$1.50) disregarding transaction fee and interest on margin money. When the hedge is lifted during late January, February futures are $65 and cash is $61.50. The actual basis is -$3.50 ($61.50 -$65), $2 more negative than the estimated basis. So, the actual price received is $66.50, $2 less than the estimated price of $68.50 when the hedge was placed.

This difference can be shown by working through Example 1. February futures are sold in October for $70 and bought back in late January for $65. A $5 gain is made in the futures transaction. The five dollar futures gain plus the $61.50 cash price is $66.50 ($61.50 + $5). The actual price received is $2 less than the estimated price because the cash selling price is $3.50 lower than the ending futures price. In other words, the actual basis ($61.50-$65 = -$3.50) is $2 more negative than the original -$1.50 estimate of basis.

Example 1. Basis analysis.

	Hedge placed	Hedge lifted
Futures	$70.00	$65.00
Estimated basis	$ -1.50	
Price	$68.50 [1]	
Futures gain or loss		+ $ 5.00 [2]
Cash price		61.50
Actual price received		$66.50 [3]
Actual basis		$ -3.50 [4]
Actual price received		$66.50 [5]
Price difference (estimated vs. actual)		$ 2.00 [6]
Basis difference (estimated vs. actual)		$ 2.00 [7]

[1] $70.00 - 1.50 = $68.50
[2] $70.00 - 65.00 = $ 5.00
[3] $ 5.00 + 61.50 = $66.50
[4] $61.50 - 65.00 = $-3.50
[5] $70.00 - 3.50 = $66.50
[6] $68.50 - 66.50 = $ 2.00
[7] $ 3.50 - 1.50 = $ 2.00

If the actual basis when the hedge is lifted is -$1.50 (our original estimate), either futures price would be $2 lower resulting in $2 more gain in the futures market, or cash price would be $2 higher resulting in a $2 higher selling price, or some of both.

If the actual basis when the hedge is lifted is more negative than expected, a producer may find it profitable to hold the hedge a bit longer until the basis returns to a more normal level. In our example, the average historic basis is -$1.50, considerably less than the current basis of -$3.50 so it may be profitable to postpone lifting the hedge for a short time until the basis returns to a more normal level. Other factors that should be considered before extend-

ing the hedge include the cost of added gain and price discounts for cattle that are too heavy or over finished.

Delay is advised if the odds favor a much improved basis and if the number of outstanding contracts (open interest) still available is above 1,000. It is not advisable to delay lifting the hedge, even with an excessively wide basis, if continued futures price rises are anticipated. Usually, the closer the marketing period to the delivery period, the more predictable the basis will be.

Conversely, if the basis just before the time the hedge would normally be lifted (i.e., two weeks) is abnormally good (i.e., -40 cents), a producer may find it is profitable to lift the hedge early rather than holding (i.e., two weeks) and possibly experiencing a wider basis. Again, there are other factors to consider.

Using basis to evaluate forward contracts

Basis can also be used to evaluate the price offered by forward contracts from packers and others. If a producer is considering using a forward contract, the contracting company's basis can be compared to the historic basis. The contracting company basis is calculated by subtracting the contract price from the price of the appropriate futures contract delivery month. If the contracting company's basis is significantly more negative than the historic basis (less transaction fee and interest on margin money), the producer may realize a higher price by hedging. Conversely, if the contracting company's basis is less negative than the historic basis, the producer may realize a higher price by using the forward contract.

Of course, other factors will also influence the decision. For example, the producer may be inexperienced at hedging, or the size of the forward contract may meet his/her needs better. Forward contracting also commits the livestock to a known packer, raising concerns about captive supplies.

Livestock basis vs. grain basis

Many agricultural producers who understand grain basis patterns try to transfer that knowledge to livestock basis. However, some differences exist. Grain is a storable commodity. So the basis is tied closely to storage costs and interest rates. Livestock are not storable. So there is no storage cost built into the basis and the basis is not influenced by interest rates.

Developing a personal basis

The hog basis information in *Information File* **Lean Hog Basis** is based on the Western Cornbelt carcass prices as reported by USDA. But the cash price received by an individual producer may consistently be above or below this price.

To adapt the basis information presented in *Information File* **Lean Hog Basis**, periodically compare your price to the Western Cornbelt price. If your price is consistently higher or lower, make this adjustment to the basis coefficients in *Information File* **Lean Hog Basis**.

To illustrate, if your price is consistently 50 cents higher than the Western Cornbelt price, your basis will be 50 cents higher (less negative or more positive). The same procedure can be used for personalizing the live cattle basis in *Information File* **Live Cattle Basis**.