

DEPARTMENT OF AGRICULTURAL ECONOMICS

Livestock Basis

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Basis is defined as the difference between the local cash market and a futures contract price (Basis = Cash Price - Futures Price). Knowledge of historical basis patterns can be useful when estimating expected sale or purchase prices at the conclusion of a futures or options hedge, when evaluating a current cash market quote, and when evaluating forecasted cash prices. This fact sheet explains how livestock basis is computed, outlines an approach to developing a history of local basis levels, and discusses how historical basis data can be used to forecast basis.

A futures contract price represents today's opinion of a commodity's value at the time the futures contract expires. Moreover, the futures price quote is for a specific grade of the commodity at a particular location. On the other hand, a commodity's local cash price represents the price at which buyers and sellers are willing to trade the commodity on a particular date at a given location. Cash prices vary by geographic location, actual grade or quality of the commodity, and, like futures prices, by date.

The difference between a commodity's futures contract and cash prices, for a particular grade at a specific location, is known as the basis. Basis is sometimes referred to as the price of a cash commodity at a particular location, relative to a specific futures contract, because it provides a measure of the local supply and demand conditions vs. the aggregate supply and demand situation depicted by the futures contract's price.

Defining Basis

Mathematically, the formula for computing basis can be stated as:

$$\text{Basis} = \text{Cash Price} - \text{Futures Price.} \quad (1)$$

The formula indicates that, if basis is negative, the futures price is greater than the cash price. Conversely, a positive basis indicates the futures price is less than the cash price.

Basis is usually computed using the nearby (closest to expiration) futures contract. For example, in October the nearby corn futures

contract is the December futures contract and the December contract is generally used to compute basis for corn to be delivered in the fall. Similarly, in January the nearby live cattle futures contract is the February contract since it is the contract closest to expiration.

Livestock basis is always computed using the nearby (closest to expiration) futures contract since, generally, it is not possible to store livestock into the expiration period of a subsequent futures contract. However, grain basis can be computed using a deferred futures contract price. A deferred futures contract is any futures contract farther away from expiration than the nearby futures contract. For example, in the fall you could choose to compute corn basis using the July corn futures contract, which is a deferred contract since the December contract is the nearby contract in the fall. It makes sense to do this with grains since they are a storable commodity, unlike livestock. Computing grain basis using a deferred futures contract makes it possible to evaluate expected changes in the basis over a long period of time which can be helpful when evaluating storage profitability.

Basis is much easier to predict than either the cash or futures price. This is because most of the factors that influence a commodity's price affect both cash and futures prices simultaneously. Usually there is a one-to-one relationship (approximately) between cash and

futures prices. This means that cash and futures prices tend to move together, i.e., if live cattle futures prices go up by \$1.00 per cwt., cash prices also tend to go up by \$1.00 per cwt. There are times, particularly in the grains, when something other than a one-to-one relationship between cash and futures prices can be expected. The ability to anticipate these situations can create a profit opportunity.

Using Basis Information

The mathematical formula used to compute basis is a powerful tool. If we rearrange equation (1) and solve for the cash price we discover the following relationship:

$$\text{Cash Price} = \text{Basis} + \text{Futures Price.} \quad (2)$$

Hedgers can use basis for the time frame when they expect to deliver (or accept delivery of) the cash commodity to estimate their expected price if they place a hedge at today's futures price level. This works because a hedger effectively locks in the futures price when the futures contract is sold, in the case of a short hedger, or when the futures contract is purchased, in the case of a long hedger. Effectively, this means that the difference between a hedger's actual price, at the conclusion of the hedge, and the expected price, at the outset of a hedge, will be attributable to the difference between the actual and expected basis.

Suppose, for example it is currently April and you will have fed cattle market ready in September. The October *Live Cattle* contract is currently trading at \$71 per hundred weight (cwt.). But what does that mean to you when feeding and selling finished steers in Hereford, Texas. To more accurately estimate what your actual selling price might be, you would need a basis estimate for 1) fed steers, 2) at Hereford, Texas, and 3) during September. Suppose, historically, such a basis had averaged - \$2.00 cwt., then your estimated selling price would be \$69 cwt. At this time, if pricing through the futures market with an October Live Cattle contract, this would be the best estimate of your September fed cattle selling price in Hereford, Texas. This is the first and foremost use of estimate basis.

Knowledge of historical basis levels also can be useful when judging the acceptability of a local cash market price. As equation (2) indicates, a commodity's cash price can be decomposed into its futures price and basis components. The basis component can be compared with historical basis levels for that particular time of year and a judgment made regarding the acceptability of the cash price. If the basis differs substantially from histori-

cal levels, some additional research to determine why the difference exists and whether it is likely to persist is warranted.

Finally, you can generate a forecast of the cash price by replacing basis with expected basis. In this case the formula becomes

$$\text{Expected Cash Price} = \text{Expected Basis} + \text{Futures Price.} \quad (3)$$

This means you can use a basis forecast, in conjunction with the futures price, as a cash price forecasting tool. The technique is straightforward. Simply add today's futures price (choosing the futures contract that will be the nearby contract during the forecast period) and a forecast of the basis during the forecast period to obtain a cash price forecast. To clarify, assume that you need a western Kansas fed steer cash price forecast for mid-November. Take today's December live cattle futures price and add a forecast of the mid-November western Kansas slaughter steer basis to the futures price. The result will be an expected mid-November cash price, based upon today's futures market price and your basis forecast. This futures based price forecast can then be compared to forecasts from alternative sources such as university extension economists, the U.S. Department of Agriculture and market advisory firms.

Constructing Historical Basis Tables

Basis tends to follow the same pattern year after year. As a result, historical basis data can be used to forecast basis. The first step to forecasting basis is to generate a historical basis table to compare basis across years. Setting up basis tables on a weekly basis is the preferred approach since it provides enough detail to be useful for forecasting without requiring that you spend an inordinate amount of time collecting prices.

Both feeder cattle and lean hog basis can be computed one day per week for most markets. Feeder cattle auction markets typically trade just one day per week. As a result, cash prices are only available one day per week. When performing the feeder cattle basis computations, it is important to use the futures and cash price from the same date. Lean hog basis data for major markets can also be recorded just one day per week since most hog markets trade every day. To avoid holidays, recording the closing cash and futures prices on Wednesday is often a good choice. Unfortunately, computing and recording slaughter cattle basis one day per week is not satisfactory.

Many cash slaughter cattle markets, such as western Kansas slaughter cattle, don't trade everyday. As a result, picking a single day per week (i.e., every

Wednesday) to compute basis will yield a surprisingly large number of weeks with no basis to report, simply because the cash trade occurred on days other than the one chosen. To avoid this problem, you can average both cash and nearby futures prices for the week and use them to calculate weekly average basis. Whether you choose the weekly average technique or one day per week approach, it's important that you use the same technique from week to week and year to year to ensure consistency.

Calculating the weekly average basis for slaughter cattle requires that a rule be established regarding when to change the futures contract used to compute basis. One rule that works well for livestock basis is to continue using the futures contract closest to expiration to compute the weekly average futures price as long as it continues to trade the entire week. If the nearby contract expires during the middle of the week, switch all of your calculations for that week to the next closest to expiration contract. To clarify, examine how this rule would have been employed with the October 1997 and December 1997 live cattle futures contracts. October live cattle futures expired on Wednesday, October 22. Consequently, the last week to compute live cattle basis using the October contract was the week ending Friday, October 17. Basis for the week ending October 24 was computed using the December live cattle futures contract since, by the end of that week, it was the new nearby futures contract.

Remember, anything that affects cash prices will have an impact on basis. For example, since feeder steer and heifer basis is computed using the same futures contract, feeder steers and heifers will generally have a much different basis because heifer prices typically trade at a substantial discount to steer prices. Similarly, different feeder cattle weight classes will also have substantially different basis levels and patterns because light weight cattle prices generally trade at a premium to heavy weight cattle prices and follow a different seasonal pattern. As a result, it's important to have data available for the appropriate sex and weight since it can have a big impact on basis.

Other factors that influence cash prices can also have a big impact on basis. Prices for Choice and Select slaughter cattle vary and, as a result, these two quality grades have a different basis pattern. Similarly, there are a wide variety of physical characteristics that influence cash sale prices for feeder cattle, all of which can impact the basis for a particular pen of steers or heifers. Lean hog prices vary depending on the carcass

weight and the percentage of the carcass that is lean meat, which means both these characteristics will affect lean hog basis.

Forecasting Basis

Since basis tends to follow the same pattern year after year, historical basis data can be used to help forecast future basis levels. The basis tables described previously can be a great help when forecasting livestock basis. The simplest technique, and one of the most reliable, is to use the historical average basis level for the week you are interested in forecasting as a forecast. Recent research indicates that, generally, three year averages are preferred when forecasting feeder cattle or slaughter cattle basis (Dhuyvetter and Parcell). Comparable research regarding the appropriate historical average to use when forecasting lean hog basis is not available, but it's likely that a three to five year average will perform well.

Forecasting Example

Table 1 provides historical weekly feeder steer basis data for steers weighing 700-800 pounds which were sold at the Winter Livestock Auction in Dodge City, KS. If you are interested in forecasting basis for 700-800 pound steers which will be marketed in southwest Kansas the week of October 15, 1998, it's reasonable to expect basis to be near the three year average of negative \$0.27 per cwt. and recognize that the actual basis could be above or below that level.

Updated Basis Information Available on the World Wide Web (WWW)

Although it's best to maintain your own historical basis data for markets that you customarily use, current livestock basis data for several major markets is available from the Kansas State University website at www.agecon.ksu.edu/livestock. Point your web browser to the following address to obtain historical livestock basis information for feeder cattle (Dodge City, KS), slaughter cattle (western Kansas direct, 1,100-1,300 lb. steers) and lean hogs (Western Cornbelt Lean). Weekly historical basis charts are available for each futures contract and the nearby basis chart is updated each week. In addition, Texas Agricultural Extension Service has historical feeder cattle and calf basis available for many Texas auction markets, as well as the Texas Panhandle slaughter cattle trade.

*Table 1. Dodge City, KS 700-800 Lb. Feeder Steer Basis
Chicago Mercantile Exchange October Feeder Cattle
Futures*

1997 Dates	1995	1996	1997 \$/cwt.	3 year Average
10/1	1.23	-0.12	-1.88	-0.26
10/8	1.29	-0.82	2.27	0.91
10/15	-0.01	-0.34	-0.47	-0.27
10/22	1.29	-0.14	-1.10	0.02
10/29	N/A	1.98	-3.24	N/A

References

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