

Understanding and Using Cattle Basis in Managing Price Risk

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Introduction

Understanding the concept of basis is a key element in developing a sound marketing plan. Basis refers to the relationship between the cash price in a local market and the *futures*

market price. *Basis* is the difference between the cash price and the futures price for the time, place and quality where delivery actually occurs ($\text{Basis} = \text{Cash Price} - \text{Futures Price}$). Using the futures market to hedge is a way to trade price risk for basis risk. Prices tend



Futures market: a central financial exchange where standardized futures contracts can be traded; that is, a contract to buy specific quantities of a commodity at a specified price with delivery set at a specified time in the future.

The UT Extension publication W 320A “[Using Futures Markets to Manage Price Risk in Feeder Cattle Operations](#)” contains a more detailed explanation of futures markets.

Basis: the difference between a commodity’s current cash price and a designated futures contract price (Basis = Local Cash Price - Futures Price).

to be more volatile than the basis, and it may be advantageous for a producer to trade price risk for basis risk. The basis can change in time, but, in general, as the futures price increases/decreases, the local price increases/decreases and the difference is less than that experienced in prices.

Commodity futures market price quotations reflect the collective opinion of thousands of traders concerning the overall supply and demand balance for a commodity. In today’s world, futures markets reflect a market of global proportions. Commodity prices in Tennessee are directly influenced by worldwide supply and demand factors reflected in the futures markets.

Tennessee prices are heavily influenced by, but seldom identical to, the futures market prices on the Chicago Mercantile Exchange (CME). Local cash prices and futures market prices are usually positively correlated for a

given commodity; however, there is usually a difference between the local Tennessee cash price and the price on the CME. The difference between Tennessee cash prices and the futures market prices is called the basis. Basis reflects the supply and demand situation in the local Tennessee market. Tennessee buyers signal their eagerness or reluctance to purchase a commodity by bidding a higher or lower price. This eagerness or reluctance is communicated in the changing basis.

Estimating The Basis

In general, reasonably accurate basis estimates can be obtained by selecting a day during the week to collect a cash and futures price quote and averaging this value over a three- to five-year period. Local cash livestock prices are available from state and federal market news services or farm organizations. Commercial vendors also provide price quotes for a fee. Current futures quotes can be obtained from most newspapers, radio stations and private vendors. A useful website for collecting basis information for Tennessee auctions is www.beefbasis.com. Readers in the southeastern states may also find the Southeast Cattle Advisor website (www.secattleadvisor.com) useful for obtaining local cash market and futures price information.

Interpreting The Basis

A basis of zero means futures market prices and local cash prices are the same. When the basis is not zero, local supply and demand factors are different from those prevailing in the futures market. The basis can be positive or negative. A negative basis indicates the local cash price is less than the futures market. When the basis is positive, the cash price is greater than the futures market price, which means the cash market is

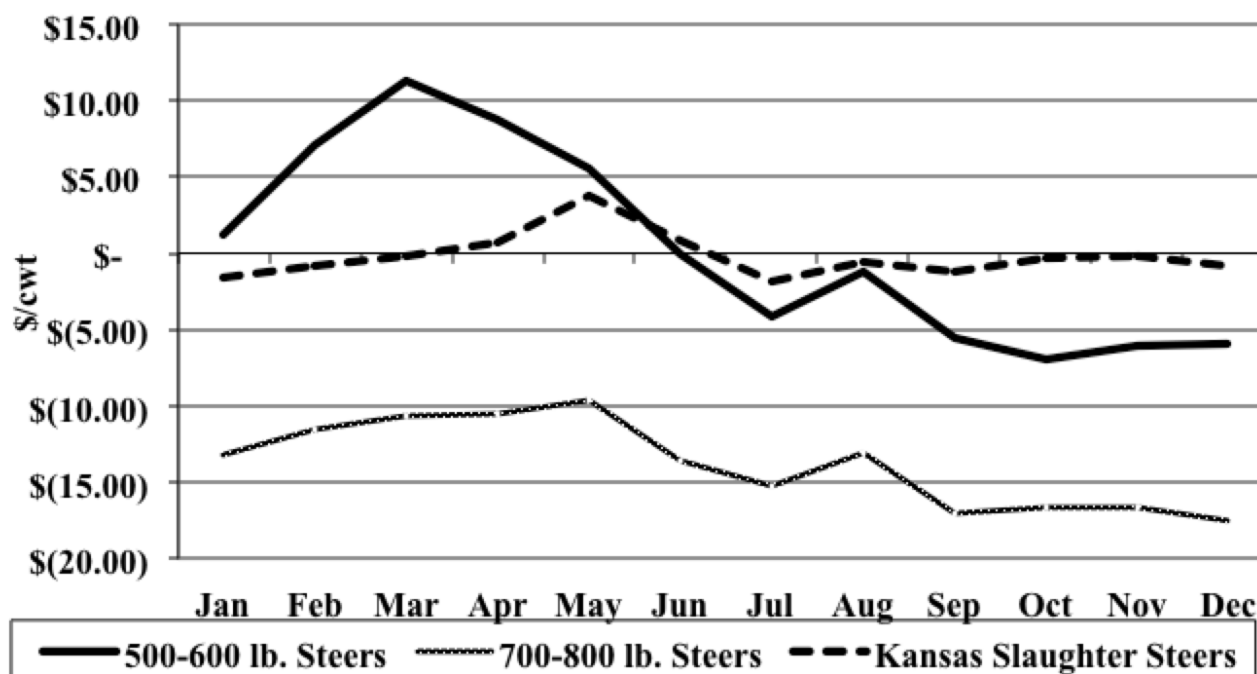
trading at a premium to the futures. As a result, the basis is preceded by a plus (+) or minus (-) sign representing a positive or negative basis, respectively.

Basis tends to fluctuate because local supply and demand conditions continually change. Changes in the basis are known as basis patterns. Basis patterns are one of the fundamental means of evaluating marketing decisions. When the basis becomes more positive or less negative over time, it is said to narrow or strengthen. In Figure 1, a 500- to 600-pound steer basis is weak during December at -\$5.87. By March, the basis is strong, at +\$11.35. The basis for feeder cattle (700-800 pounds) in Tennessee is usually weakest during the fall and strengthens during the winter and early spring.

Variability Of The Basis

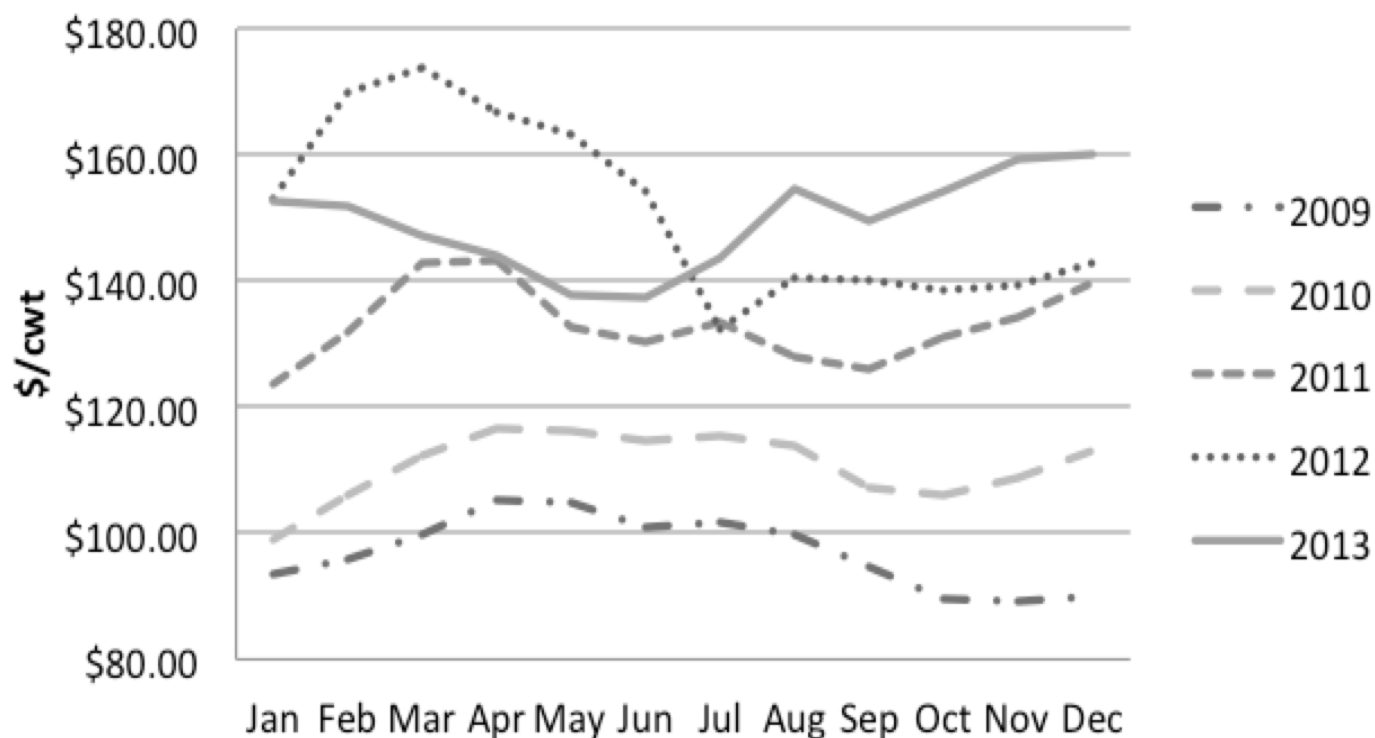
Although the basis varies throughout the year and from one year to the next, it tends to be more stable than changes in cash prices of feeder cattle or live cattle. Figure 2 contains cash prices for feeder cattle by month in Tennessee from 2009 – 2013. By looking at the chart, one can see the volatility of cash prices of steers during this time. Cash prices for 500- to 600-pound steers ranged from a low of \$89.02 per hundredweight (cwt) to a high of \$173.78/cwt. By comparison, during the same period, basis ranged \$30.98/cwt, from a strong point of +\$19.55/cwt to a weak point of -\$11.43/cwt. Other steer, heifer, and slaughter cattle price examples would show similar results.

Figure 1. Monthly Average Basis Estimates for Tennessee Calves, Feeder Cattle, and Kansas Live Cattle, 2009 – 2013



Data compiled from McKinley, 2014.

Figure 2. Average Monthly Cash Prices for Medium-Large Frame, Number 1-2 Muscle Score, 500-600 Steers in Tennessee Auction Markets, 2009 – 2013



Data compiled from McKinley, 2014.

Forecasting The Livestock Basis

Studies¹ have shown the use of the recent three- or five-year average of the local basis (adjusted for quality differences) provides as accurate a forecast of the basis as more sophisticated forecast techniques. The important information from historical basis studies is the variability in the cash/futures difference. If, in July, the basis for 500- to 600-pound steers sold locally has averaged -\$4.20/cwt during the last five years but has varied from \$8.47/cwt below to \$1.56/cwt above futures prices, it

may be expected that local 500- to 600-pound steers will bring \$4.20/cwt less than the August futures price. However, there is some chance of receiving a price as much as \$1.56/cwt above the current futures price or \$8.47/cwt less than the corresponding futures contract price.

Historical basis information would normally be summarized in a table such as Table 1, which displays the average basis for the time period and the variability (standard deviation) of the basis. Approximately two-thirds of the basis experienced over the given time period were within the range of the average basis, plus or minus the standard deviation.

¹ Taylor, M.R., K.C. Dhuyvetter, and T.L. Kastens. 2006. Forecasting Crop Basis Using Historical Averages Supplemented with Current Market Information. *Journal of Agricultural and Resource Economics* 31(3):549-567.

Table 1. Tennessee Feeder Cattle Basis Comparisons for Medium-Large Frame, Number 1 and Number 2 Muscle Steers; 500-600 pounds, 2009 – 2013

Month	Average Basis	Standard Deviation	Highest Monthly Basis	Lowest Monthly Basis
January*	\$ 1.25	\$ 2.37	\$ 4.46	\$ (1.10)
February	\$ 7.10	\$ 4.15	\$ 13.79	\$ 3.36
March*	\$ 11.35	\$ 4.96	\$ 19.55	\$ 7.50
April*	\$ 8.71	\$ 5.26	\$ 17.10	\$ 4.05
May*	\$ 5.55	\$ 3.72	\$ 10.89	\$ 0.36
June	\$ (0.62)	\$ 4.81	\$ 3.65	\$ (8.41)
July	\$ (4.20)	\$ 4.23	\$ 1.56	\$ (8.47)
August*	\$ (1.23)	\$ 2.60	\$ 0.30	\$ (5.85)
September*	\$ (5.58)	\$ 2.37	\$ (3.09)	\$ (8.40)
October*	\$ (6.96)	\$ 3.13	\$ (3.69)	\$ (11.43)
November*	\$ (6.08)	\$ 1.91	\$ (4.62)	\$ (9.35)
December	\$ (5.87)	\$ 1.75	\$ (3.43)	\$ (8.22)

* Denotes futures contract month
Data compiled from McKinley, 2014.

Livestock Basis Patterns

Feeder and live cattle basis are not constant throughout the year. The seasonal basis pattern for 500- to 600-pound steers, 700- to 800-pound steers and live cattle is shown in Figure 1.² Most of the seasonal pattern is due to production differences, which impact marketing patterns. For instance, most of the U.S. beef cow herd is on a spring calving system. As a result, supplies of weaned calves are greatest in the fall. When

these calves are placed in feedlots, they are typically ready for slaughter in mid- to late summer.

Due to seasonal supply variations, the feeder cattle basis is strongest in the spring, when the least number of calves and feeder cattle are available, and weakest in the fall and early winter, when there are larger numbers of cattle. On the other hand, live cattle basis is relatively strong in late spring to early summer, when average slaughter weights tend to be lowest and before the number of cattle ready for slaughter increases. Prices then decline into the weakest basis period in the fall, when average slaughter weights peak and beef demand slows.

² The UT publication "Basis Estimates for Feeder Cattle and Fed Cattle" provides a more complete listing of Tennessee basis estimates by weight class of steers and heifers and can be found at <http://economics.aq.utk.edu/publications/livestock/2014/Basis2014.pdf>

Factors Affecting Basis For Feeder Cattle And Calves

In general, three factors determine Tennessee's livestock basis: time, location and quality. The **time** dimension of the basis is usually limited to the time the livestock are expected to be delivered on the local cash market and the nearby futures contract. As the nearby futures contract approaches expiration, the local cash prices and futures prices should converge and differ by only a small amount. Thus, as the feeder futures contract approaches expiration, the basis difference reflects only location and/or quality differences. Because livestock are not storable, basis differences, in months other than the nearby month, will also reflect the general direction of expected movements in prices.

For example, the difference between the cash price of feeder cattle in February (for which there is no futures contract) and the March futures contract will depend on the futures market anticipation of the supply of and demand for feeder cattle in March, as compared to the actual supply and demand in February. If the market expected an increase in feeder cattle supplies from February to March, the resulting March futures price could be lower than the February cash price. This would result in a positive February basis, with the February cash price being higher than the nearby March futures. The opposite situation could result in a negative basis, with a cash price lower than futures price. As the cash-marketing time approaches the futures contract expiration, the basis becomes more predictable because the market direction is not considered. Note the large "standard deviations" for the deferred or "non-expiration" feeder cattle contract months in Table 1.

Location differences in basis may also exist. Anything affecting the local supply and demand balance relative to the futures market delivery point affects the basis. For instance, a severe drought or other weather situation may have little impact on the national demand for feeder cattle, which determines the futures price, but can have a great impact on the price received locally. Delays in local cattle marketings due to field work demands in the spring or inclement weather in the winter can also affect the basis because local buyers may be willing to pay more relative to the national market price due to a reduced local supply.



In addition to location and time, quality can make a major difference in basis. Variations from the specification of the underlying futures contract can make the basis wider or more narrow. Examples of quality differences include heifers instead of steers, lighter or heavier weights, and frame-size or muscle scores different than those specified by the underlying contract.

Transportation cost is also a major determinant in the basis; therefore, any item that increases transportation costs will widen/weaken the basis. For instance, increases in fuel costs will result in Tennessee cash prices being relatively lower than other regions in the country due to feedlot proximity. Transportation costs

of moving feeder cattle from Tennessee to feedlot states are the primary reason for a large negative feeder cattle basis.

Quality is another determinant of basis. The futures market price is set for a specific quality. The basis estimate should reflect any anticipated discount or premium due to local delivery of a differing quality of livestock. For instance, the feeder cattle futures contract specifies medium- and large-frame number 1 and number 2 muscled steers weighing 650-849 pounds. Cattle that are different from this specification will receive either premiums or discounts. Heifers generally have a wider basis than steers because they present more potential management problems due to potential pregnancy and because they are less feed efficient than steers. Alternatively, producers marketing truckload lots of cattle will have a stronger basis than those presented in this publication because those cattle typically

receive premiums³. Normally, the use of the current discount or premium quality difference will provide an adequate forecast of the quality component of the basis.

It may be helpful to consider an example: In the middle of November, a cattle producer priced 91 feeder cattle weighing 550 pounds for delivery in the middle of April. The producer sold one April feeder cattle contract on November 15th when the April contract was trading for \$175/cwt. Given the expected basis for April of +\$8.71/cwt (Table1), the producer had an expected April sale price of \$183.71/cwt. However, on April 15th the producer sold the 91 head for \$190/cwt and bought back the futures contract for \$185/cwt, resulting in a +5/ cwt basis (meaning the basis weakened by \$3.71/cwt from November to April). Thus, due to the change in basis, the producer received an actual price of \$180/cwt (\$190/ cwt - \$10/cwt loss in the futures) instead of the expected price of \$183.71/cwt.

3 Approximately 80 percent of Tennessee calves and feeder cattle are sold in lots of three head or less. These cattle typically are discounted \$8.00-\$12.00 per hundredweight compared to semi-tractor load lots.

Date	Cash Market	Futures Market	Basis
Nov 15	Expected April cash price = Futures price - (basis) \$175/cwt+\$8.71/cwt = \$183.71/cwt	Sell 1 Apr FC Futures @ \$175/cwt	+\$8.71/cwt (expected)
Apr 15	Sold 91 head of cattle at local market for \$190/cwt	Bought 1 Apr FC Futures @ \$185/cwt	+\$5/cwt (actual)
		Futures Results: Sold \$175 Bought \$185 Profit of \$10/cwt	

Net Price Received = Cash Price + futures gain or loss
Net Price Received = \$190/cwt - \$10/cwt futures loss = \$180/cwt

Factors Affecting Basis For Live Or Slaughter Cattle

Much of the discussion above, namely local supply and demand as well as transportation costs, can be directly applied to live cattle. However, because slaughter cattle can be marketed on either a live-weight or carcass-weight basis, cattlemen must know how these quality differences impact their basis.

The live (slaughter) cattle futures contract specifies cattle or carcasses that are 55% Choice/45% Select Yield Grade 3 or better (Yield Grade 1 or 2 signifies a leaner carcass). Thus, producers who are marketing cattle with carcasses different than this mixture should adjust their expected basis accordingly. For instance, if a cattle producer historically produces 75 percent Choice carcasses that are Yield Grade 3 or better (Yield Grade 1 or 2), the producer would have a more narrow/stronger basis, while cattle producers that historically have a higher percentage of Select or Yield Grade 4 or 5 carcasses would have a wider/weaker basis. Finally, producers who are receiving premiums for branded or source-verified programs may have a more favorable basis and will need to adjust estimates accordingly.

Using The Livestock Basis To Increase Profits

Knowledge of livestock basis can help producers in three ways:

1. evaluation of hedging or floor pricing opportunities,

2. evaluation of cash contract opportunities, and
3. cash market timing.

By properly estimating the basis for the quality and location of the livestock to be delivered, Tennessee producers can use either the futures market or the commodity options market to forward-price cattle (University of Tennessee Extension publications [W 320A](#) and [W 320B](#), respectively). If the basis is underestimated, producers may fail to take advantage of potential profit opportunities. Likewise, producers may find forward-prices, initiated at what were thought to be profitable prices, result in losses due to an overestimation of the basis.

Live cattle futures are based on live weight. Cattle producers marketing on a carcass-weight basis should convert base (par) cash prices and any premiums or discounts back to a live-weight basis to ensure they are comparing “apple to apples.”

The formula for this conversion is:
$$\text{Cash Price} = \text{Net Carcass Price} \times \text{Dressing Percentage}$$

For instance, if the base carcass price is \$220/cwt and a producer expects net premiums of \$5 with a dressing percentage of 64%, his cash-equivalent price is $(\$220 + \$5) \times .64 = \$144/\text{cwt}$. If the nearby live cattle futures is \$140, the producer has an expected basis of +\$4/cwt on a live-weight basis.

Producers who wish to forward-price cattle and have forward-cash contracts available need an understanding of the basis to evaluate their marketing alternatives.

Typically, cash contracts are offered at basis levels less than the historical basis because the contractor is taking on the risk associated with guaranteeing the basis and the cost of hedging in the futures or options markets. In order to determine whether the contract is a “good deal,” as compared to forward-pricing directly in the futures or options markets, the difference in the contract’s basis and the estimated basis should be considered. If the difference is large enough, the producer may find it advantageous to do his/her own forward-pricing.

For instance, assume a producer is offered a forward-cash contract to deliver a truckload lot of feeder steers at \$180/cwt in April. If the April feeder cattle futures contract on this day was \$185/cwt, the contract’s implied basis is -\$5.00/cwt. If the producer’s historical basis difference has been -\$1.00/cwt, the producer has to decide if the \$4.00/cwt difference justifies contracting because the producer could forward-price by trading the feeder cattle futures contract him/herself (hedging). If the producer chooses to hedge, then the producer will take the risk that the basis turns out to be worse than normal. However, the producer would not lose money compared to the contract unless the basis was worse than -\$5.00/cwt.

The basis may also be used to help producers decide when to move their livestock. If the basis is stronger than normal, livestock may be marketed slightly ahead of their estimated market period to take advantage of the favorable basis. Alternatively, a weak basis may be a signal to delay marketings, if possible, with the

idea that the basis is likely to return to a more normal level. In either case, the cost of gain relative to the value of gain, as well as the basis movement, must be considered.

Summary

An understanding of basis and the adaptation of marketing strategies that use that knowledge can increase receipts from commodity sales in Tennessee. Basis data should be maintained and followed as a standard practice by Tennessee farmers. The time spent following the basis and using basis patterns as a guide to marketing decisions can aid in earning a favorable return.

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