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Basis Patterns for Feeder Cattle Teleauctions in Georgia

Steven C. Turner, Timothy A. Park, John McKissick*

The factors that influence feeder cattle basis was investigated using data from two Georgia teleauctions for the period from 1979 to 1994. A major goal was to use the models to forecast out-of-sample basis for individual lots of feeder cattle. These forecasts were compared to a forecast generated by using simple averages and a forecast using a market adjusted, 600-700 lb. steer average basis. Using root mean square error (RMSE) as the evaluation criterion, the results were inconclusive. For one of the teleauction organizations, the model forecast was superior, while for the other organization, the market adjusted forecast had the lowest RMSE.

Introduction

The analysis of pricing patterns in feeder cattle markets has focussed on the role of cattle characteristics and market forces in price determination (Schroeder, et al.). The emergence of electronic marketing systems such as feeder cattle teleauctions has enabled a more detailed examination of the influence of cattle characteristic on the determination of feeder cattle prices. (Turner, et al.). Another associated area of research concerns livestock basis, the difference between cash and futures price. Leuthold hypothesized that the live cattle basis reflects an expected change in cash price, caused by shifts in supply. His analysis supported this hypothesis except for the nearby basis. More recently, Trapp and Eilrich extended Leuthold's research to examine feeder cattle basis. They hypothesized that feeder cattle basis are related to live cattle futures prices, corn prices, and seasonality. Results indicated that statistically significant intertemporal relationships exist between feeder cattle basis and live cattle futures prices and corn prices. This research further extends the Trapp and Eilrich work by investigating the influence of more detailed supply information on feeder cattle basis.

The main objectives of this research are: (1) to specify and estimate an econometric model which identifies the critical factors which influence the feeder cattle basis for Georgia teleauctions, and (2) to evaluate the comparative performance of the competing teleauctions institutions in explaining basis patterns and in generating out-of-sample basis forecasts. After a brief review of the literature on cattle basis research, the model will be developed, results presented, and forecasts evaluated. Simple forecasts using past averages will be used as a base from which to evaluate the predictive accuracy of the basis models.

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Cattle Basis Research

There exists no previous study on teleauction feeder cattle basis. However, studies on feeder cattle, live cattle and other commodities basis do exist. These studies are similar conceptually as all of them relate to non-storable commodities.

According to Leuthold, simultaneous trading in both cash and futures market, known as arbitrage, means that the basis is being bought or sold. Consequently economic factors affecting the basis would be of great interest to the users of the markets. The basis for storable commodities reflects a storage or carrying charge, a transportation charge, possibly a quality differential, and may also reflect market imperfections. However the basis for nonstorable commodities, such as feeder cattle, is difficult to explain as these commodities change form over time. Leuthold interprets cash price as an indicator of current demand and supply condition and the futures price as a result of expected demand and supply condition. Thus, he defines basis, the spread between futures and cash, as an indicator of the expected movement in the cash price over time. He hypothesizes that changes in the cash price reflect expected shifts in supply. Leuthold assumes that taste and preferences do not change over a short time span. Thus expected future demand is the same as current demand.

Leuthold developed four basis models for live cattle using different contract maturity periods for the futures prices in the basis equation. The independent variables included number of cattle slaughtered in the U.S. as a proxy for current quantity supplied, cattle on feed of a different weight category as a proxy for future stock, price of corn, price of slaughtered steers, monthly average price of feeder steers and dummies for seasonality. The equations were linear in original variables, and ordinary least squares was used for estimating each equation. The data were monthly for the period 1965-77, except for the futures price which was an average of every two months. He asserted the poor statistical fit for the nearby basis, as compared to more distant futures, was because the nearby basis is more random and difficult to explain. The coefficient for cattle slaughtered had positive signs in three cases although they were not significantly different from zero. The effects of prices of corn and feeder steers on basis were positive and the effect of cash price was negative. Cattle on feed variables gave mixed results. Five out of twelve seasonal dummies were significant indicating some seasonality of basis.

Trapp and Eilrich tried to determine the systematic intertemporal relationships in the basis between cash and futures prices for feeder cattle as this is critical to executing a well conceived hedging strategy. Their approach was similar to Leuthold in the sense that basis was hypothesized to be a function of live cattle futures prices, corn prices and seasonality. However, the authors contended that both the price of corn and live cattle futures price have different impacts on different weights of feeder cattle. Moreover, they hypothesized that light weight feeder cattle will react more to a given change in feed price than the cash or futures price for heavier weight feeder cattle. This hypothesis was a result of Buccola's break-even-price analysis.

Weekly data were used based on either averages of a week or of a specific day of the week.

The futures prices were based on Tuesday closing prices to reflect the weekly prices. Data spanned the period from September 1986 to June 1990. The starting point of the data period was based on the fact that the specification of the CME feeder cattle contract was changed on September of 1986 to a cash settlement contract.

Twenty-four feeder cattle basis equations based on four weight groups and six different sales months were estimated. The independent variable, live cattle future price, was selected from the contract month whose expiration date was nearest the expected slaughter date for the weight of the feeder cattle being considered. Seasonality dummies for the six sale months were included. They concluded that live cattle and corn price changes have a significantly larger impact upon the basis for light weight feeder cattle than they do for heavier weight feeder cattle. Furthermore, the impact of live cattle futures prices and corn prices upon "prior" month basis became greater the longer the time period by which the feeder cattle cash preceded the futures price contract month. The volatility of the basis was greater for light weight cattle than heavy weight cattle.

Liu *et al.* tried to forecast the nearby basis of live cattle which was considered most difficult to model and explain in work by Leuthold and Trapp and Eilrich. The basis was modeled as a function of the expected change in cash price and the cost associated with delivery. The authors tried three alternative sub models with various combinations of independent variables and a joint model that included all the explanatory variables of the three sub models.

In the joint model, the dependent variable lagged basis (log of futures price - log of cash price) was regressed on the lagged number of cattle slaughtered in U.S., the lagged number of cattle and calves on feed in seven states (supply variables), the lagged monthly farm price of young chickens, the lagged price of barrows and gilts in seven markets, the lagged per capita income (demand variables), the lagged consumer price index (delivery cost variables), the lag of the lagged average live cattle futures price, the lagged the average monthly open interest of the nearby live cattle futures contract (futures market variables), and the lag of basis.

Three alternative sub models were run which included variables for the futures market, the lagged basis and the supply and demand indicators. The delivery cost variable was common to all models. Test for misspecification and test of structural change were insignificant on all four models. Non-nested hypothesis tests and out-of-sample forecasts were used to select among alternative models.

The futures data for each contract month from 1970 to 1986 (102 observations) were used to build the models, and the data from 1987 to 1991 (30 observations) were used to perform the out-of-sample forecasts. Regression analysis concluded that both lagged spread and lagged basis were significant. Non-nested hypothesis tests suggested that the joint model had more explanatory power than the three alternative sub models. Thus lagged spread (log of the difference between the price of nearby futures and distant futures for live cattle) and lagged basis each contained unique information. A set of supply/demand variables had little explanatory power, but the more powerful J-test indicated the supply/demand variables contained some unique information. Forecasts of all four models were similar out of sample.

Model and Data

This study identifies the factors affecting the Georgia feeder cattle basis using transactions level data matched with key information on cattle and lot characteristics gathered from two Georgia teleauctions. Two broad categories of factors are identified which determine the cash price of Georgia teleauction feeder cattle. The first category examines the impact of cattle and lot characteristics. Information on individual cattle characteristics such as sex, weight, grade, and breed are recorded for potential buyers. Data on the lot characteristics such as lot number, lot size, percentage of shrink and cutback allowed in each lot are also recorded.

The second category of variables accounts for market forces such as season of auction, the ratio of buyers to sellers, the live cattle futures price(s), and the futures price of corn as a proxy for the cost of feed. Hedonic models are developed to examine and analyze the factors which affect the feeder cattle basis using data from March 1979 to November 1994 from the competing teleauctions. Standard statistical tests will be used to compare the explanatory and forecasting power from each of the teleauctions.

Feeder cattle basis theory differs from many other agricultural commodities in that feeder cattle are not storable commodities. The relationship between cash prices and futures prices in storable commodities is primarily a function of carrying charges comprised of interest, storage, and insurance. Storable commodities such as grains and oilseeds may be produced in one time period and stored until a future time period undergoing little physical change. The futures price of a storable commodity will not exceed the cash price of that commodity at a par delivery point by more than carrying charges since arbitragers will either bid up local cash prices or force down distant futures prices such that returns from storage do not exceed the carrying charges for that commodity. However, the relationship between cash and futures prices of a non-storable commodity like feeder cattle is much more difficult to explain than storable commodity basis (Botkin *et. al.*).

Borrowing heavily from the argument of Botkin *et al.*, the two elements (cash price and futures price) of Georgia teleauction feeder cattle basis are determined differently. Cash cattle prices and futures prices represent different entities. Georgia teleauction feeder cattle prices reflect current supply and demand conditions at a specific market and time, for a specific lot of cattle, which may or may not coincide with CME feeder cattle futures contract specifications. Futures prices represent feeder cattle in a future time period which bear physical characteristics coinciding with CME feeder cattle contract specifications for a market which comprises the whole nation. Feeder cattle in Georgia teleauctions may not precisely represent CME requirements.

Variations in teleauction feeder cattle basis result from specific factors which affect the cash and futures price differently. Since cash feeder cattle represent a much more heterogenous group than feeder cattle futures, much of the variation in the feeder cattle basis can be attributed to the variation in the cash price element of basis. Therefore, the factors are categorized into two groups based on their domain of influence on the two components of basis. The first group of

variables called cash variables exclusively influence the cash price element of the basis but have no influence whatsoever on the futures price component of the basis. The other groups of variables (called dual variables) are hypothesized to influence both the cash and futures prices though their degree and direction of influence on the two components might be different. More factors affect the cash price element of the feeder cattle basis than the futures price element, thus there is a greater number of cash variables. Therefore, it is critical to this study to isolate and identify the variation in the cash market prices.

Turner *et al.* (1991) have previously identified two broad categories of factors which determine the cash price of Georgia teleauction feeder cattle. The first category of characteristics are cattle and lot characteristics such as sex, weight, grade (frame, muscling, flesh), breed, health treatments, lot number (order in which the given lot appears in the auction), lot size (number of head in a lot), percentage of shrink and cutback allowed. The second category accounts for market forces such as season of auction, total number of buyers and sellers, feeder cattle price in nearby sale barn auctions, total number of lots in a given auction, live cattle futures price, and futures price of corn as a proxy for the cost of feed.

These factors can be used to explain the variation of the cash price element of the teleauction basis. Factors such as seasonality, live cattle futures price, futures price of corn also influence the futures price element of the basis (dual variables).

As is always the case, the scope of an investigation is limited by the amount of data collected/available and the quality of data. Fortunately, Georgia teleauctions provide detailed data about the cattle and lot characteristics and market forces (table 1). Previous research has not tried to explain feeder cattle basis using the factors outlined above. This research will use hedonic models to fully exploit the teleauction data set.

Using the concept of the hedonic price models, a teleauction basis model is hypothesized to have the functional form:

$$TAB_{itf} = \sum_{k} \alpha_{ikt} C_{ikt} + \sum_{h} \beta_{iht} L_{iht} + \sum_{h} \gamma_{ht} M_{ikt} + U_{it} \qquad (1)$$

where TAB_{itf} is the teleauction feeder cattle basis of a lot of cattle i, at time t, hedged using CME feeder cattle futures f, with k cattle characteristics, C, h lot characteristics, L, under market influence, M. The implicit marginal value (effect) of cattle characteristics, lot characteristics and market forces, respectively, on teleauction basis is α, β, γ. Note, C, L, M, α, β, γ are all vectors and U_{it} is the disturbance term.

Cattle characteristics included in the model are sex, weight, frame, flesh, and breed type. Health treatments received was hypothesized to influenced feeder cattle basis but proved insignificant and was not included in the final models. Lot characteristics include: how many head of cattle are in a given lot, the order of a lot in a given auction, and how much shrink and cutback are allowed. The market forces vector (M) has variables which can be thought of as market influences on basis. They include season, total number of lots (TOTLOT) in the auction, a buyer/seller ratio (BSRatio), , live cattle futures price (L), and nearby futures price of corn (CF)

as a proxy for cost of feeding. Introduction of cash settlement for the feeder cattle futures contract in September, 1986 has been proven to reduce basis variability (Rich *et al.*), so a dummy for cash settlement (CashSetl) was included in the model. Thus, the general model with the variables discussed above is:

$$TABasis_i = f(S_i, Frame_i, Flesh_i, W_i, Steer, Head, Head^2, LotNo, Breed_i, L_i, Shrink, Cutback, TotLot, TotLot^2, BSRatio, CF, CashSetl, Trend) \quad (2)$$

where variables are as defined in table 2. The variables included in the above hedonic model were included for theoretical and practical reasons. Since the model's primary function is to forecast feeder cattle basis, only variables available at the time of the forecast were included. The forecast approach was to use the model to forecast the basis for an individual lot. The forecast were made two season before the transaction. More detailed information on the forecasting is presented later.

Expected Results

Variables are categorized into two groups based on their domain of influence on the two components of basis. The first group of variables, called cash variables, exclusively influence the cash price element of the basis but have little or no influence on the futures price component of the basis. The other groups of variables, called dual variables are hypothesized to influence both the cash and futures prices though their degree and direction of influence on the two components might be different.

Influence of Cash Variables

Sex: Heifers are heavily discounted in teleauctions (cash market) compared to steers, ceteris paribus, as noted by Turner *et al.*, and Bailey and Peterson. The sex of teleauction feeder cattle has no influence over the futures price. Thus a heifer is going to lower the cash price and thereby should decrease the basis (negative sign).

BSRatio: This is the ratio of total buyers to total sellers participating in a given teleauction. Earlier studies have used total buyers and total sellers as two independent variables which resulted in some contradictory signs. One would expect that if the total number of buyers increases then it will increase the total demand thereby pushing up the cash price which would result in an increase of the basis. Similarly, an increase in the total number of sellers should increase the total supply thereby depressing the cash price and thus decreasing the teleauction basis. In preliminary studies which included these two independent variables, their coefficients sometimes had the opposite expected sign. The important factor is the relative increase of total buyers to the total sellers not their absolute number. For example, if the total buyers double and the total sellers also double then the price should not be affected. A BSRatio variable should be interpreted as follows: an increase in BSRatio implies that the total number of buyers is increasing more than the total number of sellers. This can be considered as a net increase in the total demand. This should result in a greater cash price and should increase the basis.

Head and Head^2 : Buyers are expected to prefer an optimum number of feeder cattle in a lot. If

the number of head is below or above the optimum level then a discounted price is expected. A curvilinear relationship is hypothesized between these variables and cash price, and thus, the basis.

TotLot and TotLot^2: TotLot represents the number of lots present in a given auction. TotLot^2 is the squared term of TotLot. Similar to Head, it is hypothesized there is an optimum number of lots in an auction. Number of lots below this optimum may not attract enough buyers and a number of lots exceeding this optimum may have a depressing effect on cash prices. Thus, an increase in TotLot is expected up to this optimum which would increase cash price and, thus, increase the basis. Beyond this optimum, an increase in the number of lots decreases the cash price and, thus, decreases the basis. Because of this hypothesized curvilinear relationship, both TotLot and TotLot^2 variables were included in this model.

LotNo: Previous studies by Buccola, and Turner *et al.* have shown a downward trend in cash prices in an auction moving from the first lot in the auction to the last. Therefore, we expect a higher LotNo to decrease the cash price and thus decrease the basis.

Shrink: Shrink represents whether the sellers allow some shrinkage of weight to the buyers or not. Since shrinkage allowed normally falls in a narrow range of two to three percent, inclusion of shrinkage as a binary variable is justified. Shrink is an additional incentive to buyers which may result in higher bidding of cash price and thus may increase the basis.

Cutback: This is the percentage by weight of cattle, which the buyer has the option to cull from a given lot. This is an incentive which should be expected to make the buyers bid more and thus should increase the basis. However, Bailey and Peterson found cutback to have a negative influence on the cash price in Superior Livestock Video Auctions. They argued it might be because the buyer interprets a higher cutback as a defensive strategy to cover up lower quality cattle. If that's also the case in Georgia teleauctions, then it would decrease the basis. The values of this variable ranged from 0% to 80% which would not justify its inclusion as a dummy variable. However, as the data set (prior to 1993) recorded it as a dummy variable, it is included as a dummy.

Breed: This represents whether a particular breed type constitutes more than 50% of the lot. Black and Black White Face was selected as the base breed because it is the most common breed type in both the auctions. If because of the presence of a breed type, the lot receives a premium compared to the presence of the base type, then it would increase the basis. Turner *et al.* found Angus and Angus crosses to bring premiums and Dairy breeds to bring discounts to the cash price in GFB. Thus, Angus was expected to increase the basis. Dairy cattle were not included in this study. Other breed types were not significant in the Turner *et al.* study so their effects remain to be seen.

Frame: In a study by Bailey and Peterson, large, medium-large, and medium frame all attracted premiums over small frame. Turner *et al.* found small frame cattle to attract discounts over medium. Thus, medium and small frame cattle are expected to result in discounts in cash markets over the control type of large frame, thereby increasing the basis.

Flesh: Bailey found medium-heavy and medium fleshed cattle to generate some premiums over light fleshed cattle. It was significant at the 10% level. However, in the study by Turner *et al.* this variable was not significant. Thus, medium and light fleshed lots are expected to generate some discounts in cash markets compared to the control type of heavy fleshed cattle and thereby decrease the basis.

Influence of Dual Variables

Live Cattle Futures Prices:(L_j) These are the closing futures price of live cattle of the contract nearest (L_1), next most nearest (L_2), next most nearest (L_3), and so on (L_4)to the teleauction day. If the final product (live cattle) price increases, it should also increase the price of its intermediary product (feeder cattle). As it would both influence the cash and futures price of the feeder, its net effect would be positive or negative depending upon its relative influence over the two dependent variables. Thus it can either increase or decrease the basis.

CF: This is the closing corn future price for the nearby contract on the day the teleauction occurred. This is included in the model as a proxy for the input price. Leuthold argued that a higher futures price of corn would discourage feeding, causing higher cattle futures prices and thus it would decrease the basis. Trapp and Eilrich contended that light weight cash feeder cattle prices would react more to a given change in feed price than the cash or futures price for heavier weight feeder cattle. Since the futures price is the price of feeder cattle of 600-800 lbs., it is expected that for W1 ($\leq$ 500 lbs.) and W2 (500 to 600 lbs.) categories, the cash price will increase more than the future price. Thus, it should increase the basis for these categories.

CashSetl: Because the cash settlement was introduced to promote convergence between the cash and future prices, it is expected to reduce the absolute value of basis. Since basis is mostly negative, the cash settlement should result in a basis with a smaller negative number. Thus, it should have a positive sign.

Trend: This variable was included to account for the influence of inflation or deflation on prices. Trend is equal to one for the first auction held by the organization, two for the subsequent auction and so on. Depending on its relative influence on cash price and futures it can be either positive or negative. Turner *et al.* noted that Trend had a positive impact on cash prices. However, its influence on futures prices remains to be tested.

Seasons: Previous research has shown varying effects of seasons on basis in local markets (Leuthold; Trapp and Eilrich; Liu *et al.*). Turner *et al.* found that Fall gets the largest discount, and Spring gets the least discount over the base season, Summer, for GFB. However, for RC, only Fall was significant and it generated a premium. Thus, if seasonality has a greater impact on cash price than on the futures price, one would expect it to decrease the basis in Fall for GFB and increase it for RC.

Results

Separate models were estimated for each organization (GFB and RC) and for each forecast period. The first forecast period started in the fall of 1988 and ended in the spring of 1994. Thus, for the 1988 forecast period, the 1987 model was used, for the 1989 forecast period the 1988 model was used, and so on. Additional data was included when the models were reestimated each year. Seven models were estimated for each organization, starting with the first model that included data through 1987 and ending with the last model which included data through 1993. For discussion purposes, parameter estimates for only four models are presented (table 3 and 4).

In general, the models had adjusted R^2's of .6113 to .5388 for the Red Carpet models and .6495 to .5539 for the Georgia Farm Bureau models. Several variables were consistently statistically significant (0.10 level) in almost all fourteen models. For the Georgia Farm Bureau models,

heavy flesh (fl1), large frame (fr1), 600-700 lb (EW4), and winter (S1) were taken as the base class for flesh, frame, weight, and season, respectively. For the Red Carpet models, medium flesh (fl2), large frame (fr1), 600-700 lb (EW4), and winter (S1) were taken as the base class for flesh, frame, weight, and season, respectively. Flesh and frame variables were not included in the 1987 Red Carpet model.

Trend had a positive sign in every GFB model except the 1987 model. For RC, the Trend parameter estimate was significant and positive in all but one model.

As expected the LOTNO has a negative sign and was significant in all fourteen models. For GFB the parameter estimate was between -.09 and -.11, while the RC parameter estimates for LOTNO ranged from -0.7 to -.04. There appears to a slightly more severe discount for cattle selling later in a particular GFB auction than in a RC auction. Number of lots per auction for RC (16) is double that for GFB (8).

The sign for the corn futures price (CF) for GFB was similar to that found in Leuthold's analysis. Significant in all seven models, it was negative in sign implying that a higher corn futures price has a widening influence on basis. The corn futures price was not significant in any of the RC models.

Parameter estimates for live cattle future prices (L2, L3, and L4) exhibited a pattern. For GFB, L2 was always negative whenever it was significant (3 out of seven models), while L3 was always positive (significant in 5 out of seven models). L4 was significant in only one model (positive). For RC, results for the live cattle variable were similar to the GFB models, except L4 was consistently significant and positive (4 out of 7 models). These results indicate that live cattle futures has a significant influence on feeder cattle basis and the contract that coincides with the slaughter date for the feeder cattle is most significant and has a direct influence.

TOTLOT (negative sign) and $TOTLOT^2$ (positive sign) were significant in all the GFB models and almost never significant in the RC models. BSRatio was used only in the RC models due to data limitations in the GFB data set. This variable was significant in three of the seven RC models and contrary to expectations, it was negative implying that having more buyers relative to sellers has negative impact on basis.

HEAD (positive) and $HEAD^2$ (negative) were significant in all GFB models and four out of the seven RC models. This confirms the hypothesized curvilinear relationship between total number of heads and basis. However, the absolute value of the coefficients for $Head^2$ was very small. This suggests although the basis starts to decrease after reaching a peak, this peak is a very high number. In most cases, basis has a linear increasing relationship with total number of head in a lot.

HEIFER was highly significant and the sign was negative in all fourteen models. The parameter estimate for HEIFER ranged from -5.70 to -7.44 in the RC models and from -8.21 to -6.89 in the GFB models. The earlier models (1987, etc.) had steeper discounts for heifers than did the later models (1993, etc.) The results suggest heifers are discounted more in GFB teleauctions, thus their basis decreases more than RC.

SHRINK and CUTBACK were not significant in almost any of the models. For GFB, the FLESH variable was insignificant. For RC, FL1 was positive and significant in 2 cases. The frame characteristic gave mixed results. In general, FR1 was significant and positive in the RC models, while FR3 was significant and negative in the GFB models.

For the coefficients representing seasonal dummy variables in the GFB models, summer was always positive and significant. For the RC models, spring was always significant and positive. The base season was winter. The significance of seasonality should be known by producers and the variations in basis depending upon the season should be noted.

Cash settlement was significant and positive in the RC models beyond 1990, with a positive estimate of 4.51 for the 1993 model. For the GFB models, cash settlement was significant and positive for three of the seven models. The estimates was 1.91 in the 1987 model and 1.10 in the 1993 model. The actual change in Georgia feeder cattle basis due to the change to cash settlement in 1986 was $4.73/cwt.

The weight variable generated parameter estimates as expected with the lighter weights producing premiums and heavier weights bringing discounts relative to the 600-700 lb. category. This result was consistent and significant in all models. For the breed variables, Hereford crosses brought consistent discounts in the GFB models, while the Angus breed brought consistent premiums in the RC models.

Forecasts

The econometric models were used to forecast out-of-sample basis for lots of cattle beginning in the fall of 1998 and ending in the spring of 1994. The forecast were compared to two other forecasts. One was a simple average of past basis for teleauction cattle of similar weight and sex sold during the same season. The second forecast used the simple past average basis for 600-700 steers and adjusted this with current weight and sex spreads and also accounted for the large lot premiums usually associated with teleauction cattle. These forecasts were compared using root mean square errors (table 5).

The forecasts generated from the models outperformed the other forecast in all but one case, the market adjusted steer average basis for RC. This forecast had the lowest RMSE of all the forecasts. The difference between the RMSE's for the RC forecasts was small compared to the GFB forecasts. The market adjusted steer average basis for GFB was quite large compared to the other five RMSEs. An explanation for this anomaly is not readily apparent. The forecast generated by the models do appear to be at least as useful as the more simple average. With respect to the market adjusted forecasts, the model forecast is far superior in the GFB case, but slightly inferior in the RC case.

Implications

The implications of this study are of importance to Georgia and similar southeastern U.S. feeder

cattle producers through identification of critical factors that impact basis and forecast accuracy. Also important are the empirical findings that contribute to the continued development of a theory to explain the intertemporal price relationships for nonstorable commodities. On a practical note, feeder cattle basis forecasting is an important economic exercise. The results of this study indicate that some promise exists for using micro data to forecast feeder cattle basis. Another important finding relates to the incorporation of current market information into the forecasting process. Future research might explore the effectiveness of adjusting econometric model forecasts with current market information.

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Table 1. Basic Information from Georgia Tele-auction Organizations

Description	Tele-auction Organizations	
	Georgia Farm Bureau	Red Carpet Cattlemen Association
First auction conducted on	March 22, 1979	May 5, 1976
Last auction included in the study	November 30, 1994	December 13, 1994
Years in study	16	19
Total number of auctions conducted	121	80
Number of auctions per year	7 to 8	4 to 5
Total number of lots	948	1284
Average number of lots per auction	8	16
Average number of lots per year	60	68
Total number of head	74,649	60,365
Average number of head per lot	79	47
Minimum number of Head per lot	2	2
Maximum number of Head per lot	735	415
Standard deviation of head per lot	50	34
Total number of Steers	47,767	38,211
Average number of steers per tele-auction	395	478
Total number of Heifers.	26,391	22,154
Average number of Heifers per tele-auction	218	277
Steer-Heifer Ratio	1.81	1.725
Average tele-auction price per cwt	68.505	70.766
Standard Deviation of tele-auction price per cwt	11.68	13.33

Description	Tele-auction Organizations	
	Georgia Farm Bureau	Red Carpet Cattlemen Association
Maximum tele-auction price	107.5	100.5
Minimum tele-auction price	43.5	29.1
Average price per steer per cwt	70.054	71.93
Standard deviation of price of steer per cwt	11.365	13.457
Average price per Heifer per cwt	65.562	68.924
Standard deviation of price of Heifer per cwt	11.575	12.926

Table 2. Definition and Measurement of Variables Names Used in the Models

Variable	Definition	Measurement
S_i	Seasons where i = 2 if spring = 3 if summer = 4 if fall	1 if i 0 otherwise
Fl_i	Flesh where i = 1 if heavy = 3 if light	1 if i 0 otherwise
EW_i	Weight where i = 2 if >400 but ≤500 lbs. = 3 if >500 lbs. but ≤ 600 lbs. = 5 if >700 but ≤800 lbs. = 6 if ≥ 800 lbs.	1 if i 0 otherwise
Heifer		1 if lot contains heifers 0 otherwise
Head	Number of cattle in lot	Actual number
$Head^2$	Number of cattle in lot squared	Actual number
LotNo	Order of the lot in the tele-auction	Ascending
$Breed_i$	Where i = 1 if Hereford = 2 if Angus = 3 if White face (WF), = 4 if Black = 7 if Charrolais cross (CX) = 8 if Simmental cross (SX) = 9 if Angus cross (Angus X) = 11 if Santa Gertrudis cross (SGX) = 12 if Angus - Herford cross (AHX) = 14 if Hereford cross (HerfordX) = 15 if Red = 17 if Mixed	1 if breed was greater than or equal to 50% of the lot 0 otherwise
Fr_i	Frame where i = 1 if winter 2 if spring 3 if summer 4 if fall	1 if i 0 otherwise

Variable	Definition	Measurement
L_i	where i = 1 if contract month is nearest to the tele-auction day = 2 if contract month is the second most nearest to the tele-auction day = 3 if contract month is third most nearest to tele-auction day = 4 if contract month is fourth most nearest to tele-auction day	Closing live cattle future price, for the contract j^{th} most nearest to the tele-auction day
Shrink		1 if shrink is allowed 0 otherwise
Cutback	Buyer has right to cull specified percentage of cattle at shipping	1 if cutback is allowed 0 otherwise
TotLot	Total number of lots in the tele-auction	Actual number
$TotLot^2$	TotLot square	Actual number
BSRatio	Ratio of the total number of buyers and total number of sellers participating in the given tele-auction	
CORNFUT	Closing corn future price for the nearby contract on the day the tele-auction occurred	
CASHSETL	Cash Settlement dummy variable	1 if the auction took place before CME introduced the cash settlement of the feeder cattle contract 0 otherwise

Table 3. Parameter Estimates from Georgia Farm Bureau Models

Variable	Parameter Estimates (T-Value)	
	1987	1993
INTERCEPT	-5.631047 (-1.549)	-10.889752 (4.716)
TREND	0.008984 (0.411)	0.043145 (3.956)
LOTNO	-0.101085 (-3.349)	-0.110216 (-3.545)
CORNFUT	-0.024753 (-6.615)	-0.019408 (-5.503)
L2	-0.467117 (-1.844)	-0.208176 (-2.275)
L3	0.551492 (2.232)	0.380113 (3.954)
L4	0.008241 (1.347)	-0.003025 (-0.588)
TOTLOT	-0.404915 (-4.830)	-0.352634 (-4.428)
TOTLOT2	0.019174 (7.459)	0.017679 (6.940)
HEAD2	-0.000188 (-3.969)	-0.000018223 (-1.727)
HEAD	0.053598 (4.716)	0.010326 (2.139)
HEIFER	-8.211685 (-25.864)	-6.898655 (-24.198)
SHRINK	0.766418 (0.842)	0.768180 (0.818)
CUTBACK	-0.364513 (-1.092)	-0.213611 (-0.722)
ANGUS	0.148038 (0.110)	0.574854 (0.439)

Variable	Parameter Estimates (T-Value)	
	1987	1993
WF	1.219169 (1.949)	0.341773 (0.538)
CX	-0.051624 (-0.103)	0.077155 (0.147)
ANGUSX	-0.745937 (-0.399)	-0.822075 (-0.396)
HERFORDX	-1.540625 (-1.880)	-1.315249 (-1.691)
MIXED	0.610371 (1.113)	-0.241323 (-0.501)
FL3	-0.171759 (-0.439)	0.216849 (0.558)
FR2	0.840483 (0.566)	0.451841 (0.552)
FR3	-5.061710 (-2.889)	-4.064694 (-2.345)
EW2	3.650657 (7.031)	2.978829 (5.533)
EW3	1.138559 (2.712)	1.100190 (2.775)
EW5	-2.723144 (-7.024)	-2.100520 (-6.554)
EW6	-4.676822 (-8.489)	-5.016851 (-11.542)
S2	0.375381 (0.910)	-0.314973 (-0.938)
S3	1.305983 (1.612)	1.498767 (2.233)
S4	0.185885 (0.269)	-0.470196 (-1.107)
CASHSETL	1.918907 (2.606)	1.108295 (1.891)

Table 4. Parameter Estimates from Red Carpet Models

Variable	Parameter Estimates (T-value)	
	1987	1993
INTERCEPT	-6.099038 (-2.731)	-7.838257 (-4.920)
TREND	0.241477 (5.997)	-0.034306 (-2.376)
LOTNO	-0.075030 (-3.174)	-0.050707 (-3.679)
CORNFUT	0.001350 (0.240)	0.002177 (0.534)
L2	1.119080 (4.319)	-0.149901 (-1.849)
L3	-1.145248 (-4.570)	0.172873 (2.183)
L4	0.024725 (2.361)	0.004714 (0.905)
TOTLOT	-0.184684 (-1.400)	-0.028350 (-0.857)
TOTLOT2	0.001136 (0.368)	0.000720 (1.710)
BSRATIO	-0.003676 (-0.004)	-2.007309 (-3.537)
HEAD	0.040021 (2.698)	0.050535 (7.534)
HEAD2	-0.000130 (-1.510)	-0.000173 (-5.886)
ANGUS	2.073190 (3.992)	1.253330 (3.056)
WF	0.753253 (0.742)	1.444694 (1.545)
BLACK	1.492487 (1.814)	0.119803 (0.287)

Variable	Parameter Estimates (T-value)	
	1987	1993
CX	0.251451 (0.207)	1.374776 (2.805)
SX	1.338150 (2.449)	0.531549 (1.596)
ANGUSX	-0.016525 (-0.031)	0.700157 (1.964)
SGX	1.734921 (2.194)	1.125713 (1.954)
AHX	0.977907 (1.795)	0.702330 (1.543)
RED	0.258684 (0.340)	0.254366 (0.637)
MIXED	0.874696 (1.806)	0.140841 (0.437)
HEIFER	-7.440860 (-22.340)	-5.708947 (-25.043)
SHRINK	0.181706 (0.472)	0.257999 (0.965)
CUTBACK		-0.707633 (-1.244)
FL1		3.802051 (2.252)
FL3		0.963293 (1.425)
FR2		1.710480 (3.681)
FR3		0.202497 0.283
EW2	4.000986 (7.968)	3.411787 (8.199)
EW3	2.044962 (4.849)	1.336264 (4.222)

Variable	Parameter Estimates (T-value)	
	1987	1993
EW5	-1.626170 (-3.436)	-2.630266 (-8.949)
EW6	-5.378333 (-6.622)	-5.925051 (-12.158)
S2	2.028021 (4.727)	1.543290 (4.395)
S3	-1.492141 (-0.845)	1.485422 (2.038)
S4		1.794310 (4.967)
CASHSETL	1.304529 (1.420)	4.513666 (7.323)

Table 5. Forecast Evaluation for Georgia Tele-auctions, 1988-1994.

Forecast	Organization	
	GFB	RC
	---------Root Mean Squared Error----------	
Model	4.49	4.94
Average	5.93	5.51
Market Adjusted Steer Average	7.05	4.23