An Analysis of the Effect of Corn Prices on Feeder Cattle Prices

by

John D. Anderson and James N. Trapp

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This study develops the concept of a corn price multiplier which quantifies the effect of a change in corn price on feeder cattle price. Estimation of the multiplier is accomplished using a partial adjustment model of feeder calf prices which directly incorporates elements of break-even budget analysis. Because it includes technical parameters related to cattle feeding, this model provides information on how changes in these factors affect the relationship between corn and feeder calf prices. This information will provide insight into the degree to which cattle producers can offset the effect of high grain prices by altering feeding programs.

Introduction

Economic theory maintains that the price of an input should be closely related to the price of the output and the cost of transforming the input. This theory is based on the concept of a break-even price for the input. Knowing output prices and transformation costs allows a producer to calculate a break-even price for a given input. A rational producer will not pay more than this price for the input. Conversely, given a competitive market and the assumption of zero economic profits, prices for a given input will not remain far below the break-even price for any significant length of time.

With respect to cattle markets, the foregoing theory suggests that feeder calf prices should be closely related to live cattle and corn prices. Budget calculations can be used to estimate a break-even feeder calf price under various price scenarios. For example, assume that the price of a bushel of corn is $2.50 and that the price of a 1200 pound fed steer is $74/cwt. Given a feed conversion rate of 7 pounds of corn to one pound of beef gain, a cattle feeder can estimate a break-even price for 750 pound feeder calves by the method illustrated in table 1.

In reality, several other factors such as labor costs, interest expense, and death loss must be considered in calculating a break-even price; however, this simplified budget is useful in illustrating the relationship between feeder calf prices and live cattle and corn prices. The purpose of this paper is to quantify those relationships within an econometric model for forecasting feeder cattle prices, given corn and fed cattle price expectations.

Objective

An accurate means of forecasting feeder calf prices should be particularly appealing to cattle market participants now, since recent record grain prices have resulted in a great deal of uncertainty in the market. In addition to providing a tool for price forecasting, this model should, by quantifying

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the relationships between cattle and grain prices, contribute to our understanding of the process by which feeder calf prices are established.

Previous Studies

Several authors have developed econometric models of feeder cattle markets. These models are consistent with the theory outlined here in that all include corn and live cattle prices as explanatory variables. Brester and Marsh modeled the feeder sector as one component of the entire beef industry. Their model of the feeder sector consisted of equations to estimate feeder cattle inventories, feeder placement demand, and feeder placement supply. In that model, the quantity of feeder cattle placed on feed is given as a function of feeder calf prices and a slaughter steer/corn price ratio.

Rucker, Burt, and Lafrance also used the beef/corn price ratio in generating an econometric model of cattle inventory for the state of Montana and for the entire United States. As part of their research, the authors estimated an equation to model feeder price as a function of the beef/corn price ratio. They concluded that the ratio provided information on feeder cattle prices that is not contained in current and lagged calf prices alone.

In his analysis of feeder cattle price differentials, Buccola also estimates a feeder calf price model. Rather than using a beef/corn price ratio, his model employs corn prices and live cattle futures prices. Buccola also included the annual change in all cattle inventory and the Palmer Drought Severity Index in his model.

Data and Initial Model Specifications

The initial plan pursued in this research was to estimate a feeder cattle price model similar to Buccola's, with the exception that weekly rather than semi-annual data would be used. A weekly model was believed to be more appropriate for the forecasting/decision making framework under consideration. Variables used in the model included corn prices, live cattle futures prices, a cattle inventory variable, and the Palmer Drought Severity Index for central Oklahoma. The corn price used was Thursday's average of the price received by farmers at the elevator in Omaha, NE. The feeder calf price used was an average of Friday's price for 700-800 pound feeder calves in Oklahoma City. The 700-800 pound range was used because previous research at OSU had determined that to be the most common weight of cattle entering feedlots (Eilrich and Trapp). The inventory variable used in this study was the change in the January 1 all cattle inventory. The Palmer Index was included as a proxy for a pasture condition variable. It identifies the level of soil moisture, with negative values indicating low soil moisture and positive values indicating high soil moisture. Values of the index are normally between -5 and +5.

One problem encountered with using the 700-800 pound weight range was that beginning in 1992, the weight ranges over which OKC feeder calf prices were reported changed from 100 to 50 pound intervals. Thus from 1985-1991, a single price was reported for 700-800 pound steers; but from 1992-1995, two prices were given: a 700-750 pound price and a 750-800 pound price. These two prices were averaged to obtain the feeder calf price used to estimate the model. The effect that the change in price reporting practices may have had on the model is discussed later.

The futures prices used were CME live cattle closing prices. Thursday closes were used rather than a weekly average in order to maintain consistency with the cash market prices which were each one day's price rather than a weekly average price. On Thursday holidays for which no price was available, Wednesday's close was substituted. Table 2 gives a description of the data used in the initial model.

For the purpose of this research, calves are assumed to be on feed 140 days. Thus, the feeder calf price was estimated as a function of the corn price from the same week and the live cattle futures price 140 days forward. Live cattle prices were taken from the contract that a producer would most likely use to hedge his cattle. For example, if the expected finish date was in May, prices were taken from the June live cattle contract. If the expected finish date was in June, prices were taken from the August contract because hedgers would not be inclined to take a position that they would need to maintain into the contract expiration month.

The theory presented earlier relating input prices to output prices and transformation costs provided a very straightforward means of formulating expectations of the signs of the corn and live cattle price coefficients. The expected inverse relationship between transformation costs and the price of an input indicated a negative sign on the corn price coefficient while the direct relationship between the expected price of output and the price of an input indicated a positive sign on the live cattle price coefficient.

The previously discussed budgeting exercise was examined to derive an expectation of the magnitudes of the coefficients. Referring back to the previous example which assumed a corn price of $2.50/bu and a live cattle price of $0.74/lb, the effect of a change in each of these prices on the break-even feeder price was determined. In that example, the break-even feeder price was $1.077/lb. Changing the corn price to $3.50/bu results in a break-even price of $0.9215/lb. Based on these calculations, a one dollar change in corn price should change the feeder calf price by $7.50/cwt so the corn price coefficient was expected to be around -7.5. Similar calculations were performed changing the live cattle price. The expected value of the live cattle price coefficient was calculated to be 1.6.

Initial Model Results

Using the data described above, a partial adjustment model of feeder calf price was estimated. The rèsults of that model are presented in table 3. Variable names are as defined in Table 2. The variables D2 through D12 are monthly dummy variables with January serving as the base month. The long-run coefficients for corn and live cattle futures prices correspond fairly closely to the predictions of the budgeting exercise, giving strong confirmation that break-even budget analysis is a valid theoretical basis for explaining feeder cattle price changes. However, the statistical properties of the model gave rise to concerns about model misspecification.

First, the nonlinear component of a joint conditional means test of the partial adjustment model was significant, indicating that the linear functional form was inappropriate. This test also revealed correlation between the lagged dependent variable and the error terms. The second concern related to the change in feeder cattle price reporting practices discussed earlier. A Chow test comparing the periods 1985-1991 and 1992-1995 indicated a significant difference in the coefficients for those periods. The corn price coefficient was particularly unstable, changing from a long run value of -10.450 in the earlier period to -4.827 in the later period. The live cattle futures price parameter was considerably more stable, only changing from 1.707 to 1.546.

Clearly, the two periods could not be accurately represented by the same model; however, the reason was not immediately clear. One hypothesis is that the information change which had prompted a closer look at the separate time periods was the source of the differences. An alternative hypothesis -- relating also to the persistent autocorrelation -- was that cyclical differences in the cattle market had resulted in the differences in the model. The cattle price cycle peaked in early 1991, and a Chow test at January 1991 was also significant. Despite its numerous statistical problems, the above model provides strong evidence that the feeder cattle market can be accurately described by the budgeting process/theory presented in Table 1. All variable signs are as expected and highly significant.

Respecification of the Model

It is obvious that many factors other than corn and expected slaughter cattle prices influence feeder calf prices. The break-even budget illustrates how cattle weights and feed conversion can impact feeder prices. Cattle inventories should also have some effect on prices. In addition, other factors which affect costs and, therefore, break-even price levels such as interest rates and death loss could also be important.

The problem with including these factors in a price model is that data on most of these variables is not available. Monthly cattle on feed reports and interest rate series are, of course, readily available; however, technical information about cattle in feedlots is only available from individual feedlots. Obtaining this private data would be difficult, and obtaining it from enough feedlots to create a reliable data set would be practically impossible for a researcher.

Professional Cattle Consultants (PCC) of Weatherford, Oklahoma is a consulting firm that compiles performance information from approximately one hundred major feedlots throughout the dominant cattle feeding areas of the United States. The feedlots reporting to PCC collectively produce over 25 percent of the fed cattle in the United States. While individual feedlot data is confidential, aggregate monthly data was available for use in this research. Table 4 describes this data as well as the *Cattle on Feed* data series used.

The availability of this technical data made possible the estimation of a model that is a direct extension of the feeder cattle break-even price budget. Equation (1) constitutes the basis of the break-even budget presented earlier:

$$FC \bullet IW = [(LC \bullet OW)(1 - DL)] - [(OW - IW)CONV \bullet C] \quad (1)$$

Where LC = live cattle futures price (nearest contract beyond t+140 days)
FC = feeder cattle price (t)
OW = out (slaughter) weight (t+140 days)
IW = average in (placement) weight of cattle slaughtered at t+140
C = corn price/bu (t)
$CONV$ = dry matter feed conversion rate (t+140 days)
DL = percent death loss (t+140 days)

The break-even feeder calf price can be derived from equation (1) simply by dividing both sides of (1) by IW, resulting in equation (2).

(2) $$FC=[((LC \bullet OW)/IW)(1-DL)]-[((OW-IW)CONV \bullet C)/IW]$$

The multiplicative relationships that exist between the variables in (2) indicate that a with strictly linear relationships between corn price, live cattle price, and feeder cattle price is most appropriate representation of the feeder cattle market. A more appropriate model would using the cost and revenue components of the feeder cattle break-even price equation as var The right-hand side of equation (2) can be broken into revenue and cost components as follo

(3) $$REV=((LC \bullet OW)/IW)(1-DL)$$

(4) $$COST=((OW-IW)CONV \bullet C)/IW$$

The notation following (1) indicates that cattle are assumed to be on feed for 140 Formulating a break-even feeder cattle price model therefore involves representing pro expectations with respect to future values of the technical parameters related to feeding cattle. break-even model presented here, in-weight and out-weight expectations are obtained from p adjustment models. In-weight is modeled as a function of the corn/live cattle price ratio, a variable, and sin/cosine seasonality variables. The equation estimated from this model is given b with standard errors in parentheses:

(5) $$\begin{aligned}IW=&\underset{(51.07)}{270.34}+\underset{(0.071)}{0.613}IW_{t-1}+\underset{(187.0)}{316.82}C/LC+\underset{(0.029)}{0.078}TIME+\underset{(2.184)}{6.458}SIN12+\underset{(1.403)}{7.446}SIN6\\&-\underset{(2.210)}{17.430}COS12-\underset{(1.403)}{6.728}COS6\end{aligned}$$

$R^2 = 0.8902$ F statistic = 136.628

where *IW* = placement weight at t

C/LC = corn price at t ÷ live cattle futures price at t

TIME = trend variable

SIN12 and *SIN6* = sine variables with 12 and 6 month cycles respectively

COS12 and *COS6* = cosine variables with 12 and 6 month cycles respectively

Out-weight is modeled as a function of in-weight and a time trend variable and sine/c seasonality variables identical to those of the in-weight expectation model. The estimated equ is given below with standard errors in parentheses:

(6) $$\begin{aligned}OW=&\underset{(62.970)}{109.97}+\underset{(0.049)}{0.794}OW_{t-1}+\underset{(0.064)}{0.165}IW+\underset{(0.045)}{0.144}TIME-\underset{(1.447)}{13.393}SIN12+\underset{(1.304)}{2.448}SIN6\\&-\underset{(2.507)}{11.363}COS12+\underset{(1.163)}{6.165}COS6\end{aligned}$$

$R^2 = 0.9568$ F statistic = 373.447

where OW = slaughter weight at t
IW = placement weight at t-140

An attempt was made to estimate feed conversion as a function of placement and slaughter weights and seasonality; however, in the partial adjustment specification of the model, the independent variables were not significant. In a full adjustment model, severe autocorrelation was a problem. Since it was not possible to estimate an acceptable model of feed conversion rates, monthly average feed conversion figures were calculated for the entire 10 year period of the study. These monthly average values were used in computing the cost and revenue variables of the break-even equation.

An actual death loss series was not used in generating the revenue variable. The only death loss figure available for the entire period of the study was average death loss per month. A more appropriate figure would have been average death loss per pen of cattle. Since this was not available, an average death loss per pen of 0.87 percent was used rather than an actual death loss data series. This value corresponds to the average death loss per pen in 1994 and 1995, two years for which these data are available.

In order to estimate a model which would account for the effect of in-weight changes on price, a feeder price series was needed which was not specific to a single weight interval. To obtain such a series, feeder prices were collected for the entire 600 to 800 pound weight range. As noted, for 1985-1991 prices were reported over 100 pound weight intervals, resulting in two price series for 600 to 800 pound steers. After 1991, prices were reported over 50 pound intervals, resulting in four price series for 600 to 800 pound steers.

To obtain the in-weight adjusted feeder price for use in the model, for the 1985-1991 period, the 700 pound feeder price was obtained as the average of the two price series covering the 600 to 800 pound range. This price was adjusted by a factor calculated using information on the deviation of the observed in-weight from 700 pounds and the spread between the two price series. The adjustment factor was calculated as follows:

(7) $$\text{Adjustment factor} = ((IW - 700)/100)(FC78 - FC67)$$

where $FC67$ = price of 600 to 700 pound feeder steers
$FC78$ = price of 700 to 800 pound feeder steers

This equation calculates the number of hundredweights by which the actual weight differs from 700 pounds and then multiplies that difference by the price premium (discount) for lighter calves. If the in-weight is less than 700 and light calves are selling at a premium to heavy calves, then the adjustment factor will be positive. Conversely, if the actual in-weight is greater than seven hundred pounds and light calves are at a premium to heavy calves, the adjustment factor will be negative.

For the 1991-1995 time period, the calculation of the adjusted feeder price is slightly more complicated. The base price to be used in the adjustment is determined by the actual in-weight. If the in-weight is less than 675, then the average of the 600 to 650 pound and 650 to 700 pound prices is the base. If the in-weight is between 675 and 725 pounds, then the average of the 650 to 700 pound and 700 to 750 pound prices is the base. If the in-weight is greater than 725 pounds, then the average of the 700 to 750 pound and 750 to 800 pound prices is the base. The adjustment fact varies with the base being used. Adjustment factors for the first, second, and third base prices a given in order below:

(8) $$\text{Adjustment factor 1} = ((IW - 650)/50)(FC657 - FC665)$$
(9) $$\text{Adjustment factor 2} = ((IW - 700)/50)(FC775 - FC657)$$
(10) $$\text{Adjustment factor 3} = ((IW - 750)/50)(FC758 - FC775)$$

where $FC665$ = price of 600 to 650 pound feeders
$FC657$ = price of 650 to 700 pound feeders
$FC775$ = price of 700 to 750 pound feeders
$FC758$ = price of 750 to 800 pound feeders

Of course, a positive sign was expected on revenue and a negative sign on cost. The cattl on feed variable was expected to help explain the effect of changes in cattle inventory on feeder cal prices. The variable was calculated by subtracting the number of cattle on feed one year ago from th current number of cattle on feed. The objective of calculating the change variable in this manner wa to isolate the long-term cyclical effect of inventory changes rather than the short-term seasonal effec that a monthly change variable would have reflected. A positive sign was anticipated since highe numbers of cattle being placed on feed would signal a greater demand for feeder cattle. A set o sine/cosine cyclical variables were also used to account for the long-term cattle cycle. These variable were specified assuming an eleven year cycle.

The statistical problems of the first weekly model were cleared up by the break-even model A joint conditional means test indicated no significant nonlinearity or correlation between the erro terms and the lagged dependent variable (FC_{t-1}). In addition, Chow tests at January 1991 and a January 1992 were no longer significant at the 1 percent level, indicating that model stability had bee improved.

One problem with the model was noted, however. Non-normal distribution of the errors wa indicated by the Jarque-Bera statistic and by an omnibus test for skewness and kurtosis. This non normality appeared to be due to an outlier at the observation corresponding to the third week of Jun 1988. Using robust estimation it was determined that this non-normality had little impact on th parameter estimates so no further modifications were made. Table 5 reports results of the OL estimation of the break-even model.

The real significance of the break-even model is that it allows for a determination of hov changes in in-weight, out-weight, and feed conversion affect the relationship between corn and feede calf prices. Record grain prices have recently focused much attention on this relationship. Variou rules of thumb can be found throughout the popular press describing how corn price changes affec cattle prices. Fox reports that a \$1/bu increase in the price of corn results in a \$7-\$10/cwt drop i the value of calves and feeder cattle. Similarly, Maday writes that a \$0.10/bu increase in corn pric will result in a \$0.75/cwt drop in the feeder price. During the drought of 1988 when grain price were a concern to cattle producers, Marten reported that a \$0.10/bu corn price increase would cu feeder prices by \$0.65/cwt.

These estimates are certainly consistent with break-even budgeting and with the linear partial adjustment model developed in this paper; however, they are not consistent with the break-even model presented in table 5 which is a superior model both theoretically and statistically. Due to the multiplicative relationships between corn price, feed conversion, in-weight, and out-weight, the effect of corn price on feeder cattle price will not be constant. A precise estimate of the effect of corn price on cattle price can be found by taking the first derivative of the long-run break even equation estimated here with respect to corn price.

(11) $$\partial FC/\partial C = -2.309((OW - IW)CONV)/IW$$

Note that feed conversion, in-weight, and out-weight remain in the first derivative. Thus the effect of corn price on cattle price varies with these factors. These factors are themselves quite variable.

Using the means of the in-weight and out-weight estimates and the average feed conversion rate for the period of the study, it is possible to show what impact a change in the price of corn could be expected to have under average conditions:

(12) $$\partial FC/\partial C = -2.309((1171 - 739)6.55)/739 = -8.84$$

In this case, the impact on feeder prices of a change in the price of corn is larger than that commonly reported; however, the key point to note is that this corn price multiplier is not constant. It will change in response to changes in cattle weights and feed conversion. Thus, it is inaccurate to consider the relationship between corn and feeder prices as constant. Seasonality of the technical factors alone will result in noticeable changes in the multiplier. In addition, more permanent changes in the average levels of these factors will also contribute to the dynamic character of the multiplier. Table 6 shows values of the corn price multiplier under different in-weight, out-weight, and feed conversion conditions. Values in this table illustrate that even relatively small changes in the technical factors can significantly affect the relationship between corn and feeder prices.

Summary and Conclusions

Use of break-even budgeting indicates a corn price multiplier of about -7.5. That is, for every $1 rise in corn price/bu., the feeder cattle price will be depressed by $7.50/cwt. Likewise the same budgeting exercise indicates that changes in the slaughter cattle price received should have a multiplier of approximately 1.6. Multipliers close to these values have been widely cited in the popular press by professional economists. A linear regression model (whose specification was based on previous work by Buccola) relating feeder cattle prices to current corn prices and the live cattle contract price that feeders currently being placed on feed were most likely to be hedged under was estimated. The goodness of fit of this model and strong significance of the corn price and live cattle futures prices indicated that the break-even model is descriptive of the feeder cattle market. However, the estimated model yielded corn price and live cattle price coefficients/multipliers greater than those found in the budgeting process, e.g. a long-run corn price parameter/multiplier of -9.96 and a long-run live cattle price parameter/multiplier of 1.76 were estimated. These two parameters seem intuitively suspect. Conceptually, it seems unrealistic to expect feeder cattle market prices to react to corn price and live cattle futures price changes to a larger degree than is indicated by a perfect knowledge break-even analysis. In addition, the linear model estimated was found to have significant statistical problems. The linear functional form was shown to be inappropriate, and Chow tests revealed structural instability over the data period used.

The Chow tests conducted on the linear model clearly indicate that the corn price multiplier has been falling over time. This study provides evidence that this has occurred because of improving technical efficiencies in feeding cattle over time which have blunted the impact of changing corn prices on feeder cattle break-even prices. Specifically, consideration of time series variables for in-weights and out-weights (i.e., pounds of feedlot gain per animal), and feed conversion rates to obtain a non-linear feeding and cost proxy variable alleviated the statistical and conceptual problems present in the linear model. A regression model was specified which contained a revenue variable consisting of an out-weight estimate times the appropriate futures price for live cattle, and a cost variable utilizing estimates of in-weights, pounds of gain, feed conversion rates, and corn prices to proxy feeding costs. These two variables together with seasonal and cyclical variables and a cattle-on-feed inventory variable were regressed against feeder cattle prices. This model specification alleviated the statistical problems found in the linear model and yielded a corn price multiplier whose value is related to the magnitudes of in-weights, out-weights, and feed conversion rates. Thus cattle feeders, by improving their technical efficiency and changing their purchase and sales weights can significantly reduce the impact of corn prices upon their break-even feeder price and even reduce the actual impact of corn prices upon feeder cattle break-even prices to below those estimated from budgeting. The model also shows that the value of the live cattle multiplier is tied to the magnitude of out-weights. The PCC data clearly show that out-weights have been rising over time. The value of the live cattle price multiplier at the mean estimated value of the out-weights was found to be 1.47.

The implication of this is that cattle feeders, by adjusting in-weight and out-weight, alter the relationship between grain and cattle prices. (Feed conversion rate is essentially a function of technology and must therefore be viewed as fixed in the short-run.) For example, given high corn prices, cattle feeders can put more weight on cattle with grass, increasing the average weight of cattle placed on feed. In addition, high grain prices encourage the slaughter of cattle at lighter weights. The affect of these actions is to reduce the amount of grain used in beef production, thereby reducing the effect of the high grain prices on cattle prices. This is reflected by a lower corn price multiplier.

It is important to note that the biological nature of cattle feeding imposes limits on the ability of cattle feeders to adjust in and out-weights. A certain amount of gain must come from grain feeding if cattle are to grade choice. For this reason, high in-weights generally result in higher out-weights while low in-weights result in lower out-weights; however, sufficient latitude exists for significant changes in the corn price multiplier to occur.

The break-even model presented in this paper shows that cattle producers have a real economic incentive to alter their feeding programs in response to changing corn prices. They have the opportunity to mitigate the adverse price effects of high corn prices by taking steps that reduce the amount of grain required to produce fed cattle. Conversely, they can take advantage of low corn prices by increasing the amount of grain used in the feeding process. The extent to which the cattle industry actually responds to grain prices in the manner described here and, if so, by what mechanisms within the market is a topic for further research.

Table 1. **Break-even Feeder Calf Price Estimate**

Fed Cattle Value:	1200 lbs x \$0.74/lb = \$888
Cost of Gain:	= \$140.63
Pounds of Gain = 1200 lbs - 750 lbs = 450 lbs	
Bushels of Grain = 450 lbs/(56 lbs/bu ÷ 7 lbs/lb) = 56.25 bu	
Cost of Gain = 56.25 bu x \$2.50/bu = \$140.63	
Net Revenue:	\$888 - \$140.63 = \$747.37/head
Break-even Feeder Price:	\$747.37 ÷ 750 lbs = \$0.9965/lb

Note: a bushel of corn is assumed to weigh 56 lbs.

Table 2. **Description of Variables Used in Weekly Feeder Cattle Price Model**

Variable	Description Mean	Std. Dev.	
Dependent:			
FC	OKC cash feeder calf price (\$/cwt)[a]	78.081	10.088
Independent:			
C	Omaha cash corn price (\$/bu)[b]	2.252	0.361
LC	live cattle futures price 140 days forward (\$/cwt)[c]	68.424	6.262
DINV	change in USDA Jan 1 all cattle inventory (000s)[b]	-1065.400	2318.100
PI	Palmer Drought Severity Index[d]	1.815	2.280

[a] Source: Oklahoma Dept. of Agriculture
[b] Source: Livestock Marketing Info. Center
[c] Source: CME daily closing price
[d] Source: National Climatic Data Center

Table 3. **Partial Adjustment Model of Feeder Calf Prices (1985-1995)**

Independent variables	Partial Adjustment estimated coefficients	Long-run coefficients
FC_{t-1}	0.762**	
	(0.020)	
C	-2.367**	-9.956
	(0.233)	
LC	0.419**	1.764
	(0.035)	
PI	-0.026	-0.108
	(0.027)	
$DINV$	-0.181 E-04	-0.762 E-04
	(0.268 E-4)	
$D2$	-0.175	-0.738
	(0.247)	
$D3$	-0.646**	-2.716
	(0.241)	
$D4$	-0.652**	-2.742
	(0.244)	
$D5$	-0.598*	-2.515
	(0.247)	
$D6$	0.001	0.005
	(0.249)	
$D7$	-0.078	-0.327
	(0.252)	
$D8$	-0.698 **	-2.935
	(0.254)	
$D9$	-1.329**	-5.591
	(0.266)	
$D10$	-1.588**	-6.681
	(0.273)	
$D11$	-0.206	-0.865
	(0.255)	
$D12$	-0.141	-0.595
	(0.245)	
constant	-4.273**	-17.975
	(0.814)	
F statistic	2483.656**	
R^2	0.987	

*significant at 5% level
**significant at 1% level
Standard error in parentheses

Table 4. **Feedlot Data Used in Break-Even Model of Feeder Cattle Prices**

Independent variables	description	mean	std. dev.
DCOF	change in cattle on feed[a] (000s)	72.74	467.70
IW	placement weight[b]	736.40	29.52
OW	slaughter weight[b]	1162.70	40.21
CONV	feed conversion[b] (lbs dry matter/lb gain)	6.55	0.35

[a] Source: USDA monthly 7 states cattle on feed report

[b] Source: Professional Cattle Consultants Weatherford, OK

Table 5. **Break-Even Feeder Calf Price Model Using Variable Placement Weights (1985-1995)**

Independent variables	Partial Adjustment estimated coefficients	Long Run estimated coefficients
FC_{t-1}	0.705** (0.025)	
COST	-0.680** (0.070)	-2.309
REV	0.275** (0.023)	0.934
DCOF	0.265 E -3 (0.157 E -3)	0.898 E -3
D2	0.039 (0.280)	0.134
D3	-0.002 (0.273)	-0.007
D4	0.838** (0.281)	2.845
D5	0.693* (0.281)	2.353
D6	1.120** (0.282)	3.802
D7	1.031** (0.284)	3.501
D8	0.789** (0.296)	2.680
D9	-0.136 (0.277)	-0.461
D10	-0.451 (0.274)	-1.531
D11	0.370 (0.273)	1.258
D12	0.157 (0.274)	0.535
COSD	-0.750** (0.179)	-2.547
SIND	0.317** (0.097)	1.076
constant	-0.958 (1.176)	-3.253
F statistic	1791.791**	
R^2	0.984	

*significant at 5% level
**significant at 1% level
Standard error in parentheses

Table 6. **Corn/Feeder Cattle Price Multiplier at Different In-Weight, Out-Weight, and Feed Conversion Levels**

Feed Conversion	1100	1150	1200	1250
		In Weight = 675 Out Weight		
6.25	-9.086	-10.155	-11.224	-12.293
6.50	-9.450	-10.562	-11.673	-12.785
6.75	-9.813	-10.968	-12.122	-13.277
7.00	-10.177	-11.374	-12.571	-13.769
		In Weight = 700		
6.25	-8.246	-9.277	-10.308	-11.339
6.50	-8.576	-9.648	-10.720	-11.792
6.75	-8.906	-10.019	-11.133	-12.246
7.00	-9.236	-10.391	-11.545	-12.700
		In Weight = 725		
6.25	-7.464	-8.460	-9.455	-10.450
6.50	-7.763	-8.798	-9.833	-10.868
6.75	-8.062	-9.136	-10.211	-11.286
7.00	-8.360	-9.475	-10.590	-11.704
		In Weight = 750		
6.25	-6.735	-7.697	-8.659	-9.621
6.50	-7.003	-8.005	-9.005	-10.006
6.75	-7.273	-8.312	-9.351	-10.391
7.00	-7.543	-8.620	-9.698	-10.775
		In Weight = 775		
6.25	-6.052	-6.983	-7.914	-8.845
6.50	-6.294	-7.262	-8.230	-9.199
6.75	-6.536	-7.541	-8.547	-9.553
7.00	-6.778	-7.821	-8.864	-9.906

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