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# Identifying and Managing Economic Risk in Cattle Feeding

**Darrell R. Mark, Rodney Jones, and Ted C. Schroeder***

Closeout data from two western Kansas commercial feedlots are examined to determine how cattle prices, feed costs, and animal performance impact the variability of cattle feeding profits. The relative impacts of these factors are studied across sex, placement weight, and placement month. Fed and feeder cattle prices have the largest impact on profitability. Corn prices, interest rates, and animal performance have smaller, yet relevant effects on profits. Generally, all these factors influence steer profits more than heifer profits. As placement weight increases, feeder cattle prices impact profitability more while corn prices, interest rates, and animal performance influence profitability less. Feeder cattle prices impact profitability greater for spring and fall placements. Animal performance affects cattle feeding profits greater for winter placements. Results suggest that fed cattle and feeder cattle prices should be emphasized in managing the overall risk in cattle feeding because they are the largest contributors to profit variability.

## Introduction

The variability of net returns to cattle feeding expose cattle producers to significant levels of economic risk. Jones reported monthly average returns to finishing yearling steers in Kansas feedlots ranged from a loss of $175 per head to a profit of $120 per head between 1990 and 1998. The riskiness of returns on individual pens of cattle is even greater than these averages reflect. Given the substantial variation in returns, producers need to understand how various factors contribute to the risk associated with feeding different types of cattle at various times of the year. Determining how factors contributing to profit risk vary by sex, placement weight, and placement month enables cattle feeders to implement risk management strategies tailored to the type of cattle they feed.

This research utilizes over 14,000 pens of cattle to examine how cattle prices, corn prices, interest rates, and cattle performance influence profitability. The specific objectives of this study are to: 1) identify the relative importance of input and output market prices and cattle performance characteristics in explaining profitability, 2) analyze the variability in those factors' contributions to profitability across sex, placement month, and placement weight, and 3) update previous cattle finishing profitability research with a larger data set and different methodology.

## Previous Research

Early research primarily attributed cattle feeding profitability to a change in the feeder animal value and a return to feeding. Swanson and West asserted that profitability was influenced by

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more than the cattle price margin and feed cost. In a study involving Illinois Farm Bureau Farm Management Service records, they used coefficients of separate determination to find that cattle price margin (difference between fed cattle and feeder cattle price) explained 38 percent of profit variation and feed cost per pound of gain explained 44 percent of variability. In a simulation of cattle feeding returns, Trapp and Cleveland found fed and feeder cattle price risk explained 65.5 percent and production risk explained 22.1 percent of profit volatility.

Langemeier, Schroeder, and Mintert and Schroeder *et al.* also used coefficients of separate determination to quantify the degree to which various prices and cattle performance impacted cattle feeding profits. Fed cattle and feeder cattle prices explained approximately 50 and 25 percent, respectively, of the variation in profits over time. Corn prices were a major determinant of cattle feeding profitability and feed conversion and average daily gain were important, but less significant factors. Albright, Schroeder, and Langemeier also used coefficients of separate determination to analyze the volatility of corn prices and cattle performance on the cost-of-gain. Corn price, feed conversion, and average daily gain explained 65, 27, and 2 percent of the cost-of-gain variability.

This research builds on these studies by using a larger and more recent data set, which provides additional confidence in the results and relevance to recent production situations. Additionally, this research includes heifer feedlot performance and marketing data and draws comparisons between steer and heifer results. Previous studies report negative coefficients of separate determination, which, though mathematically possible, are difficult to interpret. To avoid this problem, this study utilizes standardized beta coefficients to explain the variability in cattle feeding profitability.

Jones *et al.* tested the profitability and cost-of-gain models developed in previous studies for structural change over a 15-year time span. Structural change was present as the relative influences of various factors on feeding profitability and cost-of-gain varied over time. Jones *et al.* reported that the coefficients of separate determination for fed cattle price and feeder cattle price calculated by Langemeier, Schroeder, and Mintert and Schroeder *et al.* varied between 0 to 83 percent and 0 to 50 percent, respectively. Expanding upon Jones *et al.*, this study determines how the impact of profitability determinants vary seasonally.

## Data Description

Two commercial feedyards in western Kansas provided closeout data for 14,183 pens of cattle finished from January 1980 to March 1997. The feedlot data included date in, date out, placement weight, finished weight, days on feed, feed conversion, average daily gain, feeding cost, purchase price, and selling price. These data were augmented with corn prices, interest rates, feeder cattle prices, and fed cattle prices.

The corn price, obtained from Kansas Agricultural Statistics, was the average monthly southwestern Kansas price. The corn price for a particular pen of cattle was calculated by averaging the monthly prices corresponding to the months the cattle were on feed. Interest rates

on cattle feeding loans reported by the Federal Reserve Bank of Kansas City were used to calculate the interest costs. Interest was assessed to all of the purchase price of the feeder and to half of the feeding costs. Purchase prices and selling prices were missing in numerous pens of cattle in the closeout data. Missing purchase prices were computed from prices reported in the placement week's Dodge City, Kansas, feeder cattle auction market summaries using a linear price slide. Western Kansas direct fed cattle prices were substituted for missing selling prices. Nominal cost and return series in the data set were adjusted for inflation using the monthly consumer price index (Federal Reserve Bank of St. Louis).

The data are summarized in Table 1 by sex and placement weight. Sale weight tends to increase with placement weight and is higher for steers than for heifers. Average daily gain is naturally higher for steers and also increases with placement weight. Feed conversion increases as placement weight increases and is higher for heifers. Feeding costs and interest costs decrease as placement weight increases and is higher for steers. Gross returns increase with placement weight and are higher for steers. Average profit per head ranged from \$14.59 to \$14.75 for steers and from a loss of \$1.46 to a profit of \$15.66 for heifers (1982-1984 dollars). Average profits were about the same across placement weight for the steers and decreased with placement weight for the heifers. Profit standard deviations exceed \$40 per head for every category revealing considerable economic risk in cattle finishing.

## Model and Procedure

Profit per head was calculated by subtracting the cost of the feeder and the total feeding cost from gross returns. Gross returns are determined by sale price and sale weight. Purchase price and placement weight determines the cost of the feeder. Total feeding cost varies with feed prices, interest rates, and animal performance. Therefore, profits per head are a function of sale price, purchase price, corn price, interest rates, and animal performance. Feed conversion and average daily gain (ADG) are used to quantify performance.

Regression analysis was used to explain how these factors affect the variability in feeding profits. This relationship is:

1) Profit = $f$(Fed Price, Feeder Price, Corn Price, Interest Rate, Feed Conversion, ADG)

Fed Price is expected to be positively related to profit whereas Feeder Price, Corn Price, and Interest Rate are expected to be negatively related to profits. As feed conversion decreases (i.e., improves), profit is expected to increase. Similarly, as ADG increases (i.e., improves), profit is expected to increase.

Because ordinary least-squares regression coefficients are difficult to compare due to the varying units of the independent variables, standardized beta coefficients were computed. This is accomplished by normalizing the variables to have a mean of zero and variance of one (Pindyck and Rubinfeld). Regressing these normalized independent variables on the normalized

**Table 1. Average Costs, Returns, and Performance by Sex and Placement Weight[a]**

| | Steers | | | | Heifers | | | |
|---|---|---|---|---|---|---|---|---|
| | **All** | **600-700#** | **700-800#** | **800-900#** | **All** | **600-700#** | **700-800#** | **800-900#** |
| Observations (Pens) | 10,361 | 2,257 | 5,228 | 2,876 | 3,822 | 2,133 | 1,355 | 334 |
| Placement Weight (lbs) | 755 | 661 | 751 | 838 | 700 | 653 | 738 | 839 |
| | (67.72) | (26.71) | (27.73) | (27.24) | (64.52) | (27.73) | (26.72) | (27.02) |
| Days on Feed | 131 | 151 | 130 | 118 | 124 | 130 | 118 | 109 |
| | (20.46) | (19.23) | (16.92) | (15.16) | (18.55) | (17.28) | (16.78) | (16.76) |
| Death Loss (%) | 0.98 | 1.51 | 0.86 | 0.77 | 1.06 | 1.15 | 0.92 | 0.99 |
| | (1.69) | (2.54) | (1.37) | (1.23) | (1.64) | (1.69) | (1.56) | (1.57) |
| Sale Weight (lbs) | 1178 | 1127 | 1171 | 1231 | 1058 | 1025 | 1084 | 1167 |
| | (72.89) | (62.60) | (62.57) | (63.42) | (71.64) | (48.56) | (64.98) | (71.66) |
| Fed Price ($/cwt) | 56.47 | 58.52 | 56.72 | 54.41 | 53.80 | 54.72 | 53.18 | 50.47 |
| | (9.22) | (10.06) | (8.78) | (8.87) | (7.28) | (7.08) | (7.31) | (7.22) |
| Average Daily Gain (lbs/day) | 3.21 | 3.07 | 3.22 | 3.30 | 2.87 | 2.83 | 2.90 | 2.98 |
| | (0.39) | (0.38) | (0.38) | (0.40) | (0.35) | (0.33) | (0.35) | (0.43) |
| Feed Conversion (lbs feed/lb gain)[b] | 8.41 | 8.28 | 8.34 | 8.63 | 8.80 | 8.63 | 8.92 | 9.45 |
| | (0.96) | (0.91) | (0.92) | (1.01) | (1.02) | (0.98) | (1.00) | (1.09) |
| Feeder Cattle ($/cwt) | 59.50 | 63.03 | 59.86 | 56.08 | 55.25 | 56.15 | 54.71 | 51.73 |
| | (10.37) | (10.89) | (9.64) | (10.17) | (8.72) | (8.46) | (8.83) | (8.89) |
| Feeder Cost ($/hd) | 447.75 | 416.62 | 449.06 | 469.80 | 385.76 | 366.78 | 403.75 | 433.99 |
| | (78.66) | (72.39) | (72.92) | (85.24) | (66.08) | (56.90) | (65.74) | (76.48) |
| Corn Price ($/bu) | 2.16 | 2.28 | 2.16 | 2.06 | 2.03 | 2.08 | 1.97 | 1.93 |
| | (0.60) | (0.68) | (0.59) | (0.54) | (0.50) | (0.52) | (0.46) | (0.44) |
| Feeding Cost ($/hd)[c] | 173.68 | 194.35 | 172.07 | 160.39 | 148.36 | 154.61 | 141.44 | 136.50 |
| | (36.44) | (39.26) | (34.00) | (30.92) | (26.73) | (25.44) | (25.50) | (28.73) |
| Interest Rate (%) | 11.51 | 11.86 | 11.58 | 11.10 | 11.06 | 11.33 | 10.83 | 10.25 |
| | (2.03) | (2.21) | (2.02) | (1.84) | (1.70) | (1.73) | (1.61) | (1.49) |
| Interest ($/hd) | 23.22 | 26.58 | 23.12 | 20.76 | 17.87 | 18.58 | 17.17 | 16.17 |
| | (7.76) | (8.76) | (7.27) | (6.78) | (4.37) | (4.27) | (4.17) | (4.83) |
| Total Costs ($/hd) | 648.69 | 643.16 | 647.99 | 654.29 | 556.17 | 544.26 | 566.29 | 591.16 |
| | (97.62) | (101.04) | (92.89) | (102.89) | (70.08) | (63.45) | (70.79) | (87.43) |
| Gross Returns ($/hd) | 663.27 | 657.90 | 662.68 | 668.55 | 567.90 | 559.92 | 575.08 | 589.70 |
| | (100.49) | (105.42) | (95.86) | (104.44) | (71.89) | (66.02) | (73.28) | (92.03) |
| Profit ($/hd) | 14.59 | 14.75 | 14.69 | 14.26 | 11.73 | 15.66 | 8.79 | -1.46 |
| | (49.67) | (50.73) | (50.21) | (47.83) | (42.52) | (41.36) | (41.98) | (48.18) |

[a]All costs and returns are expressed in 1982-1984 dollars. Standard deviations are in parenthesis.

[b]Feed conversion is expressed on an as-fed basis.

[c]Feeding Cost includes feed costs, processing, and yardage.

dependent variable yields unitless coefficients called standardized beta coefficients. The model in equation (1) with normalized variables takes the form:

$$\frac{Y-\bar{Y}}{s_Y} = \sum \beta_j^* \frac{X_j - \bar{X}}{s_j} + \varepsilon$$

where $Y$ is the dependent variable (Profit), $s$ is the standard deviation, $X_j$ is the $j$th independent variable ($j$=$P_{Fed}$, $P_{Fdr}$,..., ADG), and $\beta_j^*$ is the standardized beta coefficient for the $j$th independent variable. Pindyck and Rubinfeld show that this is equivalent to multiplying the OLS beta coefficient by the ratio of the standard deviation of the independent variable to the standard deviation of the dependent variable:

(3) $$\beta_j^* = \beta_j \frac{s_{x_j}}{s_Y}$$

Therefore, a standardized beta coefficient of, say, 0.93, indicates that for a one-standard deviation change in the independent variable, the dependent variable changes by 0.93 standard deviations. By re-scaling the variables in this manner, the standardized beta coefficients can be directly compared with each other. This is particularly useful in this case because of the differences in the magnitude of the fed, feeder, and corn prices as well as the interest rates and performance variables.

The model in equation (1) was initially estimated separately for steers and heifers and standardized beta coefficients were calculated. The model was also estimated for steers and heifers across three placement-weight categories (600-700, 700-800, and 800-900 pounds) and standardized beta coefficients were calculated.

The model was also estimated across sex, placement weight, and placement month (the 800-900 pound heifers were not included due to insufficient observations in several months). Therefore, standardized beta coefficients for each independent variable were estimated for 60 different groups of cattle. To test whether these standardized beta coefficients systematically change over sex, placement weight, and placement month, the following model was developed:

$$\beta_j^* = f(\text{HEIFER}, \text{SEVWT}, \text{EIGWT}, \text{FEB}, \text{MAR}, ..., \text{DEC})$$

where HEIFER is a dummy variable representing sex (steer=0, heifer=1), SEVWT and EIGWT are dummy variables representing cattle weighing between 700-799 and 800-899 pounds, respectively, and equal to one if the placement weight of the cattle is in the category and zero otherwise (600-700 pounds being the default). FEB, MAR,..., DEC are dummy variables representing placement month equaling one if the cattle were placed during that month and zero otherwise (January is the default). The expected relationships between the standardized beta

coefficients and the independent dummy variables vary for each of the *j*th standardized beta coefficients; therefore, this discussion is relegated to the results section.

## Results

The OLS and standardized beta coefficients from the regression model in equation (1) were estimated for all steers and all heifers and the results are presented in Table 2. The coefficients were statistically significant at the 0.01 level and the R-squareds for these regressions were above 0.90. As expected, fed price and ADG are positively related to feeding profits while the remaining variables negatively affect profitability. The standardized beta coefficients provide meaningful comparisons of the impact of the independent variables on the dependent variable (profit per head). Fed price and feeder price are the largest contributors to variability. A one standard deviation increase in fed steer price increases profit per head by 2.01 standard deviations, whereas a one standard deviation increase in feeder steer price reduces steer profit by 1.51 standard deviations. Corn price, interest rate, feed conversion, and ADG all have smaller impacts on profitability with standardized betas all less than 0.50. The standardized beta coefficients for steers tend to be slightly greater than the corresponding coefficients for heifers. Steers are typically fed longer, they gain more weight, and they have greater rates of gain than heifers. Together, these factors contribute to steers having greater profit variability than heifers (Table 1).

**Table 2. Regression Results of Factors Affecting Cattle Feeding Profit, All Steers and All Heifers Models**

| | All Steers | | | All Heifers | | |
|---|---|---|---|---|---|---|
| Variable | OLS Coefficients | P-value | Standardized Beta | OLS Coefficients | P-value | Standardized Beta |
| Intercept | 105.60 | 0.0001 | 0.00 | 78.39 | 0.0001 | 0.00 |
| Fed Price | 10.83 | 0.0001 | 2.01 | 9.88 | 0.0001 | 1.66 |
| Feeder Price | -7.22 | 0.0001 | -1.51 | -6.87 | 0.0001 | -1.39 |
| Corn Price | -39.99 | 0.0001 | -0.48 | -36.84 | 0.0001 | -0.42 |
| Interest Rate | -5.30 | 0.0001 | -0.22 | -4.62 | 0.0001 | -0.18 |
| Feed Conversion | -18.83 | 0.0001 | -0.36 | -14.52 | 0.0001 | -0.34 |
| ADG | 10.22 | 0.0001 | 0.08 | 12.39 | 0.0001 | 0.10 |
| R-squared | 0.9288 | | | 0.9087 | | |
| Observations | 10,361 | | | 3,822 | | |

The standardized beta coefficients were also estimated for three different placement weights by sex. The parameters were highly significant and explained roughly 90 percent of the variability in feeding profits. To conserve space, only the standardized beta coefficients are presented (Figures 1 and 2).[1] The fed cattle price coefficient for the 600-700 pound steers is 2.10, indicating that for a one standard deviation increase in fed cattle price, profit per head increases by 2.10 standard deviations (Figure 1). Similarly, the feeder cattle price coefficient for the 600-700 pound heifers indicates that a one standard deviation decrease in feeder cattle price leads to a decrease of 1.31 standard deviations in profit per head (Figure 2). The remaining independent variables are interpreted similarly.

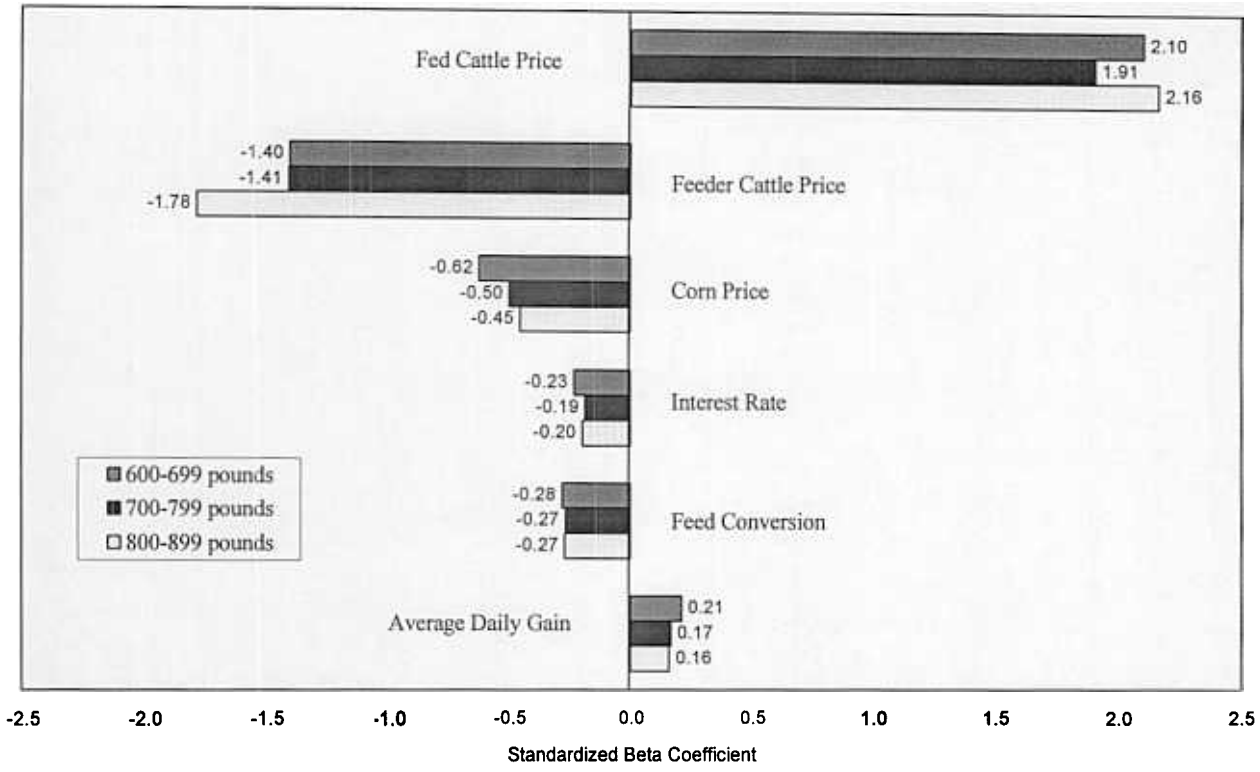


**Figure 1. Standardized Beta Coefficients of Factors Affecting Steer Feeding Profit**

The standardized beta coefficients were also estimated for both steers and heifers across placement weight and placement month (except 800-900 pound heifers which were omitted due to insufficient observations in several months). To condense the reporting of these 360 standardized beta coefficients (6 regression parameter estimates times 12 months times 5 sex/weight groups) and explain differences in them, they were used as dependent variables in models presented in equation (4). Table 3 presents the results obtained from regressing each set

[1] Complete model results are available from the authors upon request.

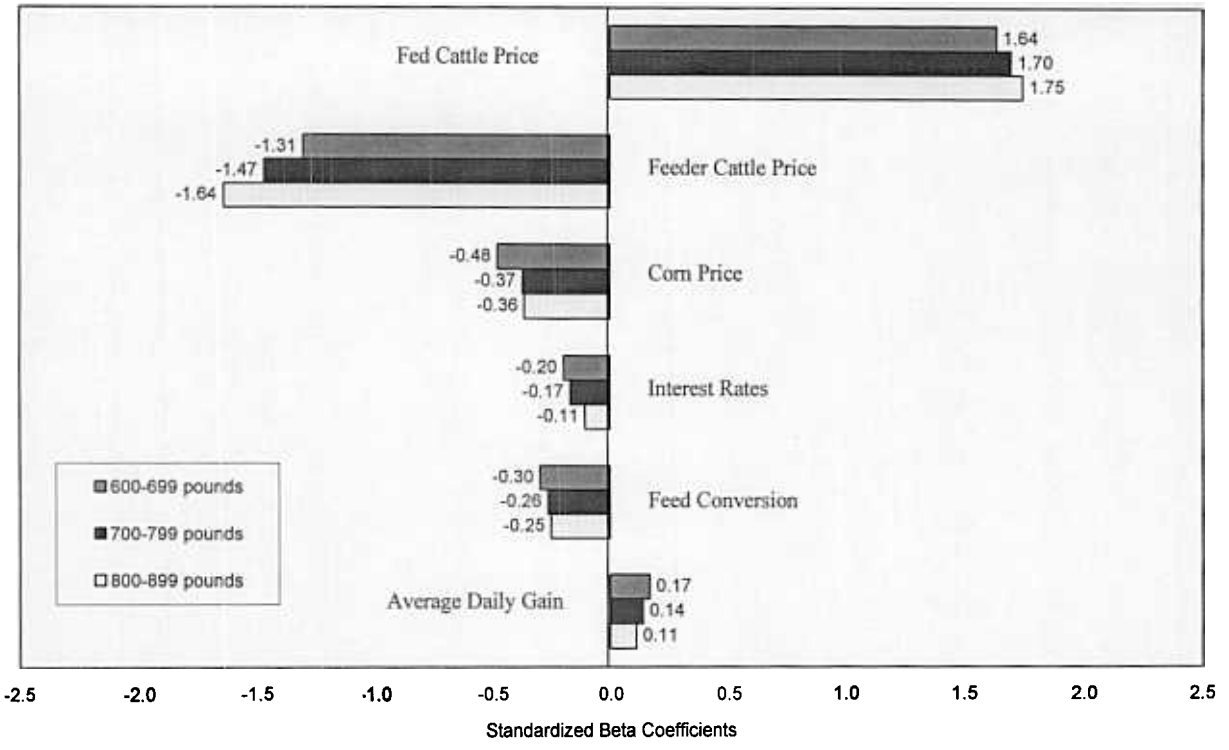


**Figure 2. Standardized Beta Coefficients of Factors Affecting Heifer Feeding Profit**

of standardized beta coefficients on dummy variables representing sex, placement month, and placement weight. The default category (intercept) is the standardized beta coefficient for 600-700 pound steers placed on feed in January. The other independent variables are dummy variables that adjust the average standardized beta coefficient to a group of cattle with that particular characteristic, *ceteris paribus*. For example, the fed cattle price standardized beta coefficient for 600-700 pound steers placed in January is 1.9254 and for 600-700 pound heifers placed in January is 1.6282 (1.9254-0.2972).

Fed cattle price has the largest impact on profit per head, followed by feeder cattle prices, corn prices, feed conversion, interest rates, and average daily gain (Figures 1 and 2). The (absolute value of the) standardized beta coefficients for fed cattle price are between 1.25 and 1.5 times greater than feeder cattle price betas and approximately four times greater than corn price standardized beta coefficients. This implies that in order to manage the factors that have historically contributed the most to cattle feeding profit risk, producers should focus on managing fed and feeder cattle price risk.

The fed cattle price standardized beta coefficient is 0.30 smaller for heifers relative to steers (Table 3), consistent with Figures 1 and 2. The standardized beta coefficients for 700-800 and 800-900 pound steers relative to 600-700 pound steers are not statistically different (Table 3). Relative to January placements, all other placement months (except April and May) have larger standardized beta coefficients; however, the parameter estimates are only significant in February,

**Table 3. Regression of Standardized Betas on Factors Affecting Cattle Feeding Profit by Sex, Weight, and Month**

| | Fed Price | | Feeder Price | | Corn Price | | Interest Rate | | Conversion | | ADG | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | *Coefficient* | *P-value* |
| **INTERCEPT** | 1.9254 | 0.0001 | -1.1073 | 0.0001 | -0.5504 | 0.0001 | -0.1469 | 0.0001 | -0.2199 | 0.0001 | 0.1549 | 0.0001 |
| **HEIFER** | -0.2972 | 0.0003 | 0.0100 | 0.8662 | 0.1418 | 0.0001 | 0.0174 | 0.1577 | -0.0401 | 0.0049 | -0.0215 | 0.0998 |
| **SEVWT** | -0.0348 | 0.6512 | -0.0979 | 0.1031 | 0.1156 | 0.0001 | 0.0332 | 0.0088 | 0.0142 | 0.3004 | -0.0150 | 0.2493 |
| **EIGWT** | 0.1105 | 0.2807 | -0.3926 | 0.0001 | 0.1749 | 0.0001 | 0.0441 | 0.0086 | 0.0066 | 0.7129 | -0.0301 | 0.0825 |
| **FEB** | 0.4027 | 0.0204 | -0.5017 | 0.0003 | -0.1028 | 0.0331 | -0.0018 | 0.9473 | -0.0088 | 0.7679 | -0.0114 | 0.6855 |
| **MAR** | 0.4342 | 0.0129 | -0.6028 | 0.0001 | -0.1426 | 0.0038 | -0.0919 | 0.0012 | -0.0461 | 0.1282 | -0.0279 | 0.3263 |
| **APR** | -0.0282 | 0.8671 | -0.2159 | 0.1009 | -0.0717 | 0.1324 | -0.0781 | 0.0051 | 0.0655 | 0.0327 | 0.0320 | 0.2596 |
| **MAY** | -0.2547 | 0.1356 | -0.1355 | 0.2987 | -0.0384 | 0.4159 | -0.1041 | 0.0003 | 0.0524 | 0.0846 | 0.0204 | 0.4703 |
| **JUN** | 0.0703 | 0.6771 | -0.3626 | 0.0073 | -0.1750 | 0.0005 | -0.1458 | 0.0001 | 0.0275 | 0.3598 | 0.0791 | 0.0072 |
| **JUL** | 0.1527 | 0.3670 | -0.4424 | 0.0013 | -0.1080 | 0.0256 | -0.1472 | 0.0001 | -0.0098 | 0.7441 | 0.0155 | 0.5845 |
| **AUG** | 0.2141 | 0.2079 | -0.4838 | 0.0005 | -0.0724 | 0.1284 | -0.0964 | 0.0007 | -0.0328 | 0.2758 | 0.0453 | 0.1137 |
| **SEP** | 0.2840 | 0.0970 | -0.4990 | 0.0003 | -0.1532 | 0.0020 | -0.0937 | 0.0010 | -0.0523 | 0.0851 | 0.0869 | 0.0034 |
| **OCT** | 0.3794 | 0.0285 | -0.5423 | 0.0001 | -0.2119 | 0.0001 | -0.0640 | 0.0199 | -0.0726 | 0.0186 | 0.1167 | 0.0001 |
| **NOV** | 0.2523 | 0.1392 | -0.1409 | 0.2802 | -0.1119 | 0.0209 | -0.0316 | 0.2396 | -0.0404 | 0.1810 | 0.0870 | 0.0033 |
| **DEC** | 0.0804 | 0.6339 | 0.0518 | 0.6898 | -0.0576 | 0.2241 | -0.0003 | 0.9910 | -0.0451 | 0.1362 | 0.0277 | 0.3282 |
| **R-squared** | 0.5641 | | 0.6848 | | 0.7167 | | 0.6860 | | 0.5641 | | 0.5734 | |
| **Observations** | 60 | | 60 | | 60 | | 60 | | 60 | | 60 | |

March, September, and October. Months with statistically significant parameters correspond to months were fed cattle prices are typically increasing (Jones, Mintert, and Albright).

The feeder cattle price standardized beta coefficient is not statistically different for steers versus heifers (Table 3), i.e., feeder cattle prices impact profitability similarly for steers and heifers. The standardized beta coefficient of feeder cattle price increases as placement weight increases because the cost of the feeder steer becomes an increasingly larger portion of the total costs of producing a finished steer as placement weight increases. This was apparent in comparing the 600-700 and 700-800 pound placements to the 800-900 pound placements (Figures 1 and 2 and Table 3). Therefore, producers should be aware of the increasing importance of managing feeder cattle price risk as they place heavier weight cattle on feed. Seasonally, the influence of feeder cattle prices on profitability tends to be greater in all placement months except December relative to January and is highest for spring and fall placements (Table 3).

One might expect that profits would be less impacted by corn prices for steers than heifers because steer performance (feed conversion, ADG) is higher relative to heifers. However, the total amount of gain for steers is typically 60 pounds greater than heifers and steers are on feed for one to three weeks longer (Table 1). This causes total feeding costs to be higher for steers. Because feeding costs are influenced by corn price risk, the impact of corn price risk on profits is greater for steers than for heifers (Table 3).

Buccola found that feed price changes impacted light-weight feeder cattle prices more than heavy-weight feeder cattle prices, suggesting that corn prices have less influence on profit per head as placement weight increases. Figures 1 and 2 (and Table 3) show that the standardized beta coefficient for corn prices decrease in absolute value as placement weight increases. This result is intuitively appealing because the cost of the feed ration becomes a smaller proportion of the total cost of finishing a steer as placement weight increases and is consistent with Langemeier, Schroeder, and Mintert.

Seasonally, the corn price standardized beta coefficients are greater in all placement months relative to January and statistically significant in seven of these months. The magnitude of the parameters indicates that the corn price standardized beta coefficient is largest in October relative to the other months, indicating that corn prices have the largest influence on cattle feeding profitability for placements during that month.

The impact of variability of interest rates is lower for heifers relative to steers (Table 3). This is a reflection of the total feeder costs and feeding costs being lower for heifers, thus interest expenses are a smaller proportion of the total expense incurred from producing a finished heifer relative to a finished steer (Table 1). The influence of interest rates on profitability decreases as placement weight increases. This could be a function of heavier placements being on feed for shorter time periods and total interest expenses decreasing as placement weight increases, leading to lower variability in interest rates for those groups of cattle. Seasonally, interest rates appear to impact feeding profitability the most during the summer months.

Feed conversion affects profitability more when feeding heifers than steers (Table 3). This is likely because feed conversion tends to be higher and more variable for heifers than steers (Table 1). The impact of feed conversion on profitability declines as placement weight increases, although this relationship is not statistically significant. Feed conversion typically has less influence on profitability for summer placements (when feed conversion is seasonally low) and increases for fall placements (when feed conversion seasonally increases reflecting the poorer performance caused by winter weather conditions).

Average daily gain influences profitability slightly more for steers than heifers (statistically significant at the 0.10 level) (Table 3). Langemeier, Schroeder, and Mintert found that average daily gain had a larger impact on profitability for heavier-weight placements relative to lighter placements and asserted that an improvement in average daily gain reduced the cost of gain and therefore increased profits. As shown in Figures 1 and 2, the results of this study contradict those of previous studies. Here, the standardized beta coefficient of average daily gain decreased slightly as placement weight increased. The reason for this is that average daily gain is more important for lighter-weight placements because they are on feed for longer periods of time. Seasonally, the average daily gain influence on profit per head increases during the summer months when average daily gain is typically highest (Jones, Mintert, and Albright).

## Implications and Conclusions

Variability of fed cattle prices and feeder cattle prices have greater impacts on cattle feeding profitability than corn prices, interest rates, and animal performance. This suggests that risk management efforts should be focused upon managing price risk in those markets to reduce riskiness associated with cattle feeding. However, the other factors explain economically important amounts of the variability in profitability so producers should also continue to monitor exposure to risk in these areas.

The factors hypothesized to influence profitability were studied across sex, placement weight category, and placement month. In general, as placement weight increases, feeder cattle prices impact profitability more while corn prices, interest rates, and animal performance influence profitability less. Feeder cattle prices impact profitability more for spring and fall placements and corn prices typically have the largest influence on profits for third quarter placements. Feed conversion influences profitability more for winter placements while ADG affects profit the most for late winter/early spring placements.

Results of this research are important for cattle feeders, cow-calf producers retaining ownership of their calves, extension personnel, and investors. Because fed cattle and feeder cattle prices are the largest contributors to cattle profitability risk, these areas should be emphasized in managing the overall risk in cattle feeding. Further, because cattle prices, corn prices, and animal performance all determine feeding profitability, break-even budgeting with sensitivity analysis should be used in placing cattle on feed.

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