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Determinants of Profit Variability in Calf-Fed and Yearling Production Systems

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Summary

Factors that were determinants of profit variability in calf-fed and yearling beef production systems were identified and ranked. The analysis indicated cattle prices have the greatest influence on profit variation for both systems and on all backgrounding and finishing phases of the yearling system. Prices of feedstuffs (i.e., corn prices, wet corn gluten feed prices, and pasture and cornstalk rental rates) were the next most important factors explaining profit risk. Cattle performance variables and interest rates had the smallest impact on profit variation.

Introduction

An understanding of the relative impact of profit determinants can help producers identify which variables of production and financial risk to focus on managing. Based on cattle feeding budgets that use actual historical cash prices of inputs and outputs, as well as variation in cattle feeding performance based on research trials described by Griffen et al. (*2007 Nebraska Beef Report*, pp. 58-60), this research identifies the magnitude of year-to-year variability in profits in calf-fed and yearling production systems.

A large amount of research has evaluated the difference in cattle feeding profit variability based on profit determinants in calf-fed and yearling finishing systems. However, less research has been done to consider the impact of the backgrounding phases on the yearling system's total profitability and profit variation, driven by determinants unique to each particular backgrounding phase. The present study evaluated profit variability of both systems and the corresponding profit variability of multiple phases in the yearling system. The objective was to identify determinants of profit variability and measure each determinant's relative impact on each system's profit risk.

Procedure

For the calf-fed system, the variables to explain the variation in profits included fed cattle sales price, feeder cattle purchase price, corn price, interest rate, ADG, and F:G. Fed cattle sales price was used in the model to represent revenue, while feeder cattle sales price was included as one of the main cost variables in the calf-fed system. Another main cost variable for this system was feed, measured here by corn price. Interest, or opportunity cost of money, was charged on variable costs associated with feeding cattle. All cattle prices and corn prices were market prices reported by USDA's Agricultural Marketing Service, and interest rates were reported by the Kansas City Federal Reserve Bank's Survey of Agricultural Credit Conditions. The impact of ADG and F:G on profits also was measured in the econometric model from experimental trials.

As discussed in Small et al. (*2009 Nebraska Beef Report*, pp. 40-42), the yearling production system incurs costs associated with backgrounding calves on crop residue in the winter and native grass pasture in the summer and finishing in the fall in a feedlot. Thus, explanatory variables in this study included fed cattle sales price, feeder cattle purchase price, average cornstalk and summer pasture rental rates, corn prices during feeding, average interest rates across the three phases, ADG for the three phases, and F:G in the feedyard finishing phase. Sources for these prices were the same as for the calf-finishing system, with the addition of cornstalk and pasture rental prices from Nebraska Farm Real Estate Reports (Johnson), which are included because they represent the bulk of feed costs for the two backgrounding phases. Also, to better account for all phases in the yearling system, the entire system's ADG was calculated based on initial weight going onto cornstalks, final weight at marketing, and total days owned.

The yearling system's profit relationship also was divided into three production stages, and profits were calculated for each by valuing the feeder steer at the end of the winter grazing phase (start of the summer grazing phase) and the end of the summer grazing phase (start of the feedlot phase). The winter cornstalk grazing variables included feeder cattle price margin (difference in the price of the calf going onto cornstalks and the price of the calf coming off cornstalks); feeder cattle purchase price; the average cornstalk rental rate; the average price of wet corn gluten feed (WCGF) fed as a supplement during winter phase; interest rate; and ADG.

In order to rank the relative impact of variables on the summer pasture grazing profits, the following variables were included in the econometric model: the feeder cattle price margin (difference in the price of the calf going onto pasture and the price of the calf coming off pasture); feeder cattle purchase value at the beginning of the summer; the average pasture rent; interest rate during the summer phase; and ADG during the summer phase. The yearling system finishing phase profit variation model included the same variables as the calf-fed model, but measured only during the yearling steers' time in the feedyard.

The feeder cattle price margin for the winter and summer grazing phases was used in place of the feeder cattle sales price to lessen econometric problems associated with inclusion of both feeder cattle sales price and feed-
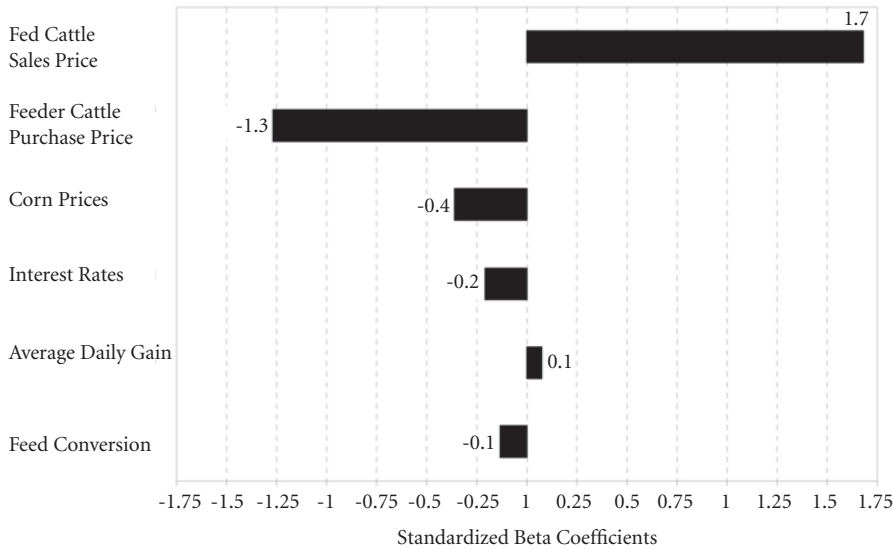
Figure 1.   Calf-fed profit variation caused by prices and performance, 1996-2007[1].

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[1]Solid bars represent statistically significant coefficients, whereas striped bars are associated with coefficients that are not statistically different than zero.

Figure 2.   Yearlings (all phases) profit variation caused by prices and performance, 1996-2007[1].

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[1]Solid bars represent statistically significant coefficients whereas striped bars are associated with coefficients that are not statistically different than zero.
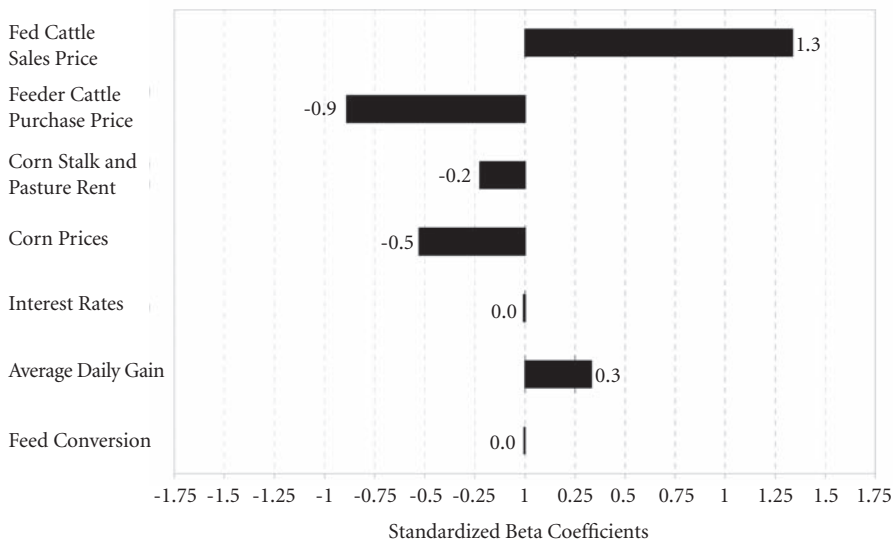
er cattle purchase price in the model. Thus, the feeder cattle purchase price measured overall input price levels, and the feeder cattle price margin quantified the price spread.

Standardized beta coefficients were used to rank the relative influence of profit determinants on profit risk. This method of analysis involved normalizing profit and the explanatory variables, resulting in a unit-less mea-sure that allowed comparison of the influence of the explanatory variables on profits regardless of differing units of measure used to define each vari-able (e.g., dollars per bushel for corn price and dollars per hundredweight for feeder cattle price). Standardized beta coefficients have a special inter-pretation. Suppose that the explana-tory variable *fed cattle sales price* has a standardized beta coefficient of 1.25.

This means that for a one standard deviation change in fed cattle sales price, profit changes from its mean by 1.25 standard deviations. Thus, the greater the standardized beta coef-ficient for a given variable, the greater the influence that variable has on profit variation.

Results

Figure 1 indicates the magnitude of the standardized beta coefficients of the variables that affected profits in calf-fed systems. The variables rep-resented by bars on the right side of the graph have a positive relationship with profits (i.e., profits increase with increases in the given variable). The variables represented by bars on the left side of zero have a negative rela-tionship with profits. Solid bars rep-resent variables with coefficients that were statistically different than zero, whereas striped bars indicate that the variable's coefficient was not statisti-cally significant. As shown in Figure 1, fed cattle sales price had the largest impact on profit variation, followed by feeder cattle purchase price. Corn price, interest rates, F:G, and ADG were the next most influential profit determinants.

These results are similar to those discussed in previous research and indicate the majority of the year-to-year profit risk from finishing calf-feds was due to cattle and corn prices. Even though animal performance was important in determining whether or not a profit resulted, ADG and F:G did not tend to explain a large propor-tion of the variation in profits across years (although they were statistically significant determinants of profit variability). In a relative sense, the variability of cattle performance was much smaller across the years of the study than the variability of cattle and corn prices, leading to the result that the more variable determinants like cattle and corn prices cause the most profit variability.

The magnitude and signs of the standardized beta coefficients for the entire yearling system are illustrated

(Continued on next page)

in Figure 2. Comparison of the bars in Figure 2 with those in Figure 1 demonstrates that the relative rank of a variable's importance in determining profits was somewhat different for yearlings (all phases) than for calf-feds. Similar to the profit determinants evaluated in the calf-fed system, fed cattle sale price, feeder cattle purchase price, and corn price had the largest influence on profits. Conversely, ADG was the next most important variable explaining profit variation for the yearling system, followed by the average cornstalk and pasture rental rates. Also note that the standardized beta coefficients for the sales price and purchase price were smaller in terms of absolute values for yearlings than for calf-feds. The total purchase price of the lighter steer at the beginning of the yearling system comprised less of the total cost of producing a finished steer, compared to the total purchase price of the heavier steer in the calf-fed system. Thus, it would be expected that the standardized beta coefficient associated with the feeder cattle purchase price for calf-feds would be greater than that of the yearling system.

It might also be assumed that corn prices for a yearling system would have a smaller impact on profit variation relative to a calf-fed system, since yearlings consumed corn for less time than calf-feds. However, yearlings were less efficient with the corn consumed (Griffin, *2007 Nebraska Beef Report*, pp.58-60), which may be the cause of the larger standardized beta coefficient for corn in the yearling model than in the calf-fed model. Moreover, corn price was used to calculate the cost of WCGF, which also was fed to yearlings during the feedlot phase and supplemented during the winter cornstalk grazing phase. Therefore, the impact of corn price on profit variation may be partially attributed to the cost of WCGF if its impact was being captured by the corn price variable in the yearling system's model.

The model used to calculate standardized beta coefficients for the winter cornstalk grazing phase had
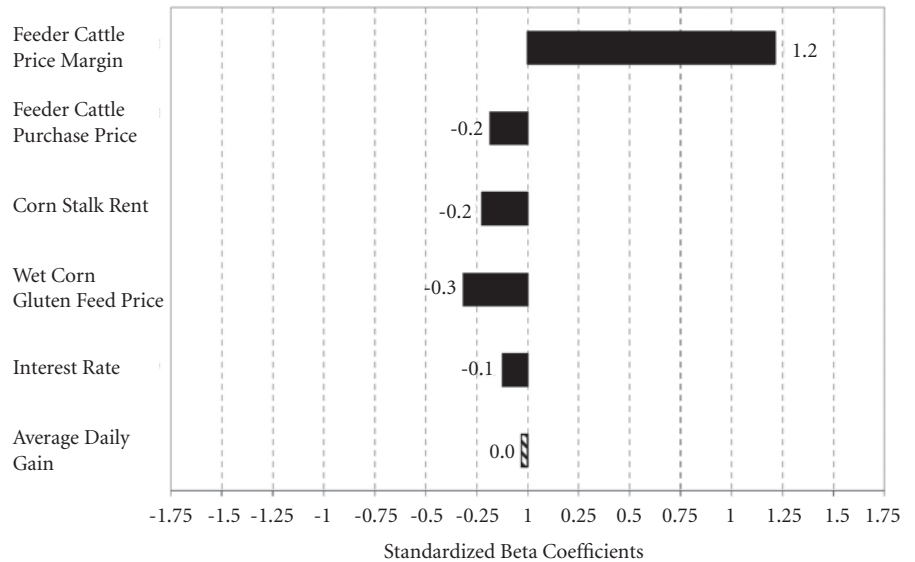

Figure 3. Yearlings (winter phase) profit variation caused by prices and performance, 1996-2007[1].

[1]Solid bars represent statistically significant coefficients whereas striped bars are associated with coefficients that are not statistically different than zero.
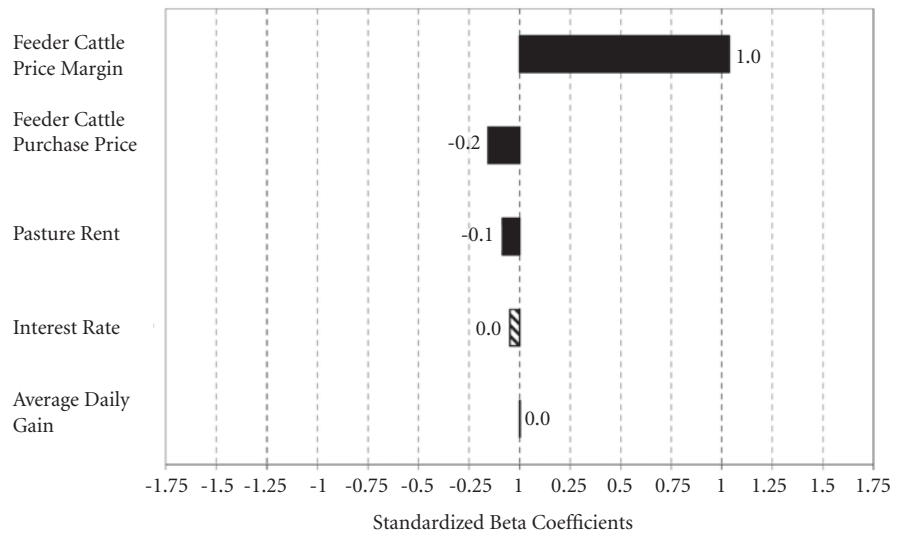

Figure 4. Yearlings (summer phase) profit variation caused by prices and performance, 1996-2007[1].

[1]Solid bars represent statistically significant coefficients whereas striped bars are associated with coefficients that are not statistically different than zero.

all variables with their expected signs (positive for profit-increasing variables, like fed cattle price and cattle performance, and negative for costs that lower profits, like cornstalk grazing, interest, and feeder cattle purchase price) except winter phase ADG, which also was not statistically significant (Figure 3). The feeder cattle price margin (difference in the total

price [$ per head] of the calf going on to cornstalks and the total price [$ per head] of the calf coming off cornstalks) was the greatest influencer of profit variation in the yearling winter phase relative to the other variables. The next most important determinant was WCGF price, followed by cornstalk rental rate, purchase price of the feeder steer, and interest rates (see
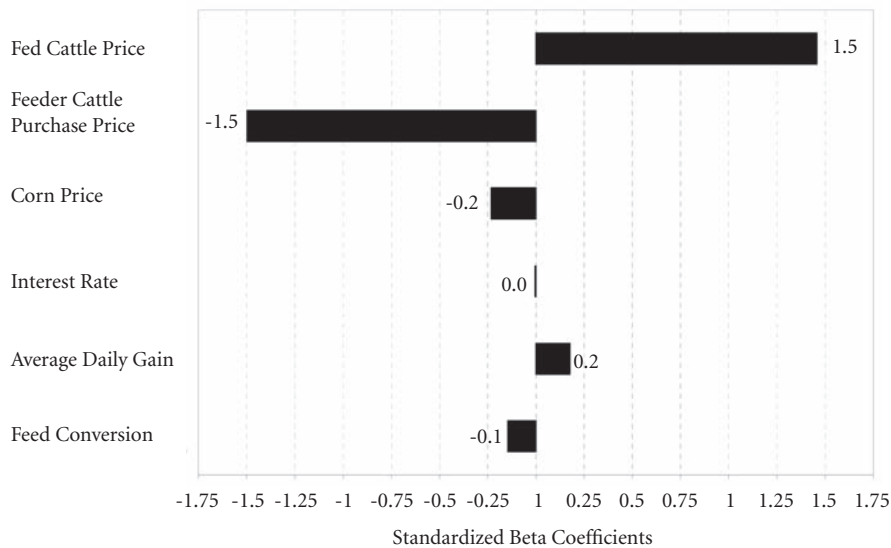
Figure 5. Yearlings (feedlot phase) profit variation caused by prices and performance, 1996-2007[1].

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[1]Solid bars represent statistically significant coefficients whereas striped bars are associated with coefficients that are not statistically different than zero.

Figure 3).

For the summer grazing profit variation analysis, all revenue-improving variables had positive signs and cost-related variables had negative signs. Similar to the yearling system's winter phase, the feeder cattle price margin had the greatest impact on profit variation of all the variables (see Figure 4). The purchase price or value of the steer entering the summer pasture grazing phase had the second largest impact on profit variation. Pasture rental rates also had an impact on profit variation. Neither interest rates nor ADG were statistically significant for summer phase profits.

In the yearling's feedlot phase model, purchase price of the feeder steer entering the feedlot was the most influential profit determinant (see Figure 5). Figure 5 also shows that fed cattle sales price was the next most important variable in influencing profit variation. Although they did not have as large an impact on profit variation, corn price, feedlot ADG, and F:G were important profit determinants as well.

All of the results showed that fed cattle sales price, feeder cattle price margins, feeder cattle purchase price, and corn price had the largest impact on profit variation for calf-feds and yearlings. In conclusion, to effectively manage profit risk associated with these two cattle production systems, it is important to manage cattle and corn price risk.

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