Factors Determining Profit for Fed Cattle Under a Value-Based Alliance

By

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Abstract: (50 words or less)

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Abstract

Data from a fed cattle alliance were used to determine the factors that effect variability in profits per head for fed cattle marketed under a grid pricing system. The feeder cattle cost and the base price used in the grid had the largest impact on profits per head over time.

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The beef industry has been struggling with a decline in consumer demand and a loss in market share over the past several decades (Purcell). Two important components that have contributed to this decline are the inconsistencies in beef quality and the pricing of fed cattle on averages (Fausti, Feuz, and Wagner; Schroeder et al.). Value-based pricing of fed cattle has been introduced to improve economic signals to producers. As a result, beef packers have developed grid pricing systems to derive a value for each carcass that is based on its overall quality. In this system, producers that market a higher quality animal receive premiums, and producers who market lower quality animals receive discounts.

As the number of cattle being marketed under value-based systems continues to increase, there are an increasing number of factors that determine cattle feeding profits. The objective of this paper is to determine the relative impacts of price, cattle quality, and feeding performance factors on the profits per head for fed cattle marketed under a value-based alliance.

The Alliance

Grid pricing mechanisms are setup differently under different alliances and vary across packers (Ward, Feuz, and Schroeder). The grid for a particular alliance is outlined here. As with all grids, a base price is the starting point from which premiums and discounts for cattle quality are applied. The base price in this alliance is based off the western Kansas direct weekly fed cattle price as reported by the USDA converted to a dressed price using the plant average hot yield for the previous week.

Premiums and discounts for quality and yield grade characteristics are added to the base price to determine the net price received. This particular grid pays premiums only on the percentages of the pen of cattle above pre-set thresholds for desirable quality traits (discounting pens below target) and discounts pens having undesirable traits present above target levels. No premiums or discounts are applied to Select, yield grade 3 carcasses. The targets and the associated premium or discount are reported in table 1. The premiums or discounts have been consistent over time except for the premium for Choice or higher quality grade. This value is equal to the USDA Choice to Select price spread. The total premium or discount is the difference in the actual percentage and the target percentage multiplied by the particular premium or discount for each quality attribute. For example, if the pen exceeds the threshold for Choice or higher quality grade, a premium is paid on the percent of cattle grading Choice or higher exceeding 55 percent of the pen. However, a discount is accessed if the pen has fewer Choice or higher cattle than the target.

Table 1. Target Percentages and Premiums/Discounts for Alliance Grid, 1995-1998.

Quality Trait	Threshold	Premium/Discount
Quality Grade		
Choice and higher	>55%	Varies[a]
Prime	>1%	$8.00
CAB	>5%	$3.50
Select	0%	0
Ungraded	<5%	-$2.00
Yield Grade		
Yield Grade 1	>5%	$3.00
Yield Grade 2	>35%	$1.50
Yield Grade 3	>56%	$0.00
Yield Grade 4 and 5	<3.5%	-$12.00
Carcass Weight		
< 550	0%	-$10.00
> 950	0%	-$10.00

[a] Varies with the USDA Choice to Select boxed beef wholesale carcass price spread over time.

The purpose of this alliance is multi-faceted. Through this alliance grid the packer is attempting to improve the flow of information to producers. Relative to average live or dressed pricing methods, the grid offers increased opportunity for producers with high quality cattle to realize premiums. Therefore, this alliance is intended to secure increased numbers of higher quality cattle for the packer that are targeted for a branded product marketing program. From a cost efficiency perspective, the alliance provides the packer with an assured component of weekly slaughter needs.

Model and Procedures

Regression analysis is used to explain the variability in profits per head for fed cattle (profithd) sold on a grid. Factors that are expected to influence profits are dressed prices (dresspr), cost of the cattle (costin), corn price (cornp), average daily gain (adg), feed conversion (conv), hot yield (hyld), and days on feed (dof).

(1) Profithd = f(dresspr, costin, cornp, adg, conv, hyld, dof)

When cattle are sold on a grid, dressed price can be further broken down into its components. The net dressed price paid for a pen of cattle is a function of the base price (base), the percentage of cattle in the different quality (prime, cab, choice, select, ungrad) and yield grades (yg1, yg2, yg3, yg45), the percentage of light-weight carcasses (light), and the percentage of heavy-weight carcasses (heavy). The following equation summarizes the price components:

(2) Dresspr = f(yg1, yg2, yg3,yg45, prime, cab, choice, select, ungrad, heavy, light, base)

Substituting factors effecting the dressed price into the original profit equation (1) gives,

(3) Profithd =f(yg1, yg2, yg3, yg45, prime, cab, choice, select, ungrad, heavy, light, base, costin, cornp, adg, conv, hyld, dof)

Equation (3) is the primary equation of interest. Of particular interest are the impacts of each regressor on profitability. Standardized beta coefficients are used to compare the relative influences of the independent variables on the dependent variable. These standardized coefficients are the beta coefficient for each independent variable multiplied by the ratio of the standard deviation of the independent variable divided by the standard deviation of the dependent variable (Pindyck and Rubinfeld). These coefficients are proportions, and thus, can be used to rank the relative importance of the independent variables.

Data Description

Feedlot closeout data and kill sheet data for cattle that were fed and slaughtered under the alliance in western Kansas were obtained for this study. The data include 1011 pens of cattle that were placed on feed between May 1995 and September 1998. The feedlot data include individual pen data for the profit per head, cost of the feeder cattle, average daily gain, feed conversion (as fed), and days on feed. The kill sheet data include the percentage of yield grade 1, 2, 3, 4, and 5 carcasses and the percentage of cattle in the pen grading Prime, Choice, Certified Angus Beef (CAB), Select, and the ungraded cattle. The kill sheet data also include the percentage of light and heavy-weight carcasses, a target hot yield, a live price, and a dressed price.

Other data used in the analysis included corn prices and the choice to select price spread. Monthly corn prices were obtained from Kansas Agricultural Statistics. The corn price for a particular pen of cattle was calculated using a simple average of monthly prices during the time the cattle were on feed. The weekly Choice to Select wholesale

boxed beef price spread was obtained from the USDA's *Livestock, Meat, and Wool Market News*.

Table 2 presents summary statistics of the data. Profit per head averaged -$10.65/cwt ranging from a loss of $272 to a profit of $209. Figure 1 displays the distribution of profit per head. The largest number of pens are contained in the range that includes zero, and a larger number of pens over the time period lost money than made money. The premium/discount for each pen relative to the base price averaged $1.09/cwt with a range from -$15.87 to $6.18 (table 2). Figure 2 shows the distribution of the premium/discount paid. The majority of the pens lie in a range around zero, although approximately 67 percent received premiums greater than zero. A small number of pens received large (> $4/cwt) premiums or large (< -$3/cwt) discounts.

Table 2. Mean, Standard Deviation, Minimum and Maximum for Cattle Fed and Marketed Under an Alliance, 1995-1998.

Variable	Mean	Std. Dev.	Minimum	Maximum
Profit ($/hd)	-10.65	80.06	-272.09	208.87
Premium/Discount ($/cwt)	1.09	1.54	-15.87	6.18
Cost in ($/cwt)	69.92	8.69	45.83	106.70
Dressed Price ($/cwt)	102.66	5.82	88.17	118.46
Base Price ($/cwt)	101.57	5.56	88.99	114.96
Corn Price ($/bu)	2.91	0.72	1.89	4.66
Choice/Select Spread ($/cwt)	6.22	3.04	0.24	20.21
Average Daily Gain (lbs/day)	3.29	0.38	2.08	4.49
Dry Matter Feed Conversion (lbs feed/lb gain)	6.31	0.51	5.21	8.97
Hot Yield (%)	63.76	0.87	60.43	66.24
Days on Feed	131.54	21.71	79	250
Yield Grade 1 (%)	4.32	5.00	0	49.67
Yield Grade 2 (%)	35.17	15.55	1.04	91.01
Yield Grade 3 (%)	55.55	16.00	0	94.76
Yield Grade 4 5 (%)[a]	5.04	5.30	0	43.55
Prime (%)	2.96	4.28	0	31.61
CAB (%)	19.18	11.63	0	69.43
Choice (%)	65.67	15.25	13.33	96.95
Select (%)	34.33	15.25	3.05	86.67
Ungraded (%)	1.73	2.60	0	40.85
Heavy Carcasses (%)	1.81	3.82	0	42.08
Light Carcasses (%)	0.93	2.66	0	24.91

[a] Yield grade 4 and 5 are added together.

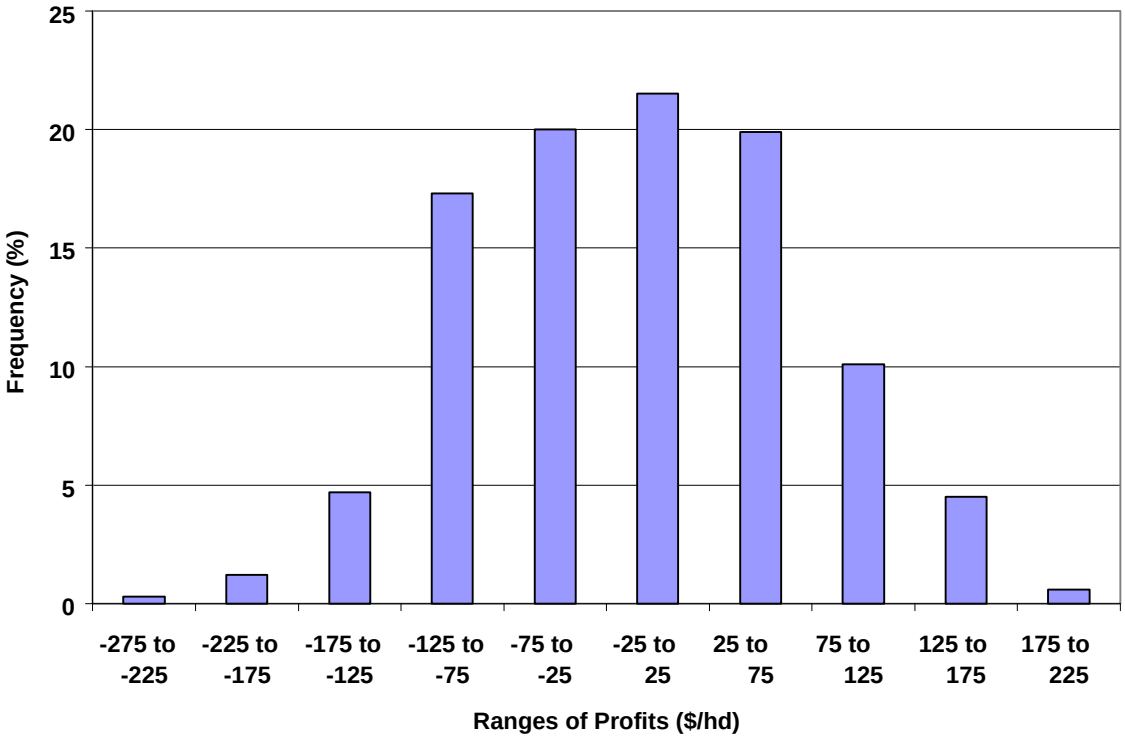

Figure 1. Distribution of Profits per Head.

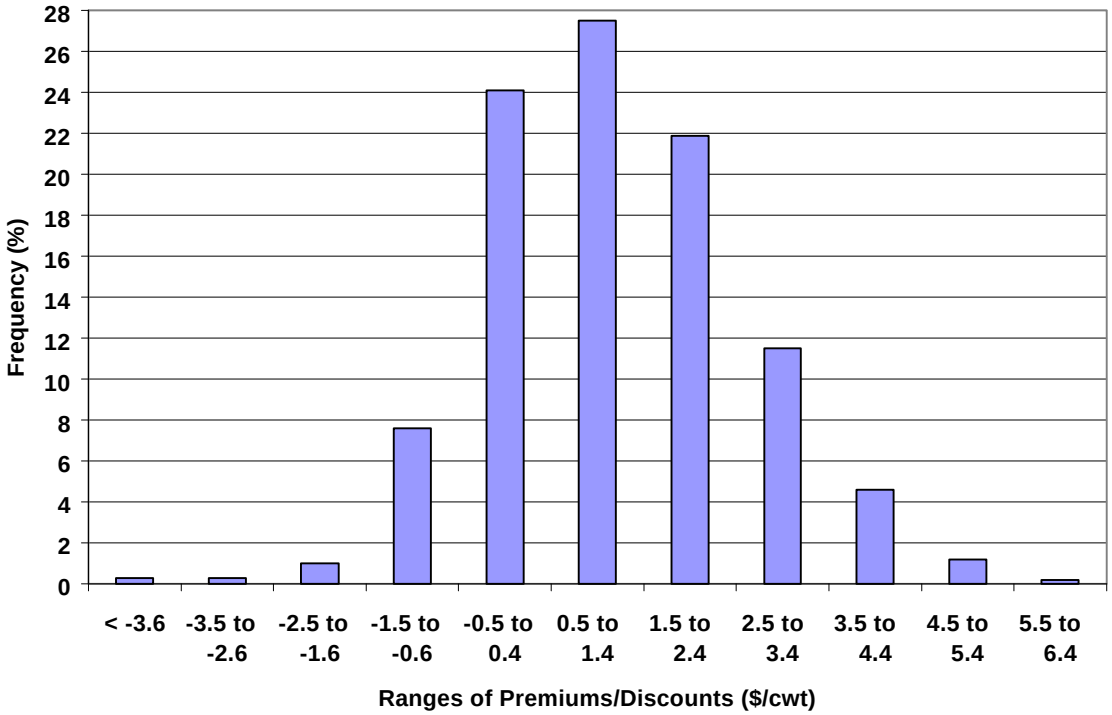

Figure 2. Distribution of Premiums/Discounts.

Empirical Results

Two regression models are estimated. The first corresponds to equation (1) and includes the dressed carcass price as a regressor. The second model corresponds to equation (3) and replaces the dressed price with all the factors affecting the dressed price in the alliance grid. The regression results are reported in table 3. The dressed price, costs, and performance measures explain approximately 95 percent of the variation in profits per head. The signs on the coefficients match the expected signs, and all of the variables are significant at the 0.01 level. The standardized coefficients provide a relative measure of the impact of each regressor on profit per head. The price of feeder cattle has the largest effect on profits per head with a standardized coefficient (SC) of –0.85 followed by the dressed carcass price with a SC of 0.56. Corn price and feed conversion have the next largest impacts with approximately one-half or less the importance relative to the feeder price and the carcass price. Average daily gain, hot carcass yield, and days on feed all have SC's of 0.12 or smaller. Average daily gain has the smallest impact on profits per head.

The second empirical model replaces the dressed price paid with all the grid components that comprise the price paid. This is represented by equation (3); however, the regression model differs some from the conceptual model presented in equation (3). The grid premiums and discounts were all essentially fixed over the period of analysis except the Choice to Select spread. This means that premiums for Choice carcasses in pens that exceeded 55 percent Choice or higher quality grade and discounts for pens with less than 55 percent Choice varied with the spread. Therefore, to adjust for this, the percent of cattle grading Choice minus the 55 percent threshold was multiplied by the

Choice to Select spread (chsprd). This allows the "value" of each percent Choice grade cattle to vary with the spread. The second model with the detailed cattle quality traits that affect the dressed price explains approximately 94 percent of the variation in the profits per head. All of the variables are significant at the 0.01 level except for the percent yield grade 1, the percent of ungraded carcasses, and the percent of light-weight carcasses. This could be due to the relatively small percentage of cattle falling into these three categories in this sample. The signs are consistent with expectation for every coefficient except YG1.

Figure 3 displays the values of the standardized beta coefficients for each independent variable in the second model. The feeder cattle purchase price has the largest impact on the profits per head (SC= -0.84) followed by the grid base price for the carcass (SC= 0.53). The corn price (-0.29) and the feed conversion (-0.23) have relatively larger effects than the hot carcass yield (0.11) and the days on feed (0.12). Disregarding the base price, the grid factors that determine the dressed price have considerably less influence on the profits per head with all SC's less than 0.10.

In comparing the two regressions, the cost and performance factors have similar absolute and relative economic importance across the two models. The dressed price has the second largest impact on the profits per head in the first equation, and the grid base price has the second largest impact on the profits per head in the second equation. Therefore, over time, the base price is the most important component of the dressed price affecting the profits per head. These results differ some from Feuz, Fausti, and Wagner (FFW). They concluded that quality grade was the most important profit determinant and average daily gain was the second most important for cattle sold on a value-based grid.

Table 3. Profit Equation Regression Estimates for Cattle Fed and Marketed Under an Alliance, 1995-1998.[ab]

Independent Variables	Equation 1	Standardized Coefficient	Equation 3	Standardized Coefficient
Intercept	-731.52*	0.00	-649.55*	0.00
	(-12.04)		(-9.32)	
Dresspr	7.74*	0.56		
	(67.25)			
YG1			-0.02	-.001
			(-0.15)	
YG2			0.18*	0.04
			(3.40)	
YG45			-0.78*	-0.05
			(-5.63)	
Prime			1.14*	0.06
			(6.57)	
CAB			0.33*	0.05
			(4.60)	
Ungraded			0.23	0.01
			(0.92)	
Chsprd			0.07*	0.09
			(8.26)	
Heavy			-0.65*	-0.03
			(-3.70)	
Light			-0.34	-0.01
			(-1.24)	
Base			7.60*	0.53
			(60.44)	
Costin	-7.85*	-0.85	-7.76*	-0.84
	(-85.33)		(-79.34)	
Cornp	-32.87*	-0.30	-31.73*	-0.29
	(-29.31)		(-24.96)	
ADG	13.57*	0.07	17.48*	0.08
	(5.90)		(5.61)	
Conv	-37.92*	-0.24	-37.17*	-0.24
	(-21.73)		(-18.70)	
Hyld	11.11*	0.12	9.630*	0.11
	(14.54)		(11.47)	
DOF	0.43*	0.12	0.44*	0.12
	(14.96)		(13.92)	
Adjusted R^2	0.95		0.94	
Number Obs	1011		1011	

[a] The t-ratios are in parentheses.
[b] Select and yield grade 3 carcasses receive no premium/discount and are omitted.
* indicates statistically different from zero at the 0.01 level.

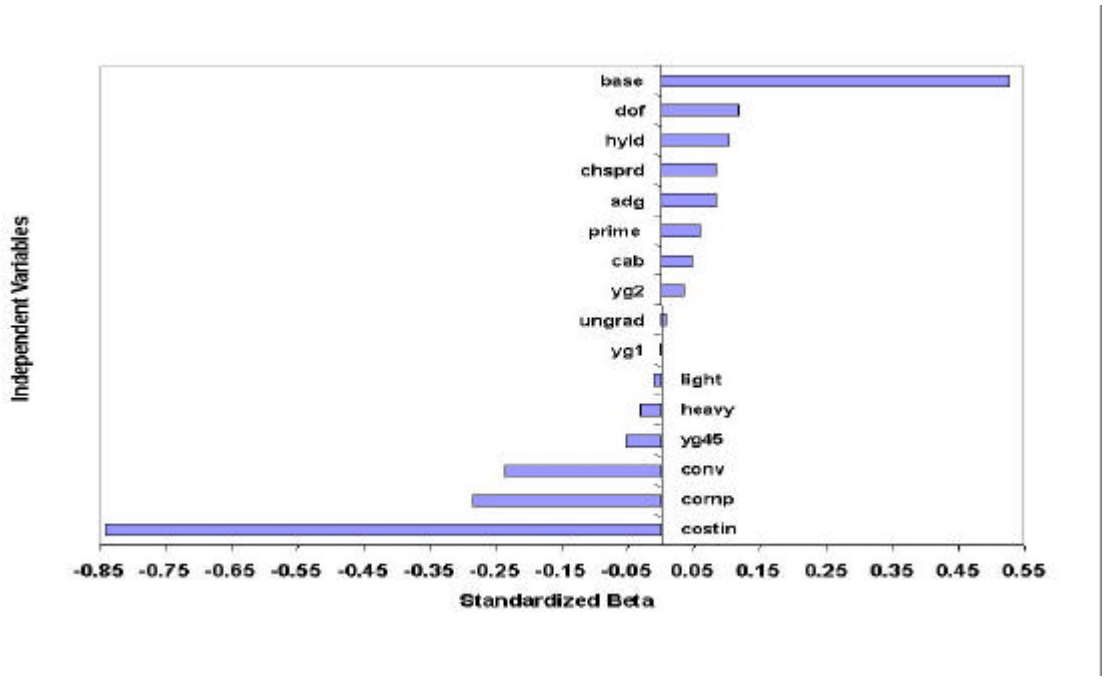

Figure 3. Standardized Beta Coefficients for Variables in Equation 3.

The main reason these results contrast is that the results presented here are over time whereas, FFW's results are essentially cross sectional. Considering just the cross sectional types of factors from our models (i.e., ignoring feeder price, corn price, and base price) suggests the grid factors together, summing the absolute values of the standardized regression coefficients, are the most important profit determinants with the sum of the absolute values of the SC's of 0.33 compared to the next most important factor, feed conversion (SC= -0.24).

A couple of limitations should be noted regarding this study. First, only one particular alliance was evaluated. Different alliances with different price grids or costs of association could result in different relative rankings of profit determinants. Second, these results are from cattle marketed over less than a two-year period (the life of this alliance) and thus, represent a limited time frame. Over different weather patterns,

production cost factors could be more important profit variability determinants. Likewise, during times with different levels of market price variability, prices and/or grid pricing components could have varied impacts on profit.

Conclusion

Results of this study have several important implications for cattle producers marketing cattle under grid pricing systems. Cattle feeding profit was negative on average and exhibited extreme variability suggesting that the need for strategies to enhance profit and manage profit risk are essential. Over time, the feeder cattle price paid and the dressed carcass price received have at least twice the importance of production factors on profit variability. This suggests that the intense management of these price factors offers the largest opportunity for profit risk management.

Ignoring the factors that are most time variant and considering those with the most cross sectional variability, when selling on a grid, the cumulative quality of cattle in a pen are the most important profit determinant followed by feed efficiency. Profit incentives to jointly manage quality grades, yield grades, and carcass weights are economically significant when marketing cattle on a grid pricing system.

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