Producer Signals and Incentives with Grid Pricing

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Previous OSU extension fact sheets address several aspects of grid pricing, from basic mechanics to more complex relationships. A grid pricing calculator is also available at http://osuextra.okstate.edu/dept/econ/mktingoutlook.shtml for use in learning more about grid pricing and how net prices are affected by the premium-discount grids and carcass characteristics.

This extension facts reports on research conducted with four separate sets of cattle totaling 18,267 head that were fed in Oklahoma, Kansas, Nebraska, and Iowa (Johnson and Ward 2004a, 2004b). The research focused on market signals sent to producers who use both the price grids and incentives to improve cattle quality and to manage and market fed cattle.

Base Price and Grid Premiums-Discounts Used

To study market signals sent from grids across cattle groups requires selecting a representative base price and set of carcass premiums and discounts. For most of the analysis, the base price and premiums-discounts remain constant across cattle groups. Thus, any representative base price can be used and for this study, the base price chosen was $96.08/cwt. This price was the boxed beef cutout value for the week ending December 26, 1998.

Similarly, representative grid premiums and discounts must be chosen. For this study, the premium-discount grid used average premiums and discounts for carcass characteristics over the period October 1996 to December 1998 as reported in the national Weekly Direct Slaughter Cattle Premiums and Discounts report at http://www.ams.usda.gov/lsmnpubs/CSDN.htm from AMS-USDA. Premiums and discounts (in $/cwt.) were: Quality grades – Prime 5.69; Choice 0.00; Select -6.92; Standard -17.05; Yield Grades – YG1 1.72; YG2 0.89; YG3 0.00; YG4 -13.70; YG5 -19.20. Later, premiums and discounts were modified to determine how sensitive the initial market signals were to alternative grids.

Summary of Cattle Characteristics

The four fed cattle data sets varied widely. Table 1 shows several live animal and carcass characteristics as well as the grid pricing values for each complete data set as well as the top and bottom quartile of cattle for each data set. Quartiles were based on the calculated grid value for each animal in each set of data.

Data for each of the fed cattle groups had been used for previous grid pricing research. Fed cattle in the Iowa data set came from a producer group affiliated with the Iowa State University Cooperative Extension Service (Forristall, May, and Lawrence). Fed cattle for the Kansas data set were fed in a commercial cattle operation and the cattle data were used in a Kansas State University study (Schroeder and Graff). The Nebraska cattle were fed in a commercial feedlot and slaughtered as part of a University of Nebraska study (Cooper et al.). Fed cattle in the Oklahoma data set were fed in a commercial feedlot and were part of a study at Oklahoma State University (Greer, Trapp, and Ward).

A few carcass characteristics are highlighted here for the four fed cattle groups:

- Lightest cattle (1156 lbs.), Iowa; Heaviest cattle (1255 lbs.), Kansas
- Choice and above – Highest quality grade cattle (66.1%), Kansas; Lowest quality grade cattle (51.2%), Oklahoma
- Yield Grades 1-2 – Highest yielding cattle (74.5%), Iowa; Lowest yielding cattle (50.7%), Kansas
- Standard quality grade, yield grade 5, heavy carcasses – Most heavily discounted cattle (9.2%), Kansas; Least heavily discounted cattle (2.7%), Nebraska.

Grid values were calculated for all cattle. A few highlights are noted for the grid values and premiums-discounts for the four fed cattle groups:

- Highest value group ($737/hd), Kansas; Lowest value group ($660/hd), Iowa
- Least quality grade discounts (-$2.86/cwt), Kansas; Most quality grade discounts (-$3.66/cwt), Oklahoma
- Most yield grade premiums ($1.01/cwt), Oklahoma; Least yield grade premiums ($0.05/cwt), Nebraska.

Grid Pricing Signals Across Fed Cattle Groups

A statistical procedure was chosen to determine the amount of variation in value explained by various grid pricing components. Thus, coefficients of separate determination

(CSD) were calculated and will be referred to here. Specifically, this procedure determines how much of grid value is attributable to weight and how much to the grid pricing components (quality grade premiums and discounts, yield grade premiums and discounts, and light/heavy carcass weight discounts). Results are summarized in Table 2.

For comparison purposes, recall that weight explains virtually all (100%) of the variation in value for live weight and dressed weight pricing. All cattle in a sale lot are priced the same so they have the same value (average weight times average price). However, we can presume the effect of weight will be reduced under grid pricing because each carcass is priced individually based on carcass characteristics. In fact, that occurred. For the four fed cattle groups, weight explained 61% (Kansas) to 71% (Nebraska) of the grid value of the cattle. Thus, grid components accounted for the remaining 29-39%. While weight continued to be most important, the components of grid pricing are strong compared with live weight and dressed weight pricing where they account for virtually none of fed cattle value.

Among the components of grid pricing, quality grade accounted for 10% (Oklahoma) to 25% (Iowa). Yield grade accounted for 1% (Iowa) to 14% (Oklahoma). And light/heavy carcasses accounted for 3% (Nebraska) to 10% (Kansas and Oklahoma).

Note that this procedure essentially found a positive relationship between the percentage of carcass characteristics that are discounted and the relative importance of grid pricing signals. For example, the Nebraska cattle had the fewest, heavily discounted cattle (Standard quality grade, yield grade 5, heavy carcasses) and the highest percentage of variation in value explained by weight. Conversely, grid pricing components were less important in the absence of carcasses with heavily discounted attributes. For example, at the other extreme, the Kansas cattle had the most heavily discounted cattle and the lowest percentage of value explained by weight. Grid pricing components were more important when the percentage of cattle that were heavily discounted was highest.

This observed relationship indicates the influence of heavily discounted cattle on the beef industry. The finding leads to two implications for the industry. One is for producers to raise and purchase high quality cattle. Quality refers to cattle that will not be heavily discounted by packers. While this may seem intuitive, until grid pricing increased in prevalence, there was not much incentive to focus on avoiding the low end of cattle quality.

Second, and similarly, is for the industry to feed and time marketing of fed cattle to avoid having heavily discounted cattle. Again, until grid pricing, these signals were virtually nonexistent. Grids send strong signals and incentives to improve quality and market timing by eliminating heavily discounted carcasses. Ironically when that occurs, weight becomes increasingly important in determining overall grid value. Conversely, weight is less important and the grid components more important when fed cattle have a higher percentage of heavily discounted carcasses.

Many grids exist in the industry. Thus, further analysis was conducted to determine the impacts from having larger discounts and premiums. Larger discounts were found to increase the importance of the grid pricing component and reduce the importance of weight. Increasing the initial Select and Standard discounts by two standard deviations from the average caused grid pricing signals to increase for all four sets of cattle. Increasing yield grade 4 and yield grade 5 discounts by similar amounts increased slightly the importance of grid pricing signals. Thus, the primary driver in grid pricing, as found in previous studies, is the discount for lower quality grades, both Select and Standard.

Increasing premiums for Prime and yield grades 1 and 2 did not affect grid pricing signals appreciably. Thus, this study also indicated what others have found, that discounts send stronger signals than premiums. This is contrary to what producers would hope to see. One argument is that the emphasis is on ridding the industry of lower valued products, while raising on average the quality of remaining products. In conjunction with the stronger signals sent by discounts to reduce or eliminate cattle that will be heavily discounted, premiums provide an incentive to increase quality. Overall, grid pricing signals cattle feeders and producers to increase quality through improved genetics as well as feeding and marketing practices.

Grid Pricing Signals for the Top and Bottom Quartile Groups

The value of cattle within each of the four fed cattle groups varied widely. Even average grid values (per head) between the top and bottom quartile groups was large, ranging from $578-740 for the Iowa cattle; $627-833 for Kansas; $628-809 for Nebraska; and $597-805 for Oklahoma (Table 1). Thus, the top to bottom ranges were $162/hd for the Iowa cattle, $206 for Kansas, $181 for Nebraska, and $208 for Oklahoma. Values for the best and poorest cattle in each group or each pen of cattle would be much wider yet. However, if you assume the lowest quartile cattle represented the breakeven value, then profit gains for the upper quartile cattle were $162-208/hd higher.

The procedure used showed even more clearly that grid pricing signals are strongest for the poorest cattle, those which have a higher percentage of heavily discounted carcass attributes (Standard, yield grade 5, and heavy carcasses). Weight is the larger determinant of value for the upper quartile cattle in all cases, ranging from 76-93% (Table 2), while the grid signals accounted for just 7-24%. However, the reverse was found for the lower quartile in each fed cattle group. There, weight accounted for 23-65% of the market signal and grid signals accounted for 35-77%. Again, grid pricing sends strong signals to not produce and market lower quality cattle.

Quality grade was the more important component of grid pricing in six of the eight quartile groups. Yield grade was more important than quality grade for the bottom quartile groups of the Nebraska and Oklahoma cattle. Weight discounts were quite important also for the bottom quartile of the Kansas and Oklahoma cattle.

Grid Pricing Incentives to Improve Cattle Quality

Grid pricing signals are harsh for lower quality cattle. Research with the four sets of cattle data show that grids

Table 1. Summary of carcass characteristics for four groups of fed cattle.

Cattle or Carcass Characteristics	Cattle Group and Quartile											
	Iowa			Kansas			Nebraska			Oklahoma		
	Top Quartile	All Cattle	Bottom Quartile	Top Quartile	All Cattle	Bottom Quartile	Top Quartile	All Cattle	Bottom Quartile	Top Quartile	All Cattle	Bottom Quartile
Average live weight (lbs.)	1,251	1,156	1,071	1,358	1,255	1,127	1,344	1,234	1,122	1,311	1,200	1,085
Average dressed weight (lbs.)	774	705	640	865	799	715	847	778	707	856	779	698
Quality grade percentage												
Prime	3.8	1.0	0.0	2.5	1.6	0.5	1.5	1.4	0.6	0.6	0.7	0.3
Choice	78.9	60.8	33.7	91.7	64.5	47.5	82.5	53.9	28.7	72.9	50.5	30.5
Select	17.3	34.4	53.5	6.2	28.0	32.5	17.0	42.4	62.8	26.5	45.6	58.8
Standard	0.0	3.8	12.8	0.0	5.9	19.5	0.0	2.3	7.9	0.0	3.2	10.4
Yield grade percentage												
YG 1	10.0	13.3	19.8	12.9	17.6	22.4	14.3	18.1	22.6	8.1	13.0	18.9
YG 2	57.1	61.2	64.9	34.2	33.1	32.6	41.5	42.5	42.9	42.4	42.3	44.0
YG 3	32.9	24.7	13.2	52.9	43.7	45.0	44.0	34.7	21.9	46.7	33.3	14.8
YG 4	0.0	0.8	2.1	0.0	5.1	12.4	0.2	4.5	11.8	2.8	10.6	20.1
YG 5	0.0	0.0	0.0	0.0	0.5	1.4	0.0	0.2	0.8	0.0	0.8	2.2
Weight percentage												
Light (<550 lbs.)	0.0	0.5	2.1	0.0	0.2	0.8	0.0	0.2	0.9	0.0	0.6	2.5
Par or base	100.0	99.5	97.9	100.0	97.0	95.7	100.0	99.6	98.5	99.1	96.5	93.4
Heavy (>950 lbs.)	0.0	0.0	0.0	0.0	2.8	3.5	0.0	0.2	0.6	0.9	2.9	4.1
Number of head	289	1,147	288	2,890	11,502	2,879	1,079	4,340	1,082	321	1,278	318
Average grid value ($/cwt.)	740	660	578	833	737	627	809	721	628	805	705	597
Average quality premium (discount) ($/cwt.)	(0.98)	(2.98)	(5.89)	(0.29)	(2.86)	(1.09)	(1.09)	(3.25)	(5.67)	(1.80)	(3.66)	(5.82)
Average yield premium (discount) ($/cwt.)	0.68	0.67	0.63	0.53	0.20	(1.29)	0.59	0.05	(1.01)	0.13	1.01	(2.46)

Table 2. Price signal summary for four groups of fed cattle.

Cattle or Carcass Characteristics	Percentage Variation in Grid Value Cattle Group and Quartile											
	Iowa			Kansas			Nebraska			Oklahoma		
	Top Quartile	All Cattle	Bottom Quartile	Top Quartile	All Cattle	Bottom Quartile	Top Quartile	All Cattle	Bottom Quartile	Top Quartile	All Cattle	Bottom Quartile
Weight	93	70	43	92	61	23	81	71	65	76	66	51
Grid Price	7	30	57	8	39	77	19	29	35	24	34	49
Quality grade	7	25	41	8	19	35	19	17	13	12	10	9
Yield grade	0	1	3	0	10	24	0	9	16	7	14	23
Light/heavy carcasses	0	4	13	0	10	18	0	3	6	5	10	17

send stronger signals than weight for the poorer quality cattle. So what is the economic incentive to improve cattle quality or to improve the timing of marketing fed cattle?

Removing the influence for weight from the value differences between upper and lower quartile groups, leaves the incentive for improving cattle quality. The incentive ranges from $35-72/hd across the four sets of fed cattle. For each set of fed cattle, the incentive ranged from $35-54/hd for the Iowa cattle, $63-68 for Kansas, $47-48 for Nebraska, and $57-72 for Oklahoma.

In a short-run sense, it appears feeders can increase the value of lower quartile cattle by feeding them longer and to heavier weight. However, this also occurs at some additional cost and the lower end of the cattle may be the most inefficient and costly to feed.

Also in a short-run sense, many of these cattle would not be sold on a grid because their live weight value might be higher. Pricing cattle in the manner that returns the most money certainly is a logical, economical decision for cattle owners. However, when that occurs, the strong grid pricing signals are not seen and the longer run market signal to improve overall cattle quality in the industry is not evident. This research showed clearly there are large value differences between upper quartile and bottom quartile cattle when their carcass attributes are considered in the pricing equation.

The need to reduce the proportion of cattle that are discounted heavily is the primary implication of this market signals research. Reducing the number of these cattle can occur both through genetic improvement and management. Management might involve improved health management, less aggressive implant strategies, improved market timing, and other factors that influence carcass traits and values.

Conclusions and Implications

Research findings were consistent with previous research on several points.

- Values of cattle marketed with a grid vary widely across qualities of cattle.
- Grid price signals are driven more by discounts than premiums.
- Grid price signals are strongest for groups of cattle that have a higher proportion of cattle that are discounted heavily (Standard, yield grade 5, heavy carcasses).
- Grid price signals provide a substantial incentive to reduce the proportion of cattle that are discounted heavily.

Cattle feeders constantly face the challenge of feeding and marketing both better quality and poorer quality cattle. The decision to price both the upper and lower end of the cattle quality spectrum on a live weight, dressed weight, or grid is not easy and depends in part on market conditions. One seemingly economical solution for some cattle feeders is to market poorer cattle on a live weight basis. This decision is supported by research reported here. While this is a logical, short run solution, it has implications for the broader market. First, it does not send the same strong signal not to continue producing these poorer quality cattle. Second, the poorer cattle marketed on a live weight basis form the set of cattle that comprise the base price (either market reported price or packer cost) for most formula-traded cattle. This is sometimes referred to as a lemons problem, where better quality cattle are being priced on the basis of poorer quality cattle.

Use of grid pricing has increased sharply. We are still learning and understanding all the implications of this trend for the future of the beef industry. However, this research strongly suggests a continued emphasis needs to be placed on improving cattle quality.

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