

Managing for Today's Cattle Market and Beyond

March 2002

Grid Pricing: Risk, Value of Information, and Management Implications

By

Clement E. Ward, Oklahoma State University

Ted C. Schroeder, Kansas State University

Dillon M. Feuz, University of Nebraska

The previous two fact sheets (Understanding Grid Pricing; and Grid Base Prices and Premiums-Discounts Over Time) introduced grid pricing and identified how some terms of trade change when using alternative fed cattle pricing methods. This fact sheet focuses on the increased risk and the many sources of risk with grid pricing. Results from research on estimating the value of carcass information and potential improvement in pricing accuracy with grid pricing are reviewed. Lastly, management implications are discussed for producers choosing to price fed cattle with grid systems.

Increased Risk with Grid Pricing

A move toward value-based pricing, or carcass merit pricing, is essential if the beef industry is going to send proper economic signals to producers. Grid pricing is one way cattle producers will be adequately rewarded for producing high quality beef and properly discounted for producing low quality beef.

At the same time, producers need to understand that the potential for higher prices compared with pricing on averages also entails more risk. For example, with live weight pricing, packers bear the risk that actual carcass characteristics for cattle

purchased will equal or exceed estimated carcass characteristics by buyers in the price discovery process. With dressed weight pricing, a step closer to value-based pricing, packers continue to bear the risk of some carcass characteristics (for example, quality grade, yield grade, "out" or non-specification carcasses). However, producers now bear the risk of dressing percentage. Packer buyers do not have to worry about carcass weight risk because they pay on the basis of the known carcass weight, not an estimated weight.

Grid pricing introduces a marked change for producers. Producers now bear the risk for all carcass characteristics. Producers are paid on the basis of what is brought to slaughter. Premiums are paid for better quality cattle and poorer quality cattle are discounted.

In economics, typically one can expect a risk and return tradeoff. Whoever accepts the most risk also has the opportunity to receive the greatest return. This concept applies to fed cattle pricing alternatives. Feuz, Fausti, and Wagner confirmed work conducted three decades ago. As pricing methods move closer to true value-based pricing, that is, from live weight, to carcass weight, to grid pricing (a refinement of grade and yield selling), prices also increased. Producer risks increased but so did their returns.

Sources and Extent of Risk

Higher prices with grid pricing do not always result since prices depend importantly on cattle quality. The Ward, Feuz, and Schroeder study contained three component pieces of work. Feuz estimated live weight, dressed weight, and two grid prices for 5,520 fed cattle (85 sale lots) marketed from one feedlot over a year-long period. He estimated prices for three points in time. The average of estimated prices (all converted to a live weight price) was highest in all cases for the two grid pricing methods (\$68.61 and \$68.54/cwt.), followed by the dressed weight basis (\$68.07/cwt.), and followed lastly by the live weight basis (\$67.60/cwt.). Average grid prices were highest for these cattle because there were relatively few carcasses which received discounts in the two grids.

Schroeder and Graff also compared estimated live weight, dressed weight, and grid prices for 11,703 fed cattle (71 sale lots) marketed from one feedlot over a one-year period. Because a higher percentage of carcasses received discounts, the average of estimated prices (all converted to a live weight price) was highest for selling on a dressed weight basis (\$67.16/cwt.), followed by grid prices (\$66.90/cwt.), followed lastly by the live weight method (\$65.60/cwt.). The variation (standard deviation) of prices was nearly twice as high for grid pricing (\$3.91/cwt.) as for the other two methods; dressed weight pricing (\$1.84/cwt.) and live weight pricing (\$1.78/cwt.).

In the third component, Ward and Lee estimated live weight and dressed weight prices and seven grid prices for 19,426 cattle slaughtered in four plants on the same day. The variation (standard deviation) of prices across slaughter plants and pricing methods was highest for grid prices, ranging from \$3.32 to \$5.39/cwt. across the four plants and compared with \$0.48/cwt. for dressed weight prices and \$0.69/cwt. for live weight prices.

In summary, while producers can expect *on average* higher prices with grid pricing compared with dressed weight and live weight prices, *higher prices will not occur for poorer quality cattle with grid pricing*. Producers also need to recognize that the variation in grid prices is much higher than with either dressed weight or live weight pricing. Over time and across a wide range of cattle qualities, the higher risk and greater return tradeoff will likely occur.

Price variability increases with grid pricing. However, increased price variability is essential if the industry expects to improve pricing accuracy and send the correct economic signals from the wholesale level to producers. The industry needs to move away from “pricing on the average.” In doing so, price variability will accordingly increase. Price variability can arise from several sources.

In the Schroeder and Graff study of 11,703 head of cattle (71 pens) sold over a year-long period, over 50% of the cattle received a price in a \$2/cwt. range when sold on a live weight basis. On a dressed weight basis, just under 50% received a price in a similar \$2/cwt. range. However, when sold on a packer grid, just over 50% of the cattle received a price in a \$6/cwt. range. They found that the largest percentage impact on grid price variability was the Choice-to-Select price difference for wholesale boxed beef. Thus, over time, the Choice-Select price spread can be an important source of variation with grid pricing. The next most important factor was the variation in quality grade of cattle sold. When assessing factors affecting revenue per head, weight variability was most important, followed by the Choice-Select price spread.

Producers need to be aware of the changes in premiums and discounts over time when pricing cattle with premium-discount grids. Historical premiums and discounts were discussed in the previous fact sheet (Grid Base Prices and Premiums-Discounts Over Time).

For a given point in time, such as a single day, there can be several sources of price variation with grid pricing. In the Ward and Lee study of 19,426 cattle (140 sale lots) slaughtered on the same day in four plants, plant average base prices were calculated. The estimated plant average base price for Choice, Yield Grade 3 cattle ranged from \$112.91 to \$110.74/dressed cwt., a variation of \$2.17/cwt. or over \$16/head. Thus, cattle feeders may experience a significant difference in the base price when that base price is tied to a plant average cost of cattle. The plant average base price depends on the quality of a given pen of cattle relative to the quality of cattle slaughtered *in that plant* for the period in which the plant average is calculated, usually the preceding week or a three to four week

moving average.

When the base price is a formal price tied to a reported market price or price quote, the base price may also vary significantly. For the week chosen in the Ward and Lee study, the base price varied over \$2/cwt or over \$15/head. These variations in the base price occur *before* considering any variation from the premium-discount grids and variation in cattle quality.

Prices can vary substantially when selling the same pens of cattle on several packer grids. Table 1

shows mean prices associated with each of seven grids with a single base price for the 140 pens of cattle across the four plants. Average grid prices varied across the seven grids by \$2.38/cwt. for the Northern Plains 1 plant, \$2.35 for the Northern Plains 2 plant, \$2.92 for the Southern Plains 1 plant, and \$2.61 for the Southern Plains 2 plant. Thus, the variation from different grids exceeded the variation from the base price. However, together, the variation could exceed \$5/cwt on a dressed weight basis or over \$38/head.

Table 1. Average Estimated Prices for Seven Grids with One Base Price (in \$/dressed cwt.)

Price	Plant				Total
	Northern Plains 1	Northern Plains 2	Southern Plains 1	Southern Plains 2	
<i>Observations</i>	52	22	25	41	140
Grid One	100.68	101.56	98.16	99.14	99.92
Grid Two	100.29	102.19	96.43	98.57	99.40
Grid Three	99.22	100.18	96.22	97.52	98.34
Grid Four	101.60	102.53	99.08	99.93	100.81
Grid Five	100.56	101.87	97.80	99.10	99.85
Grid Six	100.92	101.93	98.21	99.48	100.17
Grid Seven	101.34	102.08	99.14	100.13	100.71

The variation in average prices across plants within a single grid also varied, ranging from \$2.94/dressed cwt. for grid 7 to \$5.76/cwt. for grid 2 or a range of \$22 to \$45/head. Quality of cattle slaughtered varies from plant to plant which, when combined with alternative premium-discount grids, results in substantial variation. Quality variation across plants is one reason the authors do not recommend using plant average base prices with premium-discount grids.

Reporting average prices across plants and across grids, not the full range of estimated prices (maximum less minimum price), understates the true variation that can be encountered with grid pricing. Recall that this variation may not necessarily signify a problem. However, it is emphasized because anyone using grid pricing needs to be aware of the variation which can be experienced.

Ward and Lee summarized the variation from pricing each sale lot (the same cattle on the same day) with seven premium-discount grids and using a single base price. Their results paralleled those by Schroeder and Graff. The price range for over half the sale lots (55.7%) ranged from \$2 to \$3.99/dressed cwt. or \$15 to \$31/head. Several sale

lots (22%) had prices ranging above \$4/cwt. or over \$31/head. Thus, marketing a given sale lot of cattle on any given day can result in wide differences in prices due to the premium-discount grid used *and* cattle quality.

Research showed carcass characteristics typically receiving premiums contributed far less to variation in the price level and to variability (standard deviation) across grids than did the carcass characteristics that are discounted. The contribution to average grid prices from positive carcass characteristics (Prime quality grade and yield grades 1 and 2) was \$0.02/dressed cwt., while the negative contribution from carcass characteristics that are discounted was \$0.19/cwt. Discounted characteristics also contributed significantly to variability, while characteristics that receive premiums did not.

Value of Information and Pricing Error

To determine the value of information on cattle quality attributes to the cattle feeder, each carcass in the Schroeder and Graff study was priced using the method that resulted in the highest price among the

three methods (live weight, dressed weight, and one grid). Selling all carcasses using the pricing method having the highest price increased total revenue by \$34.74/head relative to simply selling all cattle using live weight pricing. The highest pricing method increased total revenue by \$15.14/head compared to selling all cattle on a dressed weight basis and \$18.67/head compared with selling all cattle on the grid. Thus, there is a considerable economic incentive to have a better understanding of cattle quality, as well as to properly market cattle by the specific method that returns the highest price. This represents short-term value of information. The long-term value is influenced by management changes that are made in response to the information.

To determine the value of pricing cattle on a grid instead of live weight or dressed weight pricing, the differences in revenue received for the carcasses by pricing method were compared. Schroeder and Graff assumed the grid price for each carcass was an efficient price in the sense that it fully reflected the market value of each carcass. Then, any carcass that sold for a higher price brought more than the efficient price and any carcass sold for a lower price brought less than the efficient price. Essentially, this is what many have argued is the case of poorer quality cattle being subsidized by higher quality cattle. That amounts to a welfare transfer from owners of higher quality cattle to owners of lower quality cattle when cattle are sold on a live or dressed weight basis with little price differentiation for quality differences. To determine the amount that cattle were “over-priced” or “under-priced” relative to the assumed efficient grid price, the difference in revenue from selling the cattle on the grid relative to live or dressed weight was computed.

For the 11,703 cattle in this study, Schroeder and Graff presented the amounts of “over-pricing” or “under-pricing” that would have been present had the cattle been sold by live weight or dressed weight instead of on a grid. For 3,650 of the cattle, the grid price was less than the live weight price by an average of \$2.90/cwt. or \$36.80/head. This means that if these cattle were sold on a live weight basis, they would have received \$36.80/head *more* than they were actually worth (assuming the grid price is the efficient value). For the remaining 8,053 head, the grid price exceeded the live weight price and if these cattle were sold live instead of on the grid they would have received \$40.04/head *less* than they

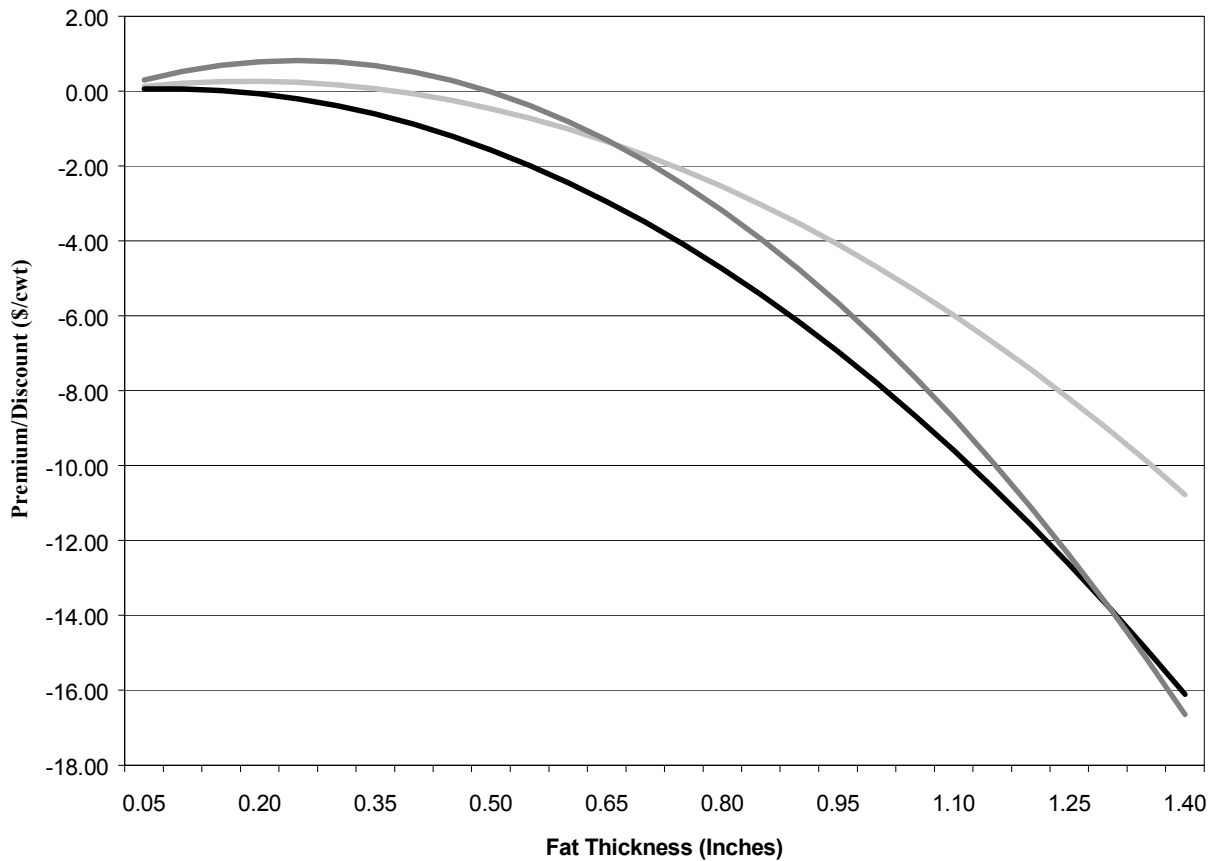
were worth. Similar magnitudes of pricing errors are present for dressed pricing relative to grid pricing. The primary conclusion is that if these cattle were sold via live or dressed weight pricing, assuming the grid pricing system is the most efficient in terms of sending appropriate pricing signals, this would have resulted in typical “pricing errors” (positive or negative) of \$30/head or more.

Management of cattle can help deal with some of the variability associated with selected grid premiums and discounts. For example, close sorting of cattle can reduce the incidence of heavy-weight and light-weight discounts and, to some extent, careful handling may help to reduce incidence of dark cutters. Perhaps adoption of ultrasound or other imaging technology at the feedlot can improve management of yield grades by helping signal when to market cattle to reduce the incidence of Yield Grade 4s and 5s. Longer run genetic management may help target higher quality grades of beef, thus reducing risk associated with varying Select and Standard discounts. Since a few heavily-discounted carcasses can offset many carcasses receiving premiums, any efforts to eliminate the discounted carcasses will likely have a high return for the cost incurred.

Feuz examined the relationship between individual animal carcass characteristics price premiums and discounts from selling on three grids. Marbling and fat thickness were important to explaining premiums and discounts for individual carcasses. However, rib eye area was not significant for two of the three grids. Marbling had a positive effect but varied for each grid. The premium associated with marbling reached a maximum when there was sufficient marbling to change from the mid-Choice to high-Choice grade. Differences among the grids were also found for fat thickness. The premiums/discounts associated with varying fat thickness for each of the three grids is shown in Figure 1. Back fat is discounted at thicknesses above 0.38, 0.17, and 0.50 inches for grids A, B, and C, respectively.

These results suggest knowledge of each grid is important and how to manage cattle marketings to receive the highest premiums. Also, depending on how base prices are calculated in a grid system (especially plant average base prices), the Choice-Select price spread may have a different impact on the premiums/discounts for each grid.

Figure 1. Premium/Discount Associated with Various Levels of Fat Thickness for Three Different Grids.



Conclusions and Implications

Several conclusions and implications can be drawn from recent grid pricing research.

Grid pricing resulted in more than twice the variability in price received per cwt. (live weight basis) across carcasses compared with live and dressed weight pricing. This indicates that grid pricing is more discriminating in terms of pricing signals conveyed to producers.

Cattle with low dressing percentage and low quality grade tended to receive a higher price when sold on a live basis. Cattle with low quality but high dressing percentage tended to receive the highest price when sold on a dressed weight basis. Grid pricing resulted in the highest price for high quality grade, better yield grade, and not excessively heavy or light carcasses. Only about half of the cattle evaluated would have received the highest price by selling them using a grid. This is not an indictment against grid pricing, rather it is a reinforcement that grid pricing leads to more price dispersion associated with cattle quality than do live or dressed weight pricing.

If cattle could have been sorted and sold to the option offering the highest price, approximately \$15/head more could have been made relative to selling the cattle using the next highest price method (dressed weight). About \$18/head more could have been made compared with selling all on a grid, and \$35/head more than marketing all under live weight pricing. This indicates substantial value of information for producers who understand the kind of cattle they market and target the cattle to the best pricing opportunity. However, over time if producers target cattle accordingly, the live and dressed weight markets will represent predominantly lower-quality cattle and grids will be used to price higher quality cattle. If enough producers adopt such a marketing strategy, live and dressed weight prices could decline relative to grid pricing opportunities, or beef packers would be over-paying for live and dressed weight cattle. This could result in the live and dressed weight markets having less advantage than they do currently relative to grid pricing, even for lower-quality cattle.

If grid pricing is efficient at sending appropriate price signals, large pricing errors exist in

both under-pricing and over-pricing carcasses on live and dressed weight selling methods compared with grid pricing. High-quality cattle subsidized low-quality cattle by an average of more than \$30/head. This quantifies how poorly average live weight or average dressed weight pricing conveys accurate price signals to cattle feeders. Cattle feeders that want to get paid for the quality of cattle they produce will only realize this value if the cattle are sold using grid pricing methods rather than live or dressed weight average pricing methods.

It is likely that pricing efficiency improves with grid pricing and production efficiency may also improve if producers can identify the type of cattle they are producing and sell them on a grid that rewards that type of cattle. However, there are often additional costs to selling on a grid, and producers may have more costs in sorting cattle to “fit” a grid. Producers must therefore analyze added costs as well as added benefits in deciding what strategy fits their operation.

The Choice-to-Select boxed beef wholesale cutout price spread had the most impact on variability of price per hundredweight for carcasses sold on a grid followed by variability in quality grade of carcasses in a pen. Carcass weight variability followed by the Choice-to-Select price spread had the largest influence on variability of revenue per head. Yield grade variability did not have a statistically significant impact on price or revenue variability. This shows the importance of the Choice-to-Select price spread and quality grade on grid price variability. Producers trying to manage the increased price risk associated with grid pricing will find the most benefit from managing cattle quality grade, carcass weights, and monitoring the Choice-to-Select price spread.

Several sources of variation exist in grid pricing. Base prices can vary \$2/dressed cwt., or \$15/head, whether using plant averages or formulas tied to reported cash-market prices. Prices across grids can add another \$2-4/cwt. of variation, another \$15 to \$30/head. In addition, variation in carcass characteristics contributes significantly to the variation in grid pricing, especially discounted characteristics such as Select and Standard carcasses, Yield Grade 4-5 carcasses, light and heavy carcasses, and non-conforming or “out” carcasses. Relatively large numbers of carcasses with discounted characteristics alone can double the amount of variation arising from grid pricing.

Grid pricing is a step towards value-based pricing when used correctly. Cattlemen can learn much about the cattle they market with grid pricing and can then use the information to make management and genetic improvements. However, simply trying to match a given sale lot of cattle to the best grid, while potentially beneficial from a short-run price, revenue, and profit perspective, is not moving the industry to value-based marketing. Only when genetic and management changes result from grid pricing information can long-term value-based marketing be achieved.

References

Feuz, D.M. “Economic Implications of Show List, Pen Level, and Individual Animal Pricing of Fed Cattle.” in Ward, C.E., D.M. Feuz, and T.C. Schroeder. *Formula Pricing and Grid Pricing Fed Cattle: Implications for Price Discovery and Variability*. Blacksburg, VA: Research Institute on Livestock Pricing, Research Bulletin 1-99, January 1999.

Feuz, D.M., S.W. Fausti and J.J. Wagner. “An Empirical Analysis of the Efficiency of Four Alternative Marketing Methods for Slaughter Cattle.” *Agribusiness: An International Journal*. 9(1993) 5:453-463

Schroeder, T.C. and J.L. Graff. “Comparing Live Weight, Dressed Weight, and Grid Pricing: Assessing the Value of Cattle Quality Information.” in Ward, C.E., D.M. Feuz, and T.C. Schroeder. *Formula Pricing and Grid Pricing Fed Cattle: Implications for Price Discovery and Variability*. Blacksburg, VA: Research Institute on Livestock Pricing, Research Bulletin 1-99, January 1999.

Ward, C.E., D.M. Feuz, and T.C. Schroeder. *Formula Pricing and Grid Pricing Fed: Implications for Price Discovery and Variability*. Blacksburg, VA: Research Institute on Livestock Pricing, Research Bulletin 1-99, January 1999.

Ward, C.E. and J.-I. Lee. “Short-Term Variability in Grid Prices for Fed Cattle.” in Ward, C.E., D.M. Feuz, and T.C. Schroeder. *Formula Pricing and Grid Pricing Fed Cattle: Implications for Price Discovery and Variability*. Blacksburg, VA: Research Institute on Livestock Pricing, Research Bulletin 1-99, January 1999.