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Does the Producer Have an Incentive to Sell Fed Cattle on a Grid?

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ABSTRACT

Barriers to the adoption of grid pricing by fed cattle producers are investigated over a 206-week period (Jan. 1997 to Dec. 2000). The empirical findings document: 1) when fed cattle are evaluated on a grid pricing system versus a dressed weight pricing system, a price differential per cwt. and a per-head revenue differential exists over time, 2) the price differential per cwt. is subject to seasonal variation which contributes to inconsistent price signals transmitted to producers concerning the market value of carcass characteristics over time; 3) grid revenue per-head variability is consistently higher than dressed weight revenue per-head variability over time; and 4) while grid pricing has not been widely adopted by producers, overall carcass quality has trended higher in the region from which data was collected.

The marketing implications for decision makers are: 1) the incentive to market on a grid versus selling fed cattle dressed weight is lower in the spring relative to the fall; 2) marketing on a grid does reward producers selling high quality steers and the incentive to market higher quality cattle on a grid has been increasing over the 206-week period of the study; 3) grid discounts levied on lower quality cattle have been increasing over time; 4) grid pricing results in higher per-head revenue variability relative to selling fed cattle dressed-weight, indicating that while producers do receive premiums for selling fed cattle on a grid, it is also a riskier marketing option relative to average pricing; and 5) the four-year trend in packer premiums and discounts for above-average and below-average quality cattle, respectively, have been increasing. This trend indicates that packers are providing a price incentive to producers to encourage improvement in overall cattle quality.

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BACKGROUND

The decline in beef's comparative advantage in the domestic meat market relative to other domestic meat products and foreign imports began in the mid 1970s.[2] In 1990, the National Cattlemen's Beef Association (NCBA) released the Value Based Marketing Task Force final report. The task force recommended that the industry seriously consider developing and adopting a Value Based Marketing System (VBMS) for fed cattle to replace the traditional average pricing systems of live weight and dressed weight pricing by the pen. This VBMS strategy called for the development of a new cash marketing system (application of discounts and premiums beyond dressed weight and grade) that would encourage producers to raise leaner cattle that still would grade at least USDA low choice. The industry has responded to the recommendations of the taskforce by developing individual carcass pricing systems; commonly referred to as grid pricing systems. However, the published literature addressing the issues of price discovery in the slaughter cattle market and value-based marketing of slaughter cattle suggest that the widespread adoption of grid pricing as an alternative to average pricing (live or dressed weight) faces several hurdles: 1) Producers receive inconsistent price signals when they sell fed cattle on packer grid systems; and 2) grid pricing is a riskier marketing alternative than average pricing.[3]

On the issue of inconsistent price signals, Feuz (1999b) recently conducted a fed cattle marketing study on the relative economic efficiency of three grid pricing systems. Feuz presented evidence that those grid carcass quality price signals that were transmitted to producers varied: 1) across the three grids at specific points in time; and 2) over six different marketing dates within the individual price grids.[4] Feuz concluded, "Present grid pricing practices are sending different price signals to producers across grids, and some signals may vary over time."

The literature focusing on uncertainty over carcass quality in the market for slaughter cattle makes a strong case that varying degrees of incomplete information on carcass quality during the transaction process generate uncertainty over the quality of cattle marketed via the live and dressed weight alternatives (Ward 1987; Feuz et al. 1993; Fausti and Feuz 1995). This uncertainty, combined with risk averse behavior, creates price differentials and increases price variability between alternatives and sustains the demand by cattle producers for multiple pricing alternatives. Empirical evidence presented in the literature demonstrates that marketing fed cattle at an average price reduces per-head price variability relative to marketing fed cattle through a value based pricing system (Feuz et al. 1993; Feuz et al. 1995; Fausti et al. 1998). The literature concludes that selling fed cattle at an average price is preferred by risk averse producers over selling fed cattle on a value based marketing alternative.

Empirical verification of the persistence of these "barriers to adoption" over time has not been documented in the literature. However, resistence to the widespread adoption of a VBMS by producers

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[2] Purcell (1998) provides an excellent discussion on the economic causes and consequences associated with the decline in the demand for beef since 1975.

[3] See Fausti et al. (1998) for a review of this literature.

[4] Carcass quality characteristics included hot carcass weight, ribeye area, marbling, backfat thickness, etc.

throughout the 1990s has been documented.[5] Greater understanding of these "barriers to adoption" is needed. The possible permanence of these barriers and their consequences for the future health of the beef industry need to be recognized by industry stakeholders. The implications for the cattle industry if average pricing of slaughter cattle continues to dominate the fed cattle market into the future are: 1) inconsistent beef quality and dissatisfied consumers, 2) failure to reduce excess fat production, which is costing the industry billions of dollars; and 3) continuing pressure on beef's market share of total US meat sales resulting from overall improvement in meat quality and reduced production costs in the pork and poultry industries.

The intent of this study is to investigate if the "barriers to the adoption of grid pricing by fed cattle producers" alluded to in the literature are empirically verifiable over time. The general issues to be addressed are: 1) Does the marketing of slaughter cattle on a grid result in producers receiving inconsistent price signals over time, and 2) Over the four-year period of the study, has it been advantageous for producers to sell fed cattle on a grid relative to selling fed cattle at an average price. The incentive structure of a grid pricing system is the key to determining if the concern over "barriers to adoption" is justified.

Grid premiums and discounts levied upon a carcass, based on an individual carcass's quality characteristics, constitute any particular grid's incentive mechanism. Our empirical study relies on AMS publicly reporting weekly grid premium and discount information supplied voluntarily by the packing industry. The overall goal is to empirically identify characteristics and trends in the incentive structure of grid pricing over time. The first objective of the empirical analysis is to determine if the findings reported in the literature (Feuz et al. 1993; Feuz et al. 1995; Fausti and Feuz 1995) are persistent over time: 1) the existence of a carcass price per cwt. differential between grid pricing and dressed weight pricing, and 2) higher per-head revenue variability associated with fed cattle sold on a grid relative to the dressed weight alternative. The second objective is to determine if the grid pricing incentive mechanism, i.e., carcass quality price signals (premiums and discounts), has been inconsistent over time (Feuz 1999b). The third objective is to identify marketing implications for fed cattle producers who are considering selling their fed cattle on a grid.

DATA DESCRIPTION AND METHODOLOGY

Data Description

The empirical approach adopted for this study is an extension of that developed by Fausti et al. (1998). Two data sets containing carcass information on 1500 slaughter steers used in the Fausti et al. study are evaluated on a grid and on an average pricing system over time. Carcass quality premium and discount information collected from weekly grid price reports published by the USDA's Agricultural Marketing News Service (AMS) over a four-year period (Jan 1997 to Dec. 2000) is used in the study.

The analysis is based on weekly market data collected over a 206-week period combined with carcass data on a set of 2590 South Dakota slaughter steers. Weekly market data were collected from USDA-AMS reports. The carcass data were collected by the Animal and Range Science Department at South Dakota State University.

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[5] Ward et al. (1999) estimates that, at most, 20% of slaughter steers and heifers are marketed on a grid pricing system.

The Animal and Range Science Department at South Dakota State University (SDSU) conducted a Retained Ownership Demonstration Program (RODP) for steer calves during the first half of the 1990s (Wagner et al. 1991-95). During this period 2590 steer calves were entered into the program by 250 beef producers and raised to slaughter weight. Two data sets of 1500 randomly selected carcasses were constructed from the set of 2590 carcasses. The data selection procedure allowed for the possibility that a particular carcass could be included in both data sets. One set was designed to be 67% choice and 33% select (above-average data set). The other was 33% choice and 67% select (below-average data set).

The grid pricing system utilized here is three-dimensional (yield grade, quality grade, and dressed carcass weight) and was designed by the Agricultural Marketing Service (AMS) division of the USDA for the purpose of price reporting.[6] For each individual steer carcass, a grid carcass price was determined weekly by applying the reported premiums and discounts according to the carcass's yield grade, quality grade, and weight classification and then adding the individual carcass's premium or discount to the AMS grid's base price. See Fausti et al. (1998) for a detailed discussion of the AMS grid price reporting system. The result of this approach is that for each of the 1500 steers a grid price per cwt. and grid price per-head are calculated for each week and then the weekly average and standard deviation of these price variables for each pen are recorded and used to construct the above and below average quality data sets.

Next, for each individual steer, a dressed weight price per-head is calculated and collected.[7] The next step was to derive the weekly price differential for each carcass (grid price per cwt. minus HCWP per cwt.). The average weekly price differentials for the above-average and below-average data sets were then derived. An important feature of this approach is: *cattle quality characteristics are held constant over time*. Thus changes in the price differential are due solely to weekly changes in the AMS grid's base price, and the reported premiums and discounts.

AMS Grid Price Structure: A Brief Overview

The AMS grid is an additive grid; that is, the grid price per cwt. of a particular carcass is determined by the base price plus any carcass premiums and minus any carcass discounts. Grid price per cwt. is defined as,

1) GRID PRICE = BASE PRICE + PREMIUMS - DISCOUNTS.

The base price varies from firm to firm, and can change from week to week. Following the work of Fausti et al. (1998) and Feuz (1999a), the base price for the AMS grid is assumed to be a function of

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[6] The report's price data are collected by the AMS through a survey of six regional packer grid pricing strategies for the previous week. The premiums and discounts reported by the AMS represent an average of those packer reported discounts and premiums. The AMS first began to report grid premiums and discounts in October, 1996.

[7] The HCWP is the reported five-area (Texas/Oklahoma, Kansas, Nebraska, Colorado, Iowa/So. Minn) weekly weighted average price for dressed weight sales of slaughter steers grading 35% to 65% choice (USDA Livestock, Meat and Wool Weekly Summary and Statistics). A steer's dressed price per-head is the HCWP multiplied by hot carcass weight. The result of this approach is that for each of the 1500 steers, a dressed weight price per cwt. and dressed weight price per-head are calculated for each week and then the weekly mean and standard deviation of these price variables for each pen is recorded and used in the empirical analysis.

the regional reported HCWP and the "Choice-Select Price Spread Effect" as discussed in Ward et al. (1999):

2) BASE PRICE = HCWP + (SELECTDISCOUNT) * (1 - %CHOICE).[8]

There are well over 25 fed cattle price grids being used by the beef packing industry (Feuz 1998). Base price formulas vary across grids. Many grids tie the base price to a market quote, such as East Nebraska direct, West Kansas top, etc. The goal of the packer when establishing the weekly base price for its grid is to discover the market value of a choice, yield grade 3 carcass that weighs between 550 and 950 pounds. On any given week the grid base price will vary from packer to packer.[9] Over time, however, it is reasonable to postulate that there is a very strong positive correlation among packer weekly base prices. Accordingly, the computed base price used in this study should be a reasonable proxy for the base price of a typical packer over the period covered in this study. Figure 1 shows a plot of the regional grading percentage and the select discount over time. The HCWP and the computed base price are shown in figure 2. Figures 1&2 confirm that the calculated base price is consistent with market conditions.

The price differential (PDIFF) for any particular carcass is defined as the grid price per cwt. minus the HCWP per cwt.:

3) PDIFF = GRID PRICE - HCWP.

Substituting equations 1&2 into equation 3, it is clear that the HCWP plays no *direct* role in determining the price differential.[10] The price differential for any individual animal is solely a function of the choice/select spread effect and the grid's quality grade, yield grade, and weight premiums and discounts associated with the animal's carcass characteristics:

4) PDIFF = SELECT-DISCOUNT * (1 -%CHOICE) + PREMIUMS - DISCOUNTS.[11]

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[8] The regional grading percentage reflects the weekly proportion of slaughter steers grading choice in AMS reporting region 7&8 (IA, KS, MO, NE, CO, MT, ND, SD, UT, and WY). One minus the regional grading percentage provides an estimate for the proportion grading select. Multiplying the regional percentage grading select by the choice/select spread and adding the product to the regional HCWP provides an estimate of the HCWP for slaughter steers grading 100% choice. Fausti et al. (1998) and Ward et al. (1999) use this approach to establish a base price in their analysis of grid pricing. At least one major packer uses the regional grading percentage when setting its weekly grid base price.

[9] Base price, premium and discount formulas are considered to be confidential by packing firms.

[10] However, a change in the HCWP does reflect a change in the equilibrium price for slaughter steers. There are two plausible hypotheses on how a change in equilibrium price will affect premium and discount levels: 1) Packers will raise and lower premium and discount levels proportional to changes in HCWP; and 2) An increase in the equilibrium price implies slaughter steers have become relatively more scarce. In turn, packers will have to increase quality grade and yield grade premiums and reduce discounts across all categories to maintain purchase levels. Both hypotheses suggest that the HCWP has an indirect effect on PDIF.

[11] The select-discount also represents the premium paid for choice carcasses relative to select carcasses. In eqs. 2 and 4, the select-discount is entered into the calculations as a positive value.

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RESULTS AND DISCUSSION

Objective I: Analysis of the Price Differential and Revenue Variability over Time.

Table I provides pen level summary statistics for the weekly average price differential per cwt. for the above and below average carcass quality data sets over a 206-week period. The summary statistics indicate, as expected, that the above-average (below-average) quality data set had a higher (lower) average price per cwt. when evaluated via the AMS grid.

TABLE I. Mean, standard deviation, and the 206-week range of the weekly average price differential per cwt. (PDIFF).

Price Difference	Mean	SD	Min	Max
Above-Average Pen	1.147	0.589	0.01	2.40
Below-Average Pen	-1.316	0.570	-2.81	-0.48

The mean value for the above-average pen and below-average pen price differentials reported in Table 1 reflect the average (over 206 weeks) weekly premium or discount per cwt. (respectively) associated with selling fed cattle on the AMS grid relative to selling on a hot carcass weight (HCW) basis.[12] The results reported in table I can be interpreted in the following manner: 1) If the steers in the above-average pen were sold at an average price, then the producer's implicit discount would be a minus $1.147 per cwt.; and 2) If the steers in the below-average pen were sold at an average price, then the producer's implicit premium would be a positive $1.316 per cwt. The ranges of the two price differentials indicate that the implicit discounts and premiums associated with average pricing are erratic but persistent over time.

The issue of implicit discounts and premiums arising when slaughter cattle are sold by the pen at an average price is at the center of the push for the development of a value based marketing system for slaughter cattle. Grid pricing eliminates implicit premiums and discounts which distort the information contained in transaction prices when fed cattle are sold by the pen at an average price. Grid pricing improves market efficiency by reducing uncertainty over carcass quality traits during the transaction (Value Based Marketing Taskforce 1990; Feuz et al. 1993; Fausti et al. 1998; Schroeder and Graff 2000). The persistence of positive premiums (over time) reported in Table I for the above-average pen indicates that packers are rewarding producers who can supply high quality cattle to the market and sell on a grid. However, the range in the premium for the above-average pen of 1 cent to $2.40 per cwt. indicates substantial fluctuations in the incentive to market higher quality cattle on a grid. The risk associated with grid price incentive variability is the next issue to be addressed.

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[12] A simple hypothesis test indicated that the mean price differential was non-zero at a level of significance of less than 1% for both the above and below quality data sets.

To accomplish the second part of objective one, we examine per-head mean revenue and the standard deviation of per-head revenue across pens over the 206-week period.[13] Table II provides pen level first moment statistics (averages) for the distribution of per-head revenues and the distribution of the weekly standard deviation of per-head revenues for the above and below-average pens over a 206-week period for both the AMS grid and dressed weight marketing alternatives.[14]

TABLE II. Mean values for the weekly per-head pen revenue and the weekly standard deviation of per-head revenue for the above and below average pens.[15]

First Moment Statistics	206-Week Pen Average for per-head revenue	206-Week Pen Average for the weekly per-head revenue standard deviation
Above-Average Pen		
GRID REV	$760.45	$86.38
DRWT REV	$752.19	$77.20
Below-Average Pen		
Grid REV	$741.92	$84.43
DRWT REV	$751.36	$78.01

The four-year average for the standard deviation of per-head revenue is significantly higher for the AMS grid relative to the dressed weight pricing alternative for both the above and below average pens.[16] The implication is that, on average, per-head revenue variability has been higher when cattle are

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[13] In the below-average quality pen, the mean and standard deviation for hot carcass weight is 718.56 pounds and 74.16 pounds respectively. In the above-average quality pen, the mean and standard deviation for hot carcass weight is 719.37 pounds and 73.83 pounds respectively.

[14] The weekly per-head grid revenue and per-head dressed weight revenue standard deviation for the above and below-average pens was calculated and collected over the 206 week period. The weekly revenue standard deviations were then summed and the mean values are those reported in Table II. The reported means of the standard deviations reflect both the average variability in the pen level hot carcass weight per-head and the average variability in price, whether it is a grid or dressed weight price. However, hot carcass weight variability in the two data sets is constant over time because carcass characteristics are being held constant over time.

[15] The statistics provided in Table II indicate that at the pen level, per-head revenue differentials have been persistent over time. The AMS grid paid, on average over four years, a per-head premium of $8.26 for cattle in the above-average pen relative to what those cattle would have received if they were sold dressed weight. The AMS grid levied a discount of $9.44 per-head on cattle in the below-average pen relative to what those cattle would have received if they were sold dressed weight. These results are consistent with the price differential results reported in Table I and the findings reported in the literature.

[16] Test for the difference between population means (large sample) for both the above and below-average pens indicate that the mean revenue per-head standard deviations are statistically different with p-values of less than 1%.

sold through a grid relative to selling fed cattle dressed weight, regardless of overall pen carcass quality.[17] Assuming that revenue variability is a reasonable indicator of riskiness, grid pricing has consistently been the riskier marketing alternative relative dressed weight pricing. The effect of increased revenue variability on producers marketing decisions requires further study.

Objective II: Empirical Analysis of How Consistent the Grid Incentive Mechanism is Over Time.

The price differential per cwt.(grid minus dressed weight) for a pen of cattle reflects the producer's incentive or disincentive to market cattle on a grid. Given that cattle quality characteristics are held constant over time in this study, changes in the price differential reflect changes in the market signal to producers, which indicates that the incentive structure of a packer's grid has changed. Feuz (1999b) raises the issue of inconsistent price signals over time and this is the issue to be investigated next. To provide insight on this question, an autoregressive model is employed. The data reveal a seasonality component in the time series that is the result of a seasonal fluctuation in the proportion of choice cattle being slaughtered (regional grading percentage) in region 7&8 (figure I). Seasonal variability in the regional grading percentage results in seasonal variability in the choice/select spread, which in turn introduces a seasonal component into the price differential. To handle this econometric issue a two-stage recursive autoregressive model is adopted.

The empirical analysis utilizes a two-step recursive OLS estimation procedure (corrected for serial correlation) as described in Johnston (1972, pp.376-80) and Kennedy (1984, p.118). In the first stage, seasonal monthly dummy variables and a time-trend variable are regressed on $\%CHOICE$.[18] Predicted values from the first stage analysis, along with a weekly time-trend variable and weekly hot carcass weight price, are regressed on the price differential $PDIFF$.[19]

FIRST STAGE:

5) $\%CHOICE_t = a + b_1 TimeTrend + b_2 Jan + b_3 Feb + b_4 Mar + b_5 Apr + b_6 May + b_7 June + b_8 July + b_9 Aug + b_{10} Sept + b_{11} Oct + b_{11} Nov + V_t.$

SECOND STAGE:

6) $PDIFF_t = \alpha + \beta_1 TimeTrend + \beta_2 \overline{Choice} + \beta_3 HCWP_t + E_t.$

The time-trend variable in the first-stage equation is included to detect any change in the weekly proportion of choice cattle being slaughtered over time. The time-trend variable in the second-stage equation is for detecting any change in the weekly price differential not due to changes in the weekly quality composition of cattle being slaughtered over time. The hot carcass weight price is included in the

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[17] For both the above and below -average pens, the weekly revenue per-head standard deviation is higher for the AMS grid than for dressed weight pricing. Analysis indicates that the range for the difference of the weekly standard deviation of per-head revenue (grid minus dressed weight) is positive for both the above and below-average pens over the entire 206-week period.

[18] December was selected as the reference month.

[19] The recursive modeling assumption is that the price differential is a function of the regional grading percentage, but the reverse is not true. The bar symbol (⁻) denotes the predicted value of the independent variable.

second stage regressions to determine if there is any evidence of packers adjusting grid premiums and discounts to changes in the general market price of fed cattle. The Yule-Walker correction procedure was used to estimate the first and second stage autoregressive models.[20] The results for the first-stage equation are reported in Table III. The results for the above-average data set are reported in Table IV and the results for the below-average data set are reported in Table V.

Table III: Yule-Walker Estimates (First-Stage).

Dependent Variable:%CHOICE $_t$

Durbin-Watson D	= 2.13	SSE =391.6
TOT RSQ	= 0.813	MSE= 2.05
Number of Obs.	= 206	

Variable	DF	Parameter Estimate	Standard Error	T for HO: Param=0	Prob > |T|
INTERCEPT	1	48.674	1.290	37.71	0.001
TIME-TREND	1	0.017	0.009	1.88	0.061
JAN	1	2.343	0.627	3.73	0.001
FEB	1	3.179	0.774	4.10	0.001
MAR	1	3.674	0.858	4.28	0.001
APR	1	1.835	0.909	2.02	0.045
MAY	1	0.588	0.933	0.63	0.529
JUNE	1	0.665	0.938	0.71	0.478
JULY	1	0.070	0.924	0.08	0.934
AUG	1	-1.07	0.889	-1.20	0.230
SEPT	1	-1.899	0.828	-2.29	0.029
OCT	1	-2.095	0.726	-2.88	0.001
NOV	1	-0.538	0.554	-0.97	0.337
AR(1)	1	-0.468	0.058	-7.96	0.001
AR(4)	1	-0.377	0.058	-6.41	0.001

The coefficients for the January thru April variables are positive and significant, indicating that there are a higher proportion of fed cattle being slaughtered, which grade at least choice and less than yield grade four. The coefficients for the September and October variables are negative and significant. The regression results generated by the first stage equation (Table III) are consistent with the life cycle production pattern of the fed cattle industry in region 7&8. A preponderance of the calving in region 7&8 occurs in the early spring, resulting in a seasonal pattern of higher quality grade cattle coming to market the following spring, relative to the quality of slaughter cattle marketed in the fall. An interesting trend developing over the four-year period of this study was that the proportion of fed steers slaughtered grading at least choice/ yield grade 3 increased in region 7&8, as indicated by the positive and significant coefficient for the time-trend variable.

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[20] The error terms V and E are assumed to be generated by an autoregressive process: For example $V_t = \varepsilon_t - \alpha_1 v_{t-1} - ... - \alpha_p v_{t-p}$, where ε_t is a sequence of independent normally distributed error terms. The autoregressive parameter estimates were generated using the Yule-Walker stepwise estimation procedure (SAS/ETS, 1990).

Table IV: Yule-Walker Estimates (below-average data set).

Dependent Variable: PDIFF$_t$

Durbin-Watson D =2.107   SSE=7.58
TOT RSQ = 0.8862   MSE=0.03
For Number of Obs.= 206

Variable	DF	Parameter Estimate	Standard Error	T for HO: Param=0	Prob > |T|
INTERCEPT	1	-2.352	1.007	-2.33	0.020
TIME-TREND	1	-0.004	0.002	-1.90	0.058
%Choice$_t$	1	0.038	0.012	3.05	0.002
HCWP$_t$	1	-0.004	0.007	-0.63	0.525
AR(1)	1	-0.906	0.029	-30.48	0.001

The regression results in Table IV provide statistical evidence to support the following conclusions: 1) Removing the effects of seasonality and time, the below-average carcass quality data set received a discount of $2.35 cwt. when evaluated using the AMS grid relative to dressed weight; 2) This discount was lower (6 to 14 cents per cwt.) during the months of January through April, and higher (6 to 7 cents per cwt.) during the September and October;[21] 3) The time-trend variable's coefficient is significant and negative, indicating that the discount per cwt. levied on the below-average pen increased by an estimated -69 cents per cwt. over the four-year period.[22] As an example, in week 1 of the study, the model estimates the average discount per cwt. at $2.35, and at week 206 the discount increases to $3.04 per cwt.; and 4) Changes in the general price level of fed steers (HCWP) did not contribute to explaining the variability in the price differential for the below-average pen.

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[21] The seasonality price effect is calculated by multiplying the first-stage coefficient estimate for a particular month by the second stage estimated coefficient for %Choice. This procedure allowed an estimate for each month's price effect to be calculated.

[22] The time trend variable has a direct and indirect effect on the dependent variable: ∂PDIFF/∂ Time-trend $+\partial$PDIFF/∂%Choice $* \partial$%Choice/∂Time-trend. The direct effect at 206 weeks is 82 cents and the indirect effect is 13 cents, therefore the discount (in absolute terms) increased by 69 cents over the 206-week period.

Table V: Yule-Walker Estimates (above-average data set).

Dependent Variable: $PDIFF_t$

Durbin-Watson D =1.53	SSE=7.13
TOT RSQ = 0.8997	MSE=0.035
For Number of Obs.= 206	

Variable	DF	Parameter Estimate	Standard Error	T for HO: Param=0	Prob > |T|
INTERCEPT	1	2.436	0.866	2.81	0.005
TIME-TREND	1	0.0017	0.0009	1.84	0.066
%Choice$_t$	1	-0.050	0.011	-4.41	0.001
HCWP$_t$	1	0.010	0.006	1.67	0.095
AR(1)	1	-0.771	0.044	-17.18	0.001

The regression results in the Table V provide statistical evidence to support the following conclusions: 1) Removing the effects of seasonality and time, the above-average carcass quality data set received a premium of $2.436 cwt. when evaluated using the AMS grid relative to dressed weight; 2) This premium was lower (10 to 18 cents per cwt.) during the months of January through April, and higher (9 to 10 cents per cwt.) during the September and October; 3) the time-trend variable's coefficient is significant and positive, indicating that the premium per cwt. paid for cattle in the above-average pen increased by 35 cents per cwt. over the four-year period.[23] As an example, in week 1 of the study, the model estimates the average premium per cwt. at $2.436, and at week 206 the premium increases to $2.61 per cwt. and 4) Changes in the general price level of fed steers (HCWP) did contribute a small amount of information to help explain the variability in the price differential for the above-average pen. A one dollar increase in the HCWP per cwt. increased the price differential premium for the above-average pen by 1 cent per cwt. There is only marginal evidence to be found in the regression results to support either of the proposed hypotheses (footnote 10) on how changes in the HCWP affect packer determined grid premiums and discounts. This result suggests that additional research is needed on how packers set and change grid premium and discount values.

SUMMARY AND IMPLICATIONS FOR DECISION MAKERS IN THE SLAUGHTER CATTLE MARKET

The simple response to the question implied in the title of this paper is yes. For the above-average quality data set the monetary incentive has been positive and increasing over the last four years. However, for producers expecting consistent premium levels superior to selling cattle at an average price, and for those producers marketing cattle not meeting minimum quality standards in order to earn grid premiums, or for those producers who are risk averse, the empirical evidence indicates that these types of

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[23] However, the time trend variable has a direct and indirect effect on the dependent variable: $\partial PDIFF / \partial$ Timetrend $+ \partial PDIFF / \partial\%$ Choice $* \partial\%$ Choice$/\partial$Time-trend. The direct effect at 206 weeks is 35cents and the indirect effect is (-17.5 cents), therefore the net premium per cwt. increased by 17.5 cents over the 206-week period.

producers will be: 1) disappointed if they market on a grid, or 2) decide to only sell their cattle dressed or live weight. We conclude that the "barriers to the widespread adoption" of grid pricing do exist and have been persistent over the time period covered by this study.

The value based marketing literature suggests the incentive mechanism of a value based pricing system, like grid pricing, should reward producers for producing superior quality cattle. The positive time-trend variable for the above-average quality pen and the negative time-trend variable for the below-average quality pen suggests that the incentive structure of the grid system has been increasing both premiums for above-average cattle and discounts levied on below-average cattle. It seems that packers are sending consistent signals concerning the type of cattle they are willing to pay a premium for. Defining consistency as: The range of the price differential being positive for the above-average pen over the entire four-year period covered by the study.

The empirical results suggest that packers are sending even stronger signals concerning the consequences to producers delivering cattle that fail to meet the minium carcass quality standards desired by the packer. A producer who has consistently delivered below-average quality cattle to a packer and sold them on a grid has experienced increasing penalties. The implication is that implicit premiums have been increasing for below-average cattle being sold at an average price. The consequence for the industry is that the market distorting effect of average pricing has become an even more pressing problem. With a majority of slaughter cattle still being sold at an average price, there will not be a dramatic improvement in the overall quality of beef produced or a large reduction in excess fat production because, at an average price, fat receives the same price as lean.

However, the four-year trend in packer premiums and discounts for above-average and below-average quality cattle, respectively, have been increasing. This trend indicates that packers are providing a price incentive to producers to encourage improvement in overall cattle quality. There is empirical evidence that the quality of cattle being slaughtered in region 7&8 has improved over the last four years. To what extent grid pricing has influenced the improvement in regional carcass quality is a topic of future research.

The price differential associated with selling on a grid relative to selling at an average price exhibits a strong seasonal pattern (figure III). The price differential narrows for both the above-average and below-average pens during the spring. This infers a lower incentive to market on a grid as the price differential narrows relative to selling cattle dressed weight. In the fall months, the price differential widens for both the above-average and below-average pens. In the fall, the grid premium paid for above-average cattle increases and the grid discount levied on below-average cattle deepens. This infers a greater incentive to market fed cattle on a grid as the price differential widens. The marketing implications for producers are: 1) grid incentives are influenced by seasonal market conditions and producers should incorporate that information into their marketing decisions; and 2) if a producer is uncertainty about carcass quality, then the potential revenue loss (poor carcass quality) from selling on grid versus selling at an average price is less in the spring relative to selling in the fall. These results are consistent with the seasonal pattern in the choice-select spread and the results reported by Feuz (1999b) that grid price signals are not consistent over time.

The results of the study also support the conclusions arrived at in the earlier literature on the existence of price differentials Fausti and Feuz (1995). The empirical evidence presented indicates that the price differentials are persistent over time and highly variable, lending further support for the time inconsistency conjecture proposed by Feuz (1999b). The data provides evidence that selling cattle on a

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grid relative to selling cattle at an average price does result in higher per-head revenue variability. This result is also shown to be persistent over time. The implication is that marketing fed cattle on a grid has consistently been a riskier marketing option for the producer relative to selling at an average price during the period covered in this study. The question that needs further investigation is if the premiums associated with grid pricing offsets the additional price risk.

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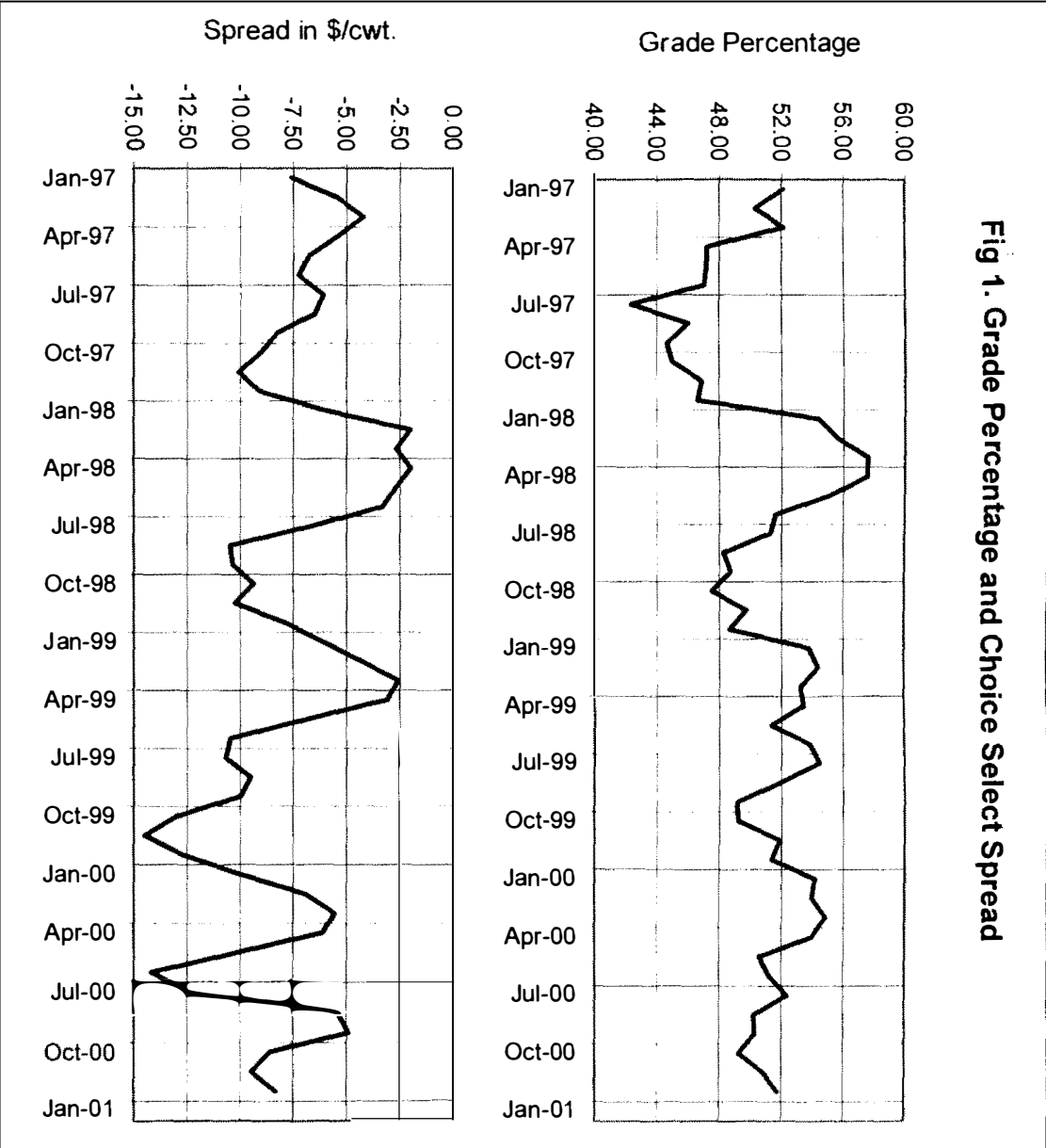
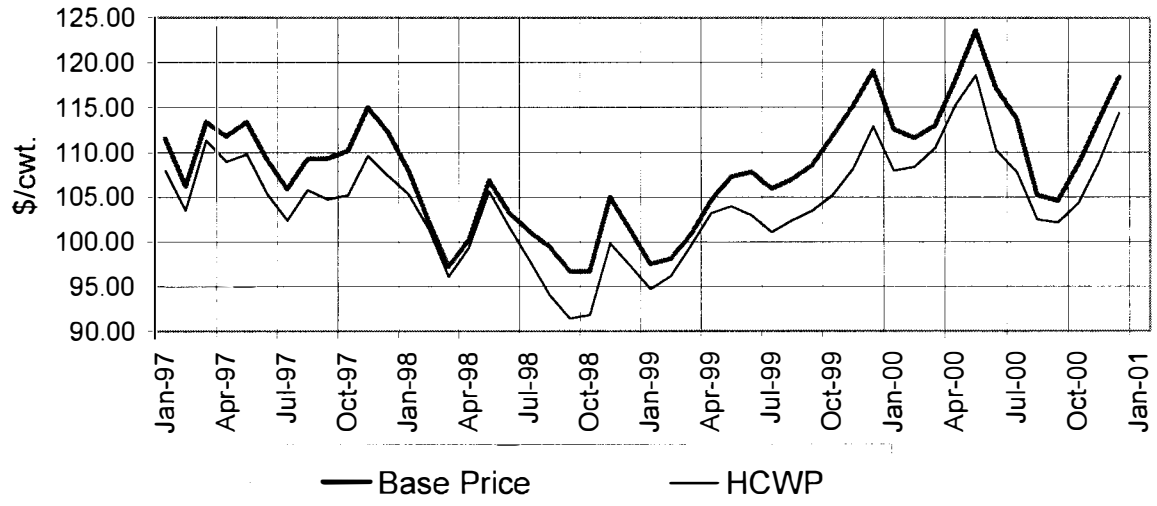Fig 1. Grade Percentage and Choice Select Spread

Fig 2. Base Price and HCWP

Base Price —— HCWP ——

Fig 3. Trends in Premiums and Discounts