AgEcon SEARCH
RESEARCH IN AGRICULTURAL & APPLIED ECONOMICS

The World's Largest Open Access Agricultural & Applied Economics Digital Library

This document is discoverable and free to researchers across the globe due to the work of AgEcon Search.

Help ensure our sustainability.

Give to AgEcon Search

AgEcon Search
http://ageconsearch.umn.edu
aesearch@umn.edu

*Papers downloaded from **AgEcon Search** may be used for non-commercial purposes and personal study only. No other use, including posting to another Internet site, is permitted without permission from the copyright owner (not AgEcon Search), or as allowed under the provisions of Fair Use, U.S. Copyright Act, Title 17 U.S.C.*

No endorsement of AgEcon Search or its fundraising activities by the author(s) of the following work or their employer(s) is intended or implied.

Mandatory Livestock Price Reporting, Market Transparency and Grid Price Dispersion

by
Scott W. Fausti, Bashir A. Qasmi, Jing Li, and Mathew A. Diersen*

ABSTRACT

Mandatory livestock price reporting (MPR) was implemented in April 2001. Empirical evidence indicates a significant change in the weekly variability of publicly reported fed cattle grid premiums and discounts occurred after MPR implementation.

We evaluate the effect of increased market transparency resulting from implementation of MPR on grid premium and discount dispersion levels. Empirical results suggest that increased transparency is compatible with either an increase or a decrease in dispersion. These results suggest that during the pre-MPR period, the weekly premium and discount data were drawn from a non-representative sample.

Key Words: Fed Cattle, Grid Pricing, Market Transparency, Price Dispersion

*Dr. Fausti is a professor in the Department of Economics at South Dakota State University. Dr. Qasmi and Dr. Diersen are associate professors, and Dr. Li is an assistant professor in the Department of Economics at South Dakota State University. We acknowledge the funding support from the SDSU Agricultural Experiment Station.

Presentation for Western Agricultural Economics Association annual meeting, Big Sky, MT, June 25-27, 2008.

Copyright 2008 by Fausti, Qasmi, Li, and Diersen. All rights reserved. Readers may make verbatim copies of this document for non-commercial purposes by any means, provided that this copy right notice appears on all such articles.

Mandatory Livestock Price Reporting, Market Transparency and Grid Price Dispersion

Introduction

The Agricultural News Marketing Service (AMS) has been providing weekly grid price reports for slaughter cattle since October 1996. These reports provide the market with information on weekly premiums and discounts for quality grade, yield grade, and weight (Fausti et al. 1998).

The Mandatory Livestock Price Reporting Act of 1999 (MPR) was implemented in April 2001. Prior to implementation of MPR, grid price reports were based on information collected from meat packing companies under a voluntary price reporting (VPR) system. When the VPR system ended, only six packing firms were providing weekly reports. Under MPR, all firms slaughtering over 125,000 animals annually were required to report price information for each plant they operate. As a result, market transparency has increased due to: a) an increased number of firms reporting, and b) an increase in the quantity and quality of information reported by the packing firms.

The general perspective on the relationship between transparency and price dispersion in the MPR literature is: As transparency increases, price dispersion decreases, which decreases price uncertainty for market participants (e.g. Azzam 2003). Azzam's discussion of declining price dispersion is analogous to a decline in the variance of a random variable's probability density function. This view is consistent with the discussion by Tomek (1980) on the inverse relationship between transaction price variance and the proportion of transactions reported. Tomek and Azzam defined the

price dispersion as the variance associated with the probability density function of a random variable.

However, the AMS only reports mean and statistical range for grid premiums and discounts for different categories on weekly basis. Time-series data for the weekly range of reported grid premiums and discounts (figures 1-3) show that the range actually increased in post-MPR period for all categories depicted in these figures. Within the context of the earlier literature, this finding is a conundrum, given that the statistical range is a measure of dispersion. Nevertheless, we know that increased transparency is the result of MPR. Therefore, an important question is raised: Is increased transparency compatible with increased dispersion?

Previous studies examining the time-series behavior of grid price series, pre- and post-MPR, also suggest that there is evidence of an increase in premium and discount variability in post-MPR period (Priebe 2004; Hogan and Ward 2005). This empirical puzzle highlights the need for the additional investigation of the relationship between increased market transparency and price dispersion. In this paper, we address the consequence of data collection regime reform (from VPR to MPR) on: a) market transparency and b) the level of dispersion associated with reported grid premiums and discounts.

Literature Review of Cattle Marketing Issues

Grid Pricing

The development of a value based marketing system for fed cattle has been a priority issue for the beef industry since the publication of War on Fat by the Value

Based Marketing Taskforce in 1990 (VBMTF, 1990).[1] Today the most successful form of value based marketing (VBM) for cattle is referred to as "grid pricing" (Fausti et al. 1998).[2] The AMS began voluntary public reporting of national grid premium and discount prices in October 1996.

The focus in the grid pricing literature has been on the incentive structure of grid pricing relative to average pricing of slaughter cattle and its potential success of supplanting the average pricing marketing channel (e.g. Johnson and Ward 2005; Fausti and Qasmi 2002; Feuz 1999; Fausti and Feuz 1995). Feuz (1999) estimated that there were at least 25 different price grids being used by the packing industry shortly after the AMS began issuing public grid price reports. This suggests that packer premium and discount schedules vary across firms. Feuz (1999) also discussed the practice of large packing firms adjusting their grid premium and discount schedules based on plant averages. The implication is that grid premiums and discounts not only vary across firms but can also vary across plants within a firm. This implies the VPR system was not fully capturing this variation in premiums and discounts.

Mandatory Livestock Price Reporting

The impetus for imposing MPR in U.S. livestock markets was the belief by producer groups, economists, and government officials that VPR had become an ineffective public information mechanism for providing transparency in livestock markets. Discussion in the fed cattle marketing literature suggests that increased industrial concentration in the packing and feedlot industries and increased use of captive supply procurement methods were the causes for the VPR system's failure to

provide accurate and timely market information to market participants (e.g. Anderson et al. 1998; Wachenheim and DeVuyst 2001).

Recent empirical studies suggest that MPR has only marginally improved transparency in the fed cattle cash market (Grunewald et al. 2004; Fausti and Diersen 2004; Pendell and Schroeder 2006, Fausti, Diersen, and Qasmi 2007a). Ward (2006), however, suggests that the level of transparency in the captive supply marketing channel has improved under MPR. Accordingly, these research findings suggest that the VPR system was not as inefficient as alluded to in the earlier literature, but the general consensus is that MPR has had a positive affect on the level of transparency in the slaughter cattle market.

Public Price Reporting and MPR

Grid Price Reporting Mechanism under VPR

Each week the AMS reports the mean and the statistical range for each grid premium and discount category. The premiums or discounts revealed by the surveyed packers to the AMS represented what individual packers were to pay for the coming week.

Under the VPR system, on Monday morning the AMS contacted each packer on their survey list and collected information on the packer's discount and premium schedule for the coming week. The packers on voluntary bases provided this information and the AMS conducted no additional follow-ups. Consequently, the weekly data observations reported to the AMS under VPR were relatively small and just prior to MPR implementation, only six packing firms were voluntarily reporting premium

and discount schedules to the AMS on a weekly basis. In MPR literature, there has been discussion about the data reported to the AMS under VPR system being prone to self-selection bias (e.g. Fausti and Diersen 2004). This issue appears to be germane subject to investigate with respect to the public reporting of grid premiums and discounts.

However, the view that firm self selection bias tainted the statistical reliability of AMS public grid reports can not be substantiated. We propose a more tractable alternative hypothesis: The AMS employed a non representative sampling selection procedure to provide weekly grid premium and discount reports, in the pre-MPR period. The use of a non representative sampling selection procedure can negatively affect the statistical accuracy of weekly reports. We shall refer to this phenomenon as "sample-selection bias."

Regime Change and Transparency

The passage of MPR regulations altered the institutional structure of public price reporting of grid premiums and discounts for slaughter cattle in two ways. First, all firms slaughtering 125,000 cattle annually were mandated to report grid premiums and discounts for all grids on which they purchase cattle at each plant. Therefore, the weekly data observations reported to the AMS under MPR are no longer merely a sample. Instead these data are actually for the entire population. Second, the AMS was given the right to audit the weekly reports submitted by firms. This is expected to change the behavior of reporting firms. Packer compliance to the MPR regulations imply increased diligence in the reporting of the data to the AMS and therefore increased quantity and quality of information reported under MPR. Obviously, this also

removed any sample-selection bias, which may have been present during the pre-MPR period. Accordingly, it is safe to conclude that these reforms have enhanced the ability of the public price reporting system to provide greater transparency in the post-MPR period.

Empirical Hypothesis

Implementation of MPR should result in an increase in the amount of transaction price information being reported by each firm as well as the number of firms reporting transactions to the AMS. According to Azzam (2003), an increased level of transactions reported after implementation of MPR should reduce dispersion associated with weekly reports because of the inverse relationship between information flow and transaction price variability. Therefore, weekly grid premium and discount reports released by the AMS should provide greater market transparency in the post-MPR period because the standard deviation of the mean of transaction prices reported to the AMS will decrease as the number of transactions increases, reducing price uncertainty. This view is consistent with the thinning market literature (Tomek, 1980, p 435).

The MPR literature assumes that the sample drawn from the weekly population of transactions being reported to the AMS in pre-MPR period is small but representative, and thus the dispersion estimators for weekly grid premium and discount values are not affected by sample-selection bias. To test this assumption we propose an alternative hypothesis: that the pre-MPR data collection process was based on firm level information being reported voluntarily by a small and non-representative sample of packers, injecting sample-section bias into public price reports.

We assert that the implementation of MPR provides us an opportunity to test our alternative hypothesis. In the post-MPR period, data is based on plant level information provided by all firms slaughtering over 125,000 animals annually under the Mandatory Livestock Price Reporting Act of 1999. Therefore, we contend that the weekly grid premium and discount data for the post-MPR period engenders complete information and market transparency. Accordingly, an appropriate empirical approach for testing the alternative hypothesis against the null hypothesis is to determine if there is the presence of unequal variances (or some proxies of variance) in pre-and post-MPR periods. Since the grid premium and discount data released by the AMS for the post-MPR period data is based on the entire population reporting, it reflects complete market transparency. Rejection of the null hypothesis of no change in the level of dispersion is tantamount to proving that grid premium and discount data released by the AMS for the pre-MPR period lacked market transparency. We assert that if we do reject the null hypothesis and grid premium/ discount variability changed, then pre-MPR reports were marred by non-representative sample selection procedure, i.e., a sample-selection bias.

Empirical methodology

Let χ_{ti} denote a grid premium or discount reported by firm i (plant i after the implement of MPR) for week t. the weekly mean $\overline{\chi}_t$ and extreme values for each grid premium and discount categories, respectively, are defined as

(1) $\overline{\chi}_t = n^{-1}\sum_{i=1}^{n}\chi_{ti}$,

(2) $\chi_t^{\max} = \max_i \chi_{ti}$,

(3) $\chi_t^{\min} = \min_i \chi_{ti}$.

Suppose the MPR takes effect at the $(j+1)$-th period. One measure of dispersion is the standard deviation. If χ_{ti} is available, the standard deviation before and after the implement of MPR can be calculated as

(4) $Sd^{before} = \left\{ \frac{1}{nj-1} \sum_{t=1}^{j} \sum_{t=1}^{n} (\chi_{ti} - \bar{\chi}_t)^2 \right\}^{1/2}$, and

(5) $Sd^{after} = \left\{ \frac{1}{nk-1} \sum_{t=j+1}^{j+k} \sum_{t=1}^{n} (\chi_{ti} - \bar{\chi}_t)^2 \right\}^{1/2}$.

However, only $\bar{\chi}_t$, $\chi_t^{\max}$ and $\chi_t^{\min}$ are available and χ_{ti} are unavailable. Therefore, the standard deviation cannot be used to measure dispersion given the data provided by AMS.

In order to assess the dispersion difference before and after the implementation of MPR, we instead find a proxy for dispersion. Define B_t as

(6) $B_t = \max\left(\chi_t^{\max} - \bar{\chi}_t, \bar{\chi}_t - \chi_t^{\min}\right)$,

and the average of B_t before and after MPR as

(7) $B^{before} = \frac{1}{j-1} \sum_{t=1}^{j} B_t$,

(8) $B^{after} = \frac{1}{k-1} \sum_{t=j+1}^{j+k} B_t$.

Simple algebra shows that

(9) $B^{before} \geq Sd^{before}$, and

(10) $B^{after} \geq Sd^{after}$.

In other words, we can use the average of B_t as an upper bound for the standard deviation. The dispersion before and after MPR is compared by the bound ratio of

(11) $BR = \frac{B^{before}}{B^{after}}$.

The BR less than 1 indicates that the dispersion increases after MPR takes effect, and vice versa. One drawback of this approach is that the distribution of the BR ratio is unknown, so that no significance value can be attached to the ratio.

Then we try alternative methods that yield testing statistics having known distributions. One method is based on the F ratio defined as

(12) $F = \frac{S^{before}}{S^{after}}$,

where

(13) $S^{before} = \frac{1}{j-1}\sum_{t=1}^{j}\left(y_t - \bar{y}^{before}\right)^2$,

(14) $S^{after} = \frac{1}{k-1}\sum_{t=j+1}^{j+k}\left(y_t - \bar{y}^{after}\right)^2$,

(15) $\bar{y}^{before} = \frac{1}{j}\sum_{t=1}^{j} y_t$,

(16) $\bar{y}^{after} = \frac{1}{k}\sum_{t=j+1}^{j+k} y_t$.

Here y_t can take values of $\overline{\chi}_t$, $\chi_t^{\max}$ and $\chi_t^{\min}$. Standard statistical theory implies that the F ratio follows the F distribution under the null hypothesis of equal variances for each series (Hogg and Craig, 1995). A significant large F ratio provides evidence

against equal variance. The adjusted F test of Shoemaker (2003) is also computed, which asymptotically follows the normal distribution with variance specified in Shoemaker (2003). This test generalizes the F test by assuming away the normality. Therefore, the adjusted F test is more robust than the F test.

The test of equal dispersion can also be conducted in a regression form (Wooldridge 2006). Defining the range R_t and our proxy for coefficient of variation C_t as

(17) $R_t = \chi_t^{\max} - \chi_t^{\min}$, and

(18) $C_t = \frac{R_t}{2\bar{\chi}_t}$.

A common approximation, found in most introductory statistics textbooks, for the standard deviation of a random variable is the statistical range divided by two. Equation 18 provides a rough approximation for the coefficient of variation associated with grid premium and discounts categories in the pre- and post-MPR periods.

Then the following regression is fitted by ordinary least squares method:

(19) $Z_t = \beta_0 + \beta_1 D_t + \mu_t$,

Where D_t is a dummy shift variable that equals zero before MPR and one after MPR. The dependent variable Z_t can be the range R_t, the coefficient of variation C_t, or B_t defined previously. The focus is on the t-ratio of the coefficient β_1. A significant t-ratio indicates that Z_t changes substantially after the implement of MPR.

These regression-based t tests are equivalent to the usual two-sample t test. Essentially, we are comparing the mean values of two samples separated by the date of

MPR. The information in the sample data is the range, the coefficient variance and the bound. These variables can provide approximation for the original data.

Data

The AMS began issuing weekly grid premium and discount reports out of its Des Moines, Iowa, office in 1996. The VPR data collection process in the Des Moines office consisted of weekly phone calls from the AMS reporter to packers on Monday morning. Packers provided their premium and discount schedules for the week. No auditing or verification procedures were conducted to confirm the reliability of the data.[3]

After MPR, the St. Joe, MO, office of the AMS was given the responsibility of collecting packer grid premium and discount data. The St. Joe office considers its premium and discount reports to be distinctly different from the reports issued under the old reporting regime. Packers under MPR are required to submit a Cattle Premiums and Discount Weekly Report (form # LS-177) by 2 pm Monday of each week. This report must be filed for each packing plant operated by the packers slaughtering over 125,000 animals annually and purchasing cattle on a grid. The St. Joe office tabulates the reported data and issues a public report each Monday. The report contains essentially the same premium and discount categories and provides the weekly simple average and range for each category. The St. Joe office is also responsible for the auditing of reports to ensure packer compliance.[4] The structure of the new reporting regime suggests that the packing industry will be more diligent in providing accurate weekly premium and discount reports to the St. Joe office.

Data on national slaughter cattle grid premium and discount for three quality categories (Prime, Select, and Standard) seven yield grade categories (Yg1.0-2.0, Yg2.0-2.5, Yg2.5-3.0, Yg3.0-3.50, Yg3.5-4.0, Yg4.0-5.0, and Yg>5.0), and four weight categories (Wt400-500, Wt500-550, Wt950-1000, and Wt>1000) were collected from a weekly AMS publication (USDA-AMS: the National Carcass Premiums and Discounts for Slaughter Steers and Heifers weekly report). The pre-MPR period is from November 4, 1996 through March 26, 2001. The post-MPR period runs from April 9, 2001 through September 26, 2005, when the MPR legislation expired due to a sunset clause.[5] With the exception of Wt950-1000, and Wt>1000, all grid category series consisted of 230 pre-MPR observations, and 234 post-MPR observations. Grid series Wt950-1000 and Wt>1000 consisted of 229 pre-MPR observations and 334 post-MPR observations. Since yield grade categories, Yg2.5-3.0, Yg3.0-3.5, and Yg3.5-4.00 are more or less at par categories with no or very small premiums or discounts, these series were not analyzed.

Empirical Results

Table 1 contains the upper bounds for standard deviations for pre- and post-MPR periods, and the bound ratio. Bound ratios for all grid categories are less than 1, indicating that the average upper bound for standard deviations increased for all categories analyzed during the post-MPR period. Since the distribution of the bound ratios is unknown, no significance value can be attached to these ratios.

Results for the F test and adjusted F two-tail test for equal variances are reported in Table 2, and 3, respectively. The adjusted F test is a generalized F test without any normality assumption and is more robust than the F test. The results of the

F test are, however, reported for comparison purpose. With the adjusted F test, the null hypothesis regarding the equal variance for the average of the min, max, and mean of the weekly statistical range was rejected for each grid category. The post-MPR variance of the min, max, and mean of the statistical range was determined to be different from the pre-MPR variance at a 95 percent level.

Results of two sample T tests based on the regression approach are reported in Table 4. The t-ratios of the shift variable in the regressions are significant for all three dispersion measure proxies (statistical range, coefficient of variation, and upper bound for the standard deviation), for all grid categories at 95 percent level. This regression based t test is equivalent to the usual two-sample t test, and a significant t ratio is analogous to rejecting the null hypothesis of equal dispersion measures.

These results show that for each of the grid categories analyzed, the post-MPR dispersion proxies are significantly different from the pre-MPR levels. These results provide an over whelming evidence that the market information contained in the grid category premiums and discount data series for post-MPR period are significantly different from the information contained in the pre-MPR series. Since we know that the post-MPR grid premiums series contain more accurate data for the whole population of meat packers buying animals on grids, we can safely conclude that the market transparency in the grid premiums and discounts during the pre-MPR era was lacking. In contrast to the assertions by Tomek (1980) and Azzam (2003), these results show that increased information flow and market transparency due to the implementation of the MPR is compatible with higher or lower market transaction price variability.

Furthermore, all of the statistical tests applied to dispersion proxies measuring absolute dispersion levels suggest that dispersion increased. This suggests that in the pre-MPR period weekly grid premium and discount values publicly reported were based on a non-representative sample. The affect of the sample-selection bias in the pre-MPR period was to understate grid premium and discount dispersion levels relative to dispersion levels reflected in the population in the post-MPR period. Thus the pre-MPR point estimators are based on a biased sampling procedure relative to the post-MPR period.

With respect to the coefficient of variation regression results reported, they can be interpreted this way. For discounts categories, the non representative sample selection procedure generated a sample-selection bias which increased relative variation (as measured by the coefficient of variation proxy) in the pre-MPR period as compared to the level of relative variation present in the population in the post-MPR period. For premium categories, sample-selection bias decreased relative variation in the pre-MPR period as compared to the level of relative variation present in the population in the post-MPR period. The pre-MPR dichotomy between grid premium and discount categories with respect to relative variability in premium and discount structures may have contributed to the pre-MPR view expressed by producers that the grid marketing channel was a system of discounts only. This issue is in need of further investigation.

Is it possible that some other market influences are responsible for the statistical results we reported? It can be an issue only if such influences coincided with the

implementation of MPR and remained effective though out the post-MPR period analyzed. We are not aware of any such factors. Accordingly, we conclude that reporting regime reform which eliminated sample-selection bias appears to be the compelling explanation for our empirical results.

Summary

The question we address in this paper is: was the reform of the public price reporting system for slaughter cattle sold on a grid necessary? The answer to this question based on empirical evidence is a categorical yes. Our results show that the post-MPR levels of premiums and discount dispersion levels (as measured by different proxies) for all grid categories are significantly different from the pre-MPR levels.

Regime reform increased the level of price transparency in public grid price reports. All absolute measures of dispersion indicated an increase in dispersion in the post-MPR period. This clearly means that the public grid price reports during the pre-MPR period were less transparent as a result of sample-selection bias. Accordingly, we assert that the empirical evidence presented here supports the decision to reform the public livestock price reporting system for the fed cattle grid marketing.

The expectations for a decreased level of price dispersion in the post-MPR, as asserted by Tomek (1980) and Azzam (2003), were based on assumption that the pre-MPR grid premiums and discounts data were collected from a representative sample of packers. In the absence of this condition, as was the case, increased market transparency resulting from MPR is compatible with either an increase or a decrease in dispersion.

The implication of the study is that pre-MPR grid premium and discount data lacked statistical reliability. This may have adversely affected price discovery in the grid market for fed cattle. An important policy implication is that public price reporting mechanisms must adhere to standard statistical sampling methods to assure the statistical reliability of the information the reporting agency is disseminating to the public.

Endnotes

1. In the late 1980s, The National Cattlemans Beef Association (NCBA) sanctioned the formation of the Valued Based Marketing Taskforce to study the competitive position of beef. The taskforce issued a white paper in 1990 titled War on Fat. The taskforce identified average pricing of slaughter cattle in the cash market as a major barrier to the transmission of consumer preferences for leaner beef product with greater quality consistency back to the producer via the price mechanism. For an expanded discussion on the issue of value based marketing for slaughter cattle see Cross and Savell (1994) and Fausti et al. (1998).

2. Grid pricing typically accesses carcass premiums and discounts based on carcass quality grade, carcass yield grade, and hot carcass weight. The concept of grid pricing evolved from the traditional grade and yield pricing system. The AMS weekly public report provides prices for quality grade (prime, select, standard), yield grade(Yg1.0-2.0, Yg2.0-2.5, Yg2.5-3.0, Yg3.0-3.5, Yg3.5-4.0, Yg4.0-5.0, Yg>5), and weight discounts based on hot carcass weight (400-500, 500-550, 950-1000, over 1000 lbs). See Fausti et al. (1998) for an expanded discussion.

3. The AMS data collection procedure was verified by the authors via a personal phone call made on July 15, 2005, to the Des Moines, Iowa, office.

4. It is the view of the AMS that packing plants are providing the actual premium and discount schedule they will be using for the week when the packers file their reports Monday morning.
5. See Fausti et al. 2007b for additional discussion on the expiration of MPR in 2005.

REFERENCES

Azzam, A., 2003, “Market Transparency and Market Structure: The Livestock Mandatory Reporting Act of 1999." *Amer. J. Agr. Econ.* 85(2): pp. 387-395.

Fausti, S.W, and D. M. Feuz, 1995, “Production Uncertainty and Factor Price Disparity in the Slaughter Cattle Market: Theory and Evidence.” *American Journal of Agricultural Economics*, Vol. 77, No. 3, pp. 533-540.

Fausti, S.W, D.M. Feuz, and J.J. Wagner, 1998, "Value Based Marketing for Fed Cattle: A Discussion of the Issues.", *International Food and Agribusiness Management Review*, Vol. 1, No.1., 1998, pp. 73-90.

Fausti, S.W, and B.A. Qasmi, 2002,"Does the Producer have an Incentive to Sell Fed Cattle on a Grid?" *International Food and Agribusiness Management Review*, Vol. 5, No.1.,2002, pp.23-39.

Fausti, S.W., and M.A. Diersen, 2004, “The Voluntary Reporting System’s Ability to Provide Price Transparency in the Cash Market for Dressed Steers: Evidence from South Dakota.” *Journal of Agricultural and Resource Economics,* 29(3): pp. 553-566.

Fausti, S.W., M.A. Diersen., and B.A. Qasmi, 2007a, “Public Price Reporting in the Cash Market for Live Cattle: A Spatial Market Approach. *Agricultural and Resource Economics Review*: 36(2): pp. 336-348.

Fausti, S.W., Qasmi, B.A., Lanblom, D.G., Beutler, M.A., Johnson, P., Gates, R., Patterson, H., and Salverson, R., 2007b, “Public Price Reporting, Marketing Channel Selection, and Price Discovery: The Perspectives of Cow/Calf Producers in the Dakotas.” Journal of Agribusiness: Volume 25, No. 1(Spring), pp. 59-76.

Feuz, D.M., 1999,"Market Signals in Value-Based Pricing Premiums and Discounts." *Journal of Agricultural and Resource Economics*: Vol. 24. No.2, pp. 327-341.

Grunewald, S, T.C. Schroeder, and C.E. Ward, 2004, “Cattle Feeder Perceptions of Livestock Mandatory Price Reporting.” *Review of Agricultural Economics,* 26(4): pp. 521-38.

Hogan, R., and C.E. Ward, 2005, “Examining the Fed Cattle Choice-Select Discount”, Paper presented at the Southern Agricultural Economics Association Annual Meeting, Little Rock AK, February 2005.

Hogg and Craig, 1995, *introduction to mathematical statistics,* 5th edition, Prentice Hall press.

Johnson, H.C., and C.E. Ward, 2005, "Market Signals Transmitted by Grid Pricing." *Journal of Agricultural and Resource Economics*: Vol. 30. No.3, pp. 561-579.

Pendell, D.L., and T.C. Schroeder, 2006, "Mandatory Price Reporting and Fed Cattle Market Integration." *Journal of Agricultural and Resource Economics*, 31(3): pp. 568-579.

Priebe, J., 2004, The Effect of Mandatory Price Reporting on the Structure of Weekly Reported Grid Premium and Discount Prices for Fed Cattle. Masters Thesis, Dept. of Economics, South Dakota State University, April.

Shoemaker L. 2003. Fixing the F Test for Equal Variances. *The American Statistician* 57: 105-114.

Tomek, W.G., 1980, "Price Behavior in a Declining Terminal Market." *American Journal of Agricultural Economics*, Vol. 62, No. 3, pp. 434-444.

USDA-AMS. *National Carcass Premiums and Discounts for Slaughter Steers and Heifers*, weekly reports 1-1-97 to 3-14-05.

Value Based Marketing Task Force. The War on Fat, National Cattleman's Association, Denver CO: (1990).

Wachenheim, C.J., and E.A. DeVuyst, 2001, "Strategic Response to Mandatory Reporting Legislation in the U.S. Livestock and Meat Industries: Are Collusive Opportunities Enhanced?" *Agribusiness* 17(2): pp. 177-95.

Ward, C. E. 2006, "An Assessment of the Livestock Mandatory Reporting Act." Fact Sheet # F-606, Oklahoma Cooperative Extension Service, Oklahoma State University, Stillwater, OK.

Wooldridge J. M. 2006. *Introductory Econometrics: A Modern Approach*. 3rd Edition, Thomson Southwestern Press.

Table 1: Upper Bound for Standard Deviations

Grid Category	Before Implementation of MPR	After Implementation of MPR	Bound Ratio, BR
Prime	4.96	12.58	0.39
Select	1.52	4.62	0.33
Standard	10.14	12.66	0.80
Yg1.0-2.0	2.35	5.08	0.46
Yg2.0-2.5	1.15	2.82	0.41
Yg4.0-5.0	6.34	7.92	0.80
Yg>5.0	6.27	8.31	0.75
Wt400-500	9.62	18.25	0.53
Wt500-550	8.06	15.46	0.52
Wt950-1000	7.79	10.55	0.74
Wt>1000	9.68	12.96	0.75

Table 2: F test for equal variances

Grid Category	$\chi_t^{\min}$	$\chi_t^{\max}$	$\overline{\chi}_t$
Prime	3.69*	9.30*	9.77*
Select	2.30*	1.19	1.66*
Standard	0.65	0.94	1.86*
Yg1.0-2.0	na	0.05	1.32*
Yg2.0-2.5	na	6.22*	5.73*
Yg4.0-5.0	0.02	4.58*	0.28
Yg>5.0	0.08	2.31*	0.18
Wt400-500	0.00	1.79*	2.96*
Wt500-550	1.11	4.24*	1.73*
Wt950-1000	1.42*	0.18	0.82
Wt>1000	0.66	1.66*	0.46

Note: All table values are test statistics, and * indicates the significance at 95% level.

Table 3: Adjusted F test for equal variances

Grid Category	$\chi_t^{\min}$	$\chi_t^{\max}$	$\overline{\chi}_t$
Prime	1.31*	2.23*	2.28*
Select	0.83*	0.18	0.51*
Standard	-0.42*	-0.06	0.62*
Yg1.0-2.0	na	-2.91*	0.28*
Yg2.0-2.5	na	1.83*	1.75*
Yg4.0-5.0	-3.75*	1.52*	-1.26*
Yg>5.0	-2.52*	0.84*	-1.71*
Wt400-500	na	0.58*	1.09*
Wt500-550	0.10	1.45*	0.55*
Wt950-1000	0.35*	-1.74*	-0.20*
Wt>1000	-0.42*	0.51*	-0.77*

Note: All table values are test statistics, and *indicates the significance at 95% level.

Table 4: Two-Sample T Test

Grid Category	Average Range, R_t	Coefficient of Variance, C_t	Bound, B_t
Prime	24.85*	11.94*	21.29*
Select	19.93*	-13.53*	19.34*
Standard	9.75*	-7.90*	11.23*
Yg1.0-2.0	38.13*	21.62*	38.14*
Yg2.0-2.5	32.23*	10.60*	31.22*
Yg4.0-5.0	13.69*	-16.03*	10.04*
Yg>5.0	20.71*	-23.76*	13.80*
Wt400-500	88.79*	-59.92*	68.85*
Wt500-550	65.93*	-68.41*	50.78*
Wt950-1000	14.45*	-43.66*	15.94*
Wt>1000	21.96*	-28.38*	20.52*

Note: All table values are test statistics, and *indicates the significance at 95% level.

Fig 1. Changes in premiums and discounts for grades

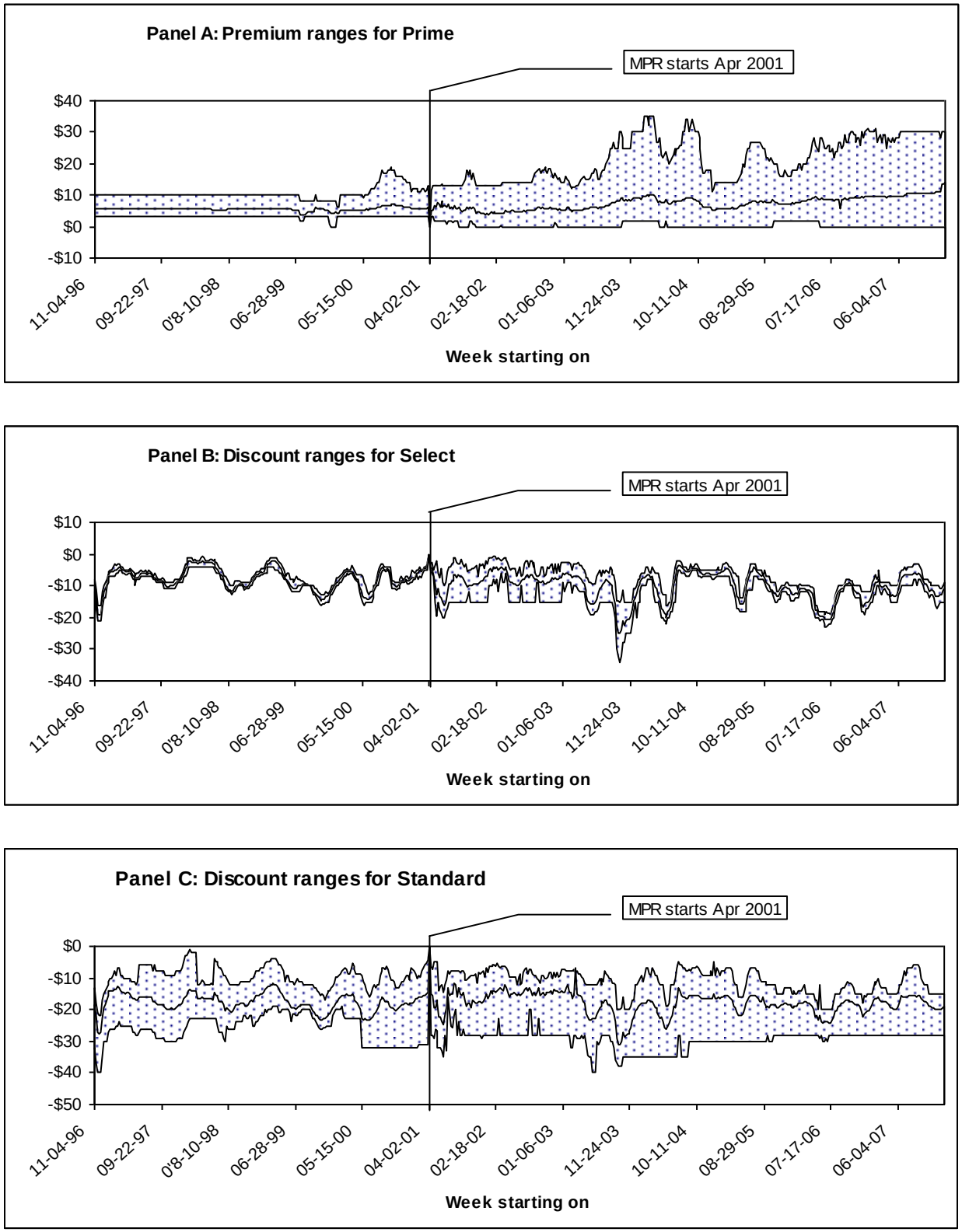

Fig 2. Changes in premiums and discounts for yield categories

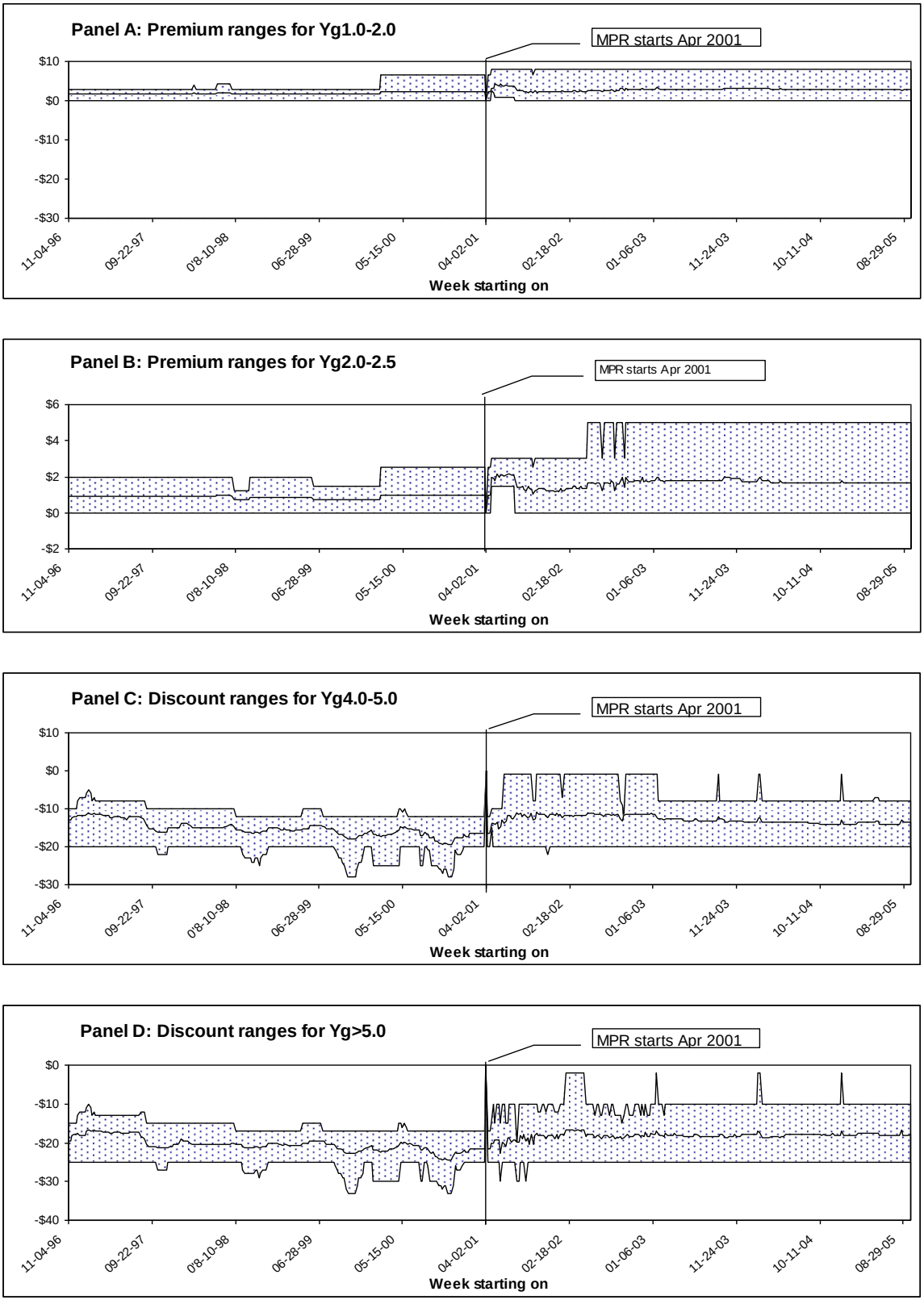

Fig 3. Changes in discount for weight categories