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An Analysis of Factors Affecting Prices in Video Cattle Auctions

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Increasingly, large numbers of cattle are being priced through video auctions. In 1987, for example, the Superior Livestock Auction (SLA), the nation's largest satellite video cattle auction, sold over 270,000 head of cattle. Indeed by 1990, the SLA is projected to be the largest cattle auction of any kind (Scharlier).

Many buyers and sellers as well as institutions are concerned about the economic viability of video auctions as opposed to the more traditional auctions. For example, in 1986 the state of North Dakota refused a business license to the SLA because new cattle auctions could be licensed only if an economic need or benefit could be demonstrated. At that time no statistical evidence was available for analyzing either the efficiency or increased revenues associated with video cattle auctions. In addition, buyers and sellers using video auctions are concerned about the accuracy of the video presentation and description, relative prices, buyer participation, and delivery of the cattle priced on the system.

The purpose of this paper is to analyze the performance of the SLA during 1987 to ascertain the relative efficiency of video cattle markets as pricing mechanisms. The components influencing prices in the SLA auction are examined by regression analysis to determine if any differences in pricing mechanisms exist between video and traditional auction markets. Past research results are used to compare some of the general influences of lot characteristics, market information, and terms of trade on prices in a video market relative to traditional auction markets. The following section reports the data source and methodology used to complete these analyses.

Data and Procedure

Presentation of cattle for sale through a video auction consists of two components--the video or visual component and the sales catalogue or written component. Clarity and precision of these two components are critical if the cattle are to be represented adequately. While the importance of the quality of the visual presentation of cattle sold on video auctions was not possible to test, the seller's description and terms of trade were available from SLA's sales catalogues.

The sales catalogue data and prices bid for each lot of cattle for 1987 were gathered from the SLA in Brush, Colorado. In that year over 335,000 head were offered for sale via 14 satellite video cattle auctions. Eighty-one percent of the cattle offered for sale were sold and were shipped an average of 264 miles for delivery.

Video auctions are unique because most terms of trade are available to the researcher for analysis. This allows examination of the impact of these terms of trade including pencil shrink, slide, days to delivery and timing on price. In addition, other characteristics not normally known in traditional auctions are available for analysis. For example, the regional location and birth place of the cattle are known. Also, it was possible to obtain the location to which cattle sold on the video auction were shipped.

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This allowed an examination of the influence of transporation costs on video auction prices for the group as a whole and also for subgroups by sex and weight.

These considerations and a general comparison of past reserach of traditional auction markets combine to reveal how bids are formulated in video auctions and will help buyers, sellers, institutions and researchers to better understand the process by which video cattle auctions function. Individual commodity characteristics are an important component of pricing (Ladd and Martin). Cattle prices vary substantially depending upon many individual lot characteristics. Hedonic pricing models have been used to estimate the value of specific characteristics of lots of cattle (Buccola, 1980; Schroeder et al.; Schulz and Marsh; and Ernst et al.). Schroeder et al. specified a model where cattle auction price was a function of lot characteristics and market information (future prices). They estimated models separately by weight and sex and included several other variables including animal health, condition, breed, shrink, muscling, frame, size, breed, time of sale, and futures price.

The video auction data analyzed in this study include most of the lot characteristics found in Schoeder et al. Other than visual appraisal of the cattle by the buyer and determination of transportation costs, most relevant information regarding lot characteristics is available in the sales catalogues including number of head in the lot, sex, location, breed, origin (birth location), frame size, flesh, average weight, weight variance within the lot, presence or absence of horns, type of feed currently fed, delivery date, weighing conditions and slide.

Price is discovered through current market prices (cash and contract) and other market information (Purcell). Futures markets are relatively efficient in price discovery for feeder cattle and other agricultural commodities (Ollerman et al. Martin and Garcia; Just and Rausser; Dole and St. Clair). Consequently, futures prices are an important tool in pricing feeder cattle on video markets, since all video sales are for future delivery. Other information that is important in formulating cattle bids includes expected profitability (Buccola, 1980). We specify a proxy for expected profit as the steer-corn ratio (SCR) or the ratio of the nearby live cattle futures contract price and the per bushel price of No. 2 yellow corn.

Merchandising strategy also plays an important role in pricing cattle lots through video auctions. Merchandising strategies are the terms of trade available to the seller to make the cattle more desirable for buyers. For example, lots of cattle can be mixed by sexes or weights. However, this practice could lead to discounting of the lot, as additional costs are incurred if further sorting is necessary after purchase. Since the buyer pays transportation costs it is likely that lots of less than a full truck load (approximately 40,000 lbs.) are also discounted.

Another merchandising strategy concerns estimated average weight of the lot of cattle. While pricing cattle in video markets is very similar to regular auction markets, buyers cannot be guaranteed an average weight of delivered cattle, since the average weight listed for each lot is the

seller's estimate. This is an important consideration, since some cattle offered for sale may not be delivered for several months.

Video auctions attempt to deal with the problem of accurately estimating weight by specifying an acceptable limit by which actual average delivered weight can exceed estimated weight. A slide is for average weights above this limit specified. Sellers decide which weight limit and slide they will offer to buyers. For example, a seller might sell calves with an estimated average weight of 450 lbs. with a slide of $ .10/cwt. for each pound that actual average weight exceeds 470 lbs. If the actual average weight of the calves were 465 lbs. there would be no discount from the bid price. If the calves averaged 480 lbs. a $1.00/cwt. (10 lbs x $0.10) discount is incurred by the seller. .pa The weight limit or acceptable variance and the slide combine to provide some protection for the buyer. The relative risk protection (i.e., the size of the slide relative to the acceptable weight variance and vice versa) should be what is important to buyers. A relative measure of protection specified as the weight risk (WRISK), is included in our regression analysis, and is calculated as the quotient of the specified acceptable weight variance and the slide. The expected sign for this variable is negative since increasing the acceptable weight variance relative to the slide should decrease the bid.

Buccola (1982) found that comparable cattle offered at different points in times during the same auction can be priced differently. Timing may be even more critical in a video auction, as large numbers of cattle are offered within a short period. A dummy variable was included in our analysis to test for significant price differences between the first half and second half of each of the 14 video auctions held by SLA during 1987.

These factors (mixed lots, even truckloads, and allowable weight variances) must be considered in merchandising each lot of cattle. Therefore, the model estimated in this study is

$$(1)\quad VP_i = a + \sum_{j=1}^{J} b_j LC_j + \sum_{k=1}^{K} C_k MC_k + \sum_{l=1}^{L} d_l MS_l,$$

where VP_i is the video auction price for lot i; "a" is an intercept; LC_j is the jth lot characteristic; MC_k is the Kth market condition (source of information); MS_l is the lth merchandising strategy; and b, c, and d, are parameter estimates.

Table 1 presents the lot, market, and merchandising characteristics considered for analysis in this study. Frame, flesh, and breed were taken from the video auction catalogue. Location was included to determine whether cattle from different regions are priced differently. Besides transportation costs, the preponderance of breed types in a particular region, general perceptions, and reputations of cattle from different regions of the country may influence price.

Log transformations were performed on all prices and characteristics except sex, flesh, frame, location, timing, breed, and truck load characteristics, which are binary variables. This allowed for a relative (percentage) rather than an absolute measure of the impact of characteristics on price. Ordinary least squares (OLS) was used to estimate the parameter of equation (1).

Results

The OLS estimates for equation (1) were estimated for all lots and then by sex and weight. The estimates are reported in Table 2 for categories that include light feeder steers and heifers (under 600 lbs.) and heavy feeder steers and heifers (over 600 lbs.).

The number of cattle (Number) in each lot had a significant impact on the price received for the lot in all five cases investigated. This indicates that some economies exist in buying cattle in large lots. Obviously, accepting delivery of a large number of animals at the same time is less costly than accepting several small shipments.

The estimated average weight (Weight) and the sex (Sex) are both statistically significant and have the expected sign. Weight variations appear to affect steers more than heifers and light feeders more than heavier feeders. This indicates that there are larger discounts (premiums) for steers than for heifers as weights increase.

The number of miles (Miles) the cattle are shipped has a negative influence on price. However, miles shipped does not significantly influence the prices received for light feeders. This would make sense if more of light cattle were purchased by order buyers, who pass shipment costs on to their clients, compared with feedlot buyers who buy heavier feeders for their own feedlots. However, data are not available to test this hypothesis. Lighter calves are shipped farther than heavier calves, on average, so a factor other than just the cost of transportation contributes to this phenomenon.

Schroeder et al. did find significant differences in prices paid for breeds. The breed of an animal has little impact on price in our analysis. However, angus heifers do have a significant premium over herefords, indicating some preference for angus heifers as replacement breeding stock.

Native heavier feeder steers (Origin) brought higher prices than resold steers. Native heavier steers however, are usually sold directly to feedlots and may be perceived to have fewer potential health problems than cattle that have changed ownership several times. Buyers might also believe that "home grown" cattle are stressed less and perform better from the day they are placed on feed (Sands).

The weight risk (WRISK) faced by buyers is a significant negative influence on price in all cases. A 1% increase in the WRISK ratio is estimated to cause a .014% decrease in price received. Buyers will bid higher if a relatively small allowable weight variance is used in

Table 1. Independent Variables of Data from the Video Auction used to Estimate Equation (1).

Binary Physical Characteristic Variables		Binary Location Characteristic Variables	Market Characteristic Variables	Lot Characteristic Variables	Merchandising Variables
Frame:	Large[a]	Current Location: Mountain States (Nevada, Utah, Idaho, Wyoming and Montana)	Steer/Corn Ratio[b] (SCR)	Number of Head (Number)	WRISK
	Medium/Large		Future Price (FP)	Average Per Head Estimated Weight (Weight)	Truckload (Truck)[c]
	Medium				Mixed Lots[d]
	Small*				
		Southwest (Texas, Oklahoma, and New Mexico)			Pencil Shrink (Shrink)
				Miles Shipped (MILES)	Days to Delivery (Days)
Flesh:	Heavy				Time During Sale (Timing)
	Medium Heavy				
	Medium	Florida			
	Light Medium	California			
	Light*	Arizona			
		Upper Midwest (North and South Dakota)			
Breed:	Hereford*				
	Angus	Midwest* (Colorado, Kansas and Nebraska)			
	Exotic Cross				
	English Cross	Other			
	Exotic/Engl.Cross	Origin: Native(home-raised)			
		Other			
Sex:	Male*				
	Female				

* Specifies the control category for each binary characteristic, i.e., no dummy variable is included in the regression analysis for the category.

[a] Categories for each characteristic are listed after the colon following the characteristic

[b] The steer/corn ratio serves as a proxy for relative profitability of the cattle feeding industry

[c] Binary variable where lots over 40,000 lbs. = 1 otherwise = 0

[d] A Binary variable where lots sold with only one sex = 1 otherwise = 0

Table 2: OLS Parameter Estimates for Video Auction Price Model.[a]

Independent Variables	Overall	Light Steers	Light Heifers	Heavy Steers	Heavy Heifers
	$\bar{R}^2$[b]: .91 n = 1579	$\bar{R}^2$: .86 n = 473	$\bar{R}^2$: .87 n = 357	$\bar{R}^2$: .78 n = 477	$\bar{R}^2$: .84 n = 298
Intercept	2.264 (29.367)**	2.043 (11.686)**	2.002 (6.532)**	2.690 (14.810)**	1.676 (8.733)**
Lot Characteristics:					
Number	0.011 (6.279)**	0.013 (3.23)**	0.018 (4.155)**	0.006 (2.121)**	0.008 (3.172)**
Weight	-0.366 (-46.278)**	-0.466 (-26.866)**	-0.335 (-14.564)**	-0.300 (-15.983)**	-0.162 (-7.431)**
Sex	0.091 (30.092)**	B/A[c]	B/A	B/A	B/A
Miles	-0.004 (-3.439)**	0.001 (0.352)	-0.001 (-0.391)	-0.011 (-4.111)**	-0.006 (-3.643)**
Breed:					
English-Exotic Cross	0.005 (0.547)	0.020 (1.254)	0.027 (0.986)	0.004 (0.301)	0.012 (1.060)
English Cross	0.002 (0.202)	0.029 (1.321)	0.020 (0.710)	0.010 (0.649)	0.016 (1.424)
Exotic Cross	-0.005 (-0.488)	0.015 (0.825)	0.028 (1.903)	-0.017 (-1.132)	0.004 (0.881)
Angus	0.004 (1.827)*	0.130 (0.388)	0.070 (1.748)	0.022 (0.703)	0.138 (4.767)**
Origin	0.004 (-0.888)*	0.003 (0.612)	0.008 (0.854)	0.009 (1.738)*	-0.004 (-0.753)
Flesh:					
Heavy	-0.027 (1.745)	0.019 (0.663)	B/A B/A	-0.049 (-2.888)**	-0.055 (-1.899)
Medium-Heavy	0.004 (2.154)**	0.001 (0.006)	0.042 (2.423)**	-0.054 (-1.867)**	-0.009 (-0.986)
Medium	0.002 (1.750)*	0.002 (0.132)	0.029 (2.676)**	-0.054 (-1.256)**	-0.002 (-0.002)
Light-Medium	-0.002 (-0.275)	-0.012 (-0.943)	0.006 (1.756)*	-0.072 (-6.138)**	-0.007 (-0.791)
Frame:					
Large	0.008 (4.211)**	0.046 (2.368)**	0.023 (1.368)*	0.028 (1.857)*	0.006 (0.477)
Medium-Large	0.009 (3.838)**	0.008 (1.536)	0.017 (1.352)	0.030 (2.341)**	0.005 (0.489)
Medium	0.005 (3.278)**	0.021 (1.333)	0.023 (1.578)	0.027 (1.988)*	0.006 (0.604)
Location:					
Mountain	-0.009 (-2.967)**	-0.021 (-3.332)**	-0.005 (-0.708)	-0.009 (-1.428)	-0.009 (-0.388)**
Southeast	-0.022 (-7.006)**	-0.045 (-6.745)**	-0.048 (-6.628)**	0.001 (0.141)	-0.004 (-3.389)**
California	-0.009 (-2.711)**	B/A B/A	B/A B/A	-0.002 (-1.000)	-0.002 (-0.002)
Arizona	-0.008 (-2.988)**	-0.008 (-1.194)	-0.002 (-0.738)	-0.005 (-2.536)	-0.009 (-0.898)
Florida	-0.007 (-11.882)**	-0.024 (-3.379)	-0.033 (-7.442)**	-0.004 (-1.488)	-0.005 (-0.484)**
Upper Midwest	0.005 (2.008)*	-0.002 (-0.382)	0.001 (-0.487)	0.004 (2.284)**	0.004 (0.321)
Market Conditions:					
Futures	0.988 (44.488)**	0.994 (19.882)**	0.988 (13.986)**	0.981 (28.382)**	0.983 (29.742)**
SCI	0.0075 (3.388)**	0.304 (1.574)	0.306 (1.364)	0.006 (0.888)	0.041 (0.979)
Merchandising Strategies:					
WEEK	-0.004 (-4.842)**	-0.006 (-1.883)**	-0.008 (-2.388)**	-0.008 (-4.889)**	-0.007 (-2.889)**
Truck	0.000 (1.230)	0.000 (0.730)	0.003 (1.887)	0.007 (0.568)	0.009 (1.343)
Mixed	0.000 (2.388)**	0.006 (1.988)**	-0.013 (-1.634)*	0.003 (0.276)	-0.008 (-0.788)
Market	-0.002 (-4.883)**	-0.003 (-3.378)**	-0.004 (-3.888)**	-0.003 (-3.567)**	-0.001 (-3.177)**
Days	0.008 (3.984)**	0.010 (2.988)**	0.015 (3.988)**	0.002 (1.136)	0.001 (0.434)
Timing	-0.004 (-1.983)	0.002 (0.284)	-0.013 (-2.349)**	0.002 (0.333)	0.003 (0.744)

* Denotes statistical significance at 5% level

** Denotes statistical significance at 10% level

[a] t-values are in parentheses

[b] adjusted R-square

[c] not applicable

combination with a relatively large slide. Based on this, the most important merchandising strategy available to sellers using a video auction is to either weigh cattle prior to consigning them to the video auction or to design a slide more in line with actual market discounts for heavier animals.

Only cattle from the upper Midwest (the Dakotas) brought higher prices than the cattle from the Midwest (Colorado, Kansas and Nebraska). One explanation is the stress caused by shipment of cattle from outlying areas. Heavily stressed cattle may take several days to recover after shipment (Minish and Fox).

Another explanation for regional price differences could be real or perceived quality differentials among regions. For example, cattle from the mountain states may be smaller, have more hereford progeny, and during the winter months, have more coarse hair than other cattle. Cattle from Florida are perceived as having less ability to withstand cold weather.

Frame and flesh conditions of animals are also important determinants of price. Large-framed cattle with medium to light flesh to bring higher prices in the sales as they are more efficient in feeding than others. Although the coefficient for lots of at least one truckload (Truck) is positive, it is not significant. Despite no significant price difference existing for short loads, they have a higher proportion of no-sales (24% for short loads and 19% for the entire sample). This may be a result of sellers refusing to take lower prices and using local alternatives instead.

The feeder cattle futures price for the contract nearest to but not preceeding the video delivery date (Futures) has a large positive effect on video auction price. This was expected, since futures prices are the main source of price information for future delivery. The steer-corn ratio .pa (SCR) also positively influences price for a group. This was also expected, since increasing profits increase bid prices (Buccola, 1980).

The offered pencil shrink is a significant determinant of price in all cases. However, the sign (negative) on SHRINK was not expected. A closer examination using regression analysis, of the relationship between prices and shrink during 1987 shows that as the price level increased during the year sellers tended to offer smaller pencil shrinks. Therefore, a large pencil shrink may be a defensive merchandising strategy in a market with adequate supplies and relatively low prices. However, as prices rise sellers reduce pencil shrink accordingly.

The number of days to delivery (Days) has a significant positive impact on the price of light feeders. In a rising market, as in 1987, buyers may anticipate higher prices and may be willing to bid more for calves with later delivery dates.

Timing of sale within a video auction (Timing) does not significantly influence the price of most lots offered. However, light heifers sold during the second half of sales are discounted. In many cases mixed lots of light heifers and steers are sold near the end of a sale and for lower prices.

The regression analysis demonstrates that a video auction functions much like other auctions in bid formulation. No irregularities were observed, and the results were similar to those of studies of the demand structure for cattle in a traditional auction setting. Most of the signs and magnitudes of the coefficients coincide with theory. Prices received were, in general, acceptable, based on the relatively large percentage of completed transactions. In short, the video auctions, function very well as a pricing mechanism and are accepted well by both buyers and sellers.

Completing transactions in a video market is different from other markets, however. Merchandising strategies play an important role in communicating information and determining favorable terms of trade. Consequently, an educational effort may be required to help sellers and buyers understand these strategies.

Summary and Conclusions

One problem video cattle auctions may face is the ability to provide adequate information (both visual and descriptive) to facilitate efficient trade. One way of testing for relative adequacy of information within a market is to analyze the bidding processes between markets. The general pricing mechanisms of video cattle auctions were investigated to provide more specific information about bid formulation in video auctions. Some of the items tested included lot characteristics, market information and merchandising strategies.

Video auctions price cattle similarly to other auctions. Discounts and premiums for lot characteristics are also similar. However, merchandising strategies, especially relating to weight risk, are more important to completing transactions through video auctions.

A substantial educational effort is required to inform interested parties about pricing using video cattle auctions. Selling cattle with video auctions, while similar to traditional auctions, does have some unique features. For example, merchandising strategies (especially weight risks) are more important in video-auction pricing than by other more traditional methods. Education as to proper formulation of slides and weight variances would be helpful to buyers and sellers.

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- CRP AND EXCESS GRAZING CAPACITY -

IMPLICATIONS FOR THE WESTERN LIVESTOCK INDUSTRY

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Decisions in the public and private sector, both recently and over the past 14 years, have had major impacts on the United States livestock industry. Apparent changes in demand for beef and sheep products on the consumer side, coupled with changes in technology, production practices, and resource use have raised questions about what might be in store for livestock producers between now and the 21st century. The following paper discusses some obvious, and perhaps not so obvious factors facing livestock producers in most of the western states. It is evident that these factors will impact producers in states aside from the 17 western states, however there are some unique factors facing the western states, and the paper will focus primarily on the west.

One of the primary thrusts of this paper will be to examine the impacts of aggregate forage availability for the extensive grazing livestock industry. Because much of the forage utilized by livestock in the western states is grazed from land that has limited alternatives for agricultural production, it is apparent that the availability and usage of this forage is a key factor in the future expansion or contraction of the western livestock industry.

The United States cattle industry reached its historical numbers peak in 1974, when the January 1, 1975 USDA cattle inventory was reported at 131,826,000 head. Of that total, 67,077,000 head, or 50.9 percent of the nations cow herd was located in the 17 western states. The USDA January 1, 1989 inventory reflects that the nations cattle numbers had dropped 32,342,000 head or 25 percent in 13 years. The 1989 figure reflects 54,210,000 head, or 54.5 percent of the U.S. cow herd is currently found in the 17 western states. (Table 1)

Sheep and lamb numbers in the United States have declined persistently since reaching their historical peak of 56.2 million head in 1942. The January 1, 1975 USDA inventory reported 14,512,000 head, with 11,552,000 head or 79.6 percent located in the 17 western states. The USDA January 1, 1989 inventory reported all sheep and lambs at 10,802,100, a decline of 25.6 percent from the 1975 figure, with 8,617,000, 79.8 percent located in the 17 western states. (Table 2)

Using the 1975 cattle and sheep inventories as a base year, and converting just the reduced beef cattle and sheep to animal unit months (AUM's)[1], the state by state decline in animal units from 1975 to 1989 are reflected in Table 3. Recognizing that aggregation errors exist by using just the beef cattle and sheep rather than total cattle numbers, I am assuming that these animals are primarily grazing animals, whereas many of the cattle reported in the all cattle and calf inventory include feedlot cattle, dairy cattle, etc. The reduction of these cattle during the 14 year period probably has a greater impact on the grains industry than grazing availability, although they are obviously related. By converting the beef cattle and sheep to animal units (AU) and then converting 1 AU equal 12 AUM's, it is then

[1] 5 sheep equal 1 animal unit, 1 animal unit equals 12 AUM's.