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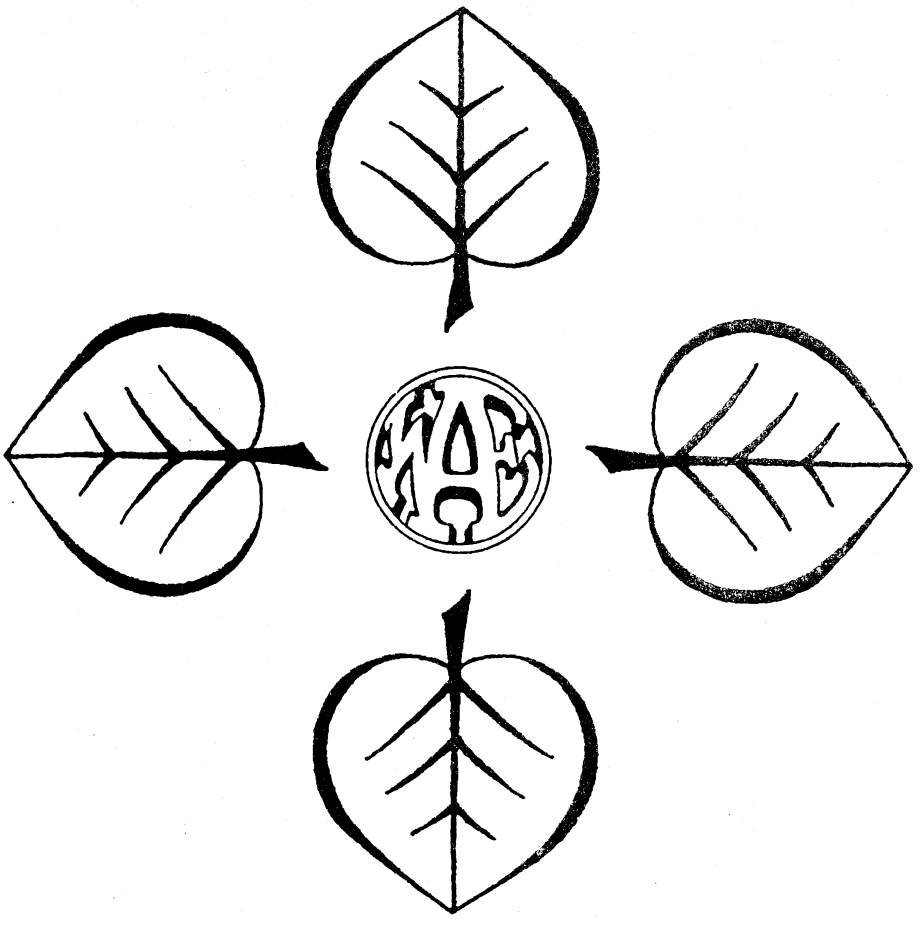

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Factors Affecting Bidding Activity for Fed Cattle

Ted C. Schroeder
Kansas State University
James Mintert
Kansas State University
Rodney Jones
Virginia Tech University

Abstract

The number of bids and bidders impact prices. Factors affecting the number of bids and bidders on fed cattle transactions were investigated. Higher quality cattle received more bids. Seller resistance to accepting the first bid impacted the number of bids and bidders. Bidding activity differences existed across feedyards and packers.

The number of bids on individual lots and the number of bidders in a market consistently impact transaction prices (Buccola; Hamm et al.; Hayenga et al.; Turner et al.; Ward 1988, 1984). Studying bidding activity in fed cattle markets is particularly important because of the price impacts of the number of bidders. Each additional bid on pens of fed cattle has been estimated to increase transaction price by $0.05/cwt to $0.12/cwt (Schroeder et al.; Ward 1992).

Fed cattle are marketed primarily through direct trade between feedyards and individual packers (Paul). The number of bids and the number of bidders may vary considerably across pens, feedyards, and over time. For this study the number of bids received on pens of cattle during the week of sale ranged from one to seven. Despite the importance of bidding activity on transaction price, we are unaware of any research that has specifically investigated what factors affect the number of bids or the number of bidders on individual transactions. The objective is to determine the factors affecting the number of bids and number of bidders on individual pens of fed cattle sold through direct trade. Data from 1405 pens of cattle are used to estimate Tobit regression models of the factors affecting the number of bids received and number of different packers placing bids.

The number of bids and bidders affect market liquidity. Thickness of a market increases with the frequency of offers (Lippman and McCall). An individual feedyard is susceptible to problems associated with thin markets (Tomek) because of the relatively small number of cattle for sale, the small number of buyers, and asymmetry in information between sellers and buyers. Knowledge of factors affecting the number of bids helps producers improve marketing skills. Determinants of the number of bidders provides evidence of factors affecting competition for fed cattle.

Tobit Model

The number of bids and number of bidders for a particular pen of cattle that is sold are never less than one. Both the number of bids and bidders have censored normal distributions which requires Tobit Maximum Likelihood estimation (Tobin). A model of bidding activity is specified as:

$$(1) \qquad Y_i = X_i \beta + e_i \qquad \text{if } X_i \beta + e_i > 1$$

$$= 1 \qquad \text{if } X_i \beta + e_i \leq 1,$$

where Y_i is the number of bids (bidders) received on pen i during the week of sale ($i=1,...,n$), X is the matrix of explanatory variables hypothesized to affect the number of bids, β is a vector of parameters, and e is a normally distributed random error with zero mean and constant variance σ^2.

The Tobit model can be used to determine changes in the number of bids received. The expected value of the dependent variable is (Tobin):

(2) $$E(Y) = X\beta\, F(z) + \sigma\, f(z),$$

where $z = X\beta/\sigma$, $f(z)$ is the unit normal density, and $F(z)$ is the cumulative normal distribution function. In a Tobit model the effect of a change in the kth explanatory factor on the expected value of Y (Total Change Derivative) is:

(3) $$\partial E(Y)/\partial X_k = F(z)\beta_k.$$

The change in probability of a pen getting more than one bid is:

(4) $$\partial F(z)/\partial X_k = f(z)\beta_k / \sigma.$$

For explanatory variables that are discrete z, f(z), F(z), and E(Y) were evaluated at alternative discrete values (0 and 1), holding other variables at their means.

Data and Empirical Model

Detailed bidding data and associated explanatory variables were collected on transactions from 13 feedyards in southwestern Kansas. Data were collected on 1405 pens sold during May-November 1990. For each pen sold, the number of bids received and the number of different packing firms that placed a bid were collected. In addition, characteristics of each pen were collected as well as aggregate market factors hypothesized to be important determinants of bidding activity.

Following Lippman and McCall, market liquidity is assumed to be determined by the characteristics of the asset and market conditions. Several variables were hypothesized to be relevant in explaining the number of bids and number of bidders. The empirical model was:

(5) $$\text{BIDS} = \beta_0 + \beta_1 \text{HEIFER} + \beta_2 \text{HEIFERETT} + \beta_3 \text{BULL} + \beta_4 \text{WEIGHT} + \beta_5 \text{WEIGHTSQ} + \beta_6 \text{CHOICE} + \beta_7 \text{DRESSING} + \beta_8 \text{HEAD} + \beta_9 \text{SPREAD} + \beta_{10} \text{TUESDAY} + \beta_{11} \text{WEDNESDA} + \beta_{12} \text{THURSDAY} + \beta_{13} \text{FRIDAY} + \beta_{14} \text{YARD 2} + \beta_{15} \text{YARD 3} + \beta_{16} \text{YARD 4} + \beta_{17} \text{YARD 5} + \beta_{18} \text{YARD 6} + \beta_{19} \text{YARD 7} + \beta_{20} \text{YARD 8} + \beta_{21} \text{YARD 9} + \beta_{22} \text{YARD 10} + \beta_{23} \text{PACKER 2} + \beta_{24} \text{PACKER 3} + \beta_{25} \text{PACKER 4} + \beta_{26} \text{PACKER 5} + \beta_{27} \text{SALEDIF} + \beta_{28} \text{CAPSUP}.$$

Variables are defined in table 1. Several explanatory variables are binary. To avoid singularity, default categories were used to define a base. The base was a pen of STEERS, sold on MONDAY, from YARD 1, to PACKER 1. Equation (5) is estimated twice, once with the number of bids received during the week of sale (BIDS), and a second time with the number of bidders placing bids during the week the cattle sold (BIDDERS). The explanatory variables include a binary variable for animal sex, continuous variables for weight, weight squared, quality, number of head, seller asking price to bid price differentials, feedyard, packer, and local cattle marketings.

Animal sex may influence bidding activity. Pens containing late-cut bulls or heiferettes may get fewer bids because of lower demand for these animals relative to steers. Likewise, pens containing heifers may attract less buyer interest because heifers are generally slaughtered at lighter weights, costing the packer more per slaughtered-pound to process.

Table 1. Expected Signs, Means and Definitions of Variables Explaining Fed Cattle Bidding Activity.

Variable	Expected Sign	Mean	Definition
Dependent Variables:			
BIDS		1.53	Number of bids received during sale week.
BIDDERS		1.19	Number of packers that bid during sale week.
Independent Variables:			
HEIFER	(-)	0.40	1 if pen contained heifers, 0 otherwise.
HEIFERETT	(-)	0.02	1 if pen contained heiferettes, 0 otherwise.
BULL	(-)	0.01	1 if pen contained late cut bulls, 0 otherwise.
WEIGHT	(+)	1141.9	Average weight of cattle (pounds per head).
WEIGHTSQ	(-)		WEIGHT squared.
CHOICE	(+)	53.6	Percent of cattle expected to grade choice.
DRESSING	(+)	63.3	Expected dressing percentage.
HEAD	(+)	119.8	Number of cattle in the pen.
SPREAD	(+)	0.37	Asking price minus first bid ($/cwt).
TUESDAY	(+)	0.44	1 if cattle sold on Tuesday, 0 otherwise.
WEDNESDA	(+)	0.19	1 if cattle sold on Wednesday, 0 otherwise.
THURSDAY	(+)	0.07	1 if cattle sold on Thursday, 0 otherwise.
FRIDAY	(+)	0.04	1 if cattle sold on Friday, 0 otherwise.
YARD i[a]	(?)	i=1,...,10	1 if cattle sold by feedyard i, 0 otherwise.
PACKER j	(?)	j=1,...,5	1 if cattle bought by packer j, 0 otherwise.
SALEDIF	(+)	57,805	Weekly Kansas fed cattle slaughter - marketings.
CAPSUP	(-)	5.95	Weekly captive supplies as percent of slaughter.

[a] Sample included 13 feedyards, because of small volume 4 were combined into one YARD variable.

Quality of the animals is expected to be related to number of bids received. Schroeder et al. and Ward (1992) show that cattle quality affects transaction prices, reflecting increased demand for higher quality cattle. It is expected that higher quality cattle would attract more bids and bidders. Cattle weight may have a nonlinear influence on the number of bids because light and heavy cattle are undesirable and expected to receive less bidder attention. The number of head in a pen could affect buyer interest if pen size affects transaction costs. Thus, the number of head is expected to positively influence bids.

Two factors are intended to measure seller resistance to accepting the first bid, increasing the chances for more bids. The spread between the feedyard managers' asking price and the first bid is a measure of how disparate the packer's and feedyard manager's perceptions are of the value of the pen. As such, the larger this spread (the larger the asking price relative to the first bid), the more likely the feedyard manager is to reject the first bid and hold the pen for subsequent bidders. The day of the week that the cattle are sold is expected to affect the number of bids because cattle held until later in the week are on the market longer with the opportunity for more bids. Which packer buys the pen may be related to the number of bids and bidders depending on the packer's purchasing strategy. Schroeder et al. and Ward (1992) found significant differences among packers in prices paid for cattle, suggesting differences in purchasing strategies.

The difference between the number of cattle marketed in Kansas and the number of cattle slaughtered during the week the cattle were sold (SALEDIF) is a measure of local supplies relative to slaughter.

It is expected that as the number of cattle brought into the region to fill slaughter needs increases, the number of bids on local pens may increase because of increased transportation costs. The percentage of cattle slaughtered during the week after the pen was sold that were from previously contracted cattle, referred to as captive supplies (CAPSUP), was included in the model because the number of bids and bidders this week may be affected by the percentage of captive supply cattle delivered in the ensuing week (Schroeder et al.). As contracted cattle are substituted for cash market cattle, bidding activity in the cash market could be adversely affected (Purcell).

Results

Sample Summary

The majority of the pens (67.7%) were sold on the first bid and generally (83.6%) only one packer bid on each pen. Either the market is quite thin, or feedyard managers frequently accept the first bid extended. In addition, packers often purchase several pens from the feedyard in a single negotiated transaction which could reduce the number of bids and number of bidders on any pen. The average number of cattle purchased by a packer at a yard during a day was 679 head when at least one pen of steers was purchased and 580 head when at least one pen of heifers was purchased. With average pen size being 120 head (table 1), five or more pens were often purchased at the same time by a packer.

Model Results

The estimated coefficients of the model used to explain the number of bids received are in table 2. The model explaining the number of bidders is not tabulated due to space constraints. The likelihood ratio test statistics exceed the chi-squared critical value indicating rejection of the hypothesis that the estimated parameters are equal to zero. The first column of table 2 is the estimated coefficients of equation (5). Although interpretation of these parameter estimates is not straight forward, the signs indicate directional impacts of each factor on bidding activity.

Number of Bids

Significant factors related to the number of bids were WEIGHT, WEIGHTSQ, dressing percentage (DRESSING), number of head in the pen (HEAD), the spread between the asking price and the first bid (SPREAD), the day of the week the cattle sold (TUESDAY, WEDNESDA, THURSDAY, and FRIDAY), several of the feedyards (YARD i), and one of the packers (PACKER 3).

Cattle weight had a nonlinear impact on the number of bids. The number of bids increased at a declining rate up to a weight of 1144 pounds and declined for heavier cattle. The higher the dressing percentage, and the more choice cattle in the pen (CHOICE is significant at the 0.10 level using a one-tailed test), the more likely the pen was to receive additional bids. For each percentage increase in dressing percentage, the number of bids increased by 0.217. The probability of receiving more than one bid was 0.154 as the dressing percentage of the cattle increased by one percent. For each ten percent increase in the number of cattle expected to grade choice, the number of bids increased 0.05. The number of cattle in the pen had a positive influence on the number of bids. For an additional 100 head of cattle in the pen the number of bids increased by 0.07. Although modest, this indicates that pen size influences buyer interest perhaps reflecting reduced transactions costs. The seller's asking price relative to the first bid impacted the number of bids. For each dollar per hundredweight the asking price exceeded the first bid, the number of bids increased by 0.475. This does not suggest that setting higher asking prices attracted more bids. It may indicate increased reluctance by cattle owners to sell cattle to the first bidder if the bid was lower than the owner's perception of the market value.

Table 2. Maximum Likelihood Estimates for Tobit Model of Factors Affecting Number of Bids Received During the Week Cattle Were Sold.

	Parameter Estimate	Asymptotic t-ratio		Change in Probability	Total Change Derivative	Total Change Elasticity
INTERCEPT	-62.766	-3.25	*	-	-	-
HEIFER	-0.264	-1.46		-0.071	-0.099	-0.106
HEIFERETT	-0.225	-0.56		-0.059	-0.079	-0.005
BULL	-0.360	-0.77		-0.093	-0.121	-0.005
WEIGHT	0.041	2.71	*	0.011	0.015	46.970
WEIGHTSQ	-1.8E-05	-2.74	*	-4.8E-06	-	-
CHOICE	0.014	1.47		0.004	0.005	0.737
DRESSING	0.569	2.08	*	0.154	0.217	36.610
HEAD	0.002	2.06	*	4.8E-04	6.8E-04	0.217
SPREAD	1.247	11.36	*	0.336	0.475	0.471
TUESDAY	0.780	4.96	*	0.186	0.224	0.261
WEDNESDA	1.526	9.06	*	0.394	0.589	0.305
THURSDAY	1.291	6.14	*	0.328	0.457	0.082
FRIDAY	1.037	3.85	*	0.257	0.332	0.035
YARD 2	2.645	9.52	*	0.627	1.036	0.338
YARD 3	2.197	7.98	*	0.514	0.733	0.243
YARD 4	2.892	10.75	*	0.681	1.223	0.569
YARD 5	3.450	11.89	*	0.778	1.691	0.417
YARD 6	1.161	2.91	*	0.228	0.240	0.019
YARD 7	-7.423	-0.00		-0.105	-0.071	-0.010
YARD 8	1.782	3.77	*	0.399	0.499	0.020
YARD 9	1.424	3.85	*	0.298	0.337	0.045
YARD 10	3.314	10.46	*	0.758	1.572	0.239
PACKER 2	0.191	0.86		0.053	0.083	0.022
PACKER 3	-0.544	-2.84	*	-0.139	-0.182	-0.075
PACKER 4	-0.179	-1.08		-0.048	-0.068	-0.046
PACKER 5	0.071	0.40		0.020	0.029	0.019
SALEDIF	-3.2E-06	-0.74		-8.6E-07	-1.2E-06	-0.188
CAPSUP	0.023	1.26		0.006	0.009	0.167
Censored Observations				952		
Non-Censored Observations				453		
Likelihood Ratio Statistic				451.53*		
McFadden's R-squared				0.30		

* Indicates significantly different from zero (two tailed test) at the 0.05 level.

Cattle sold later in the week received more bids than cattle sold on Monday. Cattle sold later in the week are on the show list longer and thus are seen by more buyers. Cattle sold on Tuesday through Friday receive 0.224 to 0.589 more bids than cattle sold on Monday. The number of bids and the probability of getting more than one bid peaked for cattle sold on Wednesday. Most cattle were sold by Wednesday (89% of pens) and cattle held beyond Wednesday may not be attracting bidder interest for several reasons. Ward (1992) and Schroeder et al. found that the day of week cattle were sold influenced transaction prices with cattle sold early in the week receiving the highest price. these results suggest that cattle market liquidity declines substantially late in the week.

Different feedyards received different average numbers of bids per pen. Relative to the default yard (YARD 1) most yards received more bids ranging from -0.071 to 1.691 more bids. Exactly why certain yards received more bids is not clear. These differences may be related to several factors including feedyard locations, personalities of managers, managers' selling strategies, and cattle quality not accounted for in other variables. Schroeder et al. found that different feedyards received different prices, a phenomenon that was explained by distance differences from the buying packer to the feedyard. These results indicate that the different feedyards also receive different numbers of bids, suggesting that liquidity may differ across feedyards.

Factors that did not influence the number of bids are also important. For example, the local marketings of cattle relative to the number of cattle that were shipped from out of state did not influence the number of bids. One might expect that tight local supplies would contribute to more bids. During the period investigated this was not the case. Similarly, increases in packers' captive supplies has been hypothesized to reduce the number of bids as packers use previously contracted cattle as a substitute for cash cattle purchases. However, this did not appear to be the case. This suggests that packers continue to bid on cash cattle during periods when they are slaughtering contracted cattle. These results leave unanswered the question of how aggressive these bids were.

Number of Different Bidders

Similar factors affected the number of different bidders as affected the number of bids. Significant factors affecting the number of different bidders were cattle weight, number of head, the spread between asking price and first bid, day of week the cattle sold, several feedyards, and three packers.

Weight had a nonlinear influence on the number of bidders. As with the number of bids, the number of bidders increased at a declining rate as the cattle weight increased up to a maximum number of bidders at an average weight of 1116 pounds and declined for heavier cattle. Each additional 100 head of cattle in the pen increased the number of bidders by 0.03, indicating that larger pens are associated with attracting slightly more bidders. Similar to the number of bids, the number of bidders increased by 0.125 for each dollar per hundredweight increase in the feedyard's asking price relative to the first bid. Also, cattle that were sold on Wednesday attracted the largest number of bidders during the week.

Several feedyards received bids from more packers than the default yard, suggesting that different feedyards typically have different numbers of packers placing bids. In addition, several packers purchased pens that received bids from less packers than the default packer. This may reflect different packers' preferences for different types of cattle that are not reflected in other variables.

Conclusions

Bidding activity is an important price determinant. Past research concurs that the number of bids and number of bidders affect transaction prices. Despite this recognized importance, factors that affect the

number of bids on transactions have not been investigated. The goal of this study was to determine the factors influencing the number of bids and number of bidders on fed cattle. The fed cattle market offers a particularly interesting environment for studying bidding activity because the direct negotiation marketing system between feedyard managers and packers has potential for being a thin market.

Cattle characteristics were significant bidder and bid number determinants. Cattle with higher dressing percentages, higher percentages of choice cattle, and of desired weight attracted more bidder interest. This confirms Lippman and McCall's claim that market liquidity differs with asset characteristics.

The feedyard managers asking price relative to the first bid had a significant impact on the number of bids and bidders. Reluctance by the feedyard manager to sell cattle on the first bid resulted in additional bids and bidders. Given the large percentage of cattle sold on the first bid and the impact bid number had on transaction price, one wonders whether feedyard managers were accepting bids more rapidly than what was in their best interests. However, studies by Schroeder et al. and Ward (1992) indicate that basis weakens by as much as $0.40/cwt later in the week. Thus, holding cattle for more bids may result in reduced price from a day-of-the-week effect. Finally, evidence of differences in marketing strategies of feedyard managers and in packer procurement strategies surfaced with significant differences in bidders and bid numbers across feedyards and packers.

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