Journal of Agricultural and Resource Economics, 19(2): 337–348

Cattle Feeder Behavior and Feeder Cattle Placements

Terry Kastens and Ted C. Schroeder

Cattle feeders appear irrational when they place cattle on feed when projected profit is negative. Long futures positions appear to offer superior returns to cattle feeding investment. Cattle feeder behavior suggests that they believe a downward bias in live cattle futures persists and that cattle feeders use different expectations than the live cattle futures market price when making placement decisions. This study examines feeder cattle placement determinants, comparing performance of expected hedgeable profit with past actual profit in explaining feeder cattle placements. Past actual profit is a more important placement determinant than expected profit based upon the live cattle futures market, even though hedgeable profit provides a superior forecast of future profit. In addition, potential deterrents to cattle feeders' use of futures as a substitute for cattle ownership are discussed.

Key words: cattle feeding profit, feeder cattle placements.

Introduction

Cattle feeders continue to place cattle on feed when expected feeding profitability (as signaled by the live cattle futures price) is negative. Purcell (1992b) reported that most respondents to a 1991 cattle feedyard operator survey indicated that a live cattle hedge would have covered variable costs less than 10% of the time that they placed cattle on feed.[1] This suggests that profit-maximizing cattle feeders who are placing cattle, whether they are cattlemen retaining ownership through feeding, feedyard operators, or outside investors, must expect an increase in the live cattle futures price.[2] If they believe this, it follows that they must believe a downward bias in the live cattle futures market is present. If feeders perceive a downward bias, that would help explain their infrequent use of futures as a short hedge at time of placement. What it does not explain is why these same feeders do not simply take long futures positions rather than own cattle.

This study addresses several related issues in an attempt to explain feeder cattle placements and cattle feeder behavior. The overtones of the above scenario are troublesome because they suggest that if cattle feeders are consistently correct in their assumption that live cattle futures prices will increase, then the futures market is inefficient, and in particular, biased. In addition, if cattle feeders are rational in their behavior to place cattle despite futures market projected losses, because a downward bias is thought to be present, then why do they not simply take a long position in live cattle futures instead? Perhaps cattle feeders use some expectation of profitability other than the futures market, such as past profit. That is, perhaps cattle feeders do not use live cattle futures prices as their primary source of cattle feeding profit expectation. Lee and Brorsen concluded that cattle feeders pay more for feeder cattle when cattle coming off feed are earning positive profits. This suggests that recent profit is an important determinant of current feeder cattle de-

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The authors are U.S. Department of Agriculture National Needs graduate Fellow and associate professor, respectively, Department of Agricultural Economics, Kansas State University.
We acknowledge helpful comments offered by Jim Mintert, Michael Langemeier, Kevin Dhuyvetter, and two anonymous reviewers.

mand. To address these issues, we examine cattle feeder placement behavior and investigate performance of the live cattle futures market.

The first objective of this study is to determine whether cattle feeders' placement decisions are more strongly influenced by expected profit based upon the live cattle futures market, or upon past cattle feeding profit. Second, we investigate whether live cattle futures have tended to move in a particular direction over the feeding period as a possible explanation for observed cattle feeder behavior (i.e., why cattle feeders continue to buy and place feeder cattle when facing expected hedgeable losses). Finally, potential deterrents to cattle feeders' uses of the futures market are discussed, suggesting future research.

Previous Literature

Two general areas of research are pertinent. The first is producer expectations and the role of futures markets in these expectations. The second related research deals with futures market efficiency. If cattle feeders place cattle despite facing large expected losses (as signaled via live cattle futures prices), then we must consider as possible explanations that their expectations are formulated using the live cattle futures market and/or that biases in the live cattle futures markets are anticipated.

Several studies have used futures prices as producer price expectations (Gardner; Helmberger and Akinyosoye; Hurt and Garcia). In addition, Eales et al. determined that soybean and corn futures prices were consistent with mean price expectations of a sample of Illinois grain producers and merchandisers. Therefore, precedence exists to consider futures prices as expected prices.

However, livestock futures markets provide poor distant price forecasts (Garcia et al.; Just and Rausser; Leuthold and Hartmann; Martin and Garcia; Shonkwiler).[3] Garcia, Hudson, and Waller concluded that based upon previous studies, livestock futures markets were more likely to be found inefficient than grain futures. Koontz, Hudson, and Hughes argued that one should not expect distant live cattle futures prices to be good forecasts of future prices. Because cattle placements can be altered early in a contract's life, production decisions can cause forecasts to be inaccurate. High prices stimulate increased placements, which cause expected delivery date prices to fall. "The futures market will not forecast if doing so elicits behavior that will prove the forecast wrong" (Koontz, Hudson, and Hughes, p. 235).

These studies bring into question the extent to which cattle feeders use live cattle futures for decisions to place cattle on feed. If live cattle futures provide relatively poor distant forecasts, what information does the futures price provide cattle feeders in making placement decisions? Additionally, the issue of futures market efficiency is raised. If the futures market is efficient, then it contains all relevant available information (Fama) and cattle feeders could use live cattle futures as their "best" available price forecast (even though it may not be highly accurate in the long run).

Futures market efficiency has been debated in the literature enough to merit a study of the studies (Garcia, Hudson, and Waller). Several studies generally supported livestock futures market efficiency (e.g., Kolb and Gay; Garcia et al.). Others found the market inefficient during specific historical time periods analyzed [Helmuth (this study has been subject to criticism—see Palme and Graham); Koppenhaver; Pluhar, Shafer, and Sporleder]. Elam and Wayoopagtr suggested that the live cattle futures market may have become more efficient in recent years. However, some inefficiency may be inherent within the live cattle futures markets (Koontz, Hudson, and Hughes).

Overall, previous studies have provided mixed results regarding live cattle futures market efficiency. Although there are no general tendencies that completely reject efficiency of the market, there are studies that found time periods when live cattle futures have been suspected of being biased. Of course, these results may reflect what seasoned futures traders generally recognize; that is, if mechanical rules are appropriately modified, large in-sample paper profit can be extracted from historical databases. If this is the case, an ex post downward bias in the futures markets may be easily uncovered. Nonetheless, these mixed results leave no resolution regarding whether cattle feeders garner significant information relevant to placement decisions from deferred live cattle futures prices.

Model of Feeder Cattle Placements

Assume cattle feeders maximize expected utility of real profit. Maximizing expected utility of profit yields a demand for feeder cattle to be placed on feed. At any point in time, cattle feeders choose either to place cattle in feedyards, or to leave them in growing or backgrounding phases. Timing of placement, although biologically constrained to some extent, has flexibility because there exists a range over which feeder cattle can be (and typically are) placed on feed. The number of cattle placed on feed in any given week will be related to the expected profitability of placing them, as follows:

$$(1) \qquad PLACEMENTS_t = f(E\pi_t, X_t),$$

where t refers to placement week, $PLACEMENTS_t$ denotes the number of feeder cattle placed on feed during week t, $E\pi_t$ is the expected real profit associated with placing cattle in week t ($/head), and X_t includes other relevant explanatory variables.

Equation (1) is the basis for modeling feeder cattle placements. Of interest is what measure(s) of expected profitability cattle feeders use in their placement decisions. In particular, do cattle feeders use expected profit based upon futures markets as their expectation of output price, or do they use a naive expectation of most recent profit (as in the cobweb model)? An empirical model was developed to determine whether cattle feeders' placement decisions are affected by expected profit based upon the live cattle futures market and projected cost of gain, or by a naive expectation of profit based upon actual recent cattle finishing profitability. If they base placement decisions on expected profit signaled by live cattle futures, then one wonders why cattle feeders often place cattle (resulting in a high feeder cattle price relative to fed cattle futures) despite large projected losses. Again, taking a long futures position would be an alternative to physical cattle ownership. If, on the other hand, placement decisions are based upon naive profit expectations, then cattle feeders are not using the futures market as an information source relevant to weekly cattle placement decisions.

Cattle placement decisions may be limited by cattle availability. In addition, it may take time to locate and transfer cattle, or for feedyard space to become available. Therefore, it is unlikely that cattle feeders can react instantaneously to changing expected profit conditions. Nerlove proposed the partial adjustment model, which allows for divergence between actual and desired changes in output (in this case feeder cattle demand). Nerlove's partial adjustment formulation is used to examine different profit expectations in the following models explaining feeder cattle placements:[4]

$$(2a) \qquad PLACEMENTS_t = \alpha_0 + \alpha_1 PLACEMENTS_{t-1} + \alpha_2 EH\pi_t^{t+19} + \alpha_3 TREND_t + \alpha_{j+3} MONTH_j + \epsilon_t,$$

$$(2b) \qquad PLACEMENTS_t = \gamma_0 + \gamma_1 PLACEMENTS_{t-1} + \gamma_2 \pi_{t-19}^t + \gamma_3 TREND_t + \gamma_{j+3} MONTH_j + \mu_t,$$

and

$$(2c) \qquad PLACEMENTS_t = \beta_0 + \beta_1 PLACEMENTS_{t-1} + \beta_2 EH\pi_t^{t+19} + \beta_3 \pi_{t-19}^t + \beta_4 TREND_t + \beta_{j+4} MONTH_j + \nu_t,$$

where $EH\pi_t^{t+19}$ is expected hedgeable profit ($/head) associated with placing cattle in week t and finishing in week $t + 19$ (19-week feeding period);[5] π_{t-19}^t is actual profit ($/head) received for cattle placed in week $t - 19$ and finished in week t (both profit measures are defined explicitly in the data section); $TREND_t$ is a trend variable that increases by one with each weekly observation; $MONTH_j$ ($j = 1, \ldots, 11$) denotes monthly dummy variables; the α's, γ's, and β's are parameters; ϵ_t's, μ_t's, and ν_t's are random errors with zero means; and other variables are as defined previously. Since cattle number cycles may be quite lengthy (5–10 years), possibly encompassing the sample period, a trend variable is included.[6] Monthly dummy variables are included to capture seasonality of feeder cattle placements.

Equations (2a) and (2b) are reduced models of equation (2c) and are estimated to determine the individual explanatory power of expected hedgeable profits and recent actual profit in explaining feeder cattle placements. Equation (2c) enables us to test which of expected hedgeable profit or recent actual profit is a more important determinant of feeder cattle placements. If β_2 is significant, this suggests cattle feeders use expected hedgeable profit as a guide in placement decisions. Significance of β_3 indicates cattle feeders use recent actual profit in making placement decisions. This also could reflect a wealth effect, implying cattle feeders bid up feeder cattle prices when recent cattle feeding has been profitable, as Lee and Brorsen suggested. This is consistent with a fixed amount of investment in cattle feeding over time.

After examining the two measures of expected profitability, of further interest in corroborating the feeder behavior [which might be described by (2a) through (2c)] is which of the two more accurately forecasts actual profitability. That is, if one or the other (expected hedgeable profit or recent actual profit) provides a superior forecast of eventual sale date profit on the placement date, then the superior information should be used in making placement decisions. To test this, the following empirical models are estimated:

$$\text{(3a)} \qquad \pi_t^{t+19} = \alpha_0 + \alpha_1 EH\pi_t^{t+19} + s_t,$$

$$\text{(3b)} \qquad \pi_t^{t+19} = \gamma_0 + \gamma_1 \pi_{t-19}^t + \tau_t,$$

and

$$\text{(3c)} \qquad \pi_t^{t+19} = \beta_0 + \beta_1 EH\pi_t^{t+19} + \beta_3 \pi_{t-19}^t + \upsilon_t,$$

where the variables are as defined previously, and s, τ, and υ are random errors. Subscripts denote placement week, and superscripts denote slaughter week.

Equations (3a) and (3b) are reduced models of equation (3c) and are estimated to determine the forecasting ability of expected hedgeable profit and recent actual profit. Out-of-sample forecasting performances of the three models are used to determine which sources of information are most useful in generating profit expectations. Information important in forecasting profit is expected to be significant in guiding feeder cattle placements.

Data

Weekly seven-state feeder cattle placements were collected from Cattle-Fax.[7] Weekly *projected* and *actual* profitability of feeding cattle were calculated using closeouts from 2 February 1987 through 17 May 1993 (329 weeks), obtained from *The Southwest Stockman,* Amarillo, Texas. *The Southwest Stockman* conducted a weekly telephone survey of a sample of participating feedyards within a 70-mile radius of Amarillo. Projected cost of gain (feed, yardage, and veterinary costs on a per pound of gain basis—here denoted *ECOG*) for steers placed on feed that week, actual cost of gain (*ACOG*) on steers closed out that week, and average selling price (*SP*) of cattle closed out were reported.

Weekly averages reported by the U.S. Department of Agriculture (USDA) for direct trade prices of 600- to 700-pound medium and large frame steers in the Texas Panhandle area were used as the weekly feeder steer purchase price (*PP*). Placement week futures prices (average of Monday through Friday closes) for the pertinent deferred live cattle futures contracts were used as the hedge prices (*HP*). An historical four-year moving

Table 1. Summary Statistics of Weekly Data for Cattle Placed on Feed, 2 February 1987 through 17 May 1993

Variable[a]	Mean	Std. Dev.	Minimum	Maximum
PLACEMENTS (head)	147,480	38,648	67,579	258,611
$EH\pi_t^{t+19}$ ($/head)	−21.99	16.89	−61.14	36.05
π_{t-19}^t ($/head)	14.30	47.89	−133.06	159.40

[a] Variables are defined as follows: Subscripts refer to placement week, superscripts refer to cattle finish week, *PLACEMENTS* are seven-state feeder cattle placements reported by Cattle-Fax, $EH\pi$ is expected hedgeable profit ($/head) for cattle placed at week t and finished at $t + 19$, and π is actual cash profit ($/head) for cattle placed at $t - 19$ and finished at t.

average of actual delivery week basis (cash price less nearby futures) was constructed using Texas Panhandle basis figures from Cattle-Fax for the estimate of expected basis (*EB*). Steers were assumed to be purchased at 650 pounds (*PW*), and slaughtered at 1,100 pounds (*SW*) 19 weeks after placement.[8] Interest rates of New York prime plus 1.5 percentage points were used to calculate interest cost (*IC*).[9] Interest was assumed to accrue for five months on the purchase cost of the feeder and one-half of the feeding cost. A zero profit thus would imply a return to capital invested equal to the rate charged by lenders. Nominal expected and nominal actual profit were deflated by the weekly personal consumption expenditure implicit price deflator (*PCE*, 1987 = 100) derived by linear interpolation of the monthly *PCE* (U.S. Department of Commerce). Expected hedgeable profit ($EH\pi$) and actual profit (π) are respectively defined here as:

$$\text{(4a)} \quad EH\pi = [(HP + EB)\cdot SW - PP\cdot PW - ECOG\cdot(SW - PW) - IC]/PCE$$

and

$$\text{(4b)} \quad \pi = [SP\cdot SW - PP\cdot PW - ACOG\cdot(SW - PW) - IC]/PCE.$$

These data allowed calculation of both breakeven projections for cattle currently being placed on feed, as well as estimates of actual performance of current closeouts. Thus, *expected* and *actual* performance easily can be compared.

Table 1 contains summary statistics of the data. Notice that projected weekly hedges resulted in real *losses* of $22/head, whereas unhedged cattle acquired actual real *profits* in the range of $14/head.[10] As expected, hedgeable profits have a considerably smaller range, as well as a standard deviation almost one-third that of cash profits. This is consistent with the argument by Koontz, Hudson, and Hughes that hedgeable profits at placement have significantly larger variability than actual profits. Weekly feeder cattle placements averaged 147,480 head and exhibited wide variability with a range larger than the mean. Weekly variations in feeder cattle placements from February 1987 through May 1993 are shown in figure 1.

Empirical Results

To determine what form of profit expectations cattle feeders use in making placement decisions, equations (2a) through (2c) were estimated using estimated generalized least squares (EGLS), allowing for first-order autocorrelation of the residuals (table 2).[11] Models explained 72% to 73% of the variability in weekly placements and all coefficients had the expected signs. Recent actual profit was positive and significantly different from zero (.01 level) in estimates of both equations (2b) and (2c). However, expected hedgeable profit

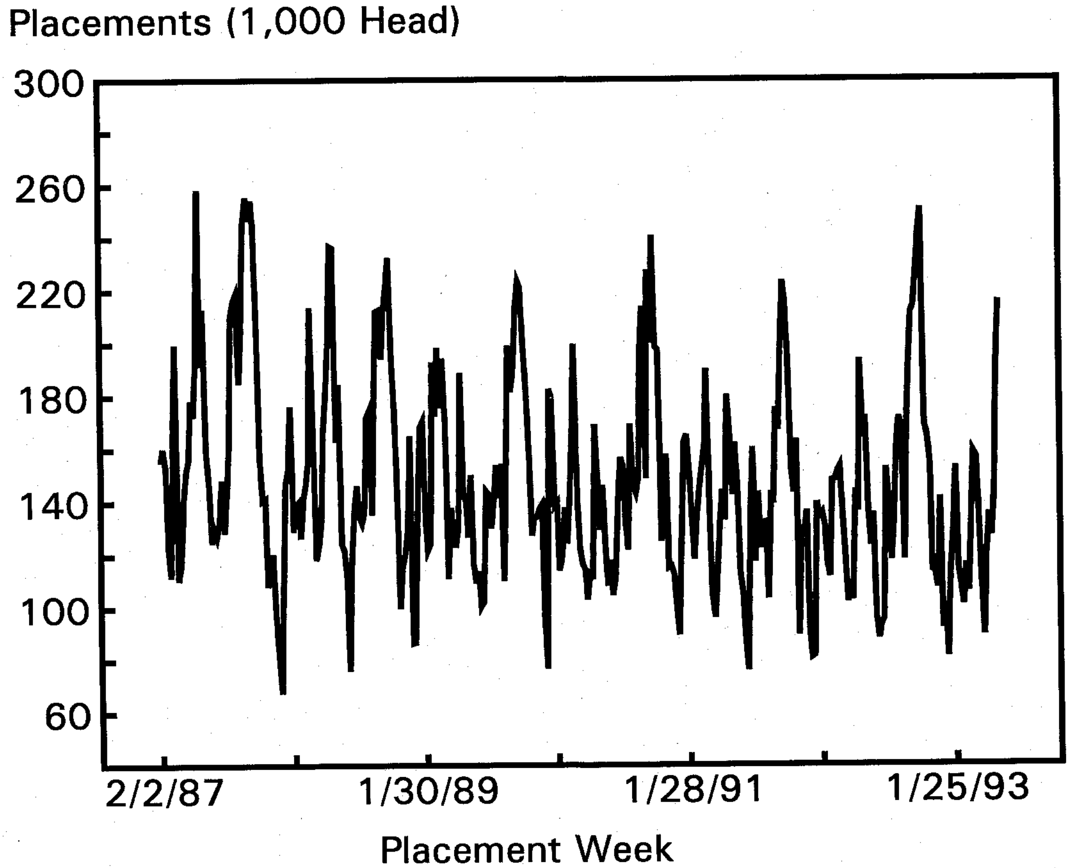

Figure 1. Weekly Cattle-Fax feeder cattle placements, 2 February 1987 through 17 May 1993

was not significant at the .10 level in either equation (2a) or (2c).[12] Several monthly dummy variables were significant, reflecting seasonal cattle placements. In addition, the coefficient on *TREND* depicted a significant decrease in feeder cattle placements over the sample period, consistent with trends in cattle numbers.

The implication of these results is that cattle feeders used recent actual profit as a significant information source for feeder cattle placement decisions, but did not use expected hedgeable profit to guide placement. The results suggest that either a wealth effect associated with recent cattle feeding profits impacts feeder cattle placements, and/or cattle feeders use naive profit expectations when placing feeder cattle. If cattle feeding profit when feeder cattle are placed could be projected more accurately using profit on cattle just closed out than by using expected future profit based upon the live cattle futures market, then this behavior still would appear rational. To test whether this was the case, equations (3a) through (3c) were estimated, and their out-of-sample forecasting ability for projecting actual profit was compared. If expected hedgeable profit has superior forecasting accuracy relative to lagged actual profit, then cattle feeders should be using this information in making placement decisions.

The ability of (3a) through (3c) to forecast actual profitability was formally compared in the following manner. Each equation was estimated with OLS over all available observations in 1987 (closeout dates of 15 June 1987 through 28 December 1987, totaling 29 weeks).[13] These competing models were used to forecast actual profits for one feeding period ahead (19 weeks into the future). For each succeeding period, the forecasting models were re-estimated, adding one more week to the data. Forecasts were thus calculated using

Table 2. Estimates of Factors Affecting Weekly Feeder Cattle Placements, 2 February 1987 through 17 May 1993

Variable	Equation (2a)	Equation (2b)	Equation (2c)
$PLACEMENTS_{t-1}$	.520	.498	.494
	(8.54)**	(8.18)**	(8.06)**
$EH\pi_t^{t+19}$	111.376		66.774
	(1.37)		(.82)
π_{t-19}^t		88.280	84.167
		(3.12)**	(2.93)**
TREND	−39.143	−29.27	−30.119
	(−3.00)**	(−2.26)*	(−2.31)*
FEBRUARY	−9,859.7	−12,871.4	−11,754.8
	(−1.65)	(−2.25)*	(−1.99)*
MARCH	3,247.3	−1,446.9	−280.8
	(.55)	(−.25)	(−.05)
APRIL	−13,112.1	−18.284.3	−17,439.4
	(−2.30)*	(−3.22)**	(−3.02)**
MAY	11,588.5	9,026.1	9,527.6
	(1.91)	(1.52)	(1.59)
JUNE	−19,083.0	−17,850.4	−18,187.8
	(−3.22)**	(−3.07)**	(−3.11)**
JULY	−11,501.6	−9,261.9	−9,756.7
	(−1.97)*	(−1.62)	(−1.69)
AUGUST	2,576.2	3,172.3	3,486.1
	(.44)	(.55)	(.60)
SEPTEMBER	16,961.3	18,302.2	18,626.8
	(2.66)**	(2.91)**	(2.95)**
OCTOBER	30,829.8	33,276.4	32,947.9
	(3.93)**	(4.29)**	(4.23)**
NOVEMBER	−17,523.1	−16,542.0	−16,982.1
	(−2.80)**	(−2.70)**	(−2.76)**
DECEMBER	−24,730.1	−23,405.5	−24,106.3
	(−4.09)**	(−3.99)**	(−4.05)**
INTERCEPT	83,015.7	81,334.7	83,277.8
	(8.10)**	(8.38)**	(8.26)**
ρ_{t-1}	−.159	−.167	−.164
	(−2.10)*	(−2.21)*	(−2.16)*
R^2	.72	.73	.73
Root Mean Squared Error	23,626	23,322	23,335
Observations	328	328	328

Notes: Dates refer to placement dates on feed. The t-statistics are reported in parentheses. Single asterisks (*) indicate significantly different from zero (two-tailed test) at the .05 level; double asterisks denote significance at the .01 level. Variables are defined as follows: Subscripts refer to placement week; superscripts refer to cattle finish week; dependent variable is feeder cattle placements (head) in week t, finished in week $t + 19$; $EH\pi$ is expected hedgeable profit ($/head) for cattle placed at week t and finished at $t + 19$; π is actual cash profit ($/head) for cattle placed at $t - 19$ and finished at t; *TREND* is linear time trend; each month is a binary variable equal to one in that month and zero otherwise; and ρ is the residual autocorrelation coefficient.

each of the models, covering a forecasted period of 16 May 1988 through 17 May 1993, for a total of 262 out-of-sample 19-week-ahead forecasts.

The final models estimated, which included data for cattle placed through 4 January 1993, are reported in table 3.[14] Both lagged actual profits and future hedgeable profits are statistically significant in explaining actual profitability in all three models. Both profit parameter estimates in (3c) are highly significant (.01 level). This suggests that the full model (3c) is statistically superior to either of the reduced models (3a) or (3b), and that

Table 3. Estimates of Hedgeable Profits and Lagged Actual Profits as a Forecast of Actual Cattle Feeding Profits, 2 February 1987 through 4 January 1993

Variable	Equation (3a)	Equation (3b)	Equation (3c)
$EH\pi_t^{t+19}$	1.041 (8.00)**		1.023 (8.22)**
π_{t-19}^t		.250 (5.13)**	.240 (5.44)**
INTERCEPT	31.065 (8.70)**	5.713 (2.39)*	27.921 (8.06)**
R^2	.17	.08	.24
Observations	310	310	310

Notes: Dates refer to placement dates on feed. The t-statistics are reported in parentheses. Single asterisks (*) indicate significantly different from zero (two-tailed test) at the .05 level; double asterisks denote significance at the .01 level. Variables are defined as follows: Subscripts refer to placement week; superscripts refer to cattle finish week; dependent variable is actual cash profit ($/head) for cattle placed in week t, finished in week $t + 19$; $EH\pi$ is expected hedgeable profit ($/head) for cattle placed at week t and finished at $t + 19$; and π is actual cash profit ($/head) for cattle placed at $t - 19$ and finished at t.

both lagged actual and expected hedgeable profits are important in explaining actual profits. Out-of-sample forecasting performance of the three models is presented in table 4. The forecast root mean squared error (RMSE) of the model, including both lagged actual and expected hedgeable profit (3c), was lowest at $42.79/head.

A comparison of the mean squared forecast errors of the three models was performed using the Ashley, Granger, and Schmalensee (AGS) procedure (table 4). This procedure is described by Bradshaw and Orden and by Goodwin. The hedgeable profits model (3a) provided a significantly more accurate forecast (.071 level) of actual profit than did the lagged actual profit model (3b). If cattle feeders used only one source of profit information to guide placements, expected hedgeable profit would be more useful than recent actual profit, yet earlier results suggested that they tend to use recent actual profit and not expected

Table 4. Ashley-Granger-Schmalensee (AGS) Tests for Significance of Forecast MSE Differences

	Forecast Model		
	Hedgeable Profit, Eqn. (3a)	Lagged Profit, Eqn. (3b)	Both Profits, Eqn. (3c)
Forecast Root Mean Squared Error	$43.27/head	$44.52/head	$42.79/head
	Significance Level of AGS Statistic[a]		
Alternative Forecast Model:			
Eqn. (3a)	—	—	.0004
Eqn. (3b)	.071	—	.042
Eqn. (3c)	—	—	—

Notes: AGS tests are obtained from regressing $\Delta_t = \beta_0 + \beta_1[E_t - \bar{E}_t] - e_t$, where Δ_t is the difference between forecast errors, E_t is the sum of the forecast errors, $\bar{E}_t$ is the sample mean of E_t, and e_t is a white noise residual.

[a] Significance levels are for the appropriate four-tailed F-test. Significance levels are relevant only when MSE of alternative forecast model exceeds MSE of forecast model.

Table 5. Average 19-Week Movement in Weekly Live Cattle Futures Prices, January 1977–May 1993

Year	Weeks	Mean	Standard Deviation	Minimum	Maximum
		($/cwt)			
1977	52	−.62	3.05	−5.88	5.45
1978	52	6.29	5.18	−1.94	18.58
1979	53	4.25	7.26	−11.51	18.85
1980	52	−1.86	5.69	−14.42	12.52
1981	52	−3.98	4.18	−13.01	2.42
1982	52	1.74	5.94	−6.81	15.20
1983	52	2.32	4.47	−5.77	14.87
1984	53	2.41	3.91	−2.28	10.51
1985	52	−2.96	5.48	−13.02	9.58
1986	52	.64	5.30	−8.56	12.22
1987	52	5.30	4.07	−4.62	13.16
1988	52	3.73	4.02	−4.55	11.51
1989	52	1.10	2.69	−5.09	6.45
1990	53	3.36	1.59	.11	6.31
1991	52	−.02	3.46	−7.18	6.46
1992	52	3.88	1.43	1.08	6.70
1993[a]	20	7.13	2.38	2.24	10.97
1977–93	855	1.73	5.30	−14.42	18.85

[a] Data ends 17 May 1993.

hedgeable profit. Equation (3c) had a significantly lower (.0004 level) out-of-sample forecast RMSE than the hedgeable profit equation (3a), and a significantly lower (.042 level) forecast RMSE than the recent actual profit model (3b). This indicates that both recent actual and expected hedgeable profit provide useful information for forecasting cattle feeding profit 19 weeks into the future.

Possible Explanations

If expected hedgeable profit offers a more superior forecast of actual profit than do lagged profits, why do cattle feeders appear to ignore this information? Similarly, why do cattle feeders not take long futures positions instead of own cattle during those times when expected profits are negative? Cattle feeders may suspect that the live cattle futures market is biased downward. Previous research results are mixed. To examine this, the average live cattle futures price movements were calculated over 19-week feeding periods for each week from January 1977 through May 1993 (table 5). Positive average price movements indicate that futures contract prices increased on average during the 19-week periods; negative values indicate prices declined. Only five years exhibited average price declines, whereas 12 years had average price increases. During the 1987–93 period, corresponding to the period used to estimate equations (2a)–(2c), live cattle futures prices increased on average between feeder placement and slaughter every year except 1991. The overall average price move across all years was $1.73/cwt. This may be part of the reason cattle feeders have not used expected hedgeable profit for placement decisions. They may expect such price movement to occur. If so, long live cattle futures positions seem a logical alternative to feeding cattle.

An obvious potential remover of downward bias, if it exists, should be cattle feeders. By purchasing cattle when a negative expected hedgeable profit exists, they are making a strong statement that they believe live cattle futures will move upward. This *has* to happen for them to make a profit feeding cattle. If one can cover variable costs with a hedge at placement only 10% of the time, as cattle feeders reported in Purcell's (1992b) survey, this implies that more than 90% of the time, cattle feeders may be better off with long futures positions rather than owning cattle in feedyards. Feeding cattle during times of negative expected hedgeable profit is somewhat of a paradox.[15]

Purcell (1992a) argued that one of the reasons feedyard operators do not take long futures positions as a substitute for cattle ownership during periods of hedgeable losses is the Internal Revenue Service's (IRS) asymmetric treatment of capital gains and losses. The IRS views long futures positions held by cattle feeders as speculation rather than hedging. Hedging incurs *normal* gains and losses, whereas speculative trading incurs *capital* gains and losses. Net capital gains are taxable in the current year. Net capital losses, for the most part, must be used to offset past or future net capital gains (Warach, pp. 240 and 680). This difference in the "time value" of incurred taxes means that a trader has to "see" a larger potential profit before going after it, implying that a bias has to be greater before it is traded out than it would be without asymmetric IRS treatment.[16]

A second IRS implication for cattle feeding investment is that feed bills, if paid, are often deducted during the current year on a pen of cattle that is slaughtered the following year (O'Byrne and Davenport, p. 156). The amount that this tax savings compounds into the following year would be an indication of this incentive to own cattle.[17] A third IRS implication is that cattle feeding investment normally is considered a "passive" activity (as defined by the IRS—see Warach, p. 539), and as such, net passive activity cattle feeding losses can be offset only by other passive activity gains, or otherwise carried forward. A cattle feeder who has few other passive investments against which to offset possible feeding losses would find this a disincentive to cattle ownership. A more definitive conclusion of the tax implications of cattle feeding investment must await further research.

One non-tax explanation of feeders' non-use of long futures as a substitute for cattle ownership is simply a lack of knowledge on the part of feeders regarding futures markets. But this is difficult to imagine, since most feedyards explicitly offer information to clients regarding futures markets or primary alternatives (Schroeder and Blair). One final explanation is that the utility of physical cattle ownership simply may be larger than the utility of the potential difference in profits between feeding cattle and trading futures.

Conclusion

Cattle feeders use naive profit expectations to make placement decisions. Recent actual profit was more important than hedgeable profit at placement in explaining weekly feeder cattle placements, despite hedgeable profit offering superior forecast information. If cattle feeders understand the live cattle futures market, the fact that they place cattle on feed when a futures hedge is offering negative profit is an indication that they must believe that the futures market is biased downward. That is, their behavior suggests that during these times they expect futures prices to rise between placement and slaughter.

During the past few years, live cattle futures prices have shown a tendency to increase over the typical feeding period. Thus, cattle feeders, by remaining in the cash market, have not realized the large losses that often were projected by hedging opportunities at placement. However, still unresolved from this investigation is why cattle feeders bid up feeder cattle prices so that placed cattle face dismal projected losses, or why in these situations cattle feeders do not take long live cattle futures positions instead. Several factors, including tax implications and knowledge of the futures market, have arisen as possible explanations of such behavior; however, at first glance, none of these appear to be sufficient to justify the behavior. Several fascinating questions arise from this study regarding cattle feeder investment behavior that would benefit from future research.

[*Received August 1993; final revision received August 1994.*]

Notes

[1] Variable costs include feeder cattle, feed, and interest. Fixed costs include a feedyard's charge for facilities. Thus, total costs would be covered even less frequently.

[2] We are assuming risk-averse behavior, as feeding cattle entails production risk as well as price risk. Thus, cattle ownership would be preferred to long futures only if it offers superior expected returns. Of course, it is always possible that agents are maximizing some non-monetary attribute of the utility of cattle ownership.

[3] The term "poor" refers to relatively large forecast mean squared errors (e.g., Just and Rausser found forecast root mean squared errors of 22% and 27% for four-quarter-ahead live cattle and live hog futures prices, respectively, compared to typically less than 15% for grains). Garcia et al., however, were unable to find a trading strategy to profit from "poor" distant forecast performance of live cattle futures. Therefore, this inaccuracy is not necessarily evidence of inefficiency.

[4] Inclusion of a risk variable similar to that introduced by Lee and Brorsen (using profit rather than price) yielded insignificant estimates of that coefficient in each of the models. Thus, the final model specifications did not include risk as a placement determinant.

[5] Cattle often are placed at different weights with different anticipated lengths of time on feed. Therefore, 19 weeks is not necessarily the feeding horizon on all cattle placed on feed in any given week. However, this feeding horizon is representative of average placements. In addition, a 19-week-ahead cost of gain projection is the only time frame collected by *The Southwest Stockman,* thus constraining us from consideration of other lag lengths.

[6] Implications of results of the model estimation reported later were insensitive to whether either lagged placements or the trend variable were included.

[7] According to Cattle-Fax, their placement numbers typically have represented roughly one-third of the monthly USDA seven-state numbers. The weekly Cattle-Fax placement numbers aggregated to monthly totals had a correlation of .90 with monthly USDA seven-state placements over 1987–92. Cattle-Fax adjusts placement numbers reported to them to account for differing numbers of feedyards that report placements through time.

[8] Prior to the selling date of 15 October 1990, *The Southwest Stockman* assumed a 1,050-pound finish weight.

[9] A personal telephone conversation with a loan officer in the Amarillo area confirmed that this was a reasonable rate for cattle feeding loans during the study period.

[10] Nominal profits per steer reported by Cattle-Fax for its total reporting area (not just the Amarillo, Texas area) during the same time period averaged around $22. Mean per head profit over the same time period reported by the USDA in the *Livestock and Poultry Situation and Outlook Report* was −$1.07. The disparity could be partially because of USDA costs that are higher than industry costs, as Koontz, Hudson, and Hughes, and Purcell (1992a) have noted.

[11] White's General Test showed no significant problem with heteroskedasticity.

[12] Collinearity between expected hedgeable and actual lagged profit is not a problem in comparing parameters of these two variables, as the simple correlation between these two variables was only −.004.

[13] First-order autocorrelation was present in the three estimated equations. Correcting for this autocorrelation yielded slope coefficient estimates that were each significant at the .05 level. The models used, however, were OLS, since correcting for autocorrelation would not be helpful for forecasting 19 weeks into the future (19 steps ahead). The information content of the lagged residual declines exponentially as one forecasts additional steps ahead.

[14] Our data set covers cattle placed through 17 May 1993. Actual profit for cattle placed on feed after 4 January 1993 would become available after 17 May 1993, which is beyond our data period. Therefore, the models in table 3 only include cattle placed through 4 January 1993.

[15] Koontz, Hudson, and Hughes, and Purcell (1992a) suggest that USDA-reported feeding costs are higher than industry averages. This explains finding long periods when one could not hedge a profit at placement. But this is not merely a data problem. Purcell's survey suggests that the industry *believes* there is only a small percentage of time during which profitable hedging opportunities coincide with placements.

[16] A simulation of this "time-value" distortion showed that a long speculative trader, trading each of the 19-week moves shown in table 5, would have made $.15/cwt less after-tax profit per trade than a long hedger. The time value of money used was 12.22% (1.5% above prime), and the income tax rate was the current top corporate rate of 34%. This is a small disincentive relative to the incentive of $1.73/cwt reported in table 5.

[17] This effect could be small, since it applies to the *interest* earned on deferred taxes only on those cattle placed in one year and sold in the next. A simulation at the means assuming a 34% tax bracket would imply an incentive to feeding cattle over trading futures of $.12/cwt.

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