INTEGRATED CATTLE FEEDING HEDGING STRATEGIES, 1972-1976

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Most major crop and livestock prices became considerably more variable after 1972, resulting in increased producer price risk. Uncertainty in cattle feeding was compounded in that both input (feeder cattle and feed) and product (fed cattle) prices became quite variable after 1972. This uncertainty, accompanied by considerable losses in cattle feeding during the 1973-1975 period, has made hedging a more desirable option [1, 9]. Several studies have examined a short hedge on live cattle at the beginning of the feeding period as a means of reducing risk and increasing returns to cattle feeders. Selective hedging strategies generally reduced the variance of returns per head as well as improved returns during periods when cash feeding was unprofitable [2, 5]. Routine hedging of every pen clearly reduced profits during periods when cattle prices were rising while providing some protection during cash-feeding loss periods [6]. Feeding live cattle on a cash basis was more profitable than routine hedging prior to 1973 [6].

Previous studies have been concerned only with the variation in live or fed cattle prices. This study examines the usefulness of live cattle, feeder cattle, and corn futures contracts in integrated hedging strategies for company-owned cattle. "Integrated" refers to the simultaneous use of long hedges with corn and feeder cattle and short hedges with live cattle futures contracts during a two-month planning period prior to actual placing of cattle on feed. Long corn and feeder cattle hedges were always lifted when cash corn and feeders were purchased to begin the actual feed-out, whereas the short live cattle hedge could be held (or placed) throughout the feeding period depending on the strategy employed.

Several previous studies have used mean-variance analysis to evaluate the performance of hedging strategies [2, 4, 5, 6, 8]. The same procedure was followed in evaluating the strategies developed here.

DATA SOURCES AND ASSUMPTIONS

The costs and prices used in the hedging strategies evaluated were those applicable to feedlots in the Castro, Deaf Smith, and Parmer Counties region of the Texas High Plains area with 10,000 head or more capacity. The feedlot's major activity was assumed to be custom feeding, with the option to feed cattle for its own account in unutilized capacity. Thus, custom feeding might well be continuous whereas the feedlot's own feeding program would depend on returns expected under the alternative hedging strategies.

Forty-seven pens of cattle were considered under the alternative strategies during the 52-month period March 3, 1972, through June 16, 1976. This period was determined by the initiation of the Chicago Mercantile Exchange's feeder cattle futures contract on November 30, 1971, and the most recent data available at the time of the study. A new pen of 200 choice 650-pound feeder steers could be started each month depending on the strategy used. Corn was the major feed grain used in the ration because corn production exceeded grain sorghum production by 35 million bushels in the three-county area. Feed costs per ton and feeder cost per hundredweight were assumed known on the first day feeder cattle were placed on feed. A conversion ratio of 8.5 pounds of feed to one pound of gain and a 2.7 pound average daily rate of gain yielded an 1100 pound choice steer in 167 days. A 4 percent "pencil shrink" yields a 1056 pound finished steer for sale. Death loss was 1 percent, and thus 198 of the original 200 head were available for sale.

Cash prices for choice 650 pound feeder cattle were weekly averages reported by USDA and Texas Department of Agriculture for the Amarillo Livestock Auction adjusted for transportation costs. Fed cattle cash prices were for choice 900-1100 pound sales in the

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Amarillo area. Cash corn prices were for the Plainview, Canyon, Farwell triangle area adjusted for handling charges and transportation to area feedlots. Prices for other feed ingredients were updated quarterly from information from a typical feedlot in the area.

Futures prices for live cattle and feeder cattle were from the Chicago Mercantile Exchange. Corn futures prices were for contracts on the Chicago Board of Trade. Futures prices were adjusted or localized to relate them to Texas High Plains area cash prices. Two alternative means of adjusting futures prices to High Plains local cash prices were considered. Adjustments A were determined from an examination of actual average bases. Cash prices were established in relation to futures prices at $2.50/cwt under for cattle, $.75/cwt under for feeder cattle, and $.10/cwt over for corn. Adjustments B were those suggested by feedlot and brokerage house representatives as applicable "rule of thumb" adjustments used in the study area. Cash prices relative to futures prices with adjustments were: $1.75/cwt under for cattle, $1.25/cwt under for feeder cattle, and $.20/cwt under for corn.

Hedging cattle feeding requires margins to be deposited and commissions to be paid on each futures contract used. Each pen of 200 head was 95 percent hedged by using five live beef cattle contracts on the Chicago Mercantile Exchange. Two corn futures and three feeder cattle futures contracts were used to hedge 95 percent of the corn and 97 percent of the feeder cattle per pen, respectively.[1] Hedges for corn and feeder cattle were placed in futures contracts with delivery months expiring as close as possible to the end of the planning period. Hedges for live cattle were placed using futures contracts with delivery months expiring as close as possible to the end of the feed-out period. Daily costs for (1) interest on original and maintenance margins and (2) commissions were included in hedging expenses for all strategies.

STRATEGIES CONSIDERED

A cash market strategy (CM) was used as a basis for evaluating four basic hedging strategies. The four hedging strategies were (1) lock-in or do not feed (LIDF), (2) lock-in or cash market (LICM), (3) extended lock-in (ELI), and (4) technical trading (TT).

Cash Market Strategy (CM)

Cattle were fed regardless of profitability and returns per head were calculated from the sale of the cattle and variable costs associated directly with a pen of cattle. CM strategy returns above variable costs were determined by equation 1.

$$(1)\quad RAVC_{cm} = \frac{(P_s \times W_s) - [(C_{fc} \times W_{fc}) + (C_c \times Q_c) + (C_{ofi} \times Q_{ofi}) + VCOFF]}{NCS}$$

where

$RAVC_{cm}$ = per head returns above direct variable costs per pen
P_s = cash sale price per cwt received for fed cattle
W_s = total net weight of cattle sold per pen (198 head × 1056 lbs per head = 2090.88 cwt)
C_{fc} = cost per cwt of feeder cattle delivered to feedlot
W_{fc} = total weight of feeder cattle purchased per pen (1300 cwt)
C_c = cost per cwt of corn delivered to feedlot
Q_c = cwt of corn fed per pen
C_{ofi} = cost per cwt of other feed ingredients delivered to feedlot
Q_{ofi} = cwt of other feed ingredients fed per pen
VCOFF = all variable costs other than feed and feeder animals per pen
NCS = number of cattle sold per pen after 1 percent death loss (198 cattle).

Hedging Strategies

In the LIDF, LICM, and ELI hedging strategies a two-month planning period preceded each scheduled feed-out. An expected lock-in margin (ELIM) per head was computed daily during the planning period by equation 2.

$$(2)\quad ELIM_{pp} = \frac{(FP^*_{lcg} \times W_s) - [(FP^*_{fc} \times W_{fc}) + (FP^*_c \times Q_c) + (C_{ofi} \times Q_{ofi}) + VCOFF]}{NCS}$$

where

$ELIM_{pp}$ = expected lock-in margin in $/head computed daily in planning period
FB^*_{lcg} = adjusted live cattle futures prices per cwt for nearest contract month after sale of pen
FP^*_{fc} = adjusted feeder cattle futures prices per cwt for nearest contract after close of planning period

[1]The futures contracts are for the following volumes: corn, 5,000 bushels; live beef cattle, 40,000 pounds; feeder cattle, 42,000 pounds.

FP^*_c = adjusted corn futures prices per cwt for nearest contract after close of planning period

W_s, W_{fc}, Q_c C_{ofi}, VCOFF and NCS are as defined before.

If the expected lock-in margin (ELIM) was equal to or exceeded a predetermined required lock-in margin (RLIM) during the planning period, hedges were simultaneously triggered short in live cattle and long in feeder cattle and corn. The long feeder cattle and corn hedges were lifted at the end of the planning period when cash feeder cattle and corn were purchased at the start of the feeding period. Futures prices were adjusted for basis during the planning period so as to approximate expected local cash prices for feeder cattle and corn when their long hedges were lifted at the end of the planning period. Live cattle short hedges continued until the end of the feeding period.

Lock-in or Do Not Feed (LIDF). If (1) an acceptable RLIM target per head was not locked in during the two-month planning period or (2) ELIM computed with cash corn and feeder prices and the live cattle futures price at the beginning of the feeding period was not greater than zero, the pen was not fed under the LIDF strategy.

Lock-in or Cash Market (LICM). The LICM strategy was a combination of the CM and LIDF strategies. If $ELIM_{pp}$ exceeded the RLIM on any day during the two-month planning period, live cattle were short hedged and feeder cattle and corn were long hedged until feeding started. However, if hedging was not done during the planning period, cattle were fed on a cash basis regardless of the profitability and this approach yielded the same results as the cash marketing strategy (CM) for those pens.

Extended Lock-in (ELI). The ELI strategy was the same as the LICM strategy except that a short live cattle hedge could be triggered on any day during the feeding period when ELIM equaled or exceeded the specified RLIM. ELIM was computed during the feeding period the same as in equation 2 except that corn and feeder cattle cash prices as of the beginning of the feeding period were used rather than the adjusted corn and feeder cattle futures prices.

Technical Trading (TT). Purcell [7] and Price [6] reported moving averages useful for indicating opportune times for placing and lifting live cattle hedges. The technical indicator used in the study consisted of 10- and 15-day moving averages and is explained in detail by Johnson [3]. For the live cattle futures, if the 10-day moving average dropped below the 15-day moving average by a specified amount and the sum of the most recent three first differences in the 15-day moving averages was < 0, live cattle futures were sold. Each day that a hedge was open, the lowest closing price since entering the position was multiplied by a specific stop percentage to set the stop price for the following day. Stop percentages for offsetting hedge positions were adjusted according to the amount of recent movement in the futures prices, i.e., the greater the range, the greater the stop percentage. Essentially, hedges were placed by the moving average indicator and lifted if the stop price was reached.

Moving average price indicators were used for placing and lifting long hedges in corn and feeder cattle during the two-month planning period. Short live cattle hedges were placed and lifted during the planning period as well as after the feed-out began. Corn, feeder cattle, and live cattle hedges were placed and lifted independently as many times as the technique indicated an adverse price movement.

Margin requirements were expected to be less than those for the other strategies although total hedging costs were expected to be greater because of increased commission expenses.

At the end of each feed-out, RAVC per head for the four hedging strategies were calculated as follows.

$$(3) \quad RAVC_h = \frac{(P_x \times W_s + NHR_{1c}) - [(C_{cf} \times W_{fc} - NHR_{fc}) + (C_c \times Q_c - NHR_c) + (C_{ofi} \times Q_{ofi}) + VCOFF]}{NCS}$$

where

$RAVC_h$ = per head returns above variable costs with hedging

NHR_{1c} = revenue from live cattle hedges net of all hedging costs

NHR_{fc} = revenue from feeder cattle hedges net of all hedging costs

NHR_c = revenue from corn hedges net of all hedging costs

Other variables are as defined in equation 1.

RESULTS

Lock-in hedging strategies were evaluated under three levels of required lock-in margin (RLIM): $10, $15, and $20 per head. As expected, the more liberal futures price Adjustments B increased the number of pens hedged under each lock-in hedging strategy (Table 1). Because Adjustments B were used by High Plains feeders, they are used throughout the rest of the analysis.[2] The number of pens hedged was reduced as the RLIM increased from $10 to $20 per head (Table 2). The $20 RLIM seems a reasonable target and is used henceforth in conjunction with Adjustments B in evaluating the lock-in strategies LIDF, LICM, and ELI.[3]

The 52-month period during which the 47 pens were fed can be divided into three subperiods based on returns per head above variable costs for the CM strategy (Table 3). The CM strategy was generally very profitable for pens placed through March 1, 1973, unprofitable for pens placed from April 1973 through October 1974, and very profitable for pens placed from November 1974 through July 1975; some losses occurred from then until early 1976.

TABLE 1. EFFECT OF FUTURES-CASH PRICE BASIS ON NUMBER OF PENS HEDGED AND MEAN RETURN AND STANDARD DEVIATIONS PER HEAD, LIDF, LICM AND ELI STRATEGIES, $20 RLIM, 47 PENS, 1972-76

Basis[a]	Units	Hedging strategies[b] LIDF	LICM	ELI
A				
Pens hedged/fed	(number)	3/3	47/3	47/32
Mean returns	($/head)	2.54	.48	19.01
Standard deviation	($/head)	11.07	69.61	52.56
B				
Pens hedged/fed	(number)	13/13	47/13	47/39
Mean returns	($/head)	7.48	9.64	21.90
Standard deviation	($/head)	15.65	57.86	32.58

[a]See text.

[b]Technical trading strategy not included because basis and RLIM not utilized.

[2]For more detailed analysis of basis adjustments, see [3].

[3]For more detailed analysis of RLIM, see [3].

[4]"Significantly" refers to a .80 level of significance.

Subperiod I: Pens Placed March 1972-March 1973

The CM strategy was most profitable during this subperiod at $30.75 per head average return over the 13 pens fed. The variance of returns was significantly lower for the ELI strategy but the mean returns per head were also significantly lower.[4] The TT strategy performed similarly to the CM strategy during this period of rising cattle prices. As no hedges were triggered during the planning period under the LIDF strategy, no pens were fed under that strategy. Results for the LICM strategy were identical to those for CM. Thus, with hindsight, the CM strategy was the best policy during this period although reasonable profits would have been obtained under the ELI and TT strategies.

TABLE 2. EFFECTS OF ALTERNATIVE REQUIRED LOCK-IN MARGINS (RLIM) PER HEAD ON NUMBER OF PENS HEDGED AND MEAN RETURNS AND STANDARD DEVIATIONS PER HEAD, LIDF, LICM, ELI STRATEGIES, BASIS ADJUSTMENTS B, 47 PENS, 1972-76

Required lock-in margin	Units	Hedging strategies[a] LIDF	LICM	ELI
($ per head)				
$10				
Pens fed/hedged	(number)	19/19	47/19	47/41
Mean returns	($/head)	7.53	6.42	13.58
Standard deviation	($/head)	17.75	53.88	30.99
$15				
Pens fed/hedged	(number)	14/14	47/14	47/39
Mean returns	($/head)	7.43	6.04	17.38
Standard deviation	($/head)	17.29	50.66	32.61
$20				
Pens fed/hedged	(number)	13/13	47/13	47/39
Mean returns	($/head)	7.48	9.64	21.90
Standard deviation	($/head)	15.65	57.86	32.58

[a]Technical trading strategy not included because RLIM not utilized.

Subperiod II: Pens Placed April 1973-October 1974

This was a disaster period for the CM strategy, with losses averaging $63.54 per head and ranging from −$147.59 to −$5.47 per head. All 19 pens lost money on a cash feed-out basis. In contrast, all hedging strategies' mean returns were significantly greater than CM returns.

It was possible to use hedges to lock-in margins for six of the 19 feed-outs during this subperiod under the LIDF strategy, three pens locked-in during the planning period and three at the start of the feeding period. Average returns per head over the 19 pens were $7.10, an average of $22.49 per head for the six pens actually hedged and zero for the other 13 pens because no cattle were fed. Of the six pens hedged and fed all were profitable under the LIDF in subperiod II. LIDF returns variance was significantly smaller than the CM variance.

Sixteen of the 19 pens were hedged with the ELI strategy in subperiod II, six hedges during the two-month planning period and 10 short live cattle hedges after the feeding periods began. Mean returns per head at $14.39 were significantly greater than the $63.54 per head loss with cash feeding but variances were similar. Only four of the 19 pens lost money with the ELI strategy and three of those pens were unhedged.

The TT strategy yielded the best results during the heavy cash loss subperiod II. Mean returns per head of $22.24 were highest but variance of returns was also highest in comparison with that of other strategies. Six of the 19 pens were losers with the TT strategy which used futures trading for all 19 feed-out periods.

Subperiod III: Pens Placed November 1974-January 1976

The CM strategy was profitable again during this time with 11 of the 15 feed-outs yielded positive returns. Mean returns were

TABLE 3. COMPARISON OF MEAN VARIANCE RESULTS AMONG CASH MARKETING, LOCK-IN OR DO NOT FEED[a], LOCK-IN OR CASH MARKET[a], EXTENDED LOCK-IN[a], AND TECHNICAL TRADING STRATEGIES, 47 PENS AND SUBPERIODS, TEXAS HIGH PLAINS, 1972-1976

Pen Number	Measure	Cash Market Strategy	Lock-in or Do Not Feed	Lock-in or Cash Market	Extended Lock-in	Technical Trading
		dollars per head				
	Mean	30.75	0	Same as	14.65	28.22
1-13	Variance	913.14	0	cash market	273.35	1131.42
	Range	(-10.12, 74.87)	0	strategy	(-10.12, 35.66)	(-20.66, 83.97)
	Pens fed/hedged	13/0	0/0	13/0	13/8	13/13
	Mean	-63.54	7.10	-34.46	14.39	22.24
14-32	Variance	1305.96	170.30	2355.16	1827.42	6730.10
	Range	(-147.59, -5.47)	(0, 46.15)	(-106.93, 46.15)	(-106.93, 51.76)	(-131.53, 161.71)
	Pens fed/hedged	19/0	6/6	19/6	19/16	19/19
	Mean	46.65	14.42	47.01	37.69	46.85
33-47	Variance	5468.84	481.36	2642.99	511.64	4744.35
	Range	(-93.98, 146.50)	(-0.95, 60.32)	(-42.30, 145.03)	(-0.95, 71.37)	(-78.13, 184.44)
	Pens fed/hedged	15/0	7/7	15/7	15/15	15/15
	Mean	-2.29	7.47	9.57	21.90	31.75
1-47	Variance	5052.66	244.60	3348.94	1061.59	4487.89
	Range	(-147.59, 146.50)	(-0.95, 60.30)	(-106.93, 145.03)	(-106.93, 71.37)	(-131.53, 184.44)
	Pens fed/hedged	47/0	13/13	47/13	47/39	47/47

[a]For ELIM of $20/head and basis adjustments B.

high at $46.65 per head but the variation in returns was very large; they ranged from −$93.00 to $146.50 per head per pen. In contrast, the ELI strategy returns averaged $37.69 per head but variance was significantly lower than that for CM; individual returns ranged from −$.93 to $71.37 per head over the 15 feed-outs. Results of the TT strategy were similar to those of the CM strategy.

Only seven of the 15 feed-outs were used under the LIDF strategy, yielding an average of $14.42 per head returns over the 15 pens. Both returns and variance were significantly lower for LIDF. The mean returns were $30.91 per head for the seven pens actually fed.

The LICM strategy provided mean returns per head comparable to those of the CM strategy but had a significantly lower variance of returns. The LICM strategy incorporated seven lock-in hedges during the planning period, leaving eight feed-outs on a cash basis.

Overall Performance: 47 Feed-Outs

The CM strategy yielded an average loss of $2.29 per head over the 47 feed-outs whereas each of the hedging strategies showed positive returns (Table 3). Only the $21.90 and $31.75 average per head for the ELI and TT strategies, respectively, were significantly greater than the −$2.29 per head for the CM strategy. Variances of returns were significantly lower for the LIDF, LICM, and ELI strategies than for the CM strategy.

The LIDF strategy initiated feeding in only 13 of the 47 possible pens, eight pens during the planning period under the $20 RLIM criterion and five additional pens on the day feeding began with ELIM ranging from $1.21 to $22.07. The RAVC per head for the 13 pens fed was only $7.47 when averaged over the 47 pens, not significantly greater than the CM strategy mean (Table 3). Variance of LIDF returns was significantly lower than CM variance. However, the eight particular pens during which simultaneous long corn and feeder cattle hedges and short live cattle hedges were placed during the planning period outperformed the corresponding cash pens significantly in terms of both higher returns and lower variance (Table 4). Mean returns per head were $51.52 greater than those for cash feeding. Five of the eight feed-out possibilities lost money with cash feeding; only one of the combined hedges' feed-outs lost money and that was less than one dollar versus −$93.89 for the corresponding cash pen. Although overall returns from LIDF were low because of the large number of unfed pens, the feature of placing long corn and feeder cattle hedges and short live cattle hedges simultaneously for a given RLIM prior to feed-out was attractive and such intermittent placements might be feasible for a custom lot with excess capacity feeding for their own account.

The ELI strategy is probably the most readily adaptable for a feedlot if continuous feeding is desired; i.e., lock in during the planning period if possible, but if not, commence feeding and short hedge in live cattle futures if the opportunity arises during the feed-out period. The ELI strategy provided both significantly higher returns and lower variance than the CM strategy. More than 80 percent of the 47 pens were eventually hedged with the ELI strategy; eight pens were locked-in during the planning period and 31 pens were hedged at the beginning or during the actual feed-out period. Starting feeding on a cash basis was, of course, speculative, but most of the pens became hedgeable during feed-out. Eighteen of the 31 hedges which involved only live cattle hedges were placed within 12 weeks of the start of feeding. The 39 hedges were opened on only 28 dates and two or three hedges were triggered on the same date on seven occasions. The proportion of live cattle short hedge opportunities which occurred during the feed-out periods over the 47-month span is consistent with the expectations of experienced hedgers [1].

The TT strategy placed and lifted as many as seven live cattle short hedges per pen based on indicated price movements whereas corn

TABLE 4. COMPARISON OF MEAN RETURNS PER HEAD FOR EIGHT PENS HEDGED DURING PLANNING PERIOD WITH SAME CASH MARKET PENS

Subperiod and Pen number	Feeding Dates	Revenue above variable costs: Cash market	Revenue above variable costs: Lock-in or Do Not Feed
		- - - - - - dollars per head	- - - -
Subperiod II			
30	8/74-1/75	-94.83	14.22
31	9/74-2/75	-45.34	21.51
32	10/74-3/75	-56.32	24.65
Subperiod III			
33	11/74-4/75	20.76	40.23
42	8/75-1/76	2.62	8.05
43	9/75-2/76	-41.00	16.23
44	10/75-3/76	-93.89	- 0.94
45	11/75-4/76	65.84	46.04
All pens	average	-30.84	21.25

and feeder cattle trades were limited to one or two per pen during the planning period. Though the TT strategy was judged the most successful because of highest average returns per head, $31.75, it was also the most complicated to conduct because of the several values which had to be derived and compared daily.

Margin Requirements

All returns for the various hedging strategies are net of hedging costs for commissions and interest on original and maintenance margins. However, acquiring the necessary margin money to maintain hedges under the lock-in strategies is critical to the hedging programs. The maximum margin requirement was $32,174 on June 18, 1975, for pen 36 under the LIDF strategy which incurred hedging costs of $647.42 but returned $46.46 per head. The next highest margin requirement under LIDF was $17,035. Maximum margin required under ELI was $29,874 for pen 37, yielding a hedging cost of $675.58 and returns of $38.93 per head. The average of the *maximum* margin requirements for the 39 pens hedged with ELI was $12,517 with a standard deviation of $7,343. Minimum and initial margin requirements were $4,500 when only live cattle hedges were used and $7,300 when live cattle, feeder cattle, and corn hedges were placed during the planning period.

Maximum net margin deposits under the TT strategy were only $7,589 (pen 39), or much less than those under the lock-in strategies, because hedged positions were offset when price trends appeared favorable to unhedged positions. In contrast, hedging costs were significantly higher for TT than for the lock-in strategies because of the greater number of roundturns generated under TT. Hedging costs were generally less than $3 per head for lock-in strategies versus $4 to $6 per head for TT.

Though margin requirements per pen did not exceed $32,174 under the lock-in strategies, five pens on feed simultaneously could approach $100,000 in margin requirements during periods of rising prices.

CONCLUSIONS

Evidence from the 47 feed-out periods spanning March 1972 through June 1976 gives strong support to the use of futures markets for hedging cattle feeding. Routine cattle hedging was not evaluated because previous studies have shown it to be inappropriate, e.g., locking-in losses. Feeding only when an acceptable return per head was expected during the two-month planning period based on simultaneous corn and long feeder cattle hedges and short fat cattle hedges was the most conservative strategy (LIDF) and definitely profitable when feasible. However, this strategy was used for only 13 of the 47 pens' periods.

The next most conservative and second most profitable strategy (ELI) involved locking-in during the two-month planning period if possible and, if not, cash feeding with the hope of hedging an acceptable return sometime within the feed-out period—that is, speculating in the cash market when the cattle were started on feed. Fortunately, most of these speculative pens were hedgeable sometime during the feed-out. Though the ELI strategy returned only half as much per head during the profitable March 1972-March 1973 period, its overall performance was clearly superior to that of the CM strategy.

Technical trading was clearly the most profitable of the hedging strategies although its variance was also large. Technical trading strategies have also performed well elsewhere and merit serious consideration by cattle feeders with the resources to maintain such activity [6, 7].

Finally, it must be noted that hedging through the use of futures contracts does not, in fact, "lock in" profits or particular prices. Locking-in would be successful only if the difference (or basis) between cash price and futures prices could be fully anticipated. Because this difference varies, a hedger is subject to basis risk. However, as illustrated in the 47 simulated feed-outs, basis risk was less than price risk and thus an appropriate selective hedging strategy can probably reduce price risk in cattle feeding.

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