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Selected Hedging Strategies for Cattle Feeders

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INTRODUCTION

Producers, feedlot operators, and investor-managers have been using the futures market for hedging live cattle since its inception in November, 1964. Their use of the market has fluctuated widely during the last 16 years because of changing attitudes toward risk, profit levels, and general economic conditions. This fluctuation in the use of futures market for hedging live cattle has been the topic of several formal research projects, popular articles, and professional economic journals. All of these reports, however, treat cattle hedging strategies theoretically (2, 3, 4, 5, 6, and 7). From a theoretical viewpoint, hedging almost always appears favorable but many things can happen under real situations that are typically not included in theoretical discussions. An alternate approach to the problem of evaluating hedging strategies would be to use actual feedlot results instead of hypothetical situations. The use of actual feedlot data removes several of the limiting assumptions and bias and therefore provides a more realistic basis from which hedging strategies can be compared.

The purpose of this paper is to report the results from using actual fat cattle feedlot data for simulating the effectiveness of five alternative hedging strategies.

Strategies and Evaluations

Evaluation of hedging strategies with hypothetical data can be misleading because:

1. The data are constructed so that the futures contracts exactly match the pounds of fed slaughter cattle marketed, i.e., three futures contracts totaling 120,000 pounds and 120 head of Choice grade 1,000-pound steers, a situation that rarely occurs under actual conditions.
2. Under hypothetical conditions, costs of gains are similar because common feed prices and feed conversion ratios are used for all pens of cattle of the same type. Under actual feeding conditions, feed prices and conversion ratios often vary widely from one pen of cattle to another. It is not uncommon to hedge into a loss situation on a pen of cattle because of underestimating costs of gains.
3. The futures contract is based on Choice grade steer cattle. Most authors using hypothetical data have assumed only steers are fed and they grade Choice, whereas possibly as many as 40 percent of all fed cattle grade lower than Choice and 40 percent are heifers. The price spread between Choice and Good or other grades, and between steers and heifers can change during the feeding period and thus influence profits.

The study reported here tested strategies with data from pens of cattle that were actually fed in a 15,000 head capacity commercial feedlot over a period of nearly 6.5 years.

Method of Evaluation

Each hedging strategy was tested with data from the feedlot's "summary sheets", which show actual costs, prices, and profits for individual pens of fed cattle. The summary sheets reported the sex, weights, numbers, and dates of cattle placed on feed and marketed; costs of the feeder animals, feed, and medical treatment; and feed conversion rates and costs per pound of gain. The feed cost category on the summary sheet includes the cost of the feed ingredients plus a charge of between $12 and $17 per ton fed for the use of the facilities, utilities, labor, management and a contribution to profit to the feedlot owners.

The 747 pens of cattle (58 percent steers and 42 percent heifers) varied in number, conversion rates, and length of feeding periods. Projections were made on breakeven costs and profit potentials from use of the futures market for each pen of cattle, with the economic conditions at the time the cattle were placed on feed. These projections were then compared by using a computer simulation model to the results that would have occurred for each pen of cattle under each of several hedging strategies. The first pen used for testing was placed on feed June 1, 1971 and the last test pen of cattle was placed on feed January 3, 1977.

For the study, daily futures prices were adjusted for the difference between the reported Omaha cash price and the Texas/New Mexico cash price for Choice grade fed steers, and for the spread between prices for steers and for heifers. The breakeven cost for each pen of cattle was

forecasted in dollars per hundredweight as a function of the estimated total cost of the animals, estimated cost per pound of gain, average weight of animals going into the feedlot, and estimated average net gain.

Brokerage fees for buying and selling futures contracts, which increased during the period, were charged against hedging strategies at the rate of $36, $40, or $50 per roundturn for each contract hedged, depending on the year and month cattle were placed on feed. Interest on margin deposits for futures contracts was calculated daily using a 10 percent annual rate.

Hedging calculations included sales of contracts when cattle were expected to be finished or the closest month beyond, if a contract was not available in the expected delivery month. Daily closing prices on the first day following a purchase or sale in the cash market were used as the futures market trading prices.

Since contracts are usually traded only in 40,000 pound units (a standard contract), it was necessary to establish the decision rule of one futures contract for each 40,000 pounds of expected delivery weight, or the weight closest to it. For example, one contract was considered sold if expected delivery weight was 40,000 to 64,000 pounds; and two contracts if 65,000 to 104,000 pounds.

Profits and losses from the futures market transactions were added to actual profits and losses from the sale of the cattle on the cash market for each pen of cattle fed and for each strategy tested. Profits and losses for each strategy were then averaged over the 6.5 year period and divided by the number of head fed, for an average profit per head.

Hedging Strategies

Six hedging strategies were tested (table 1). Five were designed for use by the feedlot owner or operator who is concerned with operating at or near feedlot capacity. The sixth strategy was designed for the investor-feeder who might want to use the futures market but is not concerned with the costs of a feedlot operating at less than capacity.

For a more detailed discussion of the various strategies see reference [1].

ANALYSIS OF RESULTS

The period studied was separated into two phases for analysis. The expansion phase of the cattle cycle and its consequent general rising prices extended from June 1, 1971 to August 13, 1973. The liquidation phase consisted of large fluctuations in cash market prices along with a slight downward trend in overall prices and extended from August 14, 1973 to January 3, 1977.

All 747 pens of cattle were used to test strategies 1 through 5 and 242 pens were used for strategy 6. Because of the difference in concept and resulting number of pens in the analysis, results of strategy 6 are discussed separately and are not reported in the tables with the other strategies.

Strategy 1 - No-Hedge

The average cash market loss was -$24.50 per head over the 6.5 years (table 2). Not all the pens lost money; feeding was profitable with approximately a third of them. Feeding steers gave higher

Table 1. Summary of hedging decision rules for the hedging strategies

Strategy	Hedge When . . .	Lift Hedge When . . .	Re-institute Hedge When . . .
1 No hedge	No hedges placed	(Not applicable)	(Not applicable)
2 Routine hedge	Cattle are placed on feed	Delivery date is reached	(Not applicable)
3 Selective hedge	1) Cattle are placed on feed 2) LFP - PT $\geq$ BEC	Delivery date is reached	(Not applicable)
4 Moving averages (3 and 10 day) (4 and 18 day)	1) Cattle are placed on feed 2) LFP - PT $\geq$ BEC; and 3) Moving averages indicated a downward trend has begun	1) Delivery date is reached; or 2) FP - \$5 $\leq$ HP; and 3) Moving averages indicate an upward trend has begun	1) Not yet delivery date 2) LFP - PT $\geq$ BEC; and 3) Moving averages indicate a downward trend has begun
5 Tolerance intervals (Regression Equation)	1) Cattle are placed on feed 2) LFP - PT $\geq$ BEC; and 3) Tolerance intervals indicate a downward trend has begun	1) Delivery date is reached; or 2) FP - PT $\leq$ HP; and 3) Tolerance intervals indicate an upward trend has begun; or 4) The stop-loss call is met	1) Not yet delivery date 2) LFP - PT $\geq$ BEC; and 3) Tolerance intervals indicate a downward trend has begun
6 Investor-feeder	Hedge only when cattle can be purchased and fed profitably	Delivery date is reached	(Not applicable)

BEC - Estimated Breakeven Cost
FP - Futures Price
HP - Hedging Price
LFP - Localized Futures Price
PT - Profit Target

Table 2. Average profit or loss per head, by sex, from both cash and futures markets, with specified hedging strategies for feedlot operators, New Mexico/West Texas, June 1, 1971 to January 3, 1977

Strategy	Profit Target Limits ($/Cwt.)	Steers and Heifers		Steers		Heifers	
		Futures ($/Head)	Combined* ($/Head)	Futures ($/Head)	Combined* ($/Head)	Futures ($/Head)	Combined* ($/Head)
1 No-hedge**	--	NA	-24.50	NA	-25.10	NA	-23.60
2 Routine hedge	--	4.30	-21.20	-1.40	-26.50	12.20	-11.40
3 Selective hedge	3.00	11.50	-13.00	11.30	-13.80	11.70	-11.90
	2.50	10.70	-13.70	10.00	-15.10	11.70	-11.90
	2.00	10.10	-14.40	8.70	-16.40	12.10	-11.50
	1.50	10.30	-14.20	9.00	-16.10	12.00	-11.60
4 Moving averages	5.00 and 3.00	12.30	-12.20	12.30	-12.80	12.30	-11.30
3- and 10-day	4.00 and 2.50	11.90	-12.60	14.10	-11.00	8.80	-14.80
	3.00 and 2.00	11.00	-13.50	11.70	-13.40	9.90	-13.60
	2.00 and 1.50	11.10	-13.40	11.40	-13.70	10.70	-12.90
4- and 18-day	3.00 and 2.00	10.00	-14.50	9.30	-15.80	10.80	-12.80
5 Tolerance intervals	5.00 and 3.00	7.20	-17.30	6.50	-18.60	8.10	-15.50

*Combined profit or loss from the futures and the cash markets.

**Only cash market profit and losses.

frequencies of large profits and large losses, but the mean loss per head was only slightly greater for steers (-$25.10) than for heifers (-$23.60). The mean loss was higher with steer pens than with heifer pens during the liquidation phase, when live cattle cash market prices were fluctuating or decreasing (table 3). During the expansion phase, steer pens yielded a smaller average loss than heifer pens, -$11.70 per head for steers and -$26.60 per head for heifers.

Strategy 2 - Routine Hedge

The routine hedge would have yielded a mean futures market profit of $4.30 per head for the entire time (table 2). This offset the -$24.50 per head average loss in the cash market by 18 percent to reduce the loss to -$21.20 per head. Slightly more than 50 percent of the pens of cattle would have been hedged profitably, but not profitably enough to offset the unprofitable hedges and losses in the cash market. Hedging the 433 pens of steers would have lost an average of -$1.40 per head in the futures market; with the 314 pens of heifers, it would have yielded and average profit of $12.20 per head in the futures market.

Strategy 3 - Selective Hedge

The selective hedge with a $3 profit target would have yielded a mean futures market profit of $11.50 per head but this was not sufficient to offset the average cash market loss of -$24.50 per head.

This strategy, however, would have reduced the cash loss by almost 50 percent, for a mean combined net loss of -$13.00 per head fed. Over two-thirds of the pens fed would have been hedged sometime during the feeding period with selective hedging.

Table 3. Average profit (loss) for pens of cattle, by cattle-cycle phase, with specified hedging strategies for feedlot operators, New Mexico/West Texas, June 1, 1971 to January 3, 1977

Phase and Strategy	Profit Target Limits ($/Cwt.)	All Pens			Steers			Heifers		
		Cash ($/Head)	Futures ($/Head)	Net ($/Head)	Cash ($/Head)	Futures ($/Head)	Net ($/Head)	Cash ($/Head)	Futures ($/Head)	Net ($/Head)
Expansion										
1	--	-16.40	NA	-16.40	-11.70	NA	-11.70	-26.60	NA	-26.60
2	--	-16.40	-21.80	-38.40	-11.70	-28.20	-39.90	-26.60	-8.00	-34.60
3	3.00	-16.40	8.80	-7.60	-11.70	8.80	-2.90	-26.60	8.90	-17.70
4	5.00 and 3.00	-16.40	15.80	-0.60	-11.70	15.00	3.30	-26.60	17.40	-9.20
5	5.00 and 3.00	-16.40	-1.40	-17.90	-11.70	-0.20	-11.90	-26.60	-4.10	-30.70
Liquidation										
1	--	-28.20	NA	-28.20	-33.20	NA	-33.20	-22.60	NA	-22.60
2	--	-23.20	16.60	-11.60	-33.20	15.00	-18.20	-22.60	18.60	-4.00
3	3.00	-28.20	12.80	-15.40	-33.20	13.00	-20.20	-22.60	12.70	-9.90
4	5.00 and 3.00	-28.20	10.70	-17.50	-33.20	10.60	-22.80	-22.60	10.80	-11.80
5	5.00 and 3.00	-28.20	11.20	-17.00	-33.20	10.60	-22.80	-22.60	12.00	-10.60

NA: Does not apply.

Expansion Phase: Cattle placed on feed between 6/1/71 and 8/13/73
Number of pens = 239 (all), 163 (steers), 76 (heifers)
Average head/pen = 115.3 (all), 120.7 (steers), 108.7 (heifers)

Liquidation Phase: Cattle placed on feed between 8/16/73 and 1/3/77
Number of pens = 508 (all), 270 (steers), 238 (heifers)
Average head/pen = 103.3 (all), 107.2 (steers), 98.9 (heifers)

On the average, hedging with this strategy would have been profitable (futures market only) for both steers and heifers, and also for both the expansion and liquidation phases of the cattle cycle.

Strategy 4 - Moving Averages

Strategy 4 (with the $5 and $3 futures profit limits for lifting the hedge) would have resulted in the highest average futures market profit of all the strategies tested, $12.30 per head (table 2). The average combined loss would have been -$12.20 per head (table 3).

During the expansion phase, Strategy 4 would have yielded an average futures market profit of $15.80 per head. Because the steer pens in that time experienced a relatively small mean cash market loss, -$11.70 per head, a mean profit of $3.30 per head would have resulted.

For the liquidation phase, approximately equal average futures market profits would have resulted for both steers and heifers, $10.60 per head and $10.80 per head, respectively. During this period, however, the average cash market losses were much greater for steers than for heifers.

Strategy 5 - Tolerance Intervals

The tolerance interval strategy was not as accurate a predcator of price trends in the futures market as was the moving average technique. A mean futures market profit of $7.20 per head for the tolerance interval strategy would have reduced the mean cash loss by 30 percent to -$17.30 per head. This strategy was not successful during the expansion phase of the cattle cycle resulting in an average loss in the futures

market of -$1.40 per head. The liquidation phase produced a mean futures market profit of $11.20 per head.

Strategy 6 - Investor-Feeder Strategy

Only 242 of the possible pens of cattle met the strategy conditions and hence would have been placed on feed and hedged with this strategy. An average futures market profit of $18.10 per head would have resulted on the 242 pens. This profit in the futures would have offset the average cash market loss of -$4.81 per head to produce an average combined (cash and futures market) profit of $13.25 per head over the period.

REMARKS

On the average, feeding cattle was not profitable during the 6.5 years studied. The average cash market loss was -$24.50 per head. A carefully chosen hedging strategy, however, could have almost halved the average loss on the 747 pens studied. Because both cash and futures market profits varied greatly over time and by sex of animal fed, certain hedging strategies proved highly profitable under particular circumstances. But, none of the strategies designed for the operator interested in keeping his feedlot full would have resulted in an average futures market profit greater than the average cash market loss. The investor-feeder could have profitably fed cattle so long as he fed only those that could be hedged in the futures market when they were placed on feed, at a price of at least $3 above estimated breakeven costs.

The period of the study was characterized by wide fluctuations in prices for cattle and feed grains. In addition, the study period included only part of a cattle price cycle. A longer period might produce different results.

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