USING DUAL OBJECTIVES AS DECISION GUIDES TO HEDGE OKLAHOMA FEEDER CATTLE—AN ECONOMIC EVALUATION

James R. Russell and Matthew C. Dickey

The continued volatility of feeder cattle prices sustains interest in hedging strategies. The stocker operator may use technical or fundamental analysis for decision guides in the hedging program. Alternatively, the stocker operator could use profit objectives to guide the operator's hedging decisions. Previous works have developed strategies based on technical tools such as moving averages (Lehenbauer), point and figure analysis (Lehenbauer), and oscillators (Russell and Franzmann). Similarly, strategies have been developed that use fundamental analysis as a decision aid (Brown). However, no work has examined, in detail, strategies based on a management by objective[1] philosophy—although at times the popular press has emphasized this approach (Farm Futures).

Using objectives to guide the decision-making process is not new to management (Carroll and Tosi; Drucker; Koontz) or to marketing (Kotler). Objectives may be classified by subject matter, time horizon, organizational unit, characteristics, and/or elements (Steiner). This paper reports the simulated results of using mutually exclusive dual profit objectives to hedge feeder cattle. Three different scenarios typical of Oklahoma stocker operations were used.

Figure 1 depicts the conceptual framework for developing marketing objectives. As the figure demonstrates, the framework is a subsystem which is a part of and interacts with the larger whole farm system. The operator's preferences, constraints, and expectations provide input into the selection of the marketing objectives. Marketing objectives and whole-farm objectives are determined simultaneously and must be mutually compatible. Preferences, constraints, expectations, and marketing and whole-farm objectives may be modified when actual results are compared with previous marketing objectives.

Production and risk preferences, financial and production constraints, operator expectations, and whole-farm objectives will vary across individuals and firms. Thus, it is impossible to rank objectives in terms of their desirability. This paper broadens the information base on the performance of specific marketing objectives. The working hypothesis is that more information will enable stocker operators to manage more effectively. It is generally assumed that larger average returns and smaller variances of returns are preferred. However, for the individual decision-maker, the timing of returns may be most important.

PROCEDURE

Marketing objectives may be formulated for the purpose of maximizing short-run profits, minimizing the variance of returns, creating stable cash flows, minimizing the risk of loss, or a host of other reasons. Marketing objectives may be expressed as a percentage return on investment, a maximum permissible loss, or a stated profit per head. Mutually exclusive dual profit objectives are a subset of the set of all possible types of marketing objectives. The procedure involves setting two mutually exclusive objectives: the first expresses an acceptable level of returns, and the second expresses a maximum permissible loss. The producer attempts to lock in, by way of the futures market (or other forward-pricing mechanism) the objective that

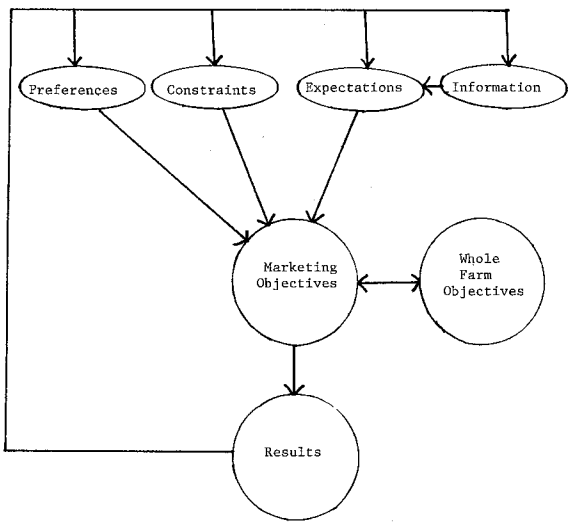

Figure 1. Conceptual Framework for Developing Marketing Objectives

James R. Russell is an Assistant Professor and Matthew C. Dickey a Graduate Research Assistant, Department of Agricultural Economics, Oklahoma State University.

Oklahoma Agricultural Experiment Station Journal Article J-4368, July 1983.

The authors gratefully acknowledge the comments and suggestions of John R. Franzmann, John E. Ikerd, James N. Trapp, and anonymous *Journal* reviewers. Errors and omissions remaining are those of the authors.

[1] For purposes of this paper, I shall use objectives, goals, and plans interchangeably.

can first be realized to the exclusion of the other objective.

For this paper, an objective of x/y means a producer would hedge his feeder cattle if a return of x dollars per head could be obtained or if a loss of y dollars per head were generated. He would choose whichever occurred first, thus excluding the other alternative. Although some would argue against hedging in a loss, it is a way for stocker operators to limit their exposure when markets look unfavorable.[2]

Using daily futures prices and Oklahoma enterprise budgets, more than 60 dual profit objectives were simulated for the years 1972–81 for three production scenarios: small grain grazing, small grain grazeout, and summer stocker. All of the scenarios are based on anticipated production of 42,000 pounds of feeder cattle to correspond with the number of pounds in one feeder cattle contract. When hedging occurred, a commission fee of $75 per contract was charged.

North central and northwestern Oklahoma enterprise budgets prepared by the cooperative extension service were used to compute production expenses and revenues after selected price adjustments were made to more accurately reflect historical costs. Steers were priced at the average weekly price for the proper weight at Oklahoma City. Feed, labor, equipment, machinery, commission, trucking, veterinary, and interest costs were obtained from the budgets for the appropriate periods of time. The adjusted returns from the budgets were added to any returns from hedging to arrive at a total return for the production period.

Small Grain Grazing Scenario

The small grain grazing scenario simulates the operation of a producer who buys stockers in the fall to graze until early spring on small grains pasture. It allows the producer to harvest the grain in late spring. For this scenario, 74 head of 400-pound stocker steers are purchased November 15 and sold as 565-pound steers on March 15. A death loss of 2 percent and gain of 1.35 pounds per day is assumed. The March feeder cattle futures contract is used for hedging.

The results of selected objectives for the small grain grazing scenario are presented in Table 1. The objectives are ordered by coefficients of variation, since coefficients of variation are often used as a measure of the desirability of specific marketing strategies (Lehenbauer).[3] Since economic theory cannot specify preferred objectives *a priori*, 60 different objectives were simulated. The objective 75/− had the lowest coefficient of variation (0.77) and the highest average returns per head ($77.29) of the strategies tested.[4] This objective was closely followed by the strategy 50/−, which had the third largest average return per head ($75.23) and the second smallest standard deviation of returns (59.35) and coefficient of variation (0.79).

Table 1. Results of Selected Dual Profit Objectives for the Small Grain Grazing Scenario, Ordered by Coefficients of Variation

Objective[a]	Average Return ($/head)	Range of Returns ($/head)	Standard Deviation	Coefficient of Variation	Percent Profitable Years
75/−∞	77.29	-17.54/190.36	59.72	0.77	90
50/−∞	75.23	-17.54/190.36	59.35	0.79	90
75/-25	76.40	-26.40/190.36	61.33	0.80	90
50/-25	74.34	-26.40/190.36	60.94	0.82	90
25/−∞	71.10	-17.54/190.36	61.59	0.87	90
25/-25	70.21	-26.40/190.36	63.06	0.90	90
100/−∞	71.85	-17.54/190.36	64.78	0.90	90
Hedge All	68.84	-22.90/190.36	63.90	0.91	90
100/-25	70.96	-26.40/190.36	66.18	0.93	90
No Hedge	61.94	-17.54/264.50	78.85	1.27	90

[a] For an objective of x/y, a producer would place a hedge if a return of x dollars per head were generated or if a loss of y dollars per head were generated—locking in a profit or limiting losses.

The table shows that operators placing hedges when per-head returns of $50 to $75 could be achieved or when losses exceeded $25 per head fared relatively well—at least if average returns, standard deviation of returns, or coefficients of variation are appropriate measures. The "hedge all" strategy had a coefficient of variation of 0.91, while the "no hedge" strategy had the highest standard deviation (78.85) and coefficient of variation (1.26).[5] Unexpectedly, all of the strategies yielded positive returns for 90 percent of the production periods.

Table 2 presents the per-head annual returns of selected strategies for the small grain grazing scenario. When compared to the dual profit objectives, the annual returns exemplify the increased variability inherent in the no hedge and hedge all strategies. The table also reveals the similiarity between the 70/−50, 75/−25, and 50/−50 strategies. The 75/−50 strategy produced the same annual returns as the 75/−25 strategy 90 percent of the time and as the 50/−50 strategy 50 percent of the time.

The simulation model indicated that over the period tested, per-head returns of $150 or better could have been hedged 10 percent of the time, and per-head returns of $50 or better could have been hedged 90 percent of the time. Per-head returns of no worse than a $25 loss could have been hedged 100 percent of the time. Over the objectives tested, when hedges were placed they occurred in November 86 percent of the time, in December 2 percent of the time, in January 10 percent of the time, and in February 2 percent of the time. Strategies based on profit objectives could prove to be a useful tool for the small grain grazing operator.

[2] The model was constrained to disallow locking in a loss within the first 14 days the stockers were owned. Not buying the stockers would appear to be a more attractive alternative in such a market.

[3] It should be remembered that for an individual decision-maker, timing of returns may be more important than either the mean or variance of returns.

[4] Since a profit objective of infinity (or minus infinity) would never be obtained, inclusion effectively changes a dual objective to a single objective. An objective of 75/− means a hedge would be placed as soon as a return of $75 per head could be achieved, and a hedge would never be placed at a loss.

[5] The hedge all strategy is characterized by the producer routinely hedging as soon as the stocker cattle are purchased.

Table 2. Annual Returns ($/head) of Selected Dual Profit Objectives for the Small Grain Grazing Scenario

Year	Objective[a]				
	No Hedge	Hedge All	75/-50	75/-25	50/-50
	dollars				
72	27.18	16.41	27.18	27.18	27.18
73	104.45	47.24	76.23	76.23	52.50
74	5.49	70.84	76.49	76.49	70.84
75	-17.54	-22.90	-17.54	-26.40	-17.54
76	42.14	44.22	42.14	42.14	50.15
77	44.14	63.82	44.14	44.14	63.82
78	65.55	20.40	75.94	75.94	57.01
79	264.50	190.36	190.36	190.36	190.36
80	62.83	137.06	137.06	137.06	137.06
81	20.83	120.90	120.90	120.90	120.90
Average	61.94	68.84	77.29	76.40	75.23

[a] For an objective of x/y, a producer would place a hedge if a return of x dollars per head were generated or if a loss of y dollars per head were generated—locking in a profit or limiting losses.

Small Grain Grazeout Scenario

This scenario simulates the operation of a producer who keeps the steers on the small grain pasture for a longer period of time instead of harvesting the grain. Sixty-three head of 400-pound stocker steers are bought November 15 and sold May 15 as 670-pound feeder steers. The scenario assumes a rate of gain of 1.35 pounds a day from November 15 to March 15, a rate of gain of 1.80 pounds per day from March 16 to May 15, and a death loss of 2 percent. Hedging is accomplished through the use of the May feeder cattle futures contract.

Table 3 presents the results of selected objectives for the small grain grazeout scenario, ordered by coefficients of variation. The 100/− objective had the largest average per-head return ($82.90) and the smallest coefficient of variation (0.70). This compares with an average return of $68.12 per head for the no hedge strategy and with $39.87 per head for the hedge all strategy. Coefficients of variation were 1.15 for the no hedge strategy and 1.78 for the hedge all strategy. Objectives that placed hedges when per-head gains were $75 to $100 or when losses were greater than $50 performed well relative to the other strategies (assuming that mean, standard deviation, or coefficient of variation of returns are appropriate measures of performance). Table 4 presents the annual per-head returns of selected objectives for the small grain grazeout scenario. Again, one notices the larger variability for the no hedge and hedge all strategies when compared to the dual objective strategies. The similarity between the dual objective strategies is also exemplified.

Per-head returns of $100 could only be hedged 40 percent of the time, whereas $25 could have been hedged 90 percent of the time. No worse than a $25 per-head loss could have been hedged 100 percent of the time. When hedges were placed, they occurred during November or December 65 percent of the time, during January or February 16 percent of the time, and in March or April 8 percent of the time. Apparently, well-tested dual profit objectives could be useful for the small grain grazeout producer.

Table 3. Results of Selected Dual Profit Objectives for the Small Grain Grazeout Scenario, Ordered by Coefficients of Variation

Objective[a]	Average Return ($/head)	Range of Returns ($/head)	Standard Deviation	Coefficient of Variation	Percent Profitable Years
100/-∞	82.90	-45.98/150.84	57.91	0.70	90
75/-∞	80.88	-45.98/150.84	57.60	0.71	90
100/-50	82.27	-52.36/150.84	59.50	0.72	90
75/-50	80.24	-52.36/150.84	59.18	0.74	90
150/-50	73.74	-52.36/150.84	60.33	0.82	90
50/-50	69.08	-52.36/150.84	60.00	0.87	90
No Hedge	68.12	-45.98/244.75	78.01	1.15	80
50/-25	57.58	-29.62/150.84	69.05	1.20	70
25/-25	44.26	-29.62/150.84	70.11	1.58	70
Hedge All	39.87	-24.67/150.84	71.16	1.78	70

[a] For an objective of x/y, a producer would place a hedge if a return of x dollars per head were generated or if a loss of y dollars per head were generated—locking in a profit or limiting losses.

Summer Stocker Scenario

This scenario simulates the operation of a producer who buys 61 head of 500-pound stocker steers on May 1, puts them on improved pasture, and sells them October 1 at a weight of 690 pounds. It assumes a rate of gain of 1.25 pounds per day and death loss of 2 per-

Table 4. Annual Returns ($/head) of Selected Dual Profit Objectives for the Small Grain Grazeout Scenario

Year	Objective[a]				
	No Hedge	All Hedge	100/-∞	100/-50	75/-∞
	dollars				
72	29.50	-24.67	29.50	29.50	29.50
73	95.18	-24.53	95.18	95.18	95.18
74	-45.98	-24.22	-45.98	-52.36	45.98
75	64.23	31.00	64.23	64.23	64.23
76	91.36	0.98	91.36	91.36	91.36
77	77.48	16.55	77.48	77.48	77.48
78	98.04	6.31	100.01	100.01	79.74
79	244.75	141.83	141.83	141.83	141.83
80	-6.40	150.84	150.84	150.84	150.84
81	32.99	124.62	124.62	124.62	124.62
Average	68.12	39.87	82.90	82.27	80.88

[a] For an objective of x/y, a producer would place a hedge if a return of x dollars per head were generated or if a loss of y dollars per head were generated—locking in a profit or limiting losses.

cent. The October feeder cattle futures contract is used for hedging.

Table 5 presents the results and Table 6 presents the annual per-head returns of selected objectives for the summer stocker scenario. The hedge all, $0/-25$, and $0/-\infty$ strategies had the smallest standard deviation (16.69) and the lowest coefficients of variation (0.58) of all strategies tested. Using these strategies, all the periods studied were profitable, but at lower profit levels than either the small grain grazing or small grain grazeout scenarios. When compared to the no hedge strategy, these strategies, raised per-head returns 85 percent and lowered the standard deviation of returns 71 percent.

The seasonal pattern in the October futures contract negates many of the benefits of using a dual objective strategy. At least over the period studied, to hedge later than May 1 (or the first trading day after if May 1 was not a trading day) decreased average returns and increased the variance of returns when compared to a hedge all strategy.

SUMMARY AND IMPLICATIONS

The study demonstrated that properly selected mutually exclusive dual profit objectives can, in many instances, increase the mean and reduce the variance of returns for the stocker operator. For the small grain grazing and small grain grazeout scenarios, many strategies performed significantly better than no hedge and hedge all strategies. For the summer stocker scenario, most strategies based on dual objectives outperformed the no hedge strategy and did worse than the hedge all strategy. The study also demonstrated that the choice of objectives is important. All scenarios had strategies which performed poorly when using either increased returns or reduced variance as evaluative criteria.

The study did not compare strategies based on dual objectives with multiple (selective) hedging strategies.[6] Such work needs to be done. However, regardless of the outcome of such work, many producers have preferences or time constraints that preclude them from multiple trades. Also, dual marketing objectives appear to fit a management-by-objective philosophy better than multiple hedging. The study assumed constant objectives across time, which may be unrealistic. Future work needs to examine goal setting (and the related strategies) in a dynamic and uncertain environment. Lastly, mutually exclusive dual objectives are not the only type of objectives. Future research should examine alternative goals and strategies. The results of this study should improve the accuracy of operator expectations regarding the types of goals that may be appropriate for hedging Oklahoma feeder cattle.

Table 5. Results of Selected Objectives for the Summer Stocker Scenario, Ordered by Coefficients of Variation

Objective[a]	Average Return ($/head)	Range of Returns ($/head)	Standard Deviation	Coefficient of Variation	Percent Profitable Years
Hedge All	28.55	0.19/47.87	16.69	0.58	100
0/-25	28.55	0.19/47.87	16.69	0.58	100
0/-∞	28.55	0.19/47.87	16.69	0.58	100
20/-25	27.62	-26.03/47.87	21.75	0.79	90
10/-25	26.17	-26.03/47.87	22.45	0.86	90
20/-50	25.12	-51.01/47.87	28.87	1.15	90
20/-∞	24.61	-56.12/47.87	30.37	1.23	90
40/-∞	17.92	-67.00/47.87	44.88	2.50	70
No Hedge	15.40	-67.00/90.52	56.95	3.70	60
50/-∞	10.12	-67.00/53.73	49.00	4.89	60

[a] For an objective of x/y, a producer would place a hedge if a return of x dollars per head were generated or if a loss of y dollars per head were generated—locking in a profit or limiting losses.

Table 6. Annual Returns ($/head) of Selected Objectives for the Summer Stocker Scenario

	Objective[a]				
Year	No Hedge	Hedge All	20/-25	20/-50	10/-25
	dollars				
72	58.83	8.75	21.51	21.51	11.16
73	19.95	26.22	26.22	26.22	26.22
74	-67.00	18.08	20.15	20.15	18.08
75	63.96	42.66	42.66	42.66	42.66
76	-39.47	47.87	47.87	47.87	47.87
77	12.00	46.66	46.66	46.66	46.66
78	90.52	42.34	42.34	42.34	42.34
79	-56.12	0.19	-26.03	-51.01	-26.03
80	77.67	33.33	33.33	33.33	33.33
81	-6.38	19.40	21.47	21.47	19.40
Average	15.40	38.55	27.62	25.12	26.17

[a] For an objective of x/y, a producer would place a hedge if a return of x dollars per head were generated or if a loss of y dollars per head were generated—locking in a profit or limiting losses.

REFERENCES

Brown, R. A. "Quantitative Models to Predict Average Feeder Steer Prices and Related Hedging Strategies." Master's thesis, Oklahoma State University, 1977.

Carroll, S. J., and H. L. Tosi. *Management by Objectives: Applications and Viewpoints.* New York: Macmillan, 1973.

[6] Multiple (sometimes called selective or speculative) hedging strategies allow the producer to place and lift hedges several times during the production period. The producer will place a hedge when some technical or fundamental indicator generates a "hedge signal" and will lift the hedge when the tool so indicates. The process may be repeated multiple times throughout the production period.

Drucker, P. F. *The Practice of Management.* New York: Harper and Brothers, 1954.
Farm Futures. "Pick a Profitable Price to Hedge your 1980 Crops." Jan., 1980, pp. 24–25.
Koontz, Harold, "Making MBO Effective." *Calif. Mgmt. Rev.* [No. 1] 20(1977):5–13.
Kotler, Philip. *Marketing Management,* 3rd ed. Englewood Cliffs: Prentice Hall, 1976.
Lehenbauer, J. D. "Simulation of Short and Long Feeder Cattle Hedging Strategies and Technical Price Analysis of the Feeder Cattle Futures Market." Master's thesis Oklahoma State University, 1978.
Russell, J. R., and J. R. Franzmann. "Oscillators as Decision Guides in Hedging Feeder Cattle: An Economic Evaluation." *S. J. Agr. Econ.* 11(1979):83–88.
Steiner, G. A. *Top Management Planning.* New York: Macmillan, 1969.