Oscillators As Decision Guides in Hedging Feeder Cattle: An Economic Evaluation

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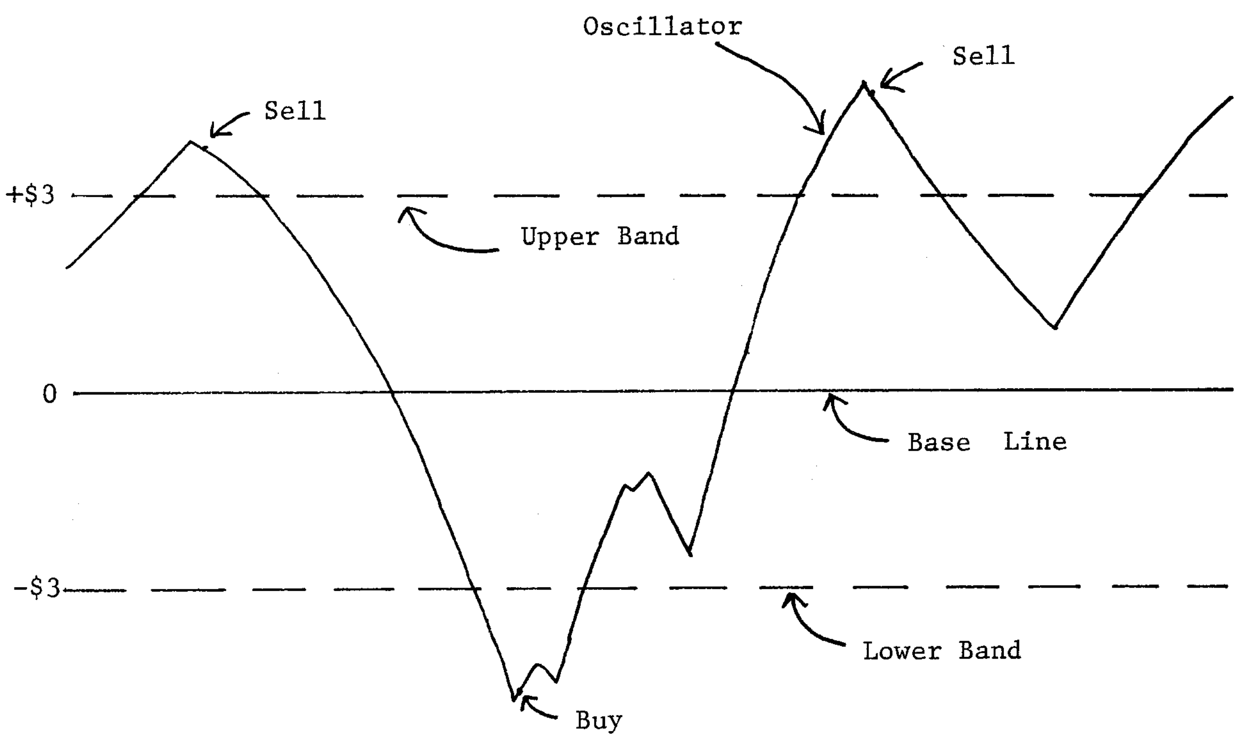
In recent years, extremely variable price movements have caused a high degree of price risk in the cattle industry. Cattle producers who chose to accept this price risk at the correct time had extraordinary gains, whereas those who accepted this risk at the improper time had returns below cost of production. Hedging offers the cattle producer an excellent opportunity to transfer a portion of the price risk to another party. Selective transfer of the risk can both increase the magnitude of returns and decrease their variance [1, 2, 4]. The family of technical tools called oscillators, one of the most useful tools employed by commodity traders [6, p. 34], was used to develop hedging strategies for feeder cattle.

The term "oscillator" refers to a concept of price relationships which depends on price differences rather than price levels to indicate futures market buy and sell signals. The methods that have been used to construct oscillators are many and vary in both usefulness and complexity. Regardless of the type of oscillator constructed, it must be based on one or both of the following rationales: (1) a price rise or fall can create an overbought or oversold condition if it gathers too much velocity and/or (2) a price trend can falter as it steadily loses momentum [5, p. 183]. Using these two premises, one can construct an innumerable variety of oscillators, although many would not prove useful.

A simple oscillator is depicted graphically in Figure 1. The following terms and decision rules are used for illustration.

Oscillator = today's price − price 5 days ago.
Base Line = $0.00.
Upper Band = base line + $3.00.
Lower Band = base line − $3.00.
Sell Signal = the first downward movement

FIGURE 1. A GRAPHIC REPRESENTATION OF A SIMPLE OSCILLATOR



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after the oscillator crosses the upper band from below.

Buy Signal = the first upward movement after the oscillator crosses the lower band from above.

From the graph, one can visualize the infinite number of oscillators and related decision rules that could be created. The base line need not equal zero, but could equal some fixed dollar amount, an average, or a moving average. The upper and lower bands could be equal to another dollar value or could be expressed in terms of standard deviations. The oscillator could be expressed as a difference between today's price and the price n days ago, a sum of daily differences, or as a product of some complex formula. The decision criteria could be changed if one wished to trade upon the crossing of an upper or lower band or the base line. Hence, the number of possible oscillators and affiliated decision rules is unlimited. Only through careful selection, testing, and evaluation can useful oscillators be found for a specific contract.

A knowledge of the advantages, disadvantages, and particular characteristics of oscillators is useful to the selective hedger who wants to use this tool. Oscillators can be extremely useful in a sideways or trading market. Numerous examples can be found in which price peaks and troughs were preceded by a decline in momentum. Oscillators are usually rather easy to compute and are objective. A trader using an oscillator should be cautious in a strong upward trending (bull) or downward trending (bear) market. In such markets, oscillators have a tendency to signal a price reversal when actually only a pause is occurring in the continuing price movement. It can also be difficult to determine the proper band width and to eliminate some of the erratic oscillator movement often encountered. A knowledge of these limitations, combined with the proper oscillator, should be useful in devising selective hedging strategies for feeder cattle.

SPECIFYING THE MODELS

Three oscillator models were tested to determine the most profitable for the feeder cattle contract. The first model relies on the premise that the best indicator of "overbought" and "oversold" contracts is found by adding some unknown number of daily price differences. The second model is based on the same premise but also has a flexible base line to eliminate some of the false signals which can be generated in a steeply trending market. The third model is based on the hypothesis that the momentum of futures price movements contains both short-term and long-term components. The short-term momentum contains erratic and unexplainable behavior and should not be used as the sole basis of trading. The long-term momentum is the preferred barometer of traders' emotions and serves as a much better signal of probable price reversals. When the long-term price momentum crosses the short-term price momentum plus or minus some penetration level, it is "sufficiently strong" to indicate a trading signal.

The three models have many similarities. For all models the March, May, and October feeder cattle contracts are used for the years 1972 through 1977. However, the March 1972 contract and the 1972, 1974, and 1975 May contracts are omitted because each model requires that the March and May contracts be opened for trade before November 15 and that the October contracts be opened before May 1. The deleted contracts were not opened until after these dates. These dates reflect the earliest that each model will allow trading and all models require the closing of any open position on the first trading day of the delivery month. Each model uses the simple average of the respective feeder cattle contract's daily high and low price as the representive price[1] for the day. This is the price at which all trades are assumed to occur. In models so designated, this representive price is smoothed by the use of an uncentered moving average (hereafter called smoothing average when used for this purpose) to remove some of the stochastic component of price movements. All upper and lower bands are measured in terms of standard deviations about the mean, which are calculated from the daily oscillator values prior to November 15 for March and May contracts and May 1 for October contracts. Each model limits the long or short trader's open position to one contract. The baseline, oscillator, and decision criteria are all dependent on the particular model chosen. All trading profits are adjusted for a $50 commission cost per round trade.

The following models were studied.

Model I: n-day oscillator = n-day total of daily changes in smoothed representative price; base line = a constant equal to the pre-trading-day average of oscillator values; decision rules = sell on first downward movement of oscillator after crossing upper band from below, buy on first upward movement of oscillator after crossing lower band from above.

[1]In practice, closing price can be substituted for representive price without significantly changing the results. In tests where this was done, average returns per contract were reduced approximately 5 percent. For purposes of analysis, the representive price was deemed to be the most desirable.

Model II: n-day oscillator = same as Model I; base line = a variable equal to an uncentered d-day moving average of oscillator; decision rules = same as Model I.

Model III: n-day oscillator = same as Models I and II; base line = a second oscillator constructed like first oscillator but of a shorter length; decision rules = buy when oscillator crosses upper band from below, sell when oscillator crosses lower band from above.

TESTING THE MODELS

More than 150 combinations of oscillators were tested across the 14 contracts. Table 1 shows results from the most profitable oscillators with each model. Model III produced the largest average returns per contract for short trades ($1,600) with a 5-day first oscillator, 1-day second oscillator, 3-day smoothing/average, band width of ±.01 standard deviations, and $1.50 stop (5/1, 3 S.A., ±.01 S.D., $1.50 S) trading strategy. By the same strategy with a $.75 stop (5/1, 3 S.A., ±.01 S.D., $.75 S), Model III also obtained the greatest average returns from long trades ($1,555). The lowest coefficients of variation for short and long trades also occurred with these strategies. Hence, for the feeder cattle contract, Model III is preferred on the basis of both magnitude and variance of trading returns.

EVALUATION OF SELECTED SHORT HEDGING STRATEGIES

The three best hedging strategies based on oscillators were compared with "no hedge" and "hedge and hold" strategies across three different production alternatives. These production alternatives [2] correspond to production decisions that are available to the producer of feeder cattle in Northwestern Oklahoma. Because the March 1972 and May 1972, 1974, and 1975 contracts could not be used with the oscillator strategies, the production alternatives corresponding to these periods of time were also eliminated. All of the production alternatives were based on an anticipated production of 42,000 pounds of feeder cattle to correspond to the number of pounds in one feeder cattle futures contract. The following production alternatives were used.

1. Summer stocker production alternative (S.S.)—Sixty-one head of 500-pound steers are bought on May 1 and sold on October 1 at a weight of 690 pounds. A rate of gain of 1.25 pounds per day and death loss of 2 percent are assumed. The October feeder cattle futures contract is used for hedging.
2. Small grain grazing alternative (S.G.Gz.)—This alternative simulates the situation in which the producer 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. Seventy-four 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 are assumed. The March feeder cattle futures contract is used for hedging.
3. Small grain grazeout alternative (S.G.G.O.)—The producer 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 calves are bought November 15 and sold

TABLE 1. AVERAGE RETURNS PER CONTRACT AND COEFFICIENTS OF VARIATION FROM TRADING ON THE FEEDER CATTLE FUTURES MARKET USING VARIED TRADING STRATEGIES BASED ON OSCILLATORS - MARCH, MAY, AND OCTOBER CONTRACTS, 1972-1977

Type Trader	Model	Oscillator Length in Days	Base Line	Length of Smoothing Average in Days	Band Width in Standard Deviations	Stop Value in $/cwt.	Average Return per Contract in Dollars	Coefficient of Variation in %
Short	I	35	Pretrade Mean	5	±1.00	1.00	1,066	181
Short	II	42	30 Day Moving Average	3	±1.00	1.00	1,223	184
Short	III	5	1 Day Second Oscillator	3	±0.01	1.50	1,600	154
Long	I	28	Pretrade Mean	3	±1.00	1.00	974	240
Long	II	42	10 Day Moving Average	3	±1.00	1.00	797	284
Long	III	5	1 Day Second Oscillator	3	±0.01	.75	1,555	123

May 15 as 670 pound steers. Rate of gain is 1.35 pounds per day from November 15 to March 15 and 1.80 pounds per day from March 16 to May 15. Death loss is 2 percent. Hedging is accomplished by use of the May feeder cattle futures contract.

The four hedging strategies and the "no hedge" strategy were evaluated over each of the production alternatives by use of Northwestern Oklahoma enterprise budgets prepared by the Cooperative Extension Service, Oklahoma State University.[2] Steers were priced at the average weekly price for the proper weight at Oklahoma City. Equipment, machinery, veterinary, commission, trucking, feed, labor, and interest costs were derived from the prices contained in the budgets for the appropriate periods of time. Margin requirements of $800 were assumed and interest costs on this requirement were computed by using the rate of interest in the budgets. The average returns per head and coefficients of variation computed for each strategy are reported in Table 2.

The largest average profits for both the S.G.G.O. and S.G.Gz. production alternatives were created by the 5-day first oscillator, 1-day second oscillator, 3-day smoothing average, band width of ±.01 standard deviations, and $.25 stop (5/1, 3 S.A., ± .01 S.D., $.25 S) hedging strategy, whereas the 3/1, 3 S.A., ±.50 S.D., $1.00 S strategy produced the greatest returns for the S.S. situation. These average returns ranged from 10 to 85 percent greater than those of the "no hedge" alternative. Hedging reduced the coefficients of variation for income in the S.S. and S.G.Gz. situations, but increased it for the S.G.G.O. alternative.[3] Selective hedging by means of oscillators generally increased the high and low returns across production alternatives. Therefore, hedging strategies based on these oscillators could be beneficial to the producer of feeder cattle in increasing average returns and, in the majority of instances, reducing the associated variance.

In comparison with Lehenbauer's optimized moving average and point and figure techniques [2], the oscillator technique provided

TABLE 2. SIMULATED RESULTS OF SELECTIVE HEDGING STRATEGIES FOR THE FEEDER CATTLE PRODUCER ACROSS VARIED PRODUCTION ALTERNATIVES, 1972-1977

Production Alternative	Strategy	Average Returns in $/Head	Coefficients of Variation in %	High Return in $/Head	Low Return in $/Head	Average Number of Trades Over Length of Hedge
S.S.	No Hedge	43.72	110.51	86.54	-39.47	0.0
S.S.	Hedge and Hold	60.30	41.08	94.17	27.75	1.0
S.S.	3/1, 3 S.A., ±.50 S.D., $1.00 S	81.01	28.11	118.29	69.34	4.9
S.S.	5/1, 3 S.A., ±.01 S.D., No Stop	77.18	30.05	11.13	51.63	6.8
S.S.	5/1, 3 S.A., ±.01 S.D., $.25 S	74.63	34.69	108.35	38.72	6.7
S.G.Gz.	No Hedge	48.86	69.57	85.11	8.60	0.0
S.G.Gz.	Hedge and Hold	57.70	41.87	79.19	22.95	1.0
S.G.Gz.	3/1, 3 S.A., ±.50 S.D., $1.00 S	71.64	32.66	101.60	38.23	3.5
S.G.Gz.	5/1, 3 S.A., ±.01 S.D., No Stop	69.47	35.47	94.53	33.42	4.8
S.G.Gz.	5/1, 3 S.A., ±.01 S.D., $.25 S	72.24	29.75	94.53	38.33	4.7
S.G.G.O.	No Hedge	124.33	9.03	136.83	115.10	0.0
S.G.G.O.	Hedge and Hold	77.11	38.91	100.33	43.23	1.0
S.G.G.O.	3/1, 3 S.A., ±.50 S.D., $1.00 S	116.80	16.22	136.60	98.84	5.4
S.G.G.O.	5/1, 3 S.A., ±.01 S.D., No Stop	135.48	12.03	149.37	117.54	7.5
S.G.G.O.	5/1, 3 S.A., ±.01 S.D., $.25 S	136.62	13.99	148.06	114.55	7.4

[2]These budgets are created by the Budget Generator Computer Routine and are currently on file at the Department of Agricultural Economics, Oklahoma State University.

[3]The authors hypothesize that this increase in variance is a statistical fluke resulting from the fact that three of the four omitted contracts were May contracts. This omission decreased the sample size from six to three contracts for the S.G.G.O. alternative. Additional testing is necessary to confirm or reject this hypothesis.

the largest increase in returns for the summer stocker and the small grain grazing alternatives; the moving average technique provided the largest increase in returns for the small grain grazeout alternative. However, the fact that the methods of analysis are not exactly the same in the two studies weakens any comparative conclusions.

EVALUATION OF SELECTED LONG HEDGING STRATEGIES

Five different hedging strategies were tested: the three best oscillator strategies, a "hedge and hold," and a "no hedge" strategy. The production situation chosen to test these hedging strategies was that of a cattle feeder who feeds two groups of cattle annually and has a 180-day planning horizon. Sixty-five head of 646 pound feeder steers were assumed to be purchased April 1, fed out, and sold on October 1. Another 65 head of 646-pound feeder steers were assumed to be purchased at that time, fattened, and sold the following April 1, thus completing the annual cycle. Feeder steers were priced at the average weekly price of choice 600-700-pound feeder steers at Oklahoma City for the appropriate week. Hedging decisions were assumed to be initiated the previous October 1 for the feeder cattle purchased in April and the previous April 1 for the feeder cattle purchased in October.

The five strategies were evaluated over nine 180-day planning periods. The 1972 through 1977 April and October contracts were used for hedging with trading allowed no sooner than October 1 for the April contracts and April 1 for October contracts. The April contracts for the years 1972, 1974, and 1975 did not begin trading until after the October 1 deadline, which negated the possibility of using the oscillator strategies with those contracts. Therefore the feeder cattle purchases and related hedging for those periods of time were omitted from consideration. Futures market profits or losses were adjusted to include a $50 commission cost per round trade and interest charges on $800 margin requirement at the rates used previously. From these figures, the magnitude and variance of the cost per steer were computed (Table 3).

The lowest average cost of feeder steers ($237.73) was obtained by using a 3-day first oscillator, 2-day second oscillator, band width of ± .25 standard deviations, and $1.00 stop (3/2, 3 S.A., ±.25 S.D., $1.00 S) strategy. This cost was 10.1 percent lower than that in the "no hedge" situation and 9.4 percent lower than that in the "hedge and hold" strategy. The 5/1, 3 S.A., ±.01 S.D., no stop strategy had the smallest standard deviation (28.57), which was 40 percent smaller than the standard deviation of the unhedged situation. All hedging strategies significantly reduced the variance of feeder cattle costs and all hedging strategies involving oscillators significantly reduced the average cost of feeder steers. Hence, hedging strategies based on oscillators

TABLE 3. SIMULATED RESULTS OF SELECTIVE HEDGING STRATEGIES FOR CATTLE FEEDER USING A 180-DAY PLANNING HORIZON, 1972-1977

Strategy	Average Cost in $/Head	Standard Deviation of Cost	High Cost in $/Head	Low Cost in $/Head	Average Number of Trades Over Length of Hedge
No Hedge	264.36	47.76	334.63	180.23	0.0
Hedge and Hold	262.40	36.47	320.38	207.81	1.0
3/2, 3 S.A., ±.25 S.D., $1.00 S	237.73	34.07	300.55	187.30	6.7
5/1, 3 S.A., ±.01 S.D., No Stop	240.98	28.57	278.67	197.17	8.0
5/1, 3 S.A., ±.01 S.D., $.75 S	242.16	34.77	297.21	184.57	8.0

could be useful to cattle feeders in reducing the magnitude and variance of their feeder cattle costs.

The oscillator technique resulted in a larger decrease in per head cost than Lehenbauer's optimized moving average and point and figure techniques. Because of different methods of analysis, however, any comparative conclusions across the two studies are weakened.

CONCLUSIONS AND IMPLICATIONS

The study shows that the use of oscillators as decision guides in hedging feeder cattle can increase the decision maker's profits and usually decreases the variance of the returns. The oscillator technique is both objective and relatively easy to compute. The use of an oscillator, however, does involve additional costs. The five to eight trades per production period require the investment of additional time on the part of the producer. Whether this additional time is a good or poor investment for a particular producer depends on the size of the operation as well as the producer's attitude toward hedging and enterprise goals. The oscillator technique is an effective tool to reduce price risk for those producers desiring to spend the time to apply it.

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