THE IMPACT OF SELECTED HEDGING STRATEGIES ON THE CASH FLOW POSITION OF CATTLE FEEDERS

Wayne D. Purcell and Don A. Riffe

Price risk has been a major problem for cattle feeders during the 1970s. Since 1972, variability in cash cattle prices has increased dramatically as a result of volatility in the feed grain sector, the cyclical liquidation of cattle numbers which began in late 1973, and cyclical moves in hog prices. The increased levels of price risk have prompted increased interest in hedging.

The literature on hedging strategies for cattle feeding operations continues to grow. Results of early studies show hedging has the capacity to reduce risk in cattle feeding as measured by the variance of per head profits (Heifner; Holland, Purcell and Hague). More recent studies have developed and tested strategies which have the potential both to reduce price risk and increase profits. Selective hedging is typically employed. A mathematical model to predict cash price, sell-buy signals based on some technical trading system, or some other approach is used to select when the cash position should be hedged.

Most of the completed studies are similar in methodology. Results are presented in terms of mean and variance of the net returns per head for feeding periods or across a multiyear analysis period. This approach is used by Holland and his colleagues, by McCoy and Price, and in the more recent work by Shafer and his colleagues.

Peck is correct in her criticism of analyses in which conclusions are based only on such measures. The mean return and variance per head fail to give a complete picture of the risk to which the operation can be exposed. At any one point in time, the feeding operation could be faced with a poor cash flow and a low net market value of partly finished cattle which would put the operation into a state of short-run financial insolvency. If the situation were to improve significantly before the feeding period or some longer analysis period is completed, neither the mean nor the variance of returns would reveal the financial difficulties.

Both cattle feeders and their creditors are increasingly interested in protection against the risk of falling cash prices. Both groups are concerned about the adequacy of analyses of selective hedging strategies which report only the results at the end of the feeding period or some longer analysis period.[1] They are not sure about the financial status of the program in the middle of a feeding period when the cost of purchased inputs surges and prompts requests for additional production credit or when other questions are raised about the ability of the operation to support added financing.

We report the results of an analysis in which we developed and tested selective hedging strategies based on a price prediction model and/or technical trading systems. The strategies were analyzed in terms of 30-day flows from the cash, futures, and combined cash-futures operations to generate a picture of the financial position of the simulated feeding operation *within* the feeding or other analysis period. More specific objectives were (1) to analyze the effectiveness of a cash price prediction model and selected technical trading systems as bases for selective hedging programs for a year-round cattle feeding operation and (2) to conceptualize, estimate, and analyze 30-day flows from the cash, futures, and combined cash-futures operations and to demonstrate the added information such measures bring to the conventional mean-variance comparisons of hedging strategies.

METHOD

Technical Systems

The use of technical trading systems as basis for selective hedging strategies is relatively new. Shafer and his colleagues employed technical systems in the Texas work on slaughter cattle. The work by Brown and Purcell on feeder cattle in Oklahoma is among other recent applications.

Wayne D. Purcell is Professor of Agricultural Economics, Virginia Polytechnic Institute and State University. Don A. Riffe is Agricultural Economist, Federal Reserve Bank of Dallas.

The research reported was conducted under Oklahoma Agricultural Experiment Station Project No. 1635.

[1]During the planning phase of the analysis, interviews were conducted with selected bank loan officers with experience in selective hedging. Questions emerged during the interviews about the adequacy of analyses which do not examine the cash flow within the feeding period.

Using technical trading systems as basis for selective hedging programs requires the adoption of a particular conceptual position on the nature of day-to-day movement in commodity futures prices. Working and Larson are among the authors who concluded that futures prices present the basic features of a random walk. More recent work on live cattle futures largely supports the opposite position, however. Leuthold found evidence of systematic or nonrandom patterns in live cattle prices. Even more recently Purcell, Flood, and Plaxico concluded that daily live cattle futures prices move in systematic patterns ranging in length from long-term trend to less than 10 days' duration. A systematic or nonrandom pattern is a necessary condition if technical trading systems, with trading rules based on past prices, are to be effective.

In our analysis, buy and sell signals based on moving averages and point and figure chart signals were used in formulating selective hedging strategies. The moving averages and the point and figure charts are simple, easy to calculate or plot, and are widely used in the trade of commodity futures.

Moving averages can be used in several ways. A common approach is to select two moving averages of different length and use crossover action to generate buy or sell decisions. The 3 and 10-day moving averages are chosen for discussion. The logic is developed as follows.

> In an upward-trending market, the 3-day moving average will rise faster than the 10-day moving average. If the upward movement of price falters and prices turn lower, the 3-day moving average will turn first and drop faster. A sell signal is generated when the 3-day moving average penetrates the 10-day moving average from above.

In a selective hedging program based on moving averages, a hedge would be placed (or replaced) when a sell signal is generated. The hedge is held in place until the end of the production period for the cash product or until a buy signal is generated by the averages when the short average crosses the longer average from below. Depending on the nature of price movement in the market, the hedge can be placed, lifted, and replaced several times during a production period. The feeder is thus using the moving averages as a trend-following system to help him decide when to be hedged and when to speculate in the cash market.

The "correct" set of moving averages is the set which is responsive to changes in market direction and avoids the frequent trades which can be generated when the market is choppy and seeking direction. In searching for the correct moving averages, we analyzed numerous sets across daily closing prices for live cattle futures for the period 1965-77. Among the criteria employed in selecting the final set of averages were:

1. The direction of price trend. We attempted to determine which set of moving averages did the best job of maintaining a position consistent with an identifiable trend. In a downward-trending market, for example, the correct set of averages would keep the hedge in place and prevent the mistake of lifting the hedge before the trend ends. We used both long-term (50-day) moving averages and least squares regression in identifying the trend as the performance of the moving averages was monitored.

2. Analysis of the 30-day flows from trades in live cattle futures. We used the mean and variance of returns from the "shorts only" trades as criteria for selection. A cattle feeder seeking protection against declining prices for slaughter cattle will sell or go "short" in live cattle futures to place a hedge. A strategy with a large mean return and small variance of returns would be preferred, other things equal, for these trades where the market is entered from the short side.

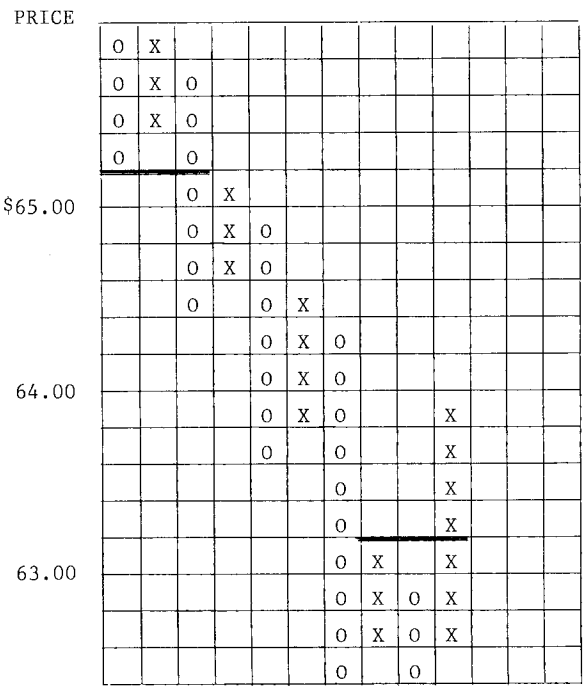
3. The simple correlation between the negative 30-day flows from the cash operation and the 30-day flows from the trading program in futures based on the moving averages. Other things equal, a large negative correlation coefficient would suggest the futures trades are successful in offsetting negative flows from the cash operation.

4. The mean and variance of the 30-day flows from the combined cash and futures operations. Any strategy which keeps the mean returns from the combined cash and futures flows high and the variance relatively low is a successful strategy. We analyzed the various moving average combinations to determine which succeeded in meeting these two somewhat competitive requirements.

The 5 and 15-day combination was selected as best. Even though it was not the optimum combination for each of the criteria, the 5 and 15-day combination fared well overall and was selected on the basis of total performance and our own judgment.[2]

[2]In the analysis, a 4-day weighted moving average was used to confirm the signal. With linear weights, the 4-day weighted average had to be below (above) the 5-day when it crossed the 15-day for the sell (buy) signal to be accepted. The objective was to eliminate some of the false signals generated by the 5 and 15-day base set when tops or bottoms were signaled prematurely.

FIGURE 1. POINT AND FIGURE CHART WITH A 20¢ CELL SIZE AND A 3-CELL REVERSAL: DOUBLE BOTTOM AT $65.20, DOUBLE TOP AT $63.20.



A point and figure chart simply records the direction of price movement (Figure 1). Each column of X's means the price is rising; each column of O's means the price is falling. Plotting procedure is simple. When plotting X's for higher prices, the analyst looks only at the high for the trading day to be plotted. If one or more new higher cells are filled, the cells are plotted. If the high for the particular day fails to fill at least one higher cell, the analyst looks to the low to see if the present reversal requirement is met. If the reversal requirement is met, the price trend is turned down and O's are plotted. If no new higher cell can be plotted and the reversal requirement is not met, nothing is plotted and the analyst looks at the high for the next trading day.

The value of each cell and the number of cells required for a reversal in price direction are the important parameters. The plot in Figure 1 has a 20-cent cell size and a 3-cell reversal requirement. For a reversal in price direction, (1) the chartist must observe failure to fill at least one higher (lower) price cell and (2) the low (high) must allow dropping a "corner" cell and plotting at least three cells down (up). Kaufman provides details on procedure in plotting, discusses interpretation, and gives guidelines for selection of the optimal set of parameters.

The parameters employed in the analysis were the 20-cent cell and 3-cell reversal illustrated in Figure 1. Numerous sets of parameters were tested. The same criteria as were used in the choice on moving averages were used in selecting the cell size and reversal requirement.

Hedge decisions were based on the sell (buy) signals generated by violation of double bottoms (tops). For example, a double bottom is formed on the chart when:

—a column of O's is plotted as prices fall,

—a trend reversal is recorded, the price direction turns toward higher prices, and a column of X's is plotted to the right of the earlier columns of O's, and

—the price trend reverses again and a column of O's extends down to the same price cell reached by the earlier column of O's.

If the latest decline in price stops or "holds" along the horizontal plane at the bottom of the first column of O's, a double bottom is formed. If, however, the latest price decline carries down past the earlier level, the potential double bottom is penetrated and a sell signal is generated. In Figure 1, for example, a sell signal is generated when the price moves down through the double bottom at $65.20. A buy signal is generated by the double top at $63.20.[3]

For both technical systems, we were careful to guard against simulating trades which could not have occurred in the real world. The simulation program was constructed to prevent trades on days in which there was a limit move in price. For example, if the price for live cattle futures dropped the daily limit of $1.50 per cwt and remained at the "limit down" position, no sell was allowed even though the moving averages or point and figure charts gave a sell signal on that particular day. The thesis by Riffe gives more detail on analytical procedure and how the precautions were incorporated into the program.

Cash Price Prediction Model

A logical alternative to technical trading systems is a cash price prediction model. Theoretically, the producer would speculate in the cash commodity when cash price forecasts are above the levels at which live cattle futures could be sold if a hedge were to be placed.

[3]More complex formations such as triple tops and bottoms, spread triple tops and bottoms, etc., were tested but gave no significant improvement over the double top and bottom approach. Alternative approaches to removing or lifting the hedge, such as using a reversal in price trend instead of waiting for a buy signal at a double top, appear to have potential but were not tested in the analysis.

When the cash price forecast is below the level at which futures contracts could be sold, the hedge would be placed. This approach has strong theoretical appeal and was employed by Brown and Purcell and by Shafer and his colleagues.

The econometric model used in this analysis is outlined in Table 1. The model was specified to forecast the average price of Choice 900-1,100 lb steers at Omaha two quarters into the future and was fitted across a 1965-77 data base. Lagged explanatory variables were employed where the theoretical relationships to the dependent variable involved a time lag. Where the theoretical relationship was not expected to be on a lagged basis, the explanatory variables were forecast by separate models. The explanatory variables forecast were FEDMAR, PORKPROD, and INCOME. The models employed and the forecasting procedures are explained in more detail by Riffe.

The two continuous variables with the weak t-statistics, PORKPROD and BEEFSTOR, were kept in the model on theoretical grounds and because they improved the forecasting accuracy of the model. Examination of the simple correlation coefficients gave evidence of multicollinearity. When the predicted values of the explanatory variables were used to test the model, the accuracy of the resulting forecasts across the 1965-77 data set was improved by keeping PORKPROD and BEEFSTOR in the model.

The results of any simulated hedging strategy which uses a forecasting model to select when to hedge will be influenced by the accuracy of the forecasts and how particular forecasts are used. In our analysis, the standard error of the forecasts was added to the cash price prediction to determine whether a hedge should be placed. A hedge was placed if the cash price forecast, adjusted for the standard error, was less than the average closing price for the appropriate futures contract for the 30 days prior to the day on which a hedging decision was being made. In all cases, the next futures contract after the projected finish date for the feeding period was used. Some other model or another set of criteria might change the results, but examination suggested the results were not extremely sensitive to the level of the forecast.[4]

The cash flows from the feeding program were calculated with the variables in Table 2. The period covered was January 1, 1965 through December 31, 1977. A set of feeder

TABLE 1. PRICE FORECASTING MODEL FOR CHOICE SLAUGHTER STEERS

	Explanatory Variable	Estimated Coefficient	Calculated t-Statistic
PRCH:	dependent variable, quarterly price of 900-1,100 lb. Choice steers at Omaha ($)	--	--
Intercept:		-37,75600	-3.06
D_2:	shift dummy for seasonal influences, second quarter	0.70112	0.76
D_3:	shift dummy for seasonal influences, third quarter	- 0.39613	-0.36
D_4:	shift dummy for seasonal influences, fourth quarter	- 2.98285	-3.25
DFREEZE:	shift dummy for the price ceiling period (set = 1 for 6 quarters January, 1973 - June, 1974)	- 0.51546	-0.32
FEDMAR:	projected fed marketings 2 quarters into future (1,000 hd.)	- 0.00617	-6.92
PORKPROD:	projected pork production 2 quarters into future (mill. lbs.)	- 0.00169	-0.97
INCOME:	projected per capita real income 2 quarters in future ($)	0.04124	9.27
WHLSBEEF:	quarterly average price of Choice 500-700 steer carcasses, lagged 2 quarters ($/cwt.)	0.13647	2.45
NONFED:	commercial nonfed beef slaughter as percent of commercial slaughter, lagged 2 quarters (%)	- 0.17801	-1.63
BEEFSTOR:	quarterly cold storage of beef, 48 states (mill. lbs.)	- 0.00670	-0.91
RETPORK:	quarterly price of pork at retail, lagged 2 quarters (¢/lb.)	- 0.07950	-2.28
	Mean of dependent series = $34.54		
	Standard deviation = $ 1.78		
	R^2 = 0.947		
	Durbin-Watson = 1.734		

[4]A quarterly price forecasting model allows the hedging decision to be made once. Theoretically, a monthly model would offer more flexibility. The initial decision could be reviewed monthly as a new set of explanatory variables becomes available. But monthly models are more difficult because of the nature and availability of data. Brown and Purcell attempted the monthly review procedure for feeder cattle. The results do not appear very promising. Updating monthly is apparently not enough to allow the forecasting model to compete effectively with technical indicators which use daily prices. The results of a simulation should also be sensitive to how the forecasted prices are used. Here, the standard error was $3.11 per cwt—the standard error of the forecast when predicted values of the explanatory variables were used. Model runs with the adjustment ranging down to the $1.78 per cwt standard error of the fitted model brought no statistically significant ($\alpha = .05$) change in mean results.

TABLE 2. VARIABLES USED IN CALCULATING MONTHLY CASH FLOWS

Variable	Price Series or Calculation Procedure
Feeder Steers (675 lbs.)	Weekly average price, Choice 600-700 lb. feeder steers, Oklahoma City
Corn (2,550 lbs.)	Weekly average price, No. 2 yellow, Omaha
Cottonseed Meal (340 lbs.)	Weekly average price, Kansas City, 41% solvent
Alfalfa Hay (680 lbs.)	Monthly average, U.S., prices received by farmers
Non-feed Expenses	Estimated for 1977 from data in the USDA's Livestock and Meat Situation. Estimated by months for 1965-76 by dividing the 1977 estimate by the monthly Index of Prices Paid by Farmers
Choice Steers (1,054 lbs.)	Weekly average price, Choice 900-1,100 lb. steers, Omaha
Interest Costs	Charged on all outstanding debt at the prime rate for the year plus 2%

cattle (116 head) weighing 675 lbs was purchased on January 1, 1965 and another set was bought and placed on feed every 30 calendar days. All feed and nonfeed inputs were assumed bought the day the cattle were placed. During the 150-day feeding period, the steers gained an averae of 2.83 lbs per day with an average conversion of 8.1:1. The selling weight was 1,056 lbs (after a 4 percent shrink) and only 114 head were sold to allow for death loss.

With the feeding period held constant at 150 days, five different sets of cattle were on feed, at different points along their growth path, at any one point in time. The cash outflow at the end of each 30-day interval therefore consisted of the cost of a new set of cattle being placed on feed, feed costs for the new set of cattle, and cumulative interest on all partially finished cattle and on the cost of the feed they had consumed. The cash inflow was from sale of the finished set of cattle. If the net cash flow for the 30-day period was negative, it was added to the cumulative outstanding debt. If the net cash flow was positive, it was subtracted from the outstanding debt (added to profits). Riffe provides detail on the equations, the programming involved, and how margin monies and commission costs for the futures trades were incorporated into the flows.

No attempt was made in our analysis to hedge against rising input costs. The results of hedging strategies applied to the input side would be independent of the output hedges unless the procedure used involved hedging based on projected margins. The primary objective was to examine the impact of selective hedging strategies on the output side of the cash flow position of a continuous feeding operation. The costs of the feeding operation are incorporated into all strategies. Comparisons across alternative hedging strategies should not be affected if the cost estimates differ from the real-world experiences of a feeder during the 1965-77 period.

TABLE 3. DEFINITIONS OF THE HEDGING STRATEGIES TESTED

Strategy	Strategy Defined
1	No hedging. There is complete exposure to cash price risk.
2	Routine hedging of all cattle. The hedge is placed when the cattle are placed and lifted when the cattle are sold.
3	This strategy is based on the price forecasting model. When the price outlook model is calling for a hedge when the cattle are placed, the hedge is placed immediately and lifted when the cattle are sold.
4	The hedge is placed (lifted) using sell (buy) signals from double bottoms (tops) on a point and figure chart with a 20¢ cell size and a 3-cell reversal requirement.
5	This strategy combines strategy 4 and the price outlook model. When the price forecast model is calling for a hedge, the hedge is then placed and lifted in accordance with the provisions of strategy 4.
6	The hedge is placed (lifted) using sell (buy) signals from the 5 and 15-day moving averages.
7	This strategy combines strategy 6 and the price outlook model. When the price forecast model is calling for a hedge, the hedge is then placed and lifted in accordance with the provisions of strategy 6.

The seven strategies analyzed are defined in Table 3. All hedges based on the price forecasting model were placed at the closing price the day the cattle were placed on feed if the hedge criterion for the price forecast was met. Hedges based on the technical systems were placed, lifted, or replaced at the closing price the day the signal was generated.[5]

ANALYTICAL RESULTS

Table 4 is a summary, using selected statistics, of the results. Only strategies 4 and 6, the

[5]It is easy to calculate the price required to give a signal for either the moving average or the point and figure system. The selective hedger therefore could place orders and take a position the day the signal is generated. The results are not extremely sensitive to which day action is taken, however. Simulations with action taken at the closing price the day *after* the signal was generated gave results that were judged equally satisfactory.

TABLE 4. SELECTED STATISTICS FOR SIMULATED 30-DAY CASH FLOWS FROM COMBINED CASH AND FUTURES OPERATIONS, BY STRATEGIES, 1965-77[a]

Strategy	Mean 30-Day Cash Balance	Std. Dev. of 30-Day Balances	Mean 30-Day Negative Balances	No. 30-Day Negative Balances	Range 30-Day Balances
1	-$1,450.96	$5,103.35	-$4,511.02	88	$28,509.23
2	- 3,126.78	5,086.86	- 5,175.09	112	34,400.82
3	- 473.90	4,897.75	- 3,717.73	79	33,655.12
4	19.57	4,414.89	- 2,974.46	81	29,086.84
5	- 320.87	5,084.79	- 3,607.79	81	36,720.66
6	73.45	4,588.63	- 2,824.40	85	30,460.71
7	- 242.25	5,156.41	- 3,556.96	81	36,990.57

[a]The analysis from 1965 through 1977 includes 153 cash flow time periods of 30 days each. At the end of each 30-day interval, 114 finished cattle are sold, 116 feeder cattle are bought, and 5 unfinished sets of cattle (580 head assuming death loss is assessed when the cattle are sold) are at varying points along their growth path. Since 114 cattle are sold every 30 days, the mean value of −$1,450.96 for strategy I can be interpreted to mean this strategy lost money over the 1965-1977 analysis period. The implicit average of $12.73 per head ($1,450.96 ÷ 114) is not comparable to pen-by-pen results in earlier studies, however, because it includes the accumulated debt at the beginning of the feeding period and the accumulated outflow on any partly finished cattle.

strategies based on the two technical systems, show estimated balances from the combined cash and futures flows that are positive. Strategies 4 and 6 also show the smallest standard deviations, the lowest mean value of the negative 30-day flows, and two of the three smallest overall ranges in the 30-day net income flows.

The routine hedging strategy generates the most negative mean value and approaches the no-hedge strategy in variability. The variance of the routine hedge strategy is significantly larger than the variance of strategy 4 ($\alpha = .05$) and the variance of strategy 6 ($\alpha = .10$). This variability in the routine hedge strategy, isolated via analysis of the 30-day net flow positions, apparently has not been revealed in earlier analyses which examined measures of per head returns at the end of the feeding or analysis period.

The strategies employing the price prediction model generate results that are not significantly different in terms of means and variances. Mean values show significant improvement ($\alpha = .05$) over the no-hedge and routine hedge alternatives, however. The standard deviations are relatively large and are not significantly different ($\alpha = .10$) from those of the no-hedge and routine hedge alternatives.

TABLE 5. INDICATORS OF PERFORMANCE DURING 1973-77: CUMULATIVE POSITIONS AND NET CHANGES FOR THE COMBINED CASH-FUTURES FLOWS

Measure	Strategies 1	2	3	4	5	6	7
				($)			
Cumulative							
Net End 1972	78,646	- 81,784	78,646	41,157	78,646	26,436	78,646
Maximum End							
of Year Net	78,646	- 81,784	87,273	161,249	114,695	160,735	121,136
1973-77 (Year)	(1973)	(1973)	(1975)	(1975)	(1975)	(1975)	(1975)
Minimum End							
of Year Net	-117,106	-251,470	3,789	789	13,422	- 15,139	13,422
1973-77 (Year)	(1977)	(1977)	(1977)	(1973)	(1973)	(1973)	(1973)
Net Change							
1973-77	-195,752	-169,686	-74,857	22,217	- 60,226	51,450	- 50,177

Table 5 shows the results of additional analytical measures. The period from 1973 through 1977 was an especially volatile and difficult one for cattle feeders. Examination of the monthly flows reveals that the cumulative net through 1972 for all strategies except strategy 2 was positive. The upward-trending prices of the late 1960s and early 1970s meant losses for strategy 2, the routine hedge strategy. But performance of all strategies varied considerably after 1972 as the industry moved into the period of volatile prices.

At the start of the 1973-77 period, strategies 1, 3, 5, and 7 had the same cumulative net. No hedges were placed under strategies 3, 5, and 7 during the 1965-72 period. Prices had trended upward prior to 1973 and the hedge criterion based on the price forecast model was never met. Strategies 4 and 6 had on occasion signaled a down trend in price and hedges were placed, but the price trend turned back up with no significant follow through on the down side. These hedges brought small losses. The routine hedge strategy had a large loss as would be expected in an upward-trending market.

During the 1973-77 period, the two technical strategies (4 and 6) performed well. The difference between the starting position and the minimum position during the 1973-77 period, as shown by the minimum end-of-year net, was about $40,000 for strategies 4 and 6. The decline during the period was less than for any of the other strategies.[6] On the positive side, the same two strategies produced the largest end-of-year nets. The only positive net changes during the period were for the two technical strategies. Strategy 6 showed a net gain of $51,450; strategy 4 showed a net gain of $22,217. All other strategies showed significant declines with the no-hedge strategy losing $195,752 during the period.

Table 6 focuses attention on the 30-day flows and shows the source of the improvements for the strategies based on technical trading systems. In Table 5, the number of 30-day intervals with negative net flows is essentially the same across most of the strategies. Only strategy 2, the routine hedge strategy, shows a significantly larger number of negative 30-day flows. Table 6 indicates that it is a change in the *distribution* of the 30-day net flows, not the number of positive or negative periods, which brings the improved results. The technical systems are the only strategies with no 30-day flows from combined cash and futures operations less than −15,000. Strategy 4 has no single 30-day flow below −$10,000; strategy 6 has only one. Both strategies fare comparatively well in recording relatively large positive flows. Figures 2 and 3 are plots of strategy 1 (cash operation), strategy 2 (routine hedge), and strategy 6 (technical system using the moving averages).

TABLE 6. FREQUENCY DISTRIBUTIONS OF SIMULATED 30-DAY NET CASH FLOWS FROM ALTERNATIVE HEDGING STRATEGIES, 1965-77

	Frequencies						
	($)						
Strategy	Less than -15001	-10001 to -15000	- 5001 to -10000	- 1 to -5000	0 to 5000	5001 to 10000	Greater than 10001
1	3	9	19	57	56	7	2
2	3	4	31	67	38	1	2
3	2	5	14	58	63	7	4
4	0	0	17	64	58	9	5
5	2	3	16	60	58	10	4
6	0	1	14	70	55	8	5
7	2	2	17	60	59	8	5

CONCLUSIONS

Extension of the analysis to include measures of the 30-day flows adds a useful dimension in the comparison of hedging strategies. Examination of the distribution of the combined cash and futures flows indicates selective hedging strategies based on technical trading systems dampened the amplitude of fluctuations in the cash flow. This finding is important because it indicates such strategies protect the financial position of the cattle feeder within the production or analysis period. Prior analyses which have reported per head mean and variance measures at the end of feeding or other analysis periods have not identified this feature of the selective hedging systems because they have not focused on either the cumulative flow coming into a feeding period or the cumulative debt associated with partly finished cattle within the feeding period.

In the final analysis, the choice of strategies will depend on the risk-bearing ability of the feeding operation and the amount of price variability to which the operation is being exposed. In stable markets, especially where an upward trend is evident, the no-hedge programs will work. There is little risk to be offset.

The routine hedge program tends to fare

[6]The strategies employing the price prediction model, strategies 3, 5, and 7, show a minimum which remains on the positive side. This outcome is due to the better starting position, however, and not to a superior ability to handle the price volatility of 1973-77. The net change during the period for these three strategies ranges from −$50,177 to −$74,857. Strategies 5 and 7, which combine the price forecasting model and the technical systems, fare better than strategy 3 which is based solely on the price prediction model.

FIGURE 2. NET 30-DAY FLOWS FROM STRATEGY 6 (MOVING AVERAGES) AND STRATEGY 1 (NO HEDGE OR CASH OPERATION)

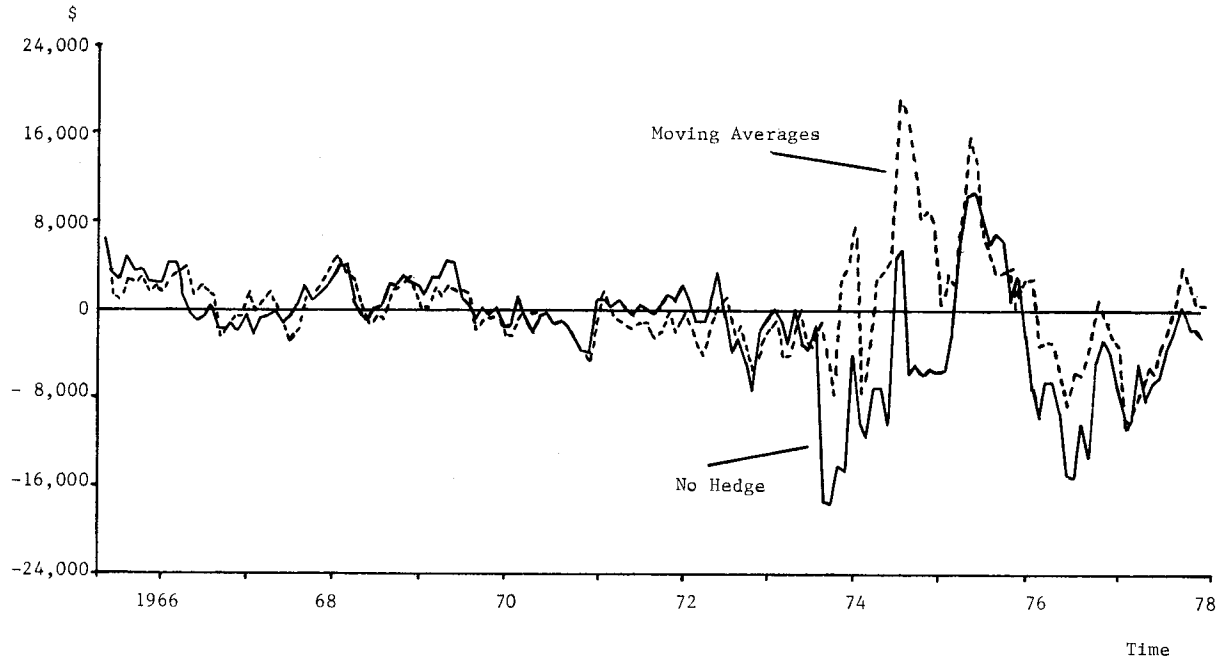
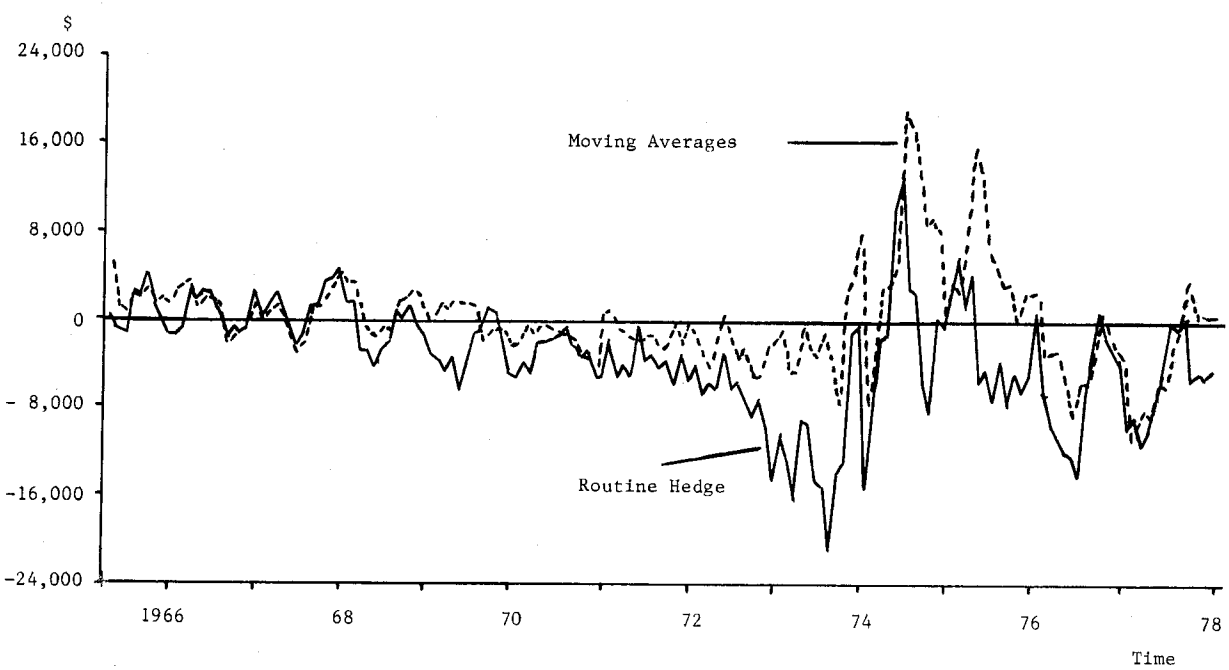


FIGURE 3. NET 30-DAY FLOWS FROM STRATEGY 6 (MOVING AVERAGES) AND STRATEGY 2 (ROUTINE HEDGE)



poorly regardless of the level of price variability. Some analysts would argue that a routine hedge program which places the hedge only when a profit can be "locked in" will work. But the dangers of this approach are apparent. Examination of feeder cattle prices, estimated production costs, and trading levels of live cattle futures indicates that opportunities to lock in a profit when the cattle are placed are rare. Waiting for an acceptable lock-in price with an objective of placing the hedge after the cattle are on feed does not work in the downward-trending market where protection is most important. The minimum acceptable lock-in price may never occur. This situation prevailed throughout the 1976 calendar year, for example, as prices trended lower under the weight of increased production.

When markets are volatile and the level of price risk is high, hedging programs based on tested technical systems appear to merit consideration. They prove to be flexible and it is this flexibility which brings the improvement in the distribution of the 30-day flows from combined cash and futures programs. A decision based on cash price forecasts has no built-in safeguard if the forecast proves wrong. Unless the models are updated each time new data become available, the cash price forecast approach is not a flexible approach. Either the point and figure approach or the moving average approach provides the safeguard. If the parameters are correctly chosen, hedging systems based on such technical trading systems will have the hedge in place when the big and sustained drop in price occurs and will have the hedge off when the significant price surge emerges.[7] These approaches thus match the needs of hedgers in the wide-swinging markets that have emerged in the 1970s.

REFERENCES

Brown, R. A. and W. D. Purcell. *Price Prediction Models and Related Hedging Programs for Feeder Cattle.* Okla. Agr. Exp. Sta. Bull. B-734, January 1978.

Heifner, R. G. "Optimal Hedging Levels and Hedging Effectiveness in Cattle Feeding." *Agr. Econ. Res.* 24(1972):25-36.

Holland, D., W. D. Purcell, and T. Hague. "Mean-Variance Analysis of Alternative Hedging Strategies." *S. J. Agr. Econ.* 4(1972):123-8.

Kaufman, P. J. *Commodity Trading Systems and Methods.* New York: John Wiley and Sons, 1978.

Larson, Arnold B. "Measurement of a Random Process in Futures Prices." *Food Res. Ins. Stud.,* Vol. 1, November 1960.

Leuthold, R. M. "Random Walk and Price Trends: The Live Cattle Futures Market." *J. Finan.* 27(1972):879-89.

McCoy, J. H. and R. V. Price. *Cattle Hedging Strategies.* Kan. Agr. Exp. Sta. Bull. 591, August 1975.

Peck, A. E. "Hedging and Income Stability: Concepts, Implications and an Example." *Amer. J. Agr. Econ.* 57(1975):410-19.

Purcell, Wayne D., David Flood, and James Plaxico. "Cash-Futures Interrelationships in Live Cattle: Causality, Variability and Pricing Processes," paper presented at the Chicago Mercantile Exchange Symposium on Research in Commodity Futures, June 1979.

Riffe, D. A. *A Simulation Analysis of the Financial Effects of Alternative Hedging Strategies for Cattle Feeders,* unpublished M.S. thesis, Oklahoma State University, Stillwater, May 1978.

Shafer, Carl E., Wade L. Griffin, and Larry Johnston. "Integrated Cattle Feeding Hedging Strategies, 1972-1976." *S. J. Agr. Econ.* 10(1978):35-42.

Working, Holbrook. "A Theory of Anticipatory Prices." *Amer. Econ. Rev. Proc.* 48(1958):188-98.

[7]Using the correct set of parameters is important. What worked in the past will not necessarily work in the future. Analyses such as the one presented here will need to be updated periodically. Given the passage of enough time, structural changes in the beef cattle complex or changes in the trading patterns of commodity traders could change the amplitude and/or frequency of price undulations in live cattle futures. The same concern about the stability of estimated parameters also applies to econometric models, however. Such models must be examined and respecified if the structure of the markets or the economic relationships within those markets change.