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Evaluation of Simple Price Forecasts as Tools for Fed Cattle Futures and Options Marketing Strategies

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EVALUATION OF SIMPLE PRICE FORECASTS AS TOOLS FOR FED CATTLE FUTURES AND OPTIONS MARKETING STRATEGIES

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and
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INTRODUCTION

Agricultural producers have faced considerable price risks for decades. In recent years price volatility has increased substantially (Purcell and Riffe, 1980). The significant increase in commodity price variability over the last decade coupled with the current financial stress in the farm economy have intensified the risks associated with price uncertainty for agricultural producers. The risks associated with adverse price variability are especially intense for cattle feeders. Feedlots face significant price risks in feeder-cattle and feed procurement, and fed-cattle marketing. Cattle feeders have several marketing alternatives available to help reduce the risks associated with the price volatility. Futures and options markets are two markets that cattle feeders can use to try to reduce price risks.

Numerous studies have been conducted investigating the use of futures markets by cattle feeders. It has been well documented that routine hedging strategies can be used by cattle feeders to reduce the variability of returns, though usually at the expense of average profitability (Gum and Wildermuth, 1970; Holland, Purcell, and Hague, 1972; Erickson, 1978; Russell, Ikerd, and Dickey, 1983). In addition, selective hedging strategies on live cattle, corn and/or feeder cattle have been found to decrease the volatility of returns and modestly increase profitability for cattle feeders (Gorman et al., 1982; Davis and Franzmann, 1985; Shafer, Griffin, and Johnston, 1978; Leuthold and Mokler, 1980; Spahr and Sawaya, 1981; Franzmann and Shields, 1982; Pluhar, Shafer, and Sporleder, 1985; Caldwell, Copeland, and Hawkins, 1982). The general conclusions are that potentials existed to reduce the volatility of returns by substituting basis risk for price risk. In addition, if done selectively hedging may also have potential to increase average returns.

The performance of hedging strategies for cattle feeders has been widely researched. However, only a limited amount of research has been done evaluating the use of options on live cattle futures as a marketing alternative for livestock producers. Catlett and Boehlje (1982) evaluated the use of put options to set minimum expected prices for fed cattle. They relied on basis relationships to signal put-option purchases. They concluded that both average

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returns and variance of returns declined when options were used as a marketingtool. However, the model used to estimate option prices was based on the assumption that option premiums would be 5, 10, or 15 percent of the underlying futures price; which leaves the interpretations of the results open to question (particularly since no test of the expected accuracy of this premium estimation technique was reported and it was likely not very accurate).

Hudson, Hauser, and Fortenbery (1985) developed an options strategy for cattle feeders. They evaluated the use of futures and commodity options for live cattle during the 1974 to 1982 period using a variant of Black's option pricing model to estimate premiums. However, they limited their evaluations to routine put option purchases and moving-average signaled put option strategies. The put-option purchases (both selective and routine) decreased average returns and increased the variability of returns relative to cash marketing. Stochastic dominance rankings also indicated that in general the put option purchases were not preferred to the cash strategies. However, as Pluhar, Shafer and Sporleder (1985) empirically show, technical marketing strategies such as this frequently perform worse beyond the original test period.[1] Thus, one may be tempted to conclude that put option strategies may be even less profitable and/or less risk-reducing than the limited amount of research has indicated.

Much more information is needed on the expected performance of option strategies for cattle feeders. Options markets are an alternative to hedging yet very little empirical evidence exists on how option strategies could be expected to perform relative to hedging by cattle feeders. The objective of this study is to investigate the performance of selective live cattle put option strategies and compare the distribution of returns generated to some of the more standard hedging strategies examined previously for cattle feeders. In addition, standard profit margin signaled marketings are contrasted to forecast signaled strategies.

PROCEDURES

Several marketing strategies for corn and feeder-cattle procurement and fed-cattle selling were analyzed. A cattle feedlot marketing model was developed to aid in the evaluation of the marketing strategies. The model was designed to estimate the returns from monthly placements and marketings of cattle for the typical large midwestern cattle feedlot over the 1978 through 1985 period.

Strategies tested and compared included routine cash marketings, routine hedging or put-option purchasing, profit-target hedging or put-option purchasing, and simple price-forecast-signaled hedging or options marketing. The strategies were compared with each other by analyzing the mean, variance and semivariance of returns.[2]

Monthly cash-price forecasts for corn, feeder cattle, and fed cattle were developed and evaluated as decision tools in the marketing process. Corn and feeder cattle price forecasts were formulated by using: 1) the most recent price as a forecast, 2) an ARIMA model, 3) a single-equation econometric model and 4) composites of the ARIMA and econometric models. Corn price forecasts were made for a one- through six-month horizon, and feeder-cattle price

forecasts were made for a one- through three-month horizon. The forecasts were evaluated based on their historical root mean squared error of the forecast (RMSE); the model that had the best 2-year historical forecasting performance was used as a marketing signal. The corn and feeder cattle price forecast models were initially estimated through 1977 and revised and updated every two years through 1985. The forecasting performances of the corn and feeder cattle price forecasts are summarized in the appendix.

Quarterly cash fed cattle price forecasts were developed by using the same four techniques as the corn and feeder cattle price forecasts in addition to using the quarterly forecasts published by Extension Livestock Marketing Specialists in the area where the study was conducted as well as simple average composite forecasts. The fed cattle forecasting models are summarized in table 1. The quarterly fed cattle price forecasts were converted to monthly forecasts by the use of 5-year moving average historical monthly fed cattle cash price indices. All forecasts used in the marketing strategies incorporated only current information available on the date the marketing decision was made. Thus, all strategies are of an exante nature relying only on out of sample data. The statistical performance of the monthly fed cattle price forecasts is reported in table 2.

MARKETING ASSUMPTIONS AND METHODS

The data used to evaluate various marketing strategies included: weekly Northwestern Iowa cash-corn prices, daily Interior Iowa-Southern Minnesota 1100-pound choice fed-steer prices, weekly No. 1 600- to 700-pound Sioux City, Iowa cash feeder-cattle prices, daily feeder-cattle and live-cattle futures closing prices at the Chicago Mercantile Exchange (CME), daily corn futures closing prices at the Chicago Board of Trade, daily closing option premiums (1985 only) on live cattle from the CME, and monthly enterprise cost of cattle feeding estimates for a typical Iowa cattle feeder ("Estimated Returns...", 1985).[3]

Option trading on live cattle futures began in late 1984; thus, to evaluate the use of commodity options in marketing strategies over the 1978-85 period the premiums needed to be backcasted. The historical 1978-84 option premiums were estimated by using a variant of the original Black and Scholes (1973) option pricing model. The option pricing model used was the Cox, Ross, and Rubinstein (1979) iterative model which was modified by Plato (1985) to apply to American options; refinements suggested by Jarrow and Rudd (1983) were also incorporated into the model.

In the simulation, feeder cattle were purchased each month at an average weight of 650 pounds and fed 6 months to a weight of 1150 pounds with a selling (pay-out) weight of 1100 pounds (adjusted downward from 1150 pounds to reflect death losses incurred over the feeding period and shrink). It was assumed that the cattle consumed 42 bushels of corn, 2.2 tons of corn silage, and 189 pounds of supplement per head over the feeding period. Nonfeed costs for the feedlot were based on estimates by University Extension Specialists.

Futures transaction brokerage commissions were assumed to be $60 per contract (round turn) for feeder cattle, corn, and fed cattle. Likewise, brokerage commissions for options on live-cattle futures were charged at $30

Table 1. Quarterly Fed Cattle Price Forecast Models (final revisions through 1985).

ECONOMETRIC[a]

1 quarter ahead:[b]

$$LCP_i = \underset{(3.50)*}{4.824} - \underset{(3.59)*}{.0049DCOF1_{i-1}} - \underset{(2.61)*}{.0296DHATCH_{i-1}} - \underset{(2.54)*}{.141DPMAR_{i-1}} + \underset{(39.30)*}{.975LCP_{i-1}} - \underset{(1.12)}{1.510D2} - \underset{(2.10)*}{2.320D3} - \underset{(3.89)*}{7.450D4}$$

RMSE = 3.43, R^2 = .96, Durbin's "h" = .65, N = 71

2 quarters ahead:[c]

$$LCP_i = \underset{(1.34)}{4.502} - \underset{(1.98)*}{.0025DCOF2_{i-2}} - \underset{(.84)}{.0007DSF_{i-2}} + \underset{(12.73)*}{.853\ LCP_{i-2}} + \underset{(3.33)*}{7.113D2} + \underset{(1.64)}{2.753D3} - \underset{(1.24)}{1.617D4} + \underset{(3.28)*}{.417P}$$

RMSE = 4.86, N = 70

3 quarters ahead:

$$LCP_i = \underset{(1.08)}{3.102} - \underset{(.09)}{.0002DCOF3_{i-3}} - \underset{(1.17)}{.0012DSF_{i-3}} + \underset{(22.27)*}{.913LCP_{i-3}} + \underset{(1.07)}{3.111D2} + \underset{(.89)}{4.096D3} + \underset{(.60)}{1.230D4}$$

RMSE = 5.66, R^2 = .88, Durbin's "h" = 4.94, N = 69

4 quarters ahead:

$$LCP_i = \underset{(1.91)}{6.606} - \underset{(.60)}{.0021DCOF4_{i-4}} - \underset{(.47)}{.0012DSFI_{i-4}} + \underset{(19.12)*}{.891LCP_{i-4}} - \underset{(.21)}{.871D2} + \underset{(.04)}{.137D3} + \underset{(.21)}{.978D4}$$

RMSE = 6.38, R^2 = .84, Durbin's "h" = 5.82, N = 68

ARIMA

$$DCLP_i = \underset{(2.14)*}{.289DLCP_{i-4}} + \underset{(1.64)}{.225E_{i-1}}$$

RMSE = 4.76, Q(12) - statistic = 6.56[d], N = 68

EXPERT

LCP_i = f (qualitative and quantitative information)

COMPOSITES

COM1 = (ECONOMETRIC + EXPERT)/2.

COM2 = (ARIMA + ECONOMETRIC + EXPERT)/3.

COM3 = (ARIMA + EXPERT)/2.

COM4 = (ARIMA + ECONOMETRIC)/2.

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a Estimated by using 1968 through 1985 quarterly data.
Variable definitions:
i refers to quarter
LCP is the quarterly average Interior Iowa fed cattle price ($/cwt).
DCLP is the first difference of LCP ($/cwt).
DCOF1 is the change from the previous quarter in all steers and heifers on feed 700 pounds and above, 13 states (1,000 head).
DCOF2 is the change from the previous quarter in 500 to 899 pound steers and heifers, 13-states (1,000 head).
DCOF3 is the change from the previous quarter in steers on feed up to 699 pounds and heifers on feed under 500 pounds, 13-states (1,000 head).
DCOF4 is the change from the previous quarter in all steers and heifers on feed under 500 pounds, 13-states (1,000 head).
DHATCH is the change from the previous three months in the broiler-type chick hatchings (million hatchings).
DPMAR is the predicted change from the previous quarter in the farm-to-retail beef margin ($/cwt). Using the following ARIMA model:

$$DPMAR_i = \underset{(2.39)}{0.312DPMAR_{i-4}} - \underset{(1.84)}{0.229E_{i-1}} \quad \text{t-statistics}$$

RMSE = 3.79 Q(12) statistic = 8.6

DSF is the change in sow farrowings from the previous quarter, 10-states (1,000 head).
DSFI is the change from the previous quarter in one quarter ahead sow farrowing intentions (1,000 head).
D2, D3, D4 are dummy variables with values of 1 for quarters 2, 3, or 4, respectively, and a value 0 otherwise.
P = first-order autocorrelation coefficient.

b Absolute t-statistics are in parentheses beneath the respective coefficients.

c Because of high first-order autocorrelation this equation was re-estimated by using a nonlinear least-squares process; thus, the R^2 and Durbin's "h" are not reported.

d Corresponds to a chi-squared statistic with 10 degrees of freedom of 18.3 at the .05 level.

* Indicates significantly different from zero at the .05 level.

Table 2.
Statistical Performance of Selected Monthly Live-Cattle Price Forecasts, 1978-85.

Months ahead forecasted	-- Forecasting technique -- ARIMA	EXP[a]	ECON[b]	COM1	COM2	COM3	COM4	FUT[c]
1-2 months ahead:								
Mean error ($/cwt)	-0.08	0.09	-0.26	0.32	0.18	0.41	-0.17	0.26
Mean absolute error ($/cwt)	4.86	3.29	4.06	3.44	3.59	3.76	4.11	2.58
RMSE ($/cwt)	5.87	4.21	5.55	4.48	4.61	4.62	5.22	3.35
Turning point accuracy (%)[d]	46	50	53	63	60	55	51	58
3-5 months ahead:								
Mean error ($/cwt)	-0.06	1.64	-0.89	0.39	0.24	0.79	-0.47	-0.18
Mean absolute error ($/cwt)	6.01	5.57	5.09	4.80	4.99	5.43	5.28	5.19
RMSE ($/cwt)	7.25	6.93	6.97	6.51	6.57	6.75	6.82	6.64
Turning point accuracy (%)	58	61	67	68	67	65	63	65
6-8 months ahead:								
Mean error ($/cwt)	-0.16	1.52	-0.72	0.20	0.20	0.68	-0.45	-0.40
Mean absolute error ($/cwt)	5.51	6.06	6.98	5.94	5.94	5.53	6.11	5.66
RMSE ($/cwt)	6.91	7.62	8.94	7.99	7.99	6.94	7.00	7.23
Turning point accuracy (%)	67	64	62	63	66	64	69	65
9-11 months ahead:								
Mean error ($/cwt)	-0.42	1.18	-0.51	0.33	0.08	0.38	-0.47	-0.92
Mean absolute error ($/cwt)	6.51	6.85	8.60	7.37	6.84	6.06	7.42	5.86
RMSE ($/cwt)	7.95	8.20	10.67	9.06	8.45	7.53	9.10	7.47
Turning point accuracy (%)	59	60	67	62	67	65	63	60

[a]EXP is the expert opinion forecasts.

[b]ECON is the econometric model forecasts.

[c]FUT is the live-cattle futures market forecasts.

[d]Percent of directional price changes accurately predicted.

per contract for options purchased and $30 per option contract offset in addition to premiums required to purchase the option. Margins for hedging were assumed to be $1200 per contract for live cattle, feeder cattle, and corn. Interest charges on margins (and option premiums paid) were calculated at the rates used for interest on borrowed funds (Production Credit Association average mid-month interest rates) from the time of margin deposit (option purchase) until the liquidation of the hedge.

MARKETING STRATEGIES

The marketing strategies that were compared for cattle sold over the July 1978 to December 1985 period include:

1. Cash. Feeder cattle are purchased in the cash market at the monthly average price in the placement month, corn is purchased over the 6-month feeding period (constant rate each month) at the monthly average price and fed cattle are sold at the average monthly choice steer price.

2. Routine hedge. A routine hedge is placed on live cattle at placement and all other transactions are on a cash basis.

3. Routine put option. A nearest to at-the-money fed cattle put option is purchased during the placement month and all inputs are purchased in the cash market.

The remaining strategies utilize price forecasts (on at least two of the three commodities) to signal marketings (with the exception of strategy 11). These strategies involve hedging the feeder cattle if the forecasted-cash-feeder-cattle price less a standard error of the forecast (SEF) is greater than the expected net hedgeable price during the two months just prior to placement.[4] If no such price signal occurs during this time the feeder cattle are purchased in the cash market unhedged. Likewise, corn is hedged over a 6-month horizon. If the forecasted-cash-corn price less one SEF is greater than the net localized corn futures price a hedge is placed. If no corn hedge is signaled over the 5-month period prior to the corn purchase month the corn is bought in the cash market (no hedges are placed in the month the corn is purchased). The forecast techniques used for the corn and feeder cattle marketing strategies were those which performed the best from a 2-year historical standard error of the forecast (SEF) perspective. For feeder cattle the forecast technique used as a hedging signal was an ARIMA model, and for corn the technique used was a composite simple average of ARIMA and econometric price forecasts. Fed cattle were hedged if the forecasted cash fed cattle price plus one SEF was greater than the basis and commission adjusted fed cattle futures price.

The remaining strategies were as follows:

4. Hedge C-FC if LFP < FORE - SEF. Corn (C) and feeder cattle (FC) are selectively hedged if their net localized futures price (LFP = current futures price - expected closing basis + hedging costs) is less than their forecasted cash price (FORE) minus the standard error of the forecast (SEF). Fed cattle are sold on a cash basis and any corn or feeder cattle not hedged are purchased in the cash market. All of the remaining

strategies (except for strategy 11) include this same hedging strategy on corn and feeder cattle.

5. Hedge fed cattle if LFP > BEP + PM. Fed cattle are hedged if the net-localized (fed-cattle) futures price (LFP = current futures price - expected closing basis - hedging costs) is greater than the expected breakeven price (BEP) plus a profit margin (PM). The profit margin levels tested are $0/cwt, $2/cwt, $4/cwt, and $6/cwt. Any cattle not hedged are sold on a cash basis.

6. Purchase a fed-cattle put option if LSP > BEP + PM. An at-the-money put option for fed cattle is purchased if the net-localized strike price (LSP = strike price - expected ending basis - premium - hedging costs) is greater than the expected breakeven price by some profit margin. Profit margins tested are $-2/cwt, $0/cwt, $2/cwt, $4/cwt, and $6/cwt. Any cattle not "protected" with an option are sold on a cash basis.

7. Hedge fed cattle if LFP > FORE + SEF. A short fed-cattle hedge is placed if the net-localized fed-cattle futures price is greater than the forecasted cash price (FORE) plus one standard error of the forecast (SEF). Again, all unhedged cattle are sold in the cash market.

8. Hedge if LFP > FORE. A short fed-cattle hedge is placed if the net-localized futures price is greater than the expert forecasted cash price (FORE) without the SEF adjustment.

9. Purchase a put option if LSP > FORE + SEF. A live cattle nearest to at-the-money put option is purchased if the net-localized strike price is greater than the expert forecast plus one SEF. Any cattle not covered by an option are sold on a cash basis.

10. Purchase a put if LSP > FORE. This strategy is the same as strategy 9 except no adjustment for the SEF is made.

11. Cover variable costs or do not feed. An at-the-money put option is purchased during the placement month only if expected total costs of production less fixed costs for lot, shelter, and feed bunks can be covered. Corn and feeder cattle are purchased on a cash basis. If an at-the-money put is not found that will cover these expected costs the lot is left empty for that month. This strategy is tested beginning two months prior to placement and the search is allowed to continue through the placement month.

STRATEGY COMPARISONS

The results of the alternative marketing strategies for cattle sold monthly from July 1978 through December 1985 are summarized in table 3. The typical cattle feeder relying on the cash market would have realized an average return of $9.08/hd with a standard deviation of returns of $68.75/hd. Consistent with most previous studies, the routine hedge yielded a smaller variability of returns as well as smaller mean returns than the cash strategy. Routinely hedging the live cattle at placement resulted in the smallest

Table 3. Performance of Alternative Corn, Feeder Cattle, and Fed Cattle Marketing Strategies, 90 Feeding Periods, July 1978 through 1985

Strategy	Mean return ($/hd)	Std. dev. ($/hd)	Semi-std dev. ($/hd)	Lots incurring losses (%)	Range of returns low ($/hd)	high ($/hd)	Percent of time forward priced C - FC - LC
1. Cash	9.08	68.75	31.56	49	-129.83	216.24	0 - 0 - 0
2. Routine hedge	-0.91*	29.39*	18.78*	48	-77.71	59.90	0 - 0 -100
3. Routine put option	-13.52*	58.63*	31.56	67	-136.08	170.11	0 - 0 -100
4. Hedge C-FC if: LFP < FORE - SEF	12.24	71.94	32.28	48	-129.29	216.26	37 - 22 - 0
5. Hedge if:							
a) LFP > BEP	3.47	46.62	32.52	42	-109.26	113.34	37 - 22 - 96
b) LFP > BEP + $2/cwt	10.01	44.87*	28.86	33	-100.69	113.34	37 - 22 - 87
c) LFP > BEP + $4/cwt	14.84	48.41*	27.23	36	-103.83	113.34	37 - 22 - 70
d) LFP > BEP + $6/cwt	14.75	54.68*	32.09	39	-129.29	107.38	37 - 22 - 53
6. Purchase Put if:							
a) LSP > BEP - $2/cwt	-2.96*	59.41*	28.87	58	-127.72	178.66	37 - 22 - 88
b) LSP > BEP	4.20	58.36*	29.87	49	-112.91	185.85	37 - 22 - 73
c) LSP > BEP + $2/cwt	8.53	60.67*	31.68	48	-129.29	181.97	37 - 22 - 49
d) LSP > BEP + $4/cwt	11.01	63.22	31.06	48	-129.29	193.76	37 - 22 - 33
e) LSP > BEP + $6/cwt	12.00	68.84	32.67	47	-129.29	203.01	37 - 22 - 19

7. Hedge if:						
a) LFP > EXP + SEF	9.85	59.00*	30.81	43	-129.29 148.87	37 - 22 - 31
b) LFP > ARIMA + SEF	12.27	58.09	31.78	41	-129.29 154.62	37 - 22 - 46
c) LFP > ECON + SEF	4.28	57.01*	31.61	47	-129.29 148.87	37 - 22 - 39
d) LFP > COM1 + SEF	4.38	59.18	31.59	49	-129.29 148.87	37 - 22 - 34
e) LFP > COM2 + SEF	2.66	58.29	32.12	49	-129.29 148.87	37 - 22 - 33
f) LFP > COM3 + SEF	9.82	62.65	32.60	44	-129.29 170.85	37 - 22 - 37
g) LFP > COM4 + SEF	7.50	55.66*	31.54	42	-129.29 152.93	37 - 22 - 42
8. Hedge if: LFP > EXP	10.05	47.52*	28.97	38	-129.29 105.06	37 - 22 - 66
9. Purchase Put if: LSP > EXP + SEF	14.79	71.04	33.52	44	-129.29 206.29	37 - 22 - 13
10. Purchase Put if: LSP > EXP	3.19	67.08	36.14	52	-134.56 180.46	37 - 22 - 36
11. Cover variable cost or do not feed						
a) placement:	3.98	35.84*	12.75*	20	-43.84 96.15	0 - 0 - 30
b) pre-placement	-11.57*	50.13*	28.28	33	-107.60 148.21	0 - 0 - 44

* - Indicates significantly different from the cash strategy at the .05 level. Statistical significance of differences between means and variances was tested using the method proposed by Ashley, Granger, and Schmalensee (1980).

variance and semivariance of all the strategies tested (with the exception of the do not feed alternative strategy). However, it also generated an average loss of $.91/hd over the entire period.

The routine put-option purchase on live cattle yielded the lowest mean return of all of the strategies, and the variance was not significantly smaller than the cash market. This is consistent with Hudson, Hauser, and Fortenbery (1985) who found that the routine options strategy resulted in a larger variance and smaller mean return than the cash market.

Hedging corn and feeder cattle when signaled via the price forecasts and selling fed cattle in the cash market (strategy 4) increased the average return by more than $3/hd but also slightly increased the variance as compared to the cash market.[5] Hedging corn as signaled by the price forecasts resulted in reducing the average corn price paid by the cattle feeder over the 90 feeding periods by an average of $.04/bu (from $2.46/bu to $2.42/bu) which was significantly smaller at the .05 level. Likewise the average feeder-cattle purchase price was reduced from an average of $68.12/cwt to $67.80/cwt (which was not significantly smaller statistically, but economically results in more than a $2/hd increase in average returns).

The profit-margin hedging signals (strategies 5a-5d) all resulted in significantly smaller profit variability than the cash strategy, with average returns at least as large as the cash strategy (with the exception of hedging at breakeven prices). The $4/cwt profit-margin hedging strategy resulted in the highest average return ($14.84/hd) of all the strategies. The $2/cwt profit-margin hedge yielded the fewest losses (33 percent) of any of the continuous feeding strategies.

The profit-margin signaled options strategies yielded somewhat different results than the cash market. The returns were smaller than the cash returns up to the $2/cwt profit margin and greater with larger profit margin targets. The variability of returns was greater and the average returns smaller for the options strategies than the respective profit-target-signaled hedging strategies.

The forecast signaled hedging strategies resulted in about the same average retruns as the cash strategy and lower variances. The forecast signaled put option strategies resulted in about the same variance as the cash strategy with a higher mean return for the SEF adjusted strategy but a lower mean for the nonadjusted strategy.

The purchase fed-cattle put options or do not feed strategies frequently resulted in empty cattle lots. The placement month put option purchased to cover variable costs resulted in placing cattle on feed only 30 percent of the months. The pen was left empty the remainder of the time. The preplacement put option purchase to cover variable costs or do not feed strategy resulted in a much smaller average return with only 44 percent of the months having cattle marketed. The preplacement strategy performed worse than the placement month only strategy primarily because expected costs of production in the 1978 to 1979 period signaled option purchases at strike prices that ended up generating large losses.[6] The relatively poor performance of these strategies is not surprising given the short period (one or two months) of time for which to search for a profitable market position.

Eight of the strategies tested were unambiguously preferred to the cash market. The profit-margin hedging strategies (5b,5c,5d), the forecast-signaled hedging strategies (7a,7b,7f,8), and the $4/cwt put option profit-margin strategy (6d) were all preferred to the cash strategy. A stochastic dominance with respect to a function ranking of the strategies indicated that for a risk-preferring individual strategy 4 (long hedge on feeder cattle and corn and cash market fed cattle) was the preferred strategy. While a risk-averse cattle feeder would prefer strategy 6d (similar to strategy 4 except fed cattle were hedged using the $4/cwt profit margin trigger). Thus, stochastic dominance rankings were similar to the mean variance rankings.

None of the selective strategies were purely inferior to the cash strategy. However, it could be argued that strategies with significantly smaller average returns and not significantly smaller variances would not be preferred by most producers. Many of the strategies ended up being neither superior nor inferior to the cash strategy from a mean-variance standpoint. It is evident that finding strategies that reduce the variability of returns versus the cash market is not a difficult task but developing strategies that also increase average returns can be more difficult.

CONCLUSIONS

Cattle feeders have faced highly variable and frequently low returns for decades, and this problem has intensified in recent years. Futures markets and recently introduced options markets are two market alternatives that producers can use in order to attempt to stabilize and/or increase cattle feeding profitability.

The purpose of this study was to compare cash marketing to some of the standard hedging strategies and similar put option purchase strategies which cattle feeders could use in their marketing plans. Over the entire 90 feeding periods, the profit-margin ($4/cwt and $6/cwt) signaled fed-cattle hedging strategies had the highest average return of the strategies tested and a smaller variance than the cash-market returns. In general, during years of rapid cattle price increases, such as the 1978 and 1979 period (following the 1976-78 herd liquidations), the put option strategies resulted in lower variability of returns and higher average returns than the hedging strategies. However, in the early 1980's the option strategies generally performed worse than the hedging strategies possibly because calculated option premiums (which were calculated using a 3-year historical moving average futures price volatility for the respective contract duration) were relatively large following the extreme volatility of prices in the late 1970's. The calculated premiums subsequently declined by the 1983 and 1984 periods and as a result, the option strategies again performed better than the hedging strategies. Overall, it is evident that some combination (or switching) of hedging, options and cash strategy would likely outperform any single strategy. This is particularly evident when one observes the differneces among strategies for different years or different months (results not reported to conserve space).

The marketing strategies examined in this study were analyzed over a historical period. It is generally assumed that these results would also apply in the near future. That is, marketing strategies that have been successful in recent history would be expected to continue to be successful in the near

future. However, given the recent changes occurring in the livestock industry this may not necessarily transpire.

Profit margins in cattle feeding could become less frequent. Changing consumer tastes away from red meats, and increased competition from poultry products may keep beef prices from sustaining high levels. If for example opportunities to lock in $4/cwt profit-margins become less frequent, strategies relying on this profit margin as a signal to hedge would likely perform less well. In this case forecast signals may outperform profit margins as marketing signals.

FOOTNOTES

1 Though Pluhar and colleagues addressed cattle hedging strategies and not options strategies, their general conclusions would likely apply to options marketing strategies as well.

2 Semivariance is the variance above or below a specified threshold. In this study semivariance is defined as the variance of returns below a breakeven threshold. In other words, the semivariance as discussed here is the variance of losses.

3 The Iowa feedlot enterpise data was very similar to the USDA's great plains feedlot costs of production during the 1978-85 period. A regression of the Iowa cost of production on the USDA series gave the following:

Iowa Cost ($/hd) = 12.06 + 0.95 (USDA Cost ($/hd)) R^2 = .92
(9.22) (0.04) standard errors in parentheses

Thus, the Iowa cost data is highly correlated with and not significantly different from the USDA series.

4 In order to reduce the number of marketings signaled by the less accurate (longer horizon) forecasts relative to those signaled by the more accurate (shorter horizon) forecasts the forecasted prices were adjusted by the standard error of the forecast. For corn and feeder cattle this amounted to increasing the forecasted prices prior to using them as marketing signals. For fed cattle strategies are reported both with and without this adjustment for comparison.

5 The increased variability in price as a result of hedging the feeder cattle is likely attributable to the wide fluctuations in feeder cattle basis which occurred during the 1978-85 period. It was not uncommon for the Sioux City feeder cattle basis during this period to fluctuate as much as $5/cwt or more from what it averaged historically during the same period. Recent feeder cattle futures contract changes, particularly switching to cash settlement, are expected to greatly reduce the feeder cattle basis risk in the future.

6 The rapidly increasing feeder-cattle prices during this time (from $63/cwt in July of 1978 to $90/cwt in April of 1979) were significantly under-forecasted which resulted in smaller expected costs of production two months before placement; and this signaled some ill-advised fed cattle put option purchases which added to the losses suffered by producers.

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APPENDIX

Table 1A. Statistical Performance of Selected Monthly Feeder-Cattle Price Forecasts, 1978-85

Months ahead forecasted	-- Forecasting technique -- NAIVE[a]	ARIMA	ECON[b]	COM1[c]	FUT[d]
1 month ahead:					
Mean error ($/cwt)	-0.16	-0.13	-1.97	-1.05	0.42
RMSE ($/cwt)	2.76	2.68	5.97	3.89	2.81
Turning point accuracy (%)[e]	--	58	46	49	66
2 months ahead:					
Mean error ($/cwt)	-0.29	-0.31	-3.82	-2.07	0.36
RMSE ($/cwt)	4.33	4.23	11.58	7.13	3.86
Turning point accuracy (%)	--	58	45	48	72
3 months ahead:					
Mean error ($/cwt)	-0.40	-0.54	-3.89	-2.22	0.21
RMSE ($/cwt)	5.59	5.53	13.52	8.71	5.13
Turning point accuracy (%)	--	57	39	48	65

[a]Naive is the average price 1, 2, and 3 months earlier for 1-, 2-, and 3-month ahead forecasts, respectively.
[b]ECON is the econometric model forecasts.
[c]COM1 is the composite simple average of ARIMA and ECON forecasts.
[d]FUT is the feeder-cattle futures market forecasts. This forecasts is the most recent weekly average localized futures price for the contract expiring nearest but not before the month being forecasted.
[e]Percent of directional price changes accurately predicted.

Table 2A. Statistical Performance of Monthly Corn-Price Forecasts, 1978-85.

Months ahead forecasted	-- Forecasting technique -- Naive[a]	ARIMA	ECON[b]	COM[c]
1 month ahead:				
Mean error ($/bu)	0.00	0.00	-0.02	-0.01
RMSE ($/bu)	0.13	0.12	0.13	0.12
Turning point accuracy (%)[d]	--	58	65	69
2 months ahead:				
Mean error ($/bu)	0.01	0.00	-0.06	-0.03
RMSE ($/bu)	0.21	0.16	0.21	0.18
Turning point accuracy (%)	--	74	63	77
3 months ahead:				
Mean error ($/bu)	0.01	0.00	-0.09	-0.05
RMSE ($/bu)	0.28	0.23	0.27	0.23
Turning point accuracy (%)	--	72	70	81
4 months ahead:				
Mean error ($/bu)	0.01	0.00	-0.14	-0.07
RMSE ($/bu)	0.34	0.30	0.33	0.29
Turning point accuracy (%)	--	66	68	74
5 months ahead:				
Mean error ($/bu)	-0.01	-0.01	-0.17	-0.08
RMSE ($/bu)	0.38	0.35	0.38	0.33
Turning point accuracy (%)	--	62	64	67
6 months ahead:				
Mean error ($/bu)	-0.02	-0.01	-0.22	-0.11
RMSE ($/bu)	0.42	0.40	0.44	0.38
Turning point accuracy (%)	--	51	63	60

[a]Naive is using the average monthly corn price in the most recently completed month as a forecast of a subsequent month.
[b]ECON is the econometric model forecasts.
[c]COM is the simple average of ECON and ARIMA forecasts.
[d]Percent of directional price changes accurately predicted.