

Managing Cattle Price Risk with Futures and Options Contracts

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The purpose of this study is to evaluate effective ways for cattle producers to manage fed cattle price risk. This is an update to a previous study which analyzed managing price risk from January 1987-2000. This study examines historical data from January 1987 through December 2006.

An estimated breakeven cost for a six-month feeding program was taken from the Iowa State University Extension Estimated Livestock Returns for Finishing Medium No. 1 Yearling Steers. The cash price is the Iowa-Southern Minnesota direct cattle price taken from daily reports published by the USDA Agriculture Market News on the first trading day of the month. All futures and options prices are the closing prices from the first trading day of the month. The estimated basis is the previous three-year average basis for Iowa Southern—Minnesota fed cattle available at the time the hedging decision was made.

The strategies evaluated were:

Cash:	Sell all cattle at the cash price on the first day of the month
Futures:	Hedge all cattle with futures contracts when cattle enter feedlot
50 Futures:	Hedge 50 % of cattle with a futures contract and sell 50 % on cash market
1 OTM Put:	Buy a put option one strike price out-of-the-money when cattle enter feedlot
ATM Put:	Buy a put option with the strike price at the money when cattle enter feedlot
1 ITM Put:	Buy a put option one strike price in-the-money when cattle enter feedlot

The average return over the 19-year period only selling on the cash market was \$2.76 per hundredweight, an increase of \$1.04 over the first 14-year average. The cash market offered the greatest average return of any of the strategies used. The next highest average strategy was 50 percent futures, followed by 1 ITM Put, 1 OTM Put, ATM put, and 100 percent futures. When compared to the prior study, the order has changed somewhat, but cash market continues to remain on the top and 100 percent futures remains with the lowest average return. Cash had the highest risk of any strategy based upon the standard deviation and the range. While cash had a higher percent of sales with a positive return, futures or 50% futures beat the cash return 39% of the time. These two strategies also had a higher minimum return than the cash market indicating that they did limit losses. The average return for the put strategies was higher than Futures, but their minimum return was lower than Futures. This suggests that the other tools can be effective. Returns are summarized in Table 1 on the next page.

Table 1. Summary of Returns to Alternative Cattle Feeding Risk Management Strategies, 1987-2006

All returns are \$/cwt.	Average	Minimum	Maximum	Standard Deviation	Positive Returns (%)	Beats Cash Sales (%)
Cash Price	2.76	-9.76	33.77	8.31	64%	NA
Futures	-0.24	-7.83	13.90	3.65	50%	39%
50% Futures	1.27	-5.84	23.83	5.32	62%	39%
1 OTM put	0.98	-10.51	32.07	7.87	55%	14%
ATM put	0.62	-11.23	31.55	7.79	53%	18%
1 ITM put	1.24	-12.01	30.88	7.89	56%	25%

The basis risk for feeding cattle is much less than the price risk. The range for the actual basis is approximately \$7.75/cwt. while the range for the cash price is \$43.35/cwt. The standard deviation for basis (\$1.46/cwt.) is also much lower than the price risk (\$8.31/cwt.).

Table 2 shows the monthly average returns and the percentage of months that a breakeven price or better could be hedged based on the month the cattle are sold. In all months selling cattle the cash market proved to produce the highest average return as shown by the black cells. However, in half of the months there are times when other strategies produce higher or the same percentage of positive average returns as the cash market. The gray cells indicate the highest percentage of returns greater than zero for each month. During the first six months of the year use of any of the marketing strategies would have resulted in a high probability of positive returns. The same cannot be said of July and August, where any strategy used would have resulted in an average loss. However, for these months the cash market and 50% futures have the highest percentage of positive returns. The later months of the year received positive returns; however, they aren't as high as the first of the year returns. The number of positive returns has increased over the past five years. For every strategy evaluated, during at least one month of the year it has the greatest percentage of returns larger than zero.

Table 2: Average Return and Percent with Positive Returns by Sales Month and Marketing Strategy 1987-2006

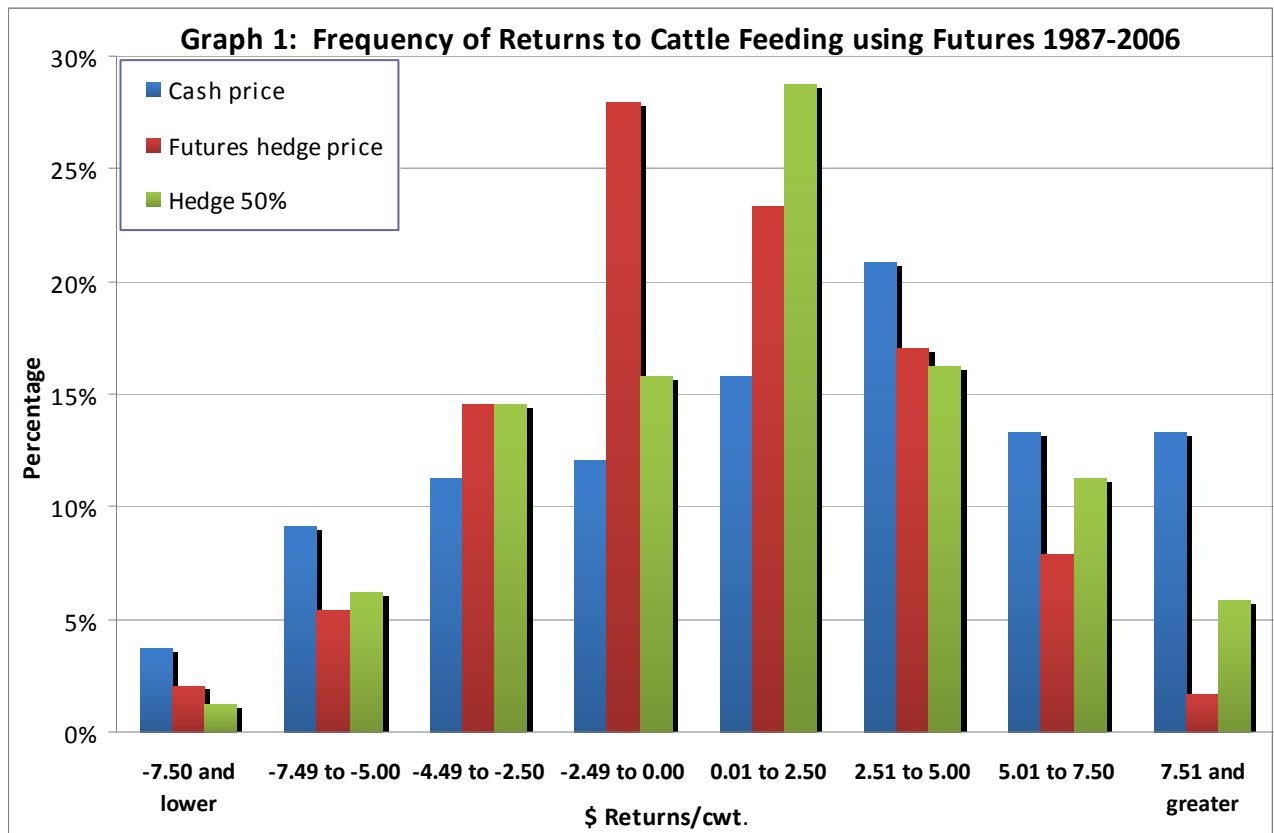
Sales Date	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Cash (\$/cwt)	2.44	3.23	4.06	4.49	3.34	0.96	-0.11	-0.14	0.10	0.65	1.92	2.59
% greater than \$0	70	75	85	80	80	55	45	45	60	55	50	60
Futures (\$/cwt)	0.73	0.88	1.46	2.00	2.37	0.24	-0.86	-1.28	-1.59	-1.67	-0.17	-0.19
% greater than \$0	50	50	55	80	85	60	30	40	35	35	40	45
50% futures (\$/cwt)	1.58	2.05	2.76	3.24	2.85	0.60	-0.48	-0.71	-0.74	-0.51	0.88	1.20
% greater than \$0	75	70	75	85	85	55	40	45	40	40	60	70
1 OTM Put (\$/cwt)	1.57	1.81	2.71	3.41	2.69	-0.29	-1.12	-1.12	-0.62	-0.36	0.70	0.89
% greater than \$0	75	65	70	80	85	50	25	40	45	25	45	55
ATM Put (\$/cwt)	1.48	1.53	2.28	3.25	2.42	-0.31	-1.24	-1.44	-0.67	-0.41	0.10	0.48
% greater than \$0	75	65	70	80	70	45	25	40	40	25	50	50
1 ITM Put (\$/cwt)	1.51	1.74	2.00	3.27	2.52	0.16	-0.55	-1.43	-0.29	-0.71	0.06	0.15
% greater than \$0	75	75	70	85	65	55	40	40	45	25	50	45

Black cells indicate the highest average monthly return

Gray cells indicates the highest percentage of years with positive returns for each month

For example, April cash sales generated a positive return average in all 19 years (80%) with an average return of \$4.49/cwt. This is a decrease of \$0.66 over the past five years. August cash sales produced returns that averaged \$-0.14 and were positive 45 % of the 19 years. However, futures in August were positive only 40% of the years and the average return was \$-1.28/cwt.

Graph 1 shows the frequency distribution of the returns per hundredweight. The cash market historically had the highest probability of a large profit or a large loss. Use of futures narrows the percentage of returns, with 68 percent of the returns falling between \$0.00 and \$5.00/cwt. Hedging 50 percent of the cattle are skewed to the right and offered increased risks of losing money (38%) and earning more than \$2.50/cwt. (62%).



The marketing decisions discussed above represent a very simple strategy, following the same marketing approach for 19 years and comparing the results. By applying some simple “if then” statements, several decisions can be evaluated:

- Rule # 1: if hedge price using futures is greater than the expected breakeven cost of production, hedge, otherwise use other futures or option strategy
- Rule #2: if the hedge price using futures is greater than the expected breakeven cost of production minus \$1, hedge, otherwise use other future or option strategy
- Rule #3: if the hedge price using futures is greater than the expected breakeven cost of production minus \$2, hedge, otherwise use other futures or option strategy

Table 3. Summary of Returns to Selected if-then-else Management Strategies 1987-2006						
Returns without added Management	Average	Min	Max	St Dev	Positive returns %	Beats Cash %
Cash price	2.76	-9.76	33.77	8.31	64%	NA
Futures hedge price	-0.24	-7.83	13.90	3.65	50%	39%
Hedge 50%	1.27	-5.84	23.83	5.32	62%	39%
1 OTM Put	0.98	10.51	32.07	7.87	55%	14%
ATM Put	0.62	11.23	31.55	7.79	53%	18%
1 ITM Put	1.24	12.01	30.88	7.89	56%	25%
Management Rule # 1						
if placement>breakeven hedge, cash	0.91	-9.76	13.90	4.36	63%	7%
if placement>breakeven hedge, 1 OTM put	-0.24	-7.83	13.90	3.65	58%	11%
if placement>breakeven hedge, 50 futures	1.27	-5.84	23.83	5.32	61%	11%
if placement>breakeven hedge, ATM put	1.65	-8.56	31.55	7.17	60%	7%
Management Rule # 2						
if placement>breakeven -1 hedge, cash	0.88	-9.76	13.90	4.13	61%	9%
if placement>breakeven -1 hedge, 1 OTM put	0.08	-8.02	13.90	4.00	57%	9%
if placement>breakeven -1 hedge, 50 futures	0.32	-6.84	13.90	3.48	53%	11%
if placement>breakeven -1 hedge, ATM put	-0.07	-8.56	13.90	4.01	56%	9%
Management Rule # 3						
if placement>breakeven -2 hedge, cash	0.29	-9.76	13.90	4.17	55%	9%
if placement>breakeven -2 hedge, 1 OTM put	-0.11	-7.83	13.90	3.98	54%	10%
if placement>breakeven -2 hedge, 50 futures	0.02	-7.83	13.90	3.63	52%	11%
if placement>breakeven -2 hedge, ATM put	-0.13	-8.56	13.90	3.95	53%	10%

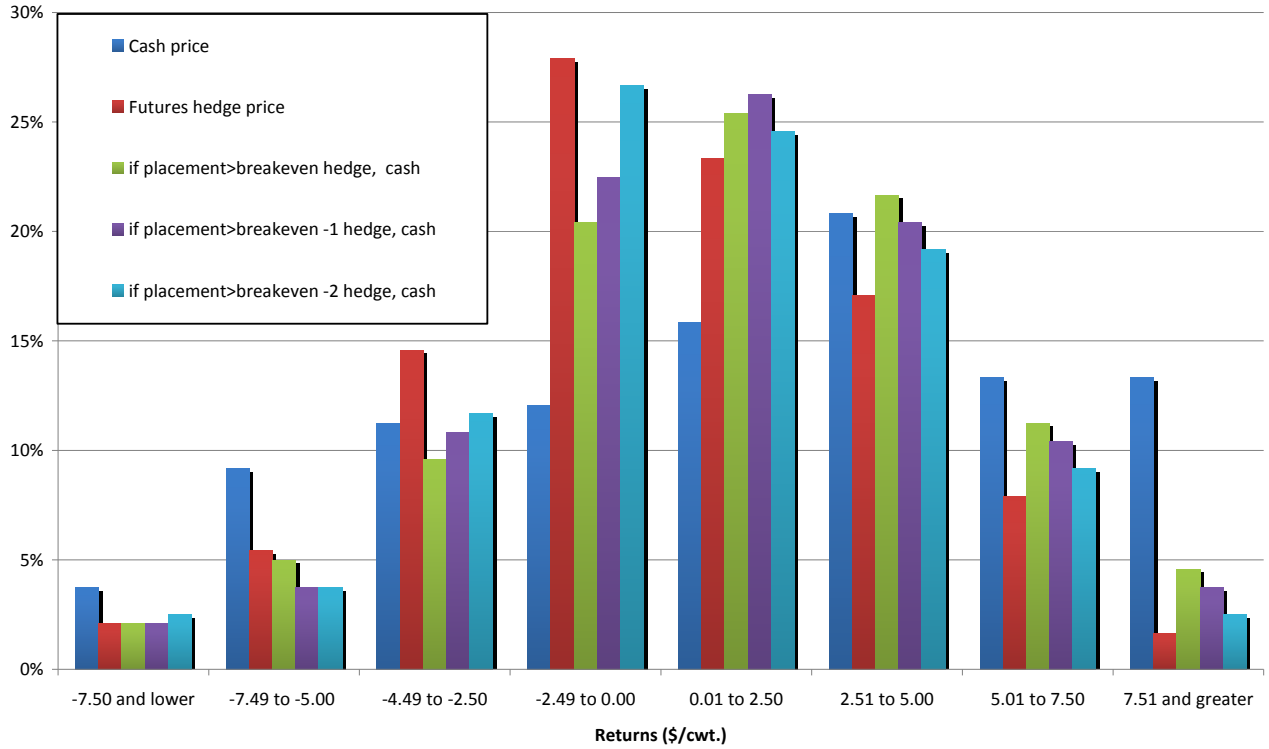
Rule # 1 produced similar results to Table 1 but the percent of times with a higher return was minimally higher. Both the 1 OTM put and the ATM put had higher average returns than the option only returns. The standard deviation also decreased slightly.

Rule # 2 still produces a similar percentage of returns greater than zero although the average return for each risk management tool decreases slightly from Rule # 1. However, the standard deviation also decreases, showing reduced risk in this case. Rule # 2 shows the results of a producer hedging when the breakeven price is \$1 higher than the expected hedge price at cattle placement.

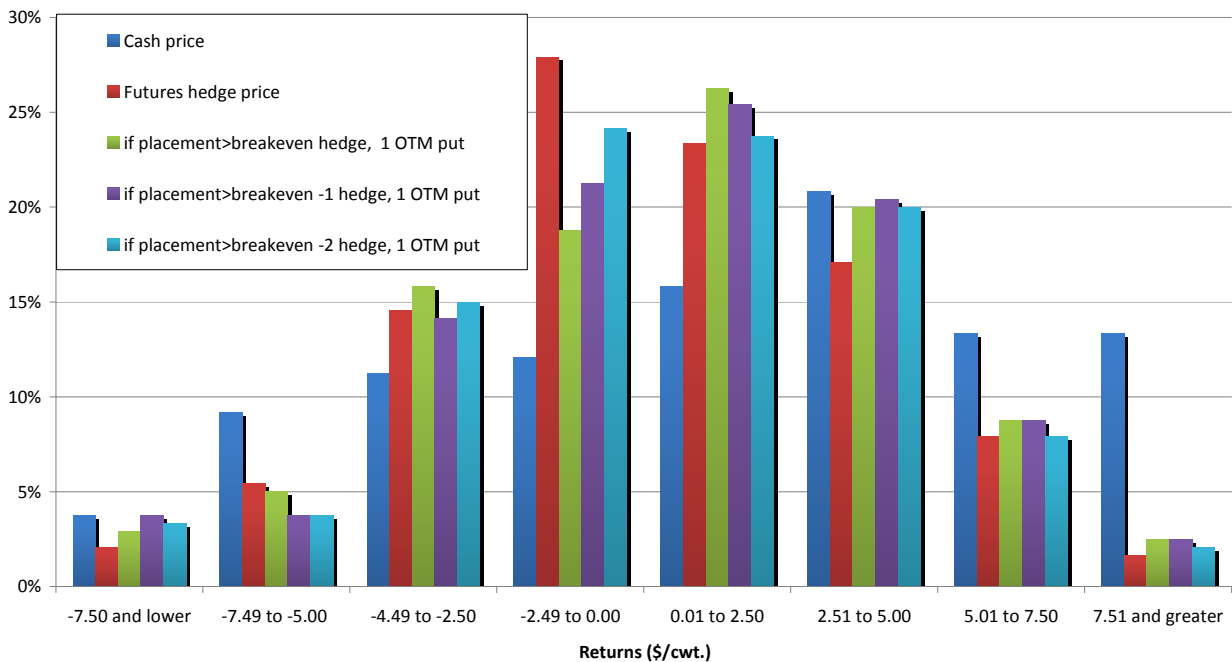
Rule # 3 is similar to Rule #2. Rule # 3 shows the results of a producer hedging when the breakeven price is \$2 higher than the expected hedge price at time of cattle placement. Average return and the percentage of returns that are greater than zero both fall. However, the percentage of returns that beat cash is slightly higher than Rule #2 and Rule #3.

All three strategies offer greater returns to the producer using the “if then” statements to selectively hedge. If the producer strictly hedges over the 19-year time period the average return to the producer would be \$-0.24/cwt. All the different strategies in Rules #1, # 2, and #3 offer greater returns as well as a higher standard deviation. While average returns were lower than cash only, these steps-wise decision rules offer slightly reduced risk.

Graph 2. Frequency Distribution of Returns to Cattle Feeding Using Various Marketing Strategies



Graph 3: Frequency Distribution of Returns to Cattle Feeding Using Various Marketing Strategies



Graphs two and three show the frequency distribution of returns when two different “if-then” statements are applied to marketing strategies. Graph # 2 shows the frequency of returns when a producer hedges with Futures if the Futures price is greater than the estimated breakeven cost and stays in the cash market if the futures price is less than the estimated breakeven cost. Graph # 3 shows the frequency of returns when a producer hedges with futures if the futures price is greater than the estimated breakeven cost and buys a 1 OTM put option if the futures price is less than the estimated breakeven cost.

It is interesting to note that the graphs are very similar. This shows that purchasing the put option has a negligible effect on the distribution of returns. The distributions of returns are very similar but the put option still provides valuable downside protection while still leaving most of the upside open.

In conclusion, a producer has many ways to manage fed cattle price risk. With the six strategies that were evaluated cash price, Futures, 50% Futures, 1 OTM put, ATM put and 1ITM put, there isn't one strategy that can be distinguished as the best money maker or the risk neutralizer. Each simple strategy has its own advantages and disadvantages that are shown in the study. One approach may have the highest average return, but yield a low percentage of positive returns, and vice versa. One way for a producer to minimize even more risk is to incorporate if-then management strategies. These strategies have shown to have lower average returns, but reduce price risk slightly more than the simple approaches.