

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 price risk. This study examines historical data from January 1987 until December 2000.

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 five-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 14-year period only selling on the cash market was \$1.63 per hundredweight. 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 OTM Put, ATM Put, 1 ITM put, and 100 percent futures. Cash also 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 40 % of the time. This suggests that the other tools have a place as well. Returns are summarized below in Table 1.

Table 1: Summary of Returns to Alternative Cattle Feeding Risk Management Strategies, 1987-2000

All returns are \$/cwt.	Average	Standard Deviation	Maximum	Minimum	Positive Returns (%)	Beats Cash Sales (%)
Cash Price	1.63	5.54	18.22	(12.33)	65%	NA
Futures	0.33	3.76	11.77	(11.29)	54%	40%
50% Futures	0.98	4.17	12.97	(9.82)	64%	40%
1 OTM put	0.82	4.86	16.15	(11.96)	58%	14%
ATM put	0.66	4.68	15.37	(11.29)	57%	21%
1 ITM put	0.52	4.51	14.50	(10.56)	58%	25%

The basis risk for feeding cattle is much less than the price risk. The range for the actual basis is approximately \$7/cwt. while the range for the cash price is \$30.30/cwt. The standard deviation for basis (\$1.38/cwt.) is also much lower than the price risk (\$4-5/cwt.).

Table 2 shows the monthly average returns and the percentage of months that a breakeven price or better could be hedged. In all months selling cattle on the cash market proved to produce the highest average return as shown by the black cells. The gray cells indicate the percentage of the months during the study that a breakeven price or better could be obtained. During the first five 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 the later months in the year where each strategy used would have resulted in an average loss.

Table 2: Average Return and Percent with Positive Returns by Sales Month and Marketing Strategy 1987-2000

Sales Date	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Cash (\$/cwt)	2.69	3.02	3.76	5.15	4.51	0.88	-0.81	-0.88	-1.32	-0.55	0.82	1.54
% greater than \$0	77	85	85	100	83	54	46	46	62	62	62	69
Futures (\$/cwt)	1.73	1.43	0.75	1.87	2.47	0.27	-1.16	-1.21	-2.16	-1.28	0.11	0.00
% greater than \$0	69	62	54	92	85	62	23	46	38	38	54	54
50% futures (\$/cwt)	2.21	2.22	2.25	3.51	3.49	0.58	-0.99	-1.04	-1.74	-0.91	0.46	0.77
% greater than \$0	85	77	77	100	100	54	38	46	31	54	77	77
1 OTM Put (\$/cwt)	2.26	2.00	2.61	4.06	4.00	-0.33	-1.32	-1.51	-1.50	-1.29	-0.07	0.25
% greater than \$0	85	77	77	92	100	54	23	46	46	31	54	62
ATM Put (\$/cwt)	2.24	1.85	2.24	3.91	3.64	-0.35	-1.37	-1.82	-1.54	-1.29	-0.39	-0.05
% greater than \$0	85	77	77	92	85	46	23	46	46	31	62	54
1 ITM Put (\$/cwt)	2.45	2.18	1.88	3.78	3.04	-0.10	-1.53	-1.85	-1.55	-1.64	-0.53	-0.39
% greater than \$0	92	85	77	100	77	54	31	46	38	31	62	54

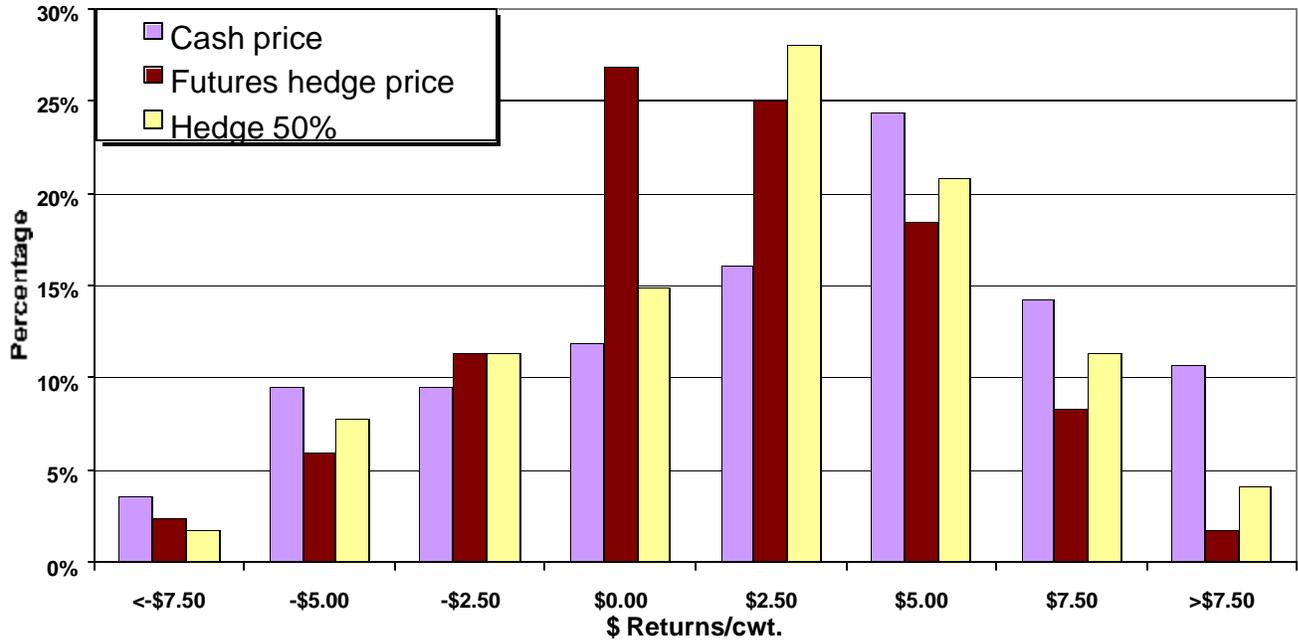
Black cells indicate the highest average monthly return

Grey cells indicate the highest percent of years with positive returns

For example, April cash sales generated a positive return in all 14 years (100 %) with an average return of \$5.15/cwt. September cash sales produced returns that averaged \$-1.32 and were positive only 62 % of the 14 years. However, futures in September were positive only 38% of the years and the average return was \$-2.16/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 70 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 (35%) and earning more than \$2.50/cwt. (63 %).

Graph 1: Frequency of Returns to Cattle Feeding using Futures 1987-2000



The marketing decisions discussed above represent a very simple strategy, following the same marketing approach for 14 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, other wise use 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 1987-2000						
Returns without added Mgmt. (same as table 1)	Average	Min	Max	St Dev	Positive	Beats
					Returns %	Cash %
Cash price	1.63	-12.33	18.22	5.54	65%	N/A
Futures hedge price	0.33	-11.29	11.77	3.76	54%	40%
Hedge 50%	0.98	-9.82	12.97	4.17	64%	40%
1 OTM Put	0.82	-11.96	16.15	4.86	58%	14%
ATM Put	0.66	-11.29	15.37	4.68	57%	21%
1 ITM Put	0.52	-10.56	14.50	4.51	58%	25%
Management Rule # 1						
if placement>breakeven hedge, cash	1.21	-12.33	13.43	4.24	67%	23%
if placement>breakeven hedge, 1 OTM put	0.84	-11.96	12.82	4.20	64%	28%
if placement>breakeven hedge, 50 futures	0.77	-9.82	11.77	3.71	63%	40%
if placement>breakeven hedge, ATM put	0.75	-11.29	12.82	4.14	62%	30%
Management Rule # 2						
if placement>breakeven -1 hedge, cash	1.01	-12.33	13.43	3.99	63%	28%
if placement>breakeven -1 hedge, 1 OTM put	0.72	-11.96	12.31	4.02	61%	31%
if placement>breakeven -1 hedge, 50 futures	0.33	-11.29	11.77	3.76	54%	40%
if placement>breakeven -1 hedge, ATM put	0.65	-11.29	11.77	4.00	60%	33%
Management Rule # 3						
if placement>breakeven -2 hedge, cash	0.77	-12.33	11.77	3.72	58%	33%
if placement>breakeven -2 hedge, 1 OTM put	0.58	-11.96	11.77	3.79	57%	35%
if placement>breakeven -2 hedge, 50 futures	0.33	-11.29	11.77	3.76	54%	40%
if placement>breakeven -2 hedge, ATM put	0.52	-11.29	11.77	3.82	56%	35%

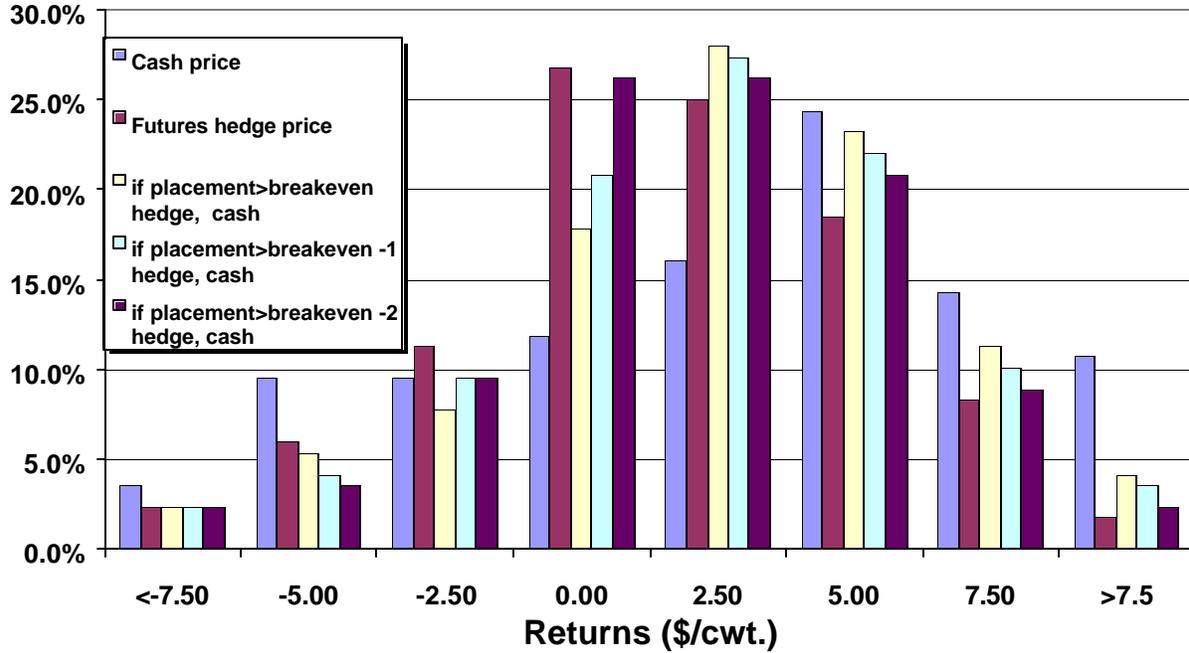
Rule # 1 produced similar results to Table 1 but the percent of times with a higher return was slightly higher. Both the 1 OTM put and the ATM put had higher average returns than the option only returns. The standard deviation also decreased slightly.

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 the results of a producer hedging when the breakeven price is \$1 higher than the expected hedge price at cattle placement.

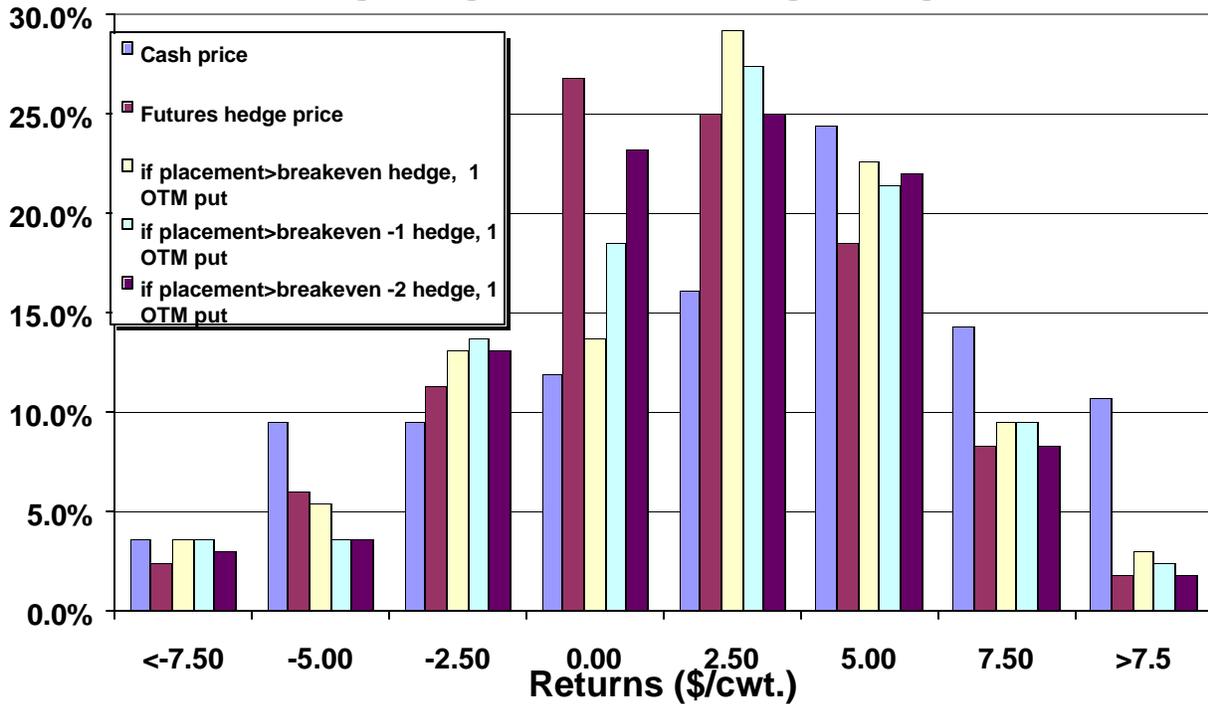
Rule # 3 is similar to Rule #2. Rule # 3 shows the results of a producer hedging when the breakeven price is \$2 higher than the expected hedge price at time of cattle placement. Average return and the percentage of returns that are greater than zero both fall. However, the percentage of returns that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

All three strategies offer greater returns to the producer using the “if then” statements to selectively hedge. If the producer strictly hedges over the 14-year time period the average return to the producer would be \$0.33/cwt. All the different strategies in Rules #1, # 2, and #3 offer greater returns as well as a lower 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. Graph # 2 shows the frequency of returns when the 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 the 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 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.