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Feeder Cattle Hedge Lifting Strategies for North Dakota

by
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PREFACE

This report represents a continuation in investigating factors that affect livestock marketing in North Dakota. Research was conducted under North Dakota Agricultural Experiment Station Research Project No. 1362, "Livestock Marketing."

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Highlights

Futures market hedging during periods of adverse price movements can be an effective method of reducing feeder cattle price risk. Since day-to-day variability exists in basis values, feeder cattle hedgers must decide when is the best time to lift the hedge.

Hedge lifting strategies that take advantage of historic basis patterns in North Dakota were developed and tested. Results of the different strategies generally supported theory regarding the tradeoff between net sales price and variability. All strategies involving hedging failed to increase the net sales price for feeder cattle marketed in the spring; however, many of them reduced the variability of returns. Strategies that yielded a higher net sales price also exhibited greater variability. Strategies that yielded lower net sales prices usually exhibited less variability.

Differences in mean net sales prices and variability of returns among all strategies were not significant at the 5 percent level. However, the analysis did indicate that historical basis values can be used as a guide to determine the best time to lift a hedge. Small differences were noted among the different hedging strategies. Several hedging strategies did increase returns over a cash only strategy for feeder cattle marketed in the fall.

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Introduction

During the past decade, cattle producers have experienced increasing production costs and widely fluctuating livestock prices. Producers have expressed the need for management techniques which offer protection from adverse price movements. Forward price contracting and futures market hedging are methods of reducing price risk.

Forward price contracting during the spring and summer months of feeder cattle to be marketed in the fall has occurred in North Dakota on a somewhat limited basis for many years. Futures trading in feeder cattle began at the Chicago Mercantile Exchange (CME) in 1972. Because futures market hedging is relatively new, it is not widely understood and has been used only in isolated cases by larger feeder cattle producers in North Dakota.

In the first few years of trading, the volume of feeder cattle futures contracts traded was relatively small and offered only limited potential for hedging. More recently, volumes have increased to a point where feeder cattle producers who raise sufficient numbers of cattle can use the futures market as a risk management tool.[1]

Hedging is defined as taking a position in the futures market opposite to a position held in the cash market. Cash and futures market prices tend to follow a similar pattern over time. Therefore, after a hedge is placed, losses resulting from declines in one market are offset by gains resulting from the approximately equal, but opposite, position held in the other market. The futures market can be used to "lock in" or establish a price for cattle up to approximately one year before they actually meet CME specifications and are ready for market.

A cattle producer considering hedging as a means of transferring price risk needs to "localize" the futures price so that it relates more closely to the local cash market. The method used to localize or adjust the futures market price is called the "basis." Basis is defined as the price of a specified futures contract month minus the current cash price. When the cash price is below the futures price, the basis is positive. When the cash price is above the futures price, the basis is negative.

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[1]The CME contract specifies a deliverable trading unit of 44,000 pounds (42,000 pounds prior to 1982) of USDA medium and large frame, number one muscle thickness beef steers. Producers raising less than 44,000 pounds or cattle not meeting CME specifications would not have a futures trading unit.

Each cash market where feeder cattle are sold has a unique basis. This basis often refers mainly to location of the cash market relative to the nearest futures market par delivery point.[2] Adjustments in the basis also can be made for grade, sex, quality, and other factors such as time prior to contract maturity.

The basis is a key element in successful hedging of a commodity. Much of the potential for successful hedging rests on accurate prediction of what the basis will be on the day the hedge is lifted or closed out. This is the critical point in time for the basis value. Adjustments and changes in the basis between the time a hedge is placed and the time it is lifted are of minor concern, as long as the hedger maintains the required margin and continues to hold the hedge. Ideally, the basis on the day the hedge is lifted will be the same value as the hedger estimated when the hedge was placed. An unexpected or "windfall" gain will occur in the profitability of a short hedge[3] if, on the day the hedge is lifted, the actual basis is narrower or more negative than the value the hedger originally estimated. The hedger will receive lower than expected returns on a short hedge if the actual basis is wider or less negative than the estimated basis.

Basis relationships are, in theory, largely dependent upon cash price differences between futures delivery points and local markets. Cash and futures prices at par delivery points tend to equalize due to arbitrage as the contract approaches maturity. Arbitrage is the act of buying in the lower-priced market and selling in the higher-priced market. Arbitrage at par delivery point markets is easily accomplished. The futures price and the cash price at the par delivery point markets are expected to converge to the point where they differ only by the costs of transferring ownership.

Differences in cash prices among markets are determined by patterns of trade among geographic locations and costs of transportation between the two markets. The futures-cash basis should, in theory, be stable and predictable if trade patterns and transfer costs are relatively stable from year to year.

There are relatively wide variations in day-to-day basis values. The basis may vary with changes in relative supply and demand, changes in production costs among regions, changes in transportation costs, changing government programs, or short-run shortages or surpluses at specific markets. Understanding and being aware of these sources of variation may assist the hedger in successfully completing the hedge. Basis can, however, usually be predicted with more accuracy than cash market prices. Even though variations exist in the basis, price uncertainty can be reduced by hedging.

Hedging establishes a price within some range rather than an exact forward price, since the basis is not precisely predictable and basis variations do occur. Once the hedge has been placed, it is the variation in

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[2]Par delivery points refer to locations where the commodity defined in the futures contract may be delivered at the price specified in the futures contract.

[3]A short hedge is a hedge in which a futures contract is first sold and then bought back or delivered upon at a later date.

basis, rather than the movement of price levels, which determines the realized net price.

The hedger should begin to carefully monitor the day-to-day variations in the basis as the time approaches to complete or lift the hedge. It may be advantageous for the hedger in a short hedged position to offset the hedge earlier than originally planned if the basis at that time is more favorable (narrower or more negative).

Feeder cattle basis relationships for North Dakota were identified and analyzed by Petry, Toman, and Aakre (5). The traditional approach for calculating the basis (futures price minus cash price) was used. The cash market was the West Fargo terminal market, the only market in North Dakota for which an adequate record of USDA daily feeder cattle prices was available.

The nearby period[4] basis was analyzed for all contracts in the 1972 through 1981 period. From 1972 through 1977, seven contracts (March, April, May, August, September, October, and November) were traded each year at the Chicago Mercantile Exchange (CME). In 1977, a January contract was added, with the first one maturing in 1978. From December 1977 through 1981, the January contract was added to the data. However, the January contract was excluded from much of the statistical analysis because of the smaller number of observations available.

Significant differences existed in basis values among the contract months. The fall contracts exhibited narrower basis values than the spring contracts. If a producer hedged feeder cattle to be marketed in the fall, especially during September and October, a relatively narrower basis could be estimated with less risk of loss on the basis. However, for the spring months a producer would need to allow for a wider basis in order to limit the risk of a loss due to the basis value. Probably the most potential exists for hedging feeder cattle to be marketed in the fall months, because historical seasonal price patterns indicate that prices generally increase until May and then decline until December.

The basis widened from nondelivery (the month prior to delivery) to delivery in March, August, October, and November contract months and narrowed in April, May, and September contracts. A narrowing in the basis would be beneficial from a short hedger's standpoint. Therefore, hedgers should consider lifting March, August, October, and November hedges during the nondelivery period; April, May, and September hedges should be lifted during the delivery month.

Analysis of the basis by week prior to expiration identified weeks when the basis was narrowest and most favorable for lifting hedges for each contract. The fourth week prior to maturity of the contract was most favorable for March, August, September, and October contracts. The most favorable basis occurred during the final week of trading for the May contract, Week 3 for the April contract, and Week 8 for the November contract.

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[4]The nearby period is defined as the month the contract matures and the month immediately preceding that month. It may be divided into the delivery period (month of contract maturity) and the nondelivery period (month prior to contract maturity).

The fact that particular basis patterns do exist means that basis values can probably be predicted more accurately than cash market prices. Therefore, futures market hedging during periods of adverse price movements can be an effective method of reducing price risk.

Most studies of feeder cattle hedging strategies have analyzed the decision of when to place the hedge. Many strategies maintained the hedge until the livestock were sold. Others have used various technical methods as indicators of when to place and lift hedges. Most studies have not analyzed lifting hedges according to daily basis variations, but instead, have used average weekly and monthly basis values. Although averages are useful, the daily basis varies substantially. This day-to-day variability is what the producer must face when marketing livestock and lifting hedges. Therefore, hedge lifting strategies that take advantage of basis patterns were developed and tested.

Hedging Strategy Assumptions and Procedures

Strategies were evaluated to identify the best time to lift the hedge. All strategies were a form of routine hedging, since they were initiated on a fixed schedule. It was assumed that the producer had already decided to hedge and that the hedged price was acceptable.

To evaluate the best time to lift the hedge for each contract, the assumption was made that livestock would be marketed during each contract month. Cash prices assumed were USDA quotations from the West Fargo terminal market for the mid-range of the USDA choice 600-700 pound feeder steer class as of the third Wednesday of each contract month.

The Wednesday feeder cattle auction has the largest daily volume at West Fargo. Therefore, most of the hedging strategies called for marketing the cattle on the third Wednesday of the delivery month. For the two strategies that did not, the cash price used was the price on the day the hedge was lifted.

Feeder cattle to be marketed in August, September, October, and November were hedged on May 15 or the first trading day thereafter. This date was selected to take advantage of the seasonally higher prices of feeder cattle during the month of May. This would be a rational choice for cattle to be marketed in the fall when prices normally are lower.

October 15, or the first trading day thereafter, was selected for hedging feeder cattle to be marketed in March, April, and May. This would correspond with the time a livestock producer would purchase feeder calves at weaning time, overwinter them, and sell them as 600-650 pound feeders in the spring.

All hedging strategies were designed to evaluate the optimum time to lift the hedge. Uniform placement times were used to limit the influence due to the time of placement.

The net sales price was computed by adding the gain or subtracting the loss on the futures market transaction to the cash market price received for

each lot of cattle, and subtracting $0.13 per hundredweight for brokerage fees. The mean net sales price and standard deviation were calculated from all transactions from each strategy. These statistics were used as comparative measures of profitability and variability. Each strategy was tested for seven contracts for 10 years with the exception of one strategy. Strategy 7 was limited to nine years as it involved the previous year's average which was not calculated for the first year of this study.

Hedging Strategies

Strategy 1 involved only cash marketing and was used as a benchmark to measure the effectiveness of the other strategies. The cash price used was the price for the third Wednesday of each contract month.

Strategy 2 was used to measure the effectiveness of remaining hedged until the contract matured. It called for lifting the hedge and marketing the cattle on the third Wednesday of the delivery month.

Strategy 3 was designed to compare the results of lifting the hedge in the month prior to delivery with the results of lifting the same hedge in the delivery month (Strategy 2). Previous research by Petry, Toman, and Aakre (5) indicated the mean basis was most favorable for lifting hedges in the delivery month for the April, May, and September contracts and most favorable in the nondelivery month for the March, August, October, and November contracts. In Strategy 3 the hedge was lifted on the third Wednesday of the month prior to delivery, and the cattle were marketed on the third Wednesday of the delivery month.

Basis analysis by week prior to delivery indicated variability in the average basis by week during the nearby period. Strategy 4 was designed to lift the hedge on Wednesday during the week prior to delivery that the most favorable average basis occurred. The most favorable basis occurred in Week 4 (fourth week prior to maturity) for the March, August, September, and October contracts, Week 1 for the May contract, Week 3 for the April contract, and Week 8 for the November contract.

Analysis of the basis indicated that negative basis values occur in all contracts sometime during the nearby period during most years. Strategy 5 called for lifting the hedge the day after a zero or negative basis occurred during the delivery month. The cattle were marketed on the third Wednesday of the delivery month. Strategy 6 called for lifting the hedge during the nearby period the day following the basis reaching the nearby period average basis value for that contract for the 1972-1981 period. The livestock were marketed the third Wednesday of the delivery month.

Strategy 7 was similar to Strategy 6 but used only the previous year's nearby period average basis for each contract. This resulted in only nine years of observations. The hedge was lifted during the nearby period the day after reaching this point. The cattle were marketed the third Wednesday of the delivery month.

Strategy 8 was an attempt to improve on the performance obtained by using nearby period averages, which were near the 50th percentile. In this

strategy, the hedge was lifted during the nearby period the day after the basis was equal to or less than the 25th percentile value of the nearby period basis for each contract month. The 25th percentile value was the value attained by the lowest 25 percent of the basis observations over the 1972-1981 period. The appropriate basis value for each contract month was obtained from frequency distribution tables developed by Petry, Toman, and Aakre (see Appendix Table 1). The feeder cattle were marketed the third Wednesday of the delivery month.

Two additional strategies were tested but could not be compared with the previous eight due to a difference in marketing times. In Strategies 9 and 10, the livestock were marketed the same day the hedge was lifted.

The same criteria were used for lifting the hedge in Strategy 9 as Strategy 6, except that the livestock were marketed at the same time the hedge was lifted. Therefore, any change in performance from Strategy 6 was due to the different marketing time rather than the time the hedge was lifted.

The same criteria were used for lifting the hedge in Strategy 10 as Strategy 5. However, the livestock were marketed at the same time the hedge was lifted rather than the third Wednesday of the delivery month.

Results of Hedging Strategies for all Contracts Combined

Net sales prices for the hedging strategies are presented in Table 1. Nine strategies involve hedging along with a cash marketing strategy used as a benchmark. Strategies 9 and 10 are discussed separately because of the difficulty in comparing results involving different marketing times. The mean net sales prices derived from the first eight strategies for all contracts combined were not significantly different from one another at the 5 percent level.

However, relatively minor differences did exist in the average net sales price received from the various strategies tested. Only $1.90 separated the strategy with the highest net sales price from the strategy with the lowest net sales price when all 10 years were considered. Strategy 7 involved using the previous year's nearby period average basis for each contract, therefore, 1972 could not be used. The values in parentheses are the net sales price for each strategy for the years 1973-1981. For the nine-year period (values in parentheses), the difference between the highest and lowest yielding strategy was only $1.60.

The strategy with the highest net sales price for both the nine- and 10-year periods was the cash marketing strategy. The highest yielding strategy involving hedging was Strategy 8 for both time periods. This strategy called for lifting the hedge when the basis reached the 25th percentile basis value. However, this criterion may not be practical for the livestock producer due to the difficulty in determining the 25th percentile value.

Strategies 4, 5, 6, and 7 all yielded very similar results. The criteria for lifting the hedge during the nearby period for these strategies included the best week for Strategy 4, a zero or negative basis for Strategy 5,

TABLE 1. NET SALES PRICES FOR SELECTED FEEDER CATTLE HEDGING STRATEGIES, 1972-1981

Contract Month	Hedging Strategies									
	1	2	3	4	5	6	7	8	9	10
	in dollars per hundredweight									
March	51.71	48.98	49.18	49.78	49.46	50.86		50.26	50.89	49.59
	(53.23)	(50.44)	(50.79)	(51.42)	(50.79)	(52.54)	(52.68)	(52.25)	(52.62)	(51.12)
April	53.85	49.92	51.03	52.17	50.73	51.08		51.03	49.59	50.64
	(55.53)	(51.45)	(52.66)	(53.90)	(52.35)	(52.71)	(52.61)	(52.65)	(51.14)	(52.26)
May	52.41	50.78	48.30	50.78	50.68	50.42		51.23	50.23	51.04
	(53.73)	(52.25)	(49.42)	(52.25)	(52.17)	(51.77)	(52.08)	(52.68)	(51.75)	(52.82)
August	54.31	51.82	54.90	53.57	53.72	54.71		53.26	53.29	53.72
	(55.67)	(53.41)	(56.78)	(55.30)	(55.35)	(56.61)	(55.22)	(54.68)	(55.01)	(55.35)
September	54.26	52.62	52.73	53.28	53.60	53.84		55.59	54.03	53.86
	(55.35)	(54.26)	(53.89)	(54.53)	(55.25)	(55.16)	(55.78)	(57.11)	(55.63)	(55.61)
October	52.91	52.30	51.76	53.10	52.79	52.64		52.66	54.36	53.10
	(53.90)	(54.04)	(53.30)	(54.90)	(54.56)	(54.27)	(54.14)	(54.43)	(56.13)	(54.83)
November	52.23	52.01	51.90	51.49	52.65	51.69		52.83	52.85	53.04
	(53.31)	(53.66)	(53.76)	(53.33)	(54.37)	(53.55)	(53.61)	(54.68)	(54.26)	(54.80)
All Contracts	53.10	51.20	51.40	52.02	51.95	52.18		52.41	52.18	52.14
	(54.39)	(52.79)	(52.94)	(53.66)	(53.56)	(53.80)	(53.73)	(54.09)	(53.83)	(53.83)

Values in parentheses do not include 1972.

1--Cash
2--Delivery Month
3--Nondelivery Month
4--Best Week
5--Zero or Negative Basis
6--Historical Average Basis
7--Previous Year's Average Basis
8--25th Percentile
9--Early Marketing-Average Basis
10--Early Marketing-Zero or Negative Basis

historic average contract basis values for Strategy 6, and the previous year's average basis for Strategy 7. These values would be easier for most producers to obtain.

The strategy that produced the lowest average net sales price was Strategy 2. It involved lifting the hedge on Wednesday during the final week of trading of a contract and marketing the livestock at the same time. Strategies 2 and 3 compared the results of lifting the same hedge in the delivery month and the nondelivery month. Lifting the hedge in the nondelivery month resulted in an increase of $0.20 in the mean net sales price. These results were consistent with the analysis indicating the basis increased near the end of trading for all except the May contract.

The Chi-Square and "t" statistics indicated that no significant differences existed among the standard deviations of the various strategies at the 5 percent level (2:352-59). However, small differences were evident in the variability of returns (Table 2). In general, performance was consistent with theory in that there was a tradeoff between net sales price and risk avoidance. The cash only strategy, which resulted in the highest net sales price, had the highest standard deviation. All strategies involving hedging resulted in a decrease in both net sales price and variability of returns.

Returns from the simulated feeder cattle sales were highly variable for all strategies. For example, the mean net sales price for all contracts over the 10-year period for Strategy 1 was $53.10 with a standard deviation of $17.60. Approximately 68 percent of the returns should be within one standard deviation of the mean. This price range, from $35.50 to $70.70, does not facilitate orderly planning based on expected returns. In addition, the remaining 32 percent of the returns would be expected to be outside of this price range.

Results of Hedging Strategies by Contract Month

Examination of results by contract month revealed larger differences in returns than existed when all contracts were combined. However, the mean net sales prices derived from all strategies for each contract month were not significantly different from one another at the 5 percent level. The performance of the various strategies was not consistent among all contracts. In general, the results of the nine-year and 10-year analyses were very similar.

The most noticeable difference was evident when comparing the spring contracts with the fall contracts. For all three spring contracts the most profitable strategy was to use the cash market only. However, for the fall contracts, the cash only strategy was second or third best.

The most profitable strategy for the March contract was to use the cash market only. However, when hedging, results indicated that lifting the hedge based on average basis value, as in Strategies 6 and 7, performed the best. These two strategies also resulted in a decrease in the variability of returns.

Strategy 4, lifting the hedge during the best week of the nearby period, and Strategy 6, lifting the hedge when the historic average nearby

TABLE 2. STANDARD DEVIATION OF NET SALES PRICES FOR SELECTED FEEDER CATTLE HEDGING STRATEGIES, 1972-1981

Contract Month	Hedging Strategies									
	1	2	3	4	5	6	7	8	9	10
	in dollars per hundredweight									
March	17.93 (18.32)	17.67 (18.10)	16.39 (16.52)	16.40 (16.50)	17.04 (17.35)	16.61 (16.69)	(16.57)	17.48 (17.61)	19.18 (19.49)	18.17 (18.58)
April	18.26 (18.53)	19.36 (19.88)	18.48 (18.83)	19.91 (20.30)	19.20 (19.63)	16.72 (16.87)	(16.68)	16.57 (16.71)	18.59 (19.02)	19.47 (19.93)
May	15.66 (16.00)	19.18 (19.73)	16.41 (17.00)	19.18 (19.73)	19.03 (19.54)	17.52 (18.02)	(18.07)	18.02 (18.48)	19.38 (19.91)	19.73 (20.06)
August	18.13 (18.68)	16.90 (17.11)	18.34 (18.41)	18.03 (18.22)	17.37 (17.59)	18.88 (18.97)	(17.94)	17.39 (17.65)	16.66 (16.70)	16.50 (16.62)
September	18.29 (19.04)	15.77 (15.80)	17.88 (18.56)	16.85 (17.37)	16.54 (16.66)	18.72 (19.35)	(19.23)	17.68 (18.04)	16.96 (17.17)	16.90 (16.94)
October	17.06 (17.78)	16.50 (16.51)	14.70 (14.71)	15.83 (15.67)	15.16 (14.93)	15.27 (15.24)	(15.04)	15.35 (15.15)	17.00 (17.02)	16.66 (16.72)
November	17.84 (18.57)	16.99 (17.14)	17.09 (17.02)	15.60 (15.35)	16.76 (16.81)	15.73 (15.47)	(16.05)	16.86 (16.77)	16.16 (16.15)	16.66 (16.65)
All Contracts	17.60 (18.13)	16.79 (16.98)	16.45 (16.63)	16.74 (16.83)	16.65 (16.78)	16.42 (16.51)	(16.33)	16.39 (16.45)	17.05 (17.19)	17.06 (17.17)

Values in parentheses do not include 1972.

1--Cash
2--Delivery Month
3--Nondelivery Month
4--Best Week
5--Zero or Negative Basis
6--Historical Average Basis
7--Previous Year's Average Basis
8--25th Percentile
9--Early Marketing-Average Basis
10--Early Marketing-Zero or Negative Basis

period basis value was reached, were the most profitable hedging strategies for the April contract. The cash only strategy, however, resulted in a higher net sales price. Strategy 7 decreased the variability of returns, while Strategy 4 resulted in the highest standard deviation of all strategies.

For the May contract, cash marketing was the most profitable and the least variable. All strategies involving hedging increased the standard deviation. The strategy involving hedging that yielded the highest net sales price was Strategy 8. It called for lifting the hedge the day after the nearby period basis reached the 25th percentile value.

The August contract, as with all fall contracts, yielded higher returns and generally lower standard deviations from strategies involving hedging than from cash only marketing. The most profitable Strategies were 3 and 6. Strategy 3 was designed to lift the hedge during the third week of the nondelivery month, and remain unhedged the remainder of the production period. Strategy 6 was designed to lift the hedge when the 1972-81 average nearby period basis value was reached. Generally, the hedge was lifted in the nondelivery month.

For the September contract, the most profitable Strategy (8) was to lift the hedge when the basis reached the 25th percentile value. This strategy resulted in the highest net sales price of all strategies for any of the contract months. The next two most profitable hedging strategies (6 and 7) involved the use of average basis values and were more than $1.30 less in average net sales price. The standard deviation in returns of all hedging strategies except 6 and 7 were less than for the cash marketing strategy.

For feeder cattle to be marketed in October, the most profitable Strategy was 4, followed by the cash marketing strategy. Very little difference was found in the results of Strategies 5 through 8. All of the strategies involving hedging reduced the variability of returns compared to the cash marketing strategy.

The strategy yielding the highest return for the November contract was Strategy 8, which called for lifting the hedge the day after the 25th percentile value was reached. This strategy had one of the higher standard deviations of all strategies involving hedging but was less variable than the cash strategy.

Strategies 5 through 10 called for lifting the hedge when the basis reached a particular value. If this criterion was not met, the hedge was held until the third Wednesday of the delivery month. Failure to meet the criterion occurred most often with Strategies 5 and 10, when the hedge was lifted when the basis reached zero or negative values in the delivery month. There were 26 times out of a possible 70 when the criterion was not met, with 13 of these occurring in the March and April contracts.

Results for Strategy 8 indicated the basis failed to reach the 25th percentile value 13 times out of a possible 70. These occurrances were widely dispersed among the contracts.

The previous year's average basis for each contract month was used as the criterion in Strategy 7. The hedge was held to maturity seven times, in six different contracts and in five different years.

The 10-year average basis value for each contract month was used in Strategies 6 and 9 and resulted in the lowest number of contracts being held to maturity. Only two contracts out of 70 failed to meet the criterion.

Summary of Hedging Strategies

In general, cash marketing was more profitable than hedging for the spring contracts and hedging was superior for the fall contracts. All hedging strategies tested placed the hedge for the fall contracts during the spring when prices are at a seasonal high. The increased returns from hedging for feeder cattle marketed in the fall were consistent with the results of previous studies of the West Fargo cash price and with the results of the basis analysis in this study. These studies have indicated seasonally higher prices for feeder cattle in the spring and lower prices in the fall (6). Therefore, hedging of fall sales is usually a rational decision. This decision is further supported by the basis analysis which determined that the average basis was favorable for lifting a short hedge during the fall months.

Strategy 8, which called for lifting the hedge when the 25th percentile value of the basis was reached, yielded favorable results for several contracts. However, the difficulty of determining this value makes it impractical for widespread use by livestock producers.

A strategy that increased returns for several contract months and also would be very simple to use was Strategy 5, where the hedge was lifted the day following the first time the delivery month basis was zero or negative. Strategies 6 and 7, involving the average nearby period basis, also increased returns for several contracts. However, determining average basis values requires considerable effort.

Results indicated that holding the hedge until the final week of trading of a contract is not advisable. Strategy 2 resulted in one of the lowest net sales prices for all contract months. However, it did reduce the variability of returns in most cases. This was consistent with a study by Dole and St. Clair (1). They found that returns were increased if the hedge was lifted prior to the termination of trading of a contract, although this improvement came at the expense of increased variability.

Early Marketing Strategies

Strategies 9 and 10 were analyzed separately because of the difficulty in comparing results from these two strategies with the other eight strategies. These two assumed the cattle were marketed the day the hedge was lifted, rather than the third Wednesday of the delivery month.

Strategy 9 called for lifting the hedge and marketing the livestock the day following the first time during the nearby period that the historic average nearby period basis was reached. Most of the hedges were lifted in the nondelivery month, often within the first two weeks. A problem with the strategy is that the cattle may not be ready for marketing that soon.

Strategy 9 was almost the same as Strategy 6, except for the time at which the livestock were marketed. The average return for all contracts was nearly identical with Strategy 6 except differences by month were found. Strategy 9, which marketed the cash livestock earlier, resulted in greater returns for the September, October, November, and March contracts, while Strategy 6 resulted in higher returns for the April, May, and August contracts.

The standard deviation of returns was greater for all contracts combined for Strategy 9 than for Strategy 6. Strategy 9 showed less variability during all other contract months.

Strategy 10 was about the same as Strategy 5, except the livestock were cash marketed at the time the hedge was lifted. The strategy called for lifting the hedge the day following the first time a zero or negative basis was reached in the delivery month. Therefore, the hedge could be lifted only a maximum of 20 days prior to termination of trading of a contract. The market readiness of cattle should not be affected by this strategy.

The average return of all contracts combined increased $0.19 by marketing the livestock the day the hedge was lifted (Strategy 10) rather than waiting until the third Wednesday of the delivery month (Strategy 5). However, the variability of returns was increased.

A comparison of Strategies 5 and 10 by contract month showed no change in average returns for the August contract. Increased returns were realized in Strategy 10 for the March, May, September, October, and November contracts with smaller returns for the April contract. The standard deviation of returns was greater with Strategy 10 for all contracts except August and November.

The differences resulting from Strategies 9 and 10 were due to the timing of cash marketing. Very little difference was obtained in average returns by marketing earlier. However, variability of returns generally increased.

Analysis of the Potential for Delivery

Delivery of feeder cattle to a CME delivery point, although rarely carried out, is an alternative method of lifting hedged positions. Should the future-cash price relationship be wider than anticipated, it may be more profitable to actually deliver feeder cattle to fulfill the terms of the futures market contract rather than to purchase an offsetting contract.

The nearest par delivery point to West Fargo was Sioux City, Iowa, which is approximately 320 miles from West Fargo. Delivery of feeder steers to the Sioux City terminal market was analyzed as an alternative to selling at the West Fargo terminal market and purchasing an offsetting futures contract.

Most of the costs involved in marketing feeder cattle at West Fargo would also be incurred when marketing at Sioux City. In addition, the cost of transportation, insurance, and shrinkage for the additional 320 miles, plus the cost of grading and documentation including the Livestock Delivery Certificate are the responsibility of the seller (hedger). These costs will always be incurred. Another potential cost to the hedger may be grade deviations from

those specified by the CME as par delivery units. In some cases these lower quality cattle are still deliverable, but at a discount from the hedged price.

Specifications of the feeder cattle contract in 1972 and 1973 were 42,000 pounds of feeder steers, with an average weight of 650 pounds. Beginning with the 1974 contracts, and continuing through the 1981 contracts, the specifications permitted the average weight to be between 550-650 pounds. From 1972 through the August contract of 1979, the specifications called for not less than 80 percent of the animals to be USDA Choice or better grade, with not more than 20 percent USDA Good grade. Since the September 1979 contract, specifications called for not less than 80 percent of the animals to be USDA medium frame, No. 1 muscle thickness grade, and not more than 20 percent USDA medium frame, No. 2 muscle thickness grade.

Prior to September 1979, delivery units which contained not more than 10 USDA Good grade steers beyond the 20 percent allowance for Good grade animals were deliverable at a $4.00 per hundredweight discount. Since September 1979, delivery units containing not more than 10 USDA medium frame, No. 2 muscle thickness animals beyond the 20 percent allowed were deliverable at a $4.00 per hundredweight discount. This indirect cost must be considered when deciding whether to deliver to a CME delivery point or purchase an offsetting contract.

Comparison of net returns was used to analyze the potential profitability of delivery. The net sales price received if the cattle were delivered at par minus the additional costs involved was compared with the net sales price realized had the cattle been marketed at West Fargo and an offsetting contract purchased.

The costs of trucking, insurance, and grading were obtained from a study by Lindseth (3) and updated to reflect the costs for 1980 and 1981. These additional costs were calculated on a per hundredweight basis from the values in Table 3.

TABLE 3. COSTS OF DELIVERING FEEDER CATTLE TO THE CME PAR DELIVERY POINT AT SIOUX CITY, 1972-1981

Year	Trucking Rates	Insurance Rates		Grading Fees
		West Fargo	Sioux City	
	dollars per loaded mile	dollars per head		dollars per hundredweight
1972	0.70	0.40	0.63	0.04
1973	0.80	0.40	0.63	0.04
1974	0.90	0.40	0.63	0.04
1975	1.00	0.40	0.63	0.05
1976	1.10	0.40	0.63	0.05
1977	1.15	0.40	0.63	0.05
1978	1.20	0.50	0.81	0.05
1979	1.75	0.50	0.97	0.06
1980	1.75	0.50	0.97	0.06
1981	1.80	0.50	0.97	0.06

A major cost in marketing livestock is shrinkage. Shrinkage is the loss in body weight that occurs during the marketing process. The cost assigned to shrink is a percentage of the value of the product, so it varies with the market price of the livestock.

The percentage of shrink in any lot of cattle is highly variable. Shrinkage is caused by many factors, such as time in transit, distance hauled, degree of fill, weather conditions, and weight of the cattle. Shrinkage increases as time in transit and distance of haul increase, but at a decreasing rate. Information from McCoy (4:419-425) was used to estimate the percentage of shrink. It was assumed that the average shrink in delivery from southeastern North Dakota to West Fargo would be 3 percent. Six percent was assumed to be the average shrink in delivering from southeastern North Dakota to Sioux City. The value of the additional 3 percent shrink at Sioux City was calculated by multiplying the shrink by the selling price of the futures contract.

Strategy 2 was used to analyze the potential profitability of delivery because this strategy required holding the futures contract until the feeder cattle were sold. Seven contracts for 10 years were examined. The effect on net sales price for each of the 70 lots is presented in Table 4.

TABLE 4. EFFECT ON NET SALES PRICE OF DELIVERING FEEDER CATTLE TO SIOUX CITY TO FULFILL FUTURES CONTRACT HEDGES, 1972-1981

Year	Contract Month							
	March	April	May	August	September	October	November	Average
1972	-1.07	-1.57	-3.55	-1.61	-1.62	-0.86	-1.60	-1.70
1973	+2.51	+0.04	-1.07	+1.53	-1.89	+2.02	-1.18	+0.28
1974	+0.38	-0.28	-3.27	-0.02	-4.56	-2.15	-0.49	-1.48
1975	-1.90	-0.72	-0.80	-0.22	-1.46	-5.39	-0.94	-1.63
1976	-1.23	+0.94	+0.18	-0.03	-3.10	-1.70	-2.32	-1.04
1977	-0.01	+0.14	-0.44	-4.21	-3.89	-3.18	-2.23	-1.97
1978	+1.58	+1.12	-1.39	-3.41	-1.71	-4.02	-2.03	-1.41
1979	+4.26	-2.28	-2.85	-2.86	-1.89	-5.00	-2.64	-1.89
1980	+1.23	-1.13	-4.36	-3.03	-3.05	-3.12	-4.00	-2.49
1981	-0.23	-2.17	-0.43	+1.03	-0.28	+0.92	+0.89	-0.04
Average	+0.55	-0.59	-1.80	-1.28	-2.35	-2.25	-1.65	-1.34

Had a livestock producer delivered all 70 lots to Sioux City over this 10-year period, the realized net sales price would have been $1.34 per hundredweight less than if all had been marketed at West Fargo and an offsetting contract purchased. However, the potential for delivery should not be ruled out. It would be irrational to deliver on a contract when delivery would result in a loss. However, 15 of the 70 lots did result in a higher net sales price from delivering. The average increase in net sales price for these 15 lots was $1.25 per hundredweight. Of the 15 lots, nine were March and

April contracts. Previous research indicated the basis at West Fargo, historically, was widest during March and April (5).

Another factor that must be considered when determining whether to deliver is the added risk associated with weight and grade discounts. The economic impact of this risk varies with individual lots and involves the judgment of the producer relative to that of the grader. Although USDA grades are standardized and grading is performed by USDA graders, it is judgmental in that grading is done by visual inspection. In addition to grade discounts, any lot containing animals in excess of 50 pounds above or below the average weight of the lot is not deliverable. Although these risks must be considered, they are difficult to measure. The ability of the livestock producer to accurately assess the characteristics of livestock, along with his attitude toward risk, will determine how much additional revenue is needed to justify delivery.

In general, from 1972 through 1981, delivery against a feeder cattle contract, rather than marketing at West Fargo and purchasing an offsetting contract, would have been a less profitable marketing alternative. Only 21 percent of the time was additional revenue possible by delivering, and for the majority of those lots it is unlikely that the additional revenue would have offset the risk involved. However, in March of 1979, an additional $4.26 per hundredweight before weight or grade discounts could have been realized by delivery.

Summary and Conclusions

The hedging strategies developed and tested were a form of rigid hedging in that the hedges were always placed without regard to the price trend. This limited the potential performance of hedging compared to cash marketing strategies. However, the strategies tested utilized basis information to determine the optimum time to lift the hedge.

Results of the different strategies generally supported theory regarding the tradeoff between net sales price and variability. All strategies involving hedging failed to increase the net sales price for the spring contracts; however, many of them reduced the variability of returns. Strategies that yielded a higher net sales price also exhibited greater variability. Strategies that yielded lower net sales prices usually exhibited less variability.

Differences in mean net sales prices and variability of returns among all strategies were not significant at the 5 percent level. However, the analysis did indicate that the historical nearby period basis can be used as a guide to determine the best time to lift a hedge. Small differences were noted among the different hedging strategies. Several hedging strategies increased returns over a cash only strategy for feeder cattle marketed in the fall.

Delivery to a CME par delivery point did not appear to be a profitable alternative for completing the hedge most of the time. In some instances, an increase in net sales price was attainable, but no allowance for additional risk was included.

The differences among contract months should be considered in developing a marketing plan utilizing short hedging. Analysis of selected hedging strategies revealed differences in performance among different months. Therefore, the optimum time to lift a hedge should be determined by the differences in the contract months rather than the strategy that averages best over all months.

The March contract had one of the widest average nearby period basis values at $2.15, along with the widest range in basis observations. The chances of increasing the net sales price by lifting the hedge on a day when a narrow basis existed was limited. None of the hedging strategies tested improved the returns over the cash strategy; however, all hedging strategies decreased the variability of returns. For feeder cattle to be marketed in March, a cash strategy likely will yield the highest return. However, if a producer is averse to price risk and is willing to accept a lower return, the use of hedging strategies that lift the hedge when the nearby period basis reaches the average basis would be best. If feeder cattle are hedged utilizing a March contract, a producer should consider delivery of the livestock as an alternative. For the 10 years that delivery was examined, additional revenue could have been realized by delivery during five of the 10 years. Delivery against a March contract is more likely to increase the sales price than delivery against any other contract.

The average nearby period basis for the April contract was the widest of all contracts at $2.53. Also, it had the second smallest standard deviation, indicating the probability of a wide basis during April was greater than for most other contracts. Feeder cattle marketed in April are likely to receive a higher return from a cash strategy. This strategy returned an average of $1.68 per hundredweight more than the best hedging strategy over the 10-year period. The hedging strategy that yielded the highest return assumed that the hedge was lifted during the best week, which was the third week prior to maturity for the April contract. This strategy, however, resulted in the greatest variability of returns. Therefore, lifting a hedged position during the third week prior to maturity would maximize returns if a producer is not averse to price risk. If the producer is averse to price risk, lifting the hedge based on the historical average nearby period basis would be a better strategy.

The average basis for May narrowed by almost $1.00 from the nondelivery month to the delivery month. When hedging with the May contract, higher returns were more likely if the hedge was held until near maturity. The highest yielding strategy assumed the hedge was lifted the day after the basis reached the 25th percentile value. Since the basis narrows to contract maturity, the 25th percentile is most likely to occur during the last week of trading. The next highest yielding strategy assumed the hedge was lifted during the last week of trading. As with the other spring contracts, cash marketing is likely to produce higher returns. With the May contract, cash marketing also is likely to be less variable.

Given the rigid time of placement used for these strategies, hedging feeder cattle to be marketed in the spring is not likely to improve returns over a cash strategy. More flexibility in timing placement of the hedge might improve hedging results.

The hedging strategies tested all performed better for the fall contracts than for the spring contracts. The nearby period basis at West Fargo was narrow and often negative during the fall months. Therefore, hedging in these contracts is more likely to increase returns over a cash strategy.

For feeder cattle to be marketed in August, a hedging strategy that assumes the hedge is lifted early in the nearby period is most profitable. The highest yielding strategy lifted the hedge the third week of the nondelivery month and resulted in more than $3.00 higher return than when the hedge was held to maturity. The basis increases and becomes more variable in the delivery month for the August contract; therefore, there is little reason to hold a hedge past the nondelivery month.

The historical average nearby basis for the September contract was negative. Larger and less variable negative basis values are more likely to occur in the delivery month than in the month prior to delivery. It was most profitable to hold a September contract hedge into the delivery month and await a favorable basis near the 25th percentile value. Holding a hedge until the third week in September also would reduce the variability.

Results indicated that a feeder cattle producer has much more flexibility when marketing in October. The basis was less variable for the October contract than for all other contracts. The lower variability, combined with very favorable basis values, makes possible increased revenue from lifting the hedge under various criteria. Highest returns were most likely if the hedge is lifted during the last week of the nondelivery month.

The optimum time to lift a November contract hedge was when the basis reached a zero or negative value in the delivery month. This strategy along with lifting the hedge when the 25th percentile basis value was reached gave similar results. The 25th percentile value for the November basis was near zero.

Analysis revealed that hedging feeder cattle to be marketed in the fall is more desirable than hedging spring marketings. The basis was more favorable in the fall, resulting in higher returns without increasing variability. In general, hedging with spring contracts tends to reduce returns; however, it has the advantage of lower variability which may be appealing to some producers.

The hedging strategies examined concentrated on the optimum time to lift the hedge. Since hedges were initiated regardless of price trends, potential gains from remaining unhedged in an uptrending market were ignored. This resulted in these strategies showing no significant improvement in net sales price. Studies in other states have shown that placing hedges at opportune times can add to the net sales price. Feeder cattle producers should investigate both optimal hedge placement and hedge lifting strategies.

CME feeder cattle futures contracts call for 44,000 pounds (42,000 prior to 1982). This amounts to approximately 70 head, depending on weight. Assuming a 95 percent calf crop and 50 percent bull calves, a producer would need Approximately a 150-cow herd to produce enough steers to fulfill a contract. This would limit the number of producers that are large enough to

hedge production. This limitation would not be critical unless delivery is considered, since hedging can be used for heifers with additional adjustment in the basis. However, hedging more than potential production is speculation and not true hedging.

APPENDIX

APPENDIX TABLE 1. FEEDER CATTLE BASIS PROBABILITIES BY CONTRACT MONTH, WEST FARGO, 1972-1981

Contract Month	$.00 or less	$0.50 or less	$1.00 or less	$2.00 or less	$3.00 or less	$4.00 or less	$5.00 or less
	percent						
January	18.3	20.0	20.0	45.0	56.7	73.3	83.3
March	14.7	23.5	31.8	52.4	70.0	82.9	91.2
April	9.0	17.6	24.5	40.4	64.9	80.3	89.4
May	13.9	19.8	30.5	57.8	74.3	88.8	96.8
August	44.3	53.0	66.4	78.5	85.9	89.9	94.0
September	60.7	70.6	76.7	86.5	90.2	95.7	98.2
October	69.6	77.8	82.8	90.5	94.6	97.6	99.4
November	45.5	59.3	67.7	78.4	83.8	89.8	94.6

SOURCE: Petry, Timothy A., Norman E. Toman, and Dwight G. Aakre, Feeder Cattle Basis Patterns in North Dakota, Agricultural Economics Report Number 179, North Dakota Agricultural Experiment Station, December 1983.

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