AN ANALYSIS OF THE FEEDER CATTLE BASIS AT SELECTED KANSAS LOCATIONS

by

RANDALL LEWIS JOHNSON

B. S., KANSAS STATE UNIVERSITY, 1978

A MASTER'S THESIS

submitted in partial fulfillment of the

requirements for the degree

MASTER OF SCIENCE

Department of Economics
Agricultural Economics

KANSAS STATE UNIVERSITY
Manhattan, Kansas

1980

Approved by:

John N. McCoy
Major Professor

Spec. Coll.
LD
2668
.T4
1980
J64
c. 2

TABLE OF CONTENTS

ACKNOWLEDGEMENTS

The author wishes to acknowledge my major professor, Dr. John H. McCoy, whose suggestions, questions, and guidance throughout the preparation of this thesis were most helpful. The excellence of his professional knowledge and experience has been of great benefit to me and I feel honored to be the last graduate student to work with him before his retirement from the University. Special thanks must be given to my fiance', Nancy Musick, graduate student in Computer Science, for her invaluable expertise in computer programming. Recognition must also be extended to Dr. Art Dayton of the Department of Statistics. Dr. Dayton's programming and statistical advice was of fundamental importance in the analysis of the data collected. I would also like to thank Dr. Frank Orazem and Dr. Orlo Sorenson who served on my graduate committee. Last but not least, thanks must be given to Cindy Wiley who typed the rough and final drafts of my thesis.

LIST OF TABLES

CHAPTER I

INTRODUCTION

The use of the futures market to reduce price variability through the hedging process can be an important part of a producer's management program. However, before an effective hedging strategy can be developed, the concept of the "basis" must be understood. The basis is important in the hedging process because the net results of a hedge rest upon how close the actual basis at close-out of the hedge, is to the predicted basis. Being able to estimate the relevant basis will help to decide if hedging is the right strategy at a particular point in time.

Expectations of supply and demand play a large role in the determination of futures prices. The actual supply and demand situation dictates the cash price. The difference between the actual situation and the expectations influences the basis. Futhermore, the basis varies for different marketing locations. Consequently, economic factors affecting the basis would be of interest to producers who utilize the futures market.

The basis for livestock is of a unique nature as compared to the basis for grains. The primary reason is that livestock change form over time and supplies cannot be held for long periods of time. A producer can hold livestock to heavier weights in search for a better price but eventually they will have to be sold. Without the option to store livestock, the primary fundamental demand for livestock is what exists at the present time.

Purpose of futures trading

The principal justification for establishing a futures contract is for hedging purposes. A large volume of trading is vital in order to offer the

hedger greater opportunity to buy and sell contracts at any time without unduly influencing market prices while placing or lifting the hedge. A large proportion of the volume on a futures contract is provided by speculators. Individuals have questioned whether speculative activity is good for a market, but is necessary if a producer wants to effectively hedge cattle. The speculator's presence gives the market both liquidity and continuity.

For some time after establishment of the feeder cattle futures contract, the volume necessary to insure a competitive market was slow to evolve. However, trading has gained momentum through the years to the point where the feeder cattle futures contract now appears to be a viable market.

The structure of agricultural production units changed rapidly during the period from 1950 to 1975 and appears likely to change at an even faster rate in the future.[1] Production by primary producers is becoming more specialized, concentrated, and commercialized. In particular, farm businesses engaged in livestock production are buying a higher proportion of their inputs. Borrowed capital is needed to purchase the larger proportions of variable cost to total cost that is required in livestock production. Producers are operating on increasingly thin cash flow margins so a small change in the price of the output can greatly affect cash positions, and net profits. Because of the changing equity positions, primary producers are searching for ways to absorb price variability and to produce at known profitable levels.

The risk of producer operations escalated during the seventies due to highly variable livestock prices. Futures markets are management tools that primary producers can utilize to reduce the risk of price varibility. Effective use of futures markets can help to stabilize farm income and protect against adverse price changes. The futures market offers a price for producer's

---

[1] Thomas A. Hieronymus, Economics of Futures Trading for Commerical and Personal Profit, 2nd ed. (New York: Commodity Research Bureau, Inc., 1977), p.202.

livestock. Within limits, which will be developed later in this study, a producer can obtain that price by hedging. Assurance of a price, however, does not necessarily guarantee a profit.

Profits and losses from futures transactions tend to be the main criteria that are used in evaluation of the success or failure of the futures market.[2] That criteria alone is inappropriate. The use of futures should be judged on how close the net price objective is reached. The net price received is the cash price and any gain or loss on the futures transactions. Thus, the net price objective needs to be accurately established before hedging transactions are carried out. Usually, the profit-loss outcome of hedging strategies depends on the individual's knowledge and skill in the futures market.

The feeder cattle contract

Futures trading for feeder cattle on the Chicago Mercantile Exchange was established November 30, 1971. A par delivery contract[3] consists of 42,000 pounds (about 70 head) of feeder steers averaging between 550 and 650 pounds. The basic unit is choice or better quality grades as defined by the United States Department of Agriculture (USDA). However, provision is made for minor deviations from par weight and quality specifications at stated discounts. Due to change in USDA feeder cattle grade standards in 1979, the old terminology of prime, choice, good, etc., was replaced by a dual reference system indicating frame size and thickness of muscle. The new standards place feeder cattle into large, medium, or small frame size and muscle thickness categories of number one, two, or three. The old choice grade for feeder cattle is comparable to number one muscle thickness with large or medium frame size. The new grade specifications were incorporated into feeder cattle futures contracts

---

[2] ibid., p.204

[3] Provisions are being made to change feeder cattle contract specifications. Brochures containing details of specifications and rules for trading in feeder cattle futures can be obtained through the Chicago Mercantile Exchange.

in September, 1979.

Delivery months for feeder steers are January, March, April, May, August, September, October, and November. Trading began in July 1977 for the January contract month which made delivery in the winter months possible. Termination of trading during a contract month occurs on the twentieth calendar day or if the twentieth is a non-business day, the first business day immediately preceding the twentieth calendar day of the contract month.

Objectives

The objective of the study was to empirically test the basis at five locations in Kansas for significant sources of variation through the use of a four-way analysis of variance model. The effects that were tested as sources of variation were year, location, contract month (also commonly called "option"), and the delivery versus nondelivery periods of the futures contract. These possible sources of variation were analyzed to see if consistency of variation could be found. The delivery period of a futures contract is the most critical time for hedging. The basis needs some degree of predictability at this point in order for the futures market to perform its function as a hedging mechanism. Hedging reduces price risk if the relevant basis is more predictable than the level of the cash price at the time of delivery. Having an idea of the direction and magnitude of the basis will allow for more effective utilization of the futures market for risk transference.

CHAPTER II

THE BASIS CONCEPT

"Basis" is a familar term in the hedging process. Theories of the basis in the grain trade are well established while principles for the livestock basis are in the process of development. Determinants of a basis for livestock are unique as compared to the grain trade because of the obvious physical attributes of the commodities. Livestock change form over time, and are not storable as in the case of grain. But, the basis is just as important in hedging livestock as it is in hedging grain.

Definition

The "basis" is defined as the amount by which the cash market price is above or below the futures market price. This is understood to mean that whenever the cash price is below the futures price, the basis is negative; when above, the basis is positive. Every market, local markets as well as terminals, has its own particular basis. The futures price for cattle is considered a concensus of what the traders expect the cash price to be in the future, based on expectations about future supply and demand.[4] The current cash price, however, basically is the result of actual supply and demand conditions at a particular time and market.

Determinants of the basis

When applied to livestock futures, the basis is a reflection primarily of 1) transportation and other delivery costs, and 2) of weight, quality, and sex

---

[4] However, some individuals argue that futures prices are a concensus of what the price will not be.

differences of the cattle being hedged as compared to par contract specifications. In other words, the basis is determined by specific qualities of a product at a specific market location at specified delivery dates for cash and futures markets. If any one of these factors differs between the cash and futures market, the basis will be something other than zero.

During the delivery period at par delivery points, the cash price for cattle which meet par specifications and the futures price will tend to come reasonably close together because cattle can be delivered to satisfy a futures contract. If the futures market prices are above the cash market prices by an amount larger than the cost of marketing, then it is profitable to buy feeder cattle in the cash market and deliver them through the futures contract. The same is true if the cash market price is substantially higher than the futures market price. If this is the case, it is gainful to buy futures contracts, accept delivery on the futures contracts, and sell in the cash market. The potential profit from such transactions is known as arbitrage. This concept insures that the two markets will approach each other as the futures contract nears maturity.

The basis will fluctuate during the life of the contract but will tend to diminish over time when the cash market price and the futures market price converge as the contract delivery period approaches. The convergence of cash and futures prices during the delivery period means the futures price tends to reflect actual values in the cash market. However, variation in the basis for any local cash market is contingent upon economic factors such as changes in local supply and demand and expectations of what the futures hold. Leuthold,[5] in an analysis of the basis for live cattle, hypothesizes that the basis for cattle is a function of the expected change in supply. Significant variation in the basis is found to be determined by factors that shift the supply curve.

---

[5] Raymond M. Leuthold, "An Analysis of the Futures-Cash Price Basis for Live Beef Cattle, "North Central Journal of Agricultural Economics, 1(January 1979):47.

From the standpoint of logic, the level of demand may be unique from one market to another. Thus, demand in a given market may contribute to basis variation.

Importance of the basis in hedging

The basis is an important concept that is considered the key to successful hedging. Traditional hedging can be defined as assuming an opposite but equal position in the futures market to an existing or anticipated position in the cash market. To the producer, hedging is a form of forward pricing. If hedging is used to reduce the risk of price variability, usefulness of the market depends on the futures market price and the cash market price maintaining a predictable relationship to one another. The variation in the basis has to be of a lesser magnitude than variation in cash price for the futures market to be considered an effective tool for reducing the risks associated with price fluctuations. This significant feature between cash and futures prices is regarded as a settled principle of the hedging process.

To successfully hedge livestock, producers must select the appropriate contract month to use in the hedge, and estimate the relevant basis accurately. The appropriate month is one that matures nearest to but not prior to the expected sale date in the cash market. Placing a hedge in a contract month that terminates before the livestock are sold exposes the producer to adverse price moves that may occur between the time the hedge is lifted and the day livestock are sold.

Once the contract month is chosen, the hedger must find out what the futures price means in terms of the local cash market price. This is known as localizing the futures price, or in other words, calculating the basis at the local market. There are two general methods of localizing futures prices. One method looks at the difference between actual prices at the local market and the quoted futures price. The second method adjusts the quoted futures price for marketing costs to a delivery point, and for deviations in the commodity from contract specifi-

cations, such as quality, weight, sex, etc..[6] The localized futures price is the best estimate of the price the futures market is offering for livestock at a local cash market. The hedger must localize the futures price in order to make a logical decision whether to hedge or not to hedge.

The decision to hedge insulates one's business activities from fluctuations that may occur in the price level. However, after the hedge is implemented, it is the basis rather than the actual price level which determines the net result of the hedge. If the calculated basis turns out to be the correct basis, the anticipated hedged price will be realized. However, if the actual basis is larger or smaller than the expected basis, net returns from the hedge will be above or below the expected results. In a situation where cash is below futures (i.e., negative basis) and the basis is greater than expected, the realized hedged price will be lower than expected.[7] Likewise, if the basis is smaller than expected, the realized hedged price will be larger. As the contract month approaches, the hedger should monitor his local basis rather than the level of prices.

---

[6] Cattle not fitting par contract specifications may still be hedged as long as the basis is adjusted for these differences.

[7] Cattle that are hedged can actually be delivered and the hedge price realized if the cattle meet contract specifications assumed when the local basis was calculated.

CHAPTER III

METHODOLOGY

The data used in the study were obtained from five locations in Kansas for a period January 1974 through November 1979. Three of the locations, Kansas City, Wichita, and Dodge City, are non-par delivery markets for feeder cattle as designated by the Chicago Mercantile Exchange. USDA cash price quotations were available for these markets. Several price quotations were unavailable from Wichita, especially during the latter months of the study, as feeder cattle receipts have declined at that market to the point where cattle prices are no longer reported.[8] Manhattan and Emporia were the other markets selected because of their proximity to the Flint Hills - an important feeder cattle producing area.

Cash price data were obtained from all locations for feeder steers, 500-600 pounds, and 601-700 pounds. Data from the USDA locations were a weekly average quotation as reported by the USDA on form LPGS214. The USDA data provided price quotations by grade. Feeder cattle categorized as choice grade were selected. Starting in September of 1979 with the new grade specifications, feeder cattle accepted as choice had number one muscle thickness with all frame sizes being represented.

Data from the private auction markets consisted of the sale price in dollars per hundred-weight, number of head, and total weight in each lot sold. Manhattan data were obtained from the auction's weekly market report printed in Grass and

---

[8] Even though Wichita cannot be considered a viable cattle market at present, it is the opinion of the author that historical basis data can be utilized as a guideline for hedging by surrounding markets.

Grain newspaper.[9] This report consisted of a partial listing of prices from the auction's weekly sale on Thursdays. It was the opinion of the auction management that the quoted prices were representative. Emporia data were taken directly from sale receipts at the auction market. A sampling technique was used which consisted of taking every n^{th} price depending on the number of receipts during the month. The Emporia auction conducts sales every Tuesday and Friday. The Friday sale has the largest receipts for the week with some Tuesday sales cancelled during the off season.

The data from Manhattan and Emporia auction markets did not include grade specifications. From a practical standpoint, lack of grade is not considered a major shortcoming. Few of the cattle that are hedged are delivered. A producer is generally most interested in the basis on his backgrounding run of feeder cattle and that was determined.

Price data from Manhattan and Emporia locations consisted of prices from their weekly auction on individual lots of cattle. A weighted weekly average price was needed and calculated through the use of a computer program.

A weekly average closing price for feeder cattle contracts at the Chicago Mercantile Exchange was calculated for each futures option except January for the six years studied. The January contract was omitted from the study because volume was low in the infancy stage of the contract and its beginning was in the middle of the study. Weekly average futures market price was compared to the weekly cash market price of both weight classes at each of the five locations and a weekly basis was calculated for nondelivery as well as delivery months.

For this study, the delivery period was considered to be approximately the first three weeks of a contract month, or until trading was terminated on the twentieth day of the month. The time span designated as the nondelivery period

---

[9] Grass and Grain (Manhattan, Ks), 8 January 1974 - 20 November 1979.

was from the twenty-first calendar day to the first of the following month, which consists of approximately eight business days. For example, the non-delivery period for April contract was from the twenty-first of March to the first of April. Such a short non-delivery period was necessary because the feeder cattle contract months that were used in the study run in consecutive order from March to May and August through November. It is recognized that June, December, and February also are nondelivery periods but they were not included in this analysis because relatively few feeder cattle are sold during those months.

The model

Knowing sources and causes of basis variability is vital in estimating what the cash-futures price difference will be. A least squares analysis of variance was used to test significance of the following independent sources of variation: year, location, contract, and period. Two dependent variables were analyzed: the basis values for 500-600 pound steers and basis values for 601-700 pound steers. The general form of the four-way variance model was

$$Y_{ijklm} = \mu + \alpha_i + \beta_j + \delta_k + \gamma_l + \alpha\beta_{ij} + \alpha\delta_{ik} + \alpha\gamma_{il} + \beta\delta_{jk} + \beta\gamma_{jl} + \delta\gamma_{kl} + \alpha\beta\delta_{ijk} + \alpha\beta\gamma_{ijl} + \beta\delta\gamma_{jkl} + \alpha\delta\gamma_{ikl} + \alpha\beta\delta\gamma_{ijkl} + \epsilon_{ijklm}$$

where

Y_{ijklm} = the m^{th} basis value for the $ijkl^{th}$ "treatment" group

μ = the overall mean

α_i = year effect i = 1 ...6 (1974 ... 1979)

β_j = location effect j = 1 ... 4 (Kansas City, Dodge City, Emporia, Manhattan)

δ_k = contract effect k = 1 ... 7 (March, April, May, August, September, October, November)

γ_l = period effect l = 1,2 (Nondelivery vs. delivery)

$\alpha\beta_{ij}$ ... $\alpha\beta\delta\gamma_{ijkl}$ = two, three, and four-way interaction effects

ϵ_{ijklm} = residual error

The number of observations in each "treatment" group varied from one to four. The Wichita market was not included in the four-way variance model since missing price data could not be adequately estimated and at least one observation in each treatment combination is necessary to estimate all parameters in the model simultaneously. Some additional models were used on subsets of the entire data set to examine in more detail some of the interactions.

A three-way model was used for each year, location, and contract effect so all possible interactions could be examined. Using year as an example, the mathematical model was in the following form.

$$Y_{jklm} / \alpha_i = \mu + \beta_j + \delta_k + \gamma_l + \beta\delta_{jk} + \beta\gamma_{jl} + \delta\gamma_{kl} + \beta\delta\gamma_{jkl} + \varepsilon_{ijklm}$$

where the effects in the model are as defined above and $/ \alpha_i$ indicates that this model was run for each of the six years. Similar estimates were computed for each level of location and contract month. However, Wichita was analyzed for each year and contract effect for the data that was available from 1974 through 1978. When significance was found at the .05 level for each main effect and interactions, a Least Significant Difference (LSD) procedure was used to test significance between the group means.

Based on results and interpretations of the analysis of subset models, it was decided to group the seven contract months into two groups and four locations into two groups. The contract months were grouped based on two criteria: their logical order in the calendar year, that is, spring and fall months, and through relatively consistent significant variation by the main effects in each contract month as depicted in the model that was examined cross-sectionally. Locations were grouped according to the type of market. Two locations are non-par delivery points, while the other two represent auction markets in the Flint Hills that are not delivery points. The general form of the model is the same, but contract and location effects were redefined as follows;

β_j = location effect j = 1,2 {(Kansas City, Dodge City), (Emporia, Manhattan)}

δ_k = contract effect k = 1,2 {(March, April, May),(August, September, October, November)}

Grouping reduces degrees of freedom and thus reduces the size of the model. With a smaller model, three-way and four-way interactions were estimated simultaneously. When a .05 level of significance was found, a LSD procedure was used to separate the means.

CHAPTER IV

RESULTS OF THE ANALYSIS OF VARIANCE

Analysis of variance statistics were computed from the full model with contracts and locations grouped. Statistics for 500-600 pound steers and 601-700 pound steers are given in table 1. Significance level was set at .05 and will be assumed unless indicated otherwise.

The year effect was a highly significant source of variation in the basis for both weight classes. The statistics generated from the models that were estimated cross-sectionally support the conclusion that year is a contributing effect on basis variation (tables 2 and 3). The mean square generated from the 500-600 pound class was considerably larger than the mean square for the 601-700 pound class (table 1). This would tend to indicate that the basis varied more from year to year for lighter weight feeder steers.

Location of the market was also a highly significant source of basis variation. A similar result was indicated in the subset models that were estimated cross-sectionally (tables 2 and 3). At non-par delivery markets, the mean basis value was significantly different than the mean basis value for nondelivery markets for 601-700 pound steers. Results were similar for 500-600 pound steers. However, even though means from both weight classes were significantly different from each other, 500-600 pound feeder steers had a wider range of mean basis values between locations than did 601-700 pound steers (tables 4 and 5).

Contract month was the third main effect that contributed significantly to basis variation for both weight groups. The cross-sectional analysis showed the same results for each year (tables 2 and 3). Basis means over all contract months for 601-700 pound steers were negative (i.e., cash below futures) which

Table 1: Analysis of Variance for the Basis for 500-600 and 601-700 Pound Steers

Source	Degrees of Freedom	500-600 Mean Squares	601-700 Mean Squares
Year	5	324.580 †	52.908 †
Location[1]	1	469.834 †	132.186 †
Contract[2]	1	33.244 †	197.043 †
Period[3]	1	8.422	17.628 †
Year * Location	5	36.457 †	4.279
Year * Contract	5	53.608 †	36.719 †
Year * Period	5	6.243	6.324[4]
Location * Contract	1	.333	.148
Location * Period	1	3.307	1.187
Contract * Period	1	3.486	1.163
Year * Location * Contract	5	1.721	3.789
Year * Location * Period	5	4.650	1.879
Year * Contract * Period	5	1.307	3.708
Location * Contract * Period	1	1.972	.537
Year * Location * Contract * Period	5	3.516	1.877
Residual	683	4.639	3.097

† Significant at .05 level

1 Location designates Kansas City and Dodge City versus Emporia and Manhattan

2 Contract designates March, April, May versus August, September, October, November

3 Period is used to designate delivery versus nondelivery

4 Significant at .07 level

Table 2: Significant Main Effects and Interactions through Cross-Sectional Analysis of Variance for the Basis for 500-600 Pound Steers.[1]

Contract	Source of Variation	Year	Source of Variation	Location	Source of Variation
March	Year	1974	Location	Kansas City	Year
	Location		Contract		Contract
	Period		Contract * Period		Year * Contract
April	Year	1975	Location		Year * Contract * Period
	Location		Contract	Dodge City	Year
	Period		Period		Year * Contract
	Year * Location		Contract * Period		Year * Period
	Year * Period	1976	Location		Contract * Period
May	Year		Contract		Year * Contract * Period
	Location		Contract * Period	Wichita[2]	Year
	Year * Location	1977	Location		Contract
August	Year		Contract		Year * Contract
	Location		Location * Contract	Manhattan	Year
	Year * Location	1978	Location		Contract
September	Year		Contract		Year * Contract
	Location		Period	Emporia	Year
	Period		Location * Contract		Period
	Year * Location	1979	Location		Year * Contract
	Year * Period		Contract		Year * Contract * Period
October	Year		Location * Contract		
	Location		Contract * Period		
	Year * Period				
November	Year				
	Location				
	Year * Period				

[1] Significance was at the .05 level

[2] Data was for years 1974-1978

Table 3: Significant Main Effect and Interactions through Cross-sectional Analysis of Variance for the Basis for 601-700 Pound Steers.[1]

Contract	Source of Variance	Year	Source of Variation	Location	Source of Variation
March	Year	1974	Location	Kansas City	Year
	Year * Period		Contract		Contract
April	Year		Period		Year * Contract
	Year * Period	1975	Location		Year * Contract * Period
May	Year		Contract	Dodge City	Year
	Location		Location * Contract		Contract
	Year * Location		Contract * Period		Period
August	Year	1976	Location		Year * Contract
	Location		Contract	Wichita[2]	Year
September	Year		Location * Contract		Contract
	Location		Contract * Period		Year * Contract
	Period	1977	Location		Year * Contract * Period
	Year * Period		Contract	Manhattan	Year
October	Year		Location * Contract		Contract
	Location	1978	Location		Year * Contract
	Year * Location		Contract	Emporia	Year
November	Year		Period		Period
	Location		Location * Contract		Year * Contract
	Year * Period	1979	Location		Year * Period
			Contract		Year * Contract * Period
			Period		
			Location * Contract		
			Contract * Period		

[1] Significance was set at the .05 level

[2] Data was for years 1974-1978

Table 4: Means and Standard Errors of the Basis for 500-600 Pound Steers for Significant Main Effects.[1]

Year					
1974	1975	1976	1977	1978	1979
.67 ±.20[2]	-1.07 ±.20	-.16 ±.20	.31 ±.20	.87 ±.20	4.21 ±.20

Location		Contract	
KC, DC	EM, MA[3]	Spring	Fall
173 ±.11	-.12 ±.11	.60 ±.12	1.01 ±.10

1 Significance was at the .05 level

2 Standard errors

3 Abbreviations for Kansas City, Dodge City, Emporia, Manhattan respectively

Table 5: Means and Standard Errors of the Basis for 601-700 Pound Steers for Significant Main Effects and Interaction.[1]

		Year						
		1974	1975	1976	1977	1978	1979	All Contracts
Contract	Spring	-1.57 ±.25[2]	-.19 ±.25	-.95 ±.25	-1.69 ±.25	-2.10 ±.25	-3.33 ±.25	-1.65 ±.10
	Fall	.21 ±.21	.58 ±.21	-1.23 ±.22	-.77 ±.21	-1.85 ±.22	-.12 ±.21	-.53 ±.09
	All Years	.68 ±.16	.19 ±.16	-1.09 ±.17	-1.23 ±.16	-2.02 ±.17	-1.73 ±.16	

Location		Period	
KC, DC	EM, MA[3]	Delivery	Nondelivery
-.60 ±.10	-1.58 ±.10	-1.27 ±.08	-.91 ±.12

1 Significance was at the .05 level

2 Standard errors

3 Abbreviations for Kansas City, Dodge City, Emporia, Manhattan respectively

depicts what would be considered a normal cash-futures relationship. However, contract month means for 500-600 pound steers were positive (i.e., cash above futures). Spring contract months have a larger cash-futures difference for 601-700 pound feeder steers while fall contract months have larger cash-futures differences for 500-600 pound feeders (tables 4 and 5).

Period, which denotes delivery and nondelivery, was a main effect that was significant for 601-700 pound feeders. The delivery period had the most negative basis value which was significantly different from the nondelivery basis value (see table 5).

Statistics generated from the cross-sectional analysis for Wichita are given in tables 2 and 3. The main effects year and contract month, and the year * contract interaction contributed significantly to basis variation for both weight classes. However for 601-700 pound feeder steers, the year * contract * period three-way interaction was significant. These results are similar to other locations studied.

Only two-way interactions were found significant in the full model. The year * contract interaction was significant for both weight classes and was the only interaction significant for 601-700 pound feeder steers. (table 1). The mean basis values for this interaction for 601-700 pound feeders are generally negative which again, reflects the normal situation of cash below futures. Exceptions to this were during fall contract months for 1974 and 1975. The situation for 500-600 pound feeders depicted a split between positive and negative basis means (tables 4 and 5). Significance between year * contract interactions was not consistent among years or time of the contract month. Such results yield interpretations that are virtually inconclusive. However one can say that in a discussion about variation caused by years, you must include simultanously which time of the year the contract month is traded.

The year * location interaction was found significant for 500-600 pound feeder steers. Generally, as in the case of the year * contract interaction,

mean basis values were both negative and positive. Taking a closer look at these values in the two-way model that was estimated without grouped locations shows that positive basis values generally were from delivery markets and usually occurred in the latter years of the study.

In order to discuss basis variation for 500-600 pound feeder steers for specific years, location of the market and contract month traded must be mentioned. It may be important to note that while only year * contract interaction was significant at the .05 level for 601-700 pound feeder steers, the year * period interaction was significant at the .07 level. It must be noted that the delivery period must not be discounted as a source of variation during a year. This may be due to the fact that the period main effect was significant for 601-700 pound feeders.

Overall mean basis values and standard errors for all factors for both weight classes are listed in table 6. The mean basis for 500-600 pound feeder steers was positive while 601-700 pound feeder steers had a negative basis. However, 500-600 pound feeders had a smaller absolute basis than 601-700 pound feeders but with a larger standard error.

Table 6: Means and Standard Errors[1] of the Basis For Both Weight Classes Over All Factors

500-600 pound steers	.83 ±2.16
601-700 pound steers	-1.06 ±1.76

[1] Standard errors follow least square mean

CHAPTER V

CONCLUSIONS AND SUMMARY

The basis for cattle is not so much a market-determined factor but a residual between future expectations and actual situations. Even due to this fact, utilizing the futures market for hedging may be effective as long as basis variation is less than cash and futures price variation and the basis is relatively predictable during the closeout of the hedge.

A high degree of inconsistency in the basis was found for both weight classes over all contracts and locations for the six years studied. The mean basis for all factors for 500-600 pound feeder steers was positive while 601-700 pound feeders had a negative overall mean basis. Non-par delivery markets and fall contract months had a smaller absolute mean basis while nondelivery markets and spring contract months had a larger absolute mean basis for 601-700 pound steers. The same weight class showed 1978 with the largest absolute mean basis but 1979 had the largest absolute mean basis for 500-600 pound steers.

The basis tended to be most variable during times when cattle prices were increasing. This was especially true during 1979 when prices were increasing to new highs. The basis was considered to be "out of line" especially during delivery periods of contract months. Moreover, during 1979, the 500-600 pound weight class experienced a basis that was of a larger magnitude than the basis for 601-700 pound steers. With exception of contract months, significant statistics generated from the 500-600 pound class were larger than for 601-700 pound steers. These results would tend to indicate that lighter weight feeder steers had basis values that varied in larger proportions as compared to heavier feeder steers.

In the full model, main effects along with various interactions contribute

one way or another to variation in the basis. Interpretation of results are dependant on individual situations and factors affecting that situation. Relatively large standard errors were found over all factors. Such results increase the difficulty in interpretation and prediction of the basis. However, a producer who needs the basis to carry out hedging functions should realize some of the factors to be taken into account that may cause a basis to fluctuate.

Still, effective hedging is hindered by variability in the basis. But at this point in time, fluctuation in the basis seems to be a fact that must be accepted. The producer who is marketing several times a year should average out fluctuations. However a producer who markets infrequently may suffer from windfall losses or gain from windfall profits from a hedge due to an erratic basis.

SELECTED BIBLIOGRAPHY

Books:

Draper, Norman, and Harry Smith. Applied Regression Analysis. New York: John Wiley & Sons Inc., 1966.
Applied regression Statistics text.

Hieronymus, Thomas A. Economics of Futures Trading for Commerical and Personal Profit. 2nd ed., 2nd Printing. New York: Commodity Research Bureau, Inc., 1978.
A textbook in commodity futures markets and trading.

Kirk, Roger E. Experimental Design: Procedures for the Behavioral Sciences. Wadsworth Publishing Company, 1968.
A textbook on experimental designs and techniques for behavioral scientists involved in research.

Leuthold, Raymond M., ed. The Behavior of Commodity Futures Markets and Futures Prices. Chicago: Chicago Mercantile Exchange, 1979.
A compilation of research on the behavior of commodity markets and futures prices.

McCoy, John H. Livestock and Meat Marketing, 2nd ed. Westport, CT: AVI Publishers, 1979.
General information text on all marketing facets of the industry.

Price, Robert Virgil. "The Effects of Traditional and Managed Hedging Strategies for Cattle Feeders." MS thesis Kansas State University, 1976.
Examination of traditional and development of managed hedges to aid cattle feeders in their managerial function through the use of simulation models.

Purcell, Wayne. Agricultural Marketing, Systems, Coordination, Cash and Futures Prices. Reston, Virginia: Reston Publishing Company, 1979.
Focuses attention on the total marketing system and provides the analytical base to handle complex marketing problems.

SAS Institute Inc. SAS User's Guide, 1979 Edition. Raleigh, North Carolina: SAS Institute Inc., 1979.
SAS is a computer system for data analysis.

Scheffe', Henry. The Analysis of Variance. New York, New York: John Wiley & Sons Inc., 1959.
Basic theory of the analysis of variance, considering, several different mathematical models.

Snedecor, George W., and William G. Cochran. Statistical Methods. 6th ed., 9th Printing. Ames, Iowa: The Iowa State University Press, 1978.
Text for introductory statistics and statistical techniques for research.

Teweles, Richard J., Harlow, Charles V., and Stone, Herbert L. The Commodity Futures Game - Who Wins? - Who Loses? - Why?, Abridged Ed. New York: McGraw - Hill, Inc., 1977.
General Information text about commodity futures.

Bulletins:

Harvey, Walter R. "Least Squares Analysis of Data with Unequal Subclass Numbers." Agricultural Research Service USDA., ARS-20-8, July 1960.
Procedure and description of least squares analysis.

Ikerd, John E. "The Livestock Futures Series, Numbers 430-435" Oklahoma State University Cooperative Extension Service.
A series of articles on livestock hedging.

Kemp, Kenneth E. "Least Squares Analysis of Variance, a Procedure, a Program, and Examples of their Use. Part one - The Least Squares Procedure." Kansas Agricultural Experiment Station, Kansas State University. (November, 1976).
Includes procedure, description of a least squares program, and examples of its use.

Kimple, Kris G. "The Live Cattle Basis at Selected Locations in Kansas." Kansas Agricultural Experiment Station, Kansas State University, (July 1978).
Examines the basis for sources of variation for live cattle at selected feedlots in Kansas. Includes basis table for two locations.

Journals:

Crow, J. Richard, John B. Riley, and Wayne D. Purcell. "Economic Implications of Non-par Delivery Points of Live Cattle Futures Contract." American Journal of Agricultural Economics. 51: 111-115, February 1972.
Examination of the behavior of the basis at the non-par delivery point at Gymon, Oklahoma.

Ehrich, R.L. "Cash-Futures Price Relationships for Live Beef Cattle." American Journal of Agricultural Economics. 51: 26-40, February 1969.
Presentation of the hypothesis that the closest relationship for the basis is the live cattle futures and the cash feeder cattle market.

Leuthold, Raymond M. "An Analysis of the Futures-Cash Price Basis for Live Beef Cattle." North Central Journal of Agricultural Economics. 1: 47-57, January 1979.
A hypothesis that the basis for live cattle is reflected by the expected change in cash price over time, caused by shifts in supply.

Price, Robert V., Thomas H. Morgan, Arthur D. Dayton, and John H. McCoy. "Basis Variablity of Live Cattle Futures at Selected Kansas Markets." North Central Journal of Agricultural Economics. 1: 133-139, July 1979.
An analysis of the factors that cause the basis to vary. Includes a Mathematical model.

Other:

Chicago Mercantile Exchange Yearbooks, 1970-1979. Chicago: Chicago Mercantile Exchange.

General data on price, volume, open interest, and contract specifications.

AN ANALYSIS OF THE FEEDER CATTLE BASIS AT SELECTED KANSAS LOCATIONS

by

RANDALL LEWIS JOHNSON

B. S., Kansas State University

AN ABSTRACT OF A MASTER'S THESIS

submitted in partial fulfillment of the

requirements for the degree

MASTER OF SCIENCE

Department of Economics
Agricultural Economics

KANSAS STATE UNIVERSITY
Manhattan, Kansas

1980

The use of the futures market to reduce price variability through the hedging process can be an important part of a producer's management program. Since the feeder cattle contract was developed, livestock producers who background feeder cattle have a futures market they can utilize to hedge their feeding operations from adverse price changes. However, before an effective hedging strategy can be developed, the cash-futures difference called "basis" must be understood and estimated correctly. Being able to estimate the basis correctly will help to decide if hedging is the right strategy and whether the net results of the hedge are favorable.

The "basis" is defined as the amount by which the cash market price for a particular market is above or below the futures market price. When cash is below futures, the basis is negative; when above, the basis is positive. When applied to livestock futures, the basis is a reflection, primarily of transportation and other delivery costs, and quality and sex differences of the cattle being hedged as compared to par contract quality specifications. In contrast, the grain basis is commonly accepted to be a payment for carrying charges of a commodity with seasonal production and continuous use. Since livestock are not storable and are continuously produced, the basis is not so much a market determined charge, as is the case for grains, but a calculated difference between cash and futures prices. But, the basis is just as important in hedging livestock as it is in hedging grain.

Weekly average cash price data for 500-600 pound and 601-700 pound feeder steers for years 1974 through 1979 were collected from five locations in Kansas. The cash price data were then compared to a weekly average closing price for seven feeder cattle contract months at the Chicago Mercantile Exchange for the same time period, and a weekly basis was calculated for both weight classes.

The objective was to empirically test the basis for significant sources of variation. A mathematical model using least squares analysis of variance was used to test the following independent sources of variation: year, location,

contract, and period (delivery versus nondelivery) for both weight classes. The model was also estimated cross-sectionally for each year, location, and contract effect. When significance was found at the .05 level for each main effect and interactions, a Least Significant Difference procedure was used to separate the group means.

Year, location, and contract month effects were found to be highly significant sources of variation in the basis for both weight classes. Statistics generated from the models that were estimated cross-sectionally support this conclusion. The period effect was significant only for 601-700 pound feeder steers. The year * contract interaction was significant for both weight classes and was the only interaction significant for 601-700 pound feeder steers. The year * location interaction was significant for 500-600 pound steers only. The mean basis over all factors for 500-600 pound steers was $.83 while 601-700 pound steers had a -$1.06 mean basis value. Feeder steers in the 500-600 pound class had a larger standard error for the mean basis value ($2.16) compared to 601-700 pound feeder steers ($1.76).