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BASIS VARIABILITY AND ITS EFFECTS ON HEDGING EFFICIENCY FOR KENTUCKY FEEDER CATTLE

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ABSTRACT OF THESIS

BASIS VARIABILITY AND ITS EFFECTS ON HEDGING EFFICIENCY FOR KENTUCKY FEEDER CATTLE

Kentucky plays a vital role in the beef supply chain. The cow/calf producers, back-grounding operations, and order buying industry are important parts of Kentucky's agricultural economy. Basis risk is an issue that affects these groups in a negative way. A good estimate of the expected basis must be available to make hedging efficient. Simulations were performed on Kentucky price data to determine the effectiveness of short hedging for Kentucky producers. A model was also used to describe some of the factors that determine basis levels. The research revealed that it is difficult to predict basis within an acceptable range to make short hedging with futures efficient. Even though short hedging reduced variability in net price, it was difficult to lock in a profit. Various options and spread strategies were presented as alternative hedging tools that would protect cattle producers from unexpected price declines.

KEYWORDS: Basis Risk, Price Risk, Feeder Cattle Marketing, Hedging Strategies, Risk Management

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THESIS

Nathaniel Jefferson Routt

The Graduate School

University of Kentucky

2006

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THESIS

A thesis submitted in partial fulfillment of the
requirements for the degree of Master of Science in the
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CHAPTER ONE: INTRODUCTION, BACKGROUND, AND OBJECTIVES

Kentucky plays a vital role in the beef supply chain. The 2005 calf crop was approximately 1.11 million head which ranks Kentucky approximately 11th nationally in the number of calves born (NASS). There are over 40,000 cattle producers in the state (NASS). Kentucky cattle production is characterized by a large number of cow-calf operations and a smaller number of larger size backgrounding operations. Cow-calf producers maintain a cow herd and produce a calf crop once each year. Backgrounding operations purchase calves from cow-calf producers and feed them forage and rations to grow them up to the 600-800 pound range that is suitable for feedlots. Some calf producers retain their calves to be weaned and back grounded to feeder cattle size on farm while other producers sell their calves to backgrounders at weaning. Calf production and feeder cattle backgrounding have proven to be successful businesses for many farmers in Kentucky.

The prices received by farmers for their feeder cattle vary each year due to many supply and demand factors. This variability in price leads to variability in income for each individual. Prices occasionally dip below breakeven levels causing producers to lose money. This variability and risk of loss makes it more difficult to make future production decisions. Since it is inefficient and costly for producers to make large swings in herd size from year to year, producers need an accurate forecast of future prices in order to make efficient production decisions. It is essential that the producer understand the relationship between cash and futures prices to be able to form such a forecast and possibly benefit from using futures hedging strategies.

With a large number of smaller producers in Kentucky the cattle marketing link in the beef supply chain is of large importance. Cattle marketing companies, also known as order buyers or cattle dealers provide cash market liquidity by purchasing cattle from auction markets and private sales with producers. In the case of feeder cattle, order buyers assemble load lots of cattle for sale and shipment to the major cattle feeding areas in the Midwest. These companies and their feedlot customers stay in close contact with each other and feedlots will generally give orders to individuals at the company to buy a certain number of loads of feeder cattle each week or month. This is where the name order buyer originated. Order buying companies make money by charging a commission to the feedlot on loads of cattle they purchase for current delivery. Some buyers keep an inventory of cattle purchased for future delivery and try to profit by forward selling the cattle at profitable levels to feedlots or attempt to lock in profits with feeder cattle futures. Order buyers and dealers must have a good understanding of the relationship between futures and cash markets in order to find profitable trading opportunities.

Basis and its Importance

Cash and futures markets are linked by the basis, or spread between them. Basis is defined as: Cash price minus Futures price. Basis simply reflects specific local supply and demand conditions whereas futures prices reflect overall supply and demand for a commodity. Basis typically changes over the course of a year. This is described as the time dimension of basis. An example of basis changing over time would be an increase in stocker cattle prices in the spring relative to the feeder futures price due to greater demand for stocker cattle by backgrounders. The demand is greater in early spring because that is when pastures start growing enough to support cattle. Buyers compete for

the stocker cattle to take advantage of the new season grass. On the other hand cash prices typically fall relative to feeder futures prices in the fall because that is when the largest supply of calves comes to market. Basis is typically different across markets in different areas of the country. This is known as the space dimension of basis. Basis is different across locations for a variety of reasons. Regional supply and demand conditions such as differences in quality of cattle, proximity of the market to feedlots and back-grounders, the size of the market, and weather events are some factors that make the basis different across locations. The following table shows the average basis levels for selected states around the country. Basis levels tend to follow a seasonal trend over the year within a given market, but the levels across markets differ.

Table 1.1 Four Year Average Basis for 600-700lb Feeder Steers at Selected Markets

Month	Central Ky.	Amarillo, TX	Colorado	West KS	OK City	Montana
Jan	2.97	4.02	5.46	3.97	4.14	4.87
Feb	4.93	6.03	8.07	5.91	7.10	8.47
Mar	7.37	7.83	9.41	8.07	10.24	10.34
Apr	8.36	6.76	10.62	9.80	11.21	12.34
May	6.23	6.18	9.99	7.86	9.34	11.47
Jun	7.09	5.72	7.67	4.89	8.16	10.22
Jul	6.15	4.75	5.96	6.91	8.96	5.42
Aug	3.25	3.37	4.37	5.67	6.82	4.29
Sep	1.95	1.24	2.60	3.85	6.20	3.57
Oct	-0.17	-2.61	0.36	0.13	3.77	1.35
Nov	1.20	1.04	1.47	1.28	4.99	0.34
Dec	2.63	2.12	3.90	3.21	6.39	2.69
Average	4.33	3.87	5.82	5.13	7.28	6.28

A reliable basis relationship is essential for hedging to be an effective tool in reducing price variability and locking in profitable prices. At the time a hedge is placed, hedgers must be able to predict the basis at the time of the cash sale within an acceptable range (Tonsor, Dhuyvetter, and Mintert). This aspect is extremely important to hedgers because the foundation for hedging is that basis must be easier to predict than outright

price movement. Historical basis estimates such as three and five year averages for a given local market are commonly used to predict future basis levels (Stasko).

The basis formula can be rearranged to read: Cash = Basis + Futures. If producers know the estimated historical basis for the time period they will sell their cattle, they can simply add it to the futures price representing the month the cattle will be sold to arrive at an estimated cash price. This will give producers a clearer picture of whether they can lock in a profit or not as long as they know the breakeven price for their cattle and have an accurate estimate of the expected basis.

While futures and cash prices almost always move in the same direction, some times it will not be a one for one relationship. During times of bullishness in the market the cash price will generally rise faster than the futures price or cash prices will fall slower than the futures price (Stasko). This is known as basis strengthening and can result in a market that discourages holding production to future time periods. During times of bearishness the cash market will generally fall faster than the futures market or cash prices will rise slower than the futures price (Stasko). This is known as basis weakening and can result in a market that encourages producers to hold production into future time periods. Basis strength works in hedgers' favor by giving them a larger gain or smaller loss in the cash market than the corresponding loss or gain in the futures hedge. Alternatively basis weakening hurts hedgers by giving them a larger loss or smaller gain in the cash market than the corresponding gain or loss in the futures hedge. Basis historically narrows at certain times of the year and widens at others due to seasonal supply and demand conditions in the cattle market. Some examples would be basis strength in the spring as demand for stocker cattle stimulates the cash market for feeder

cattle while the futures market generally gets resistance from anticipated higher supplies of live cattle in the summer months. In the late summer and fall basis generally weakens as seasonally larger supplies of feeder cattle weigh on the cash market while futures start to look toward holiday demand later in the fall.

Changes in the basis that are not consistent with the historical patterns are known as basis risk. A hedger exchanges price risk for this basis risk which is seen as smaller than outright movements in price. The cost of hedging comes from a lower average net price in exchange for eliminating price risk. Efficient hedging relies on the idea that basis is more predictable than outright price movement. If basis is not more predictable, then the hedger has not reduced any risk at all (Mintert).

Goals and Objectives

This research has four main goals. The first goal is to examine the basis relationships for six Kentucky markets to evaluate the effectiveness of short hedging. Hedging simulations were performed for 4 different hedge lengths at each market for five feeder cattle weight ranges. The results are presented in mean-variance tables and tested to see if short hedging achieved its purpose of lowering the variability in net prices, thus reducing income variability and making production decisions easier. The next objective was to determine hedge ratios for different weights of feeder cattle. A hedge ratio is the optimal futures to cash position that minimizes the covariance between the cash and futures price changes relative to the variance of futures price changes (Stoll and Whaley). Typically a hedge ratio of one is assumed for most hedging strategies. That is a one to one relationship with respect to futures and cash position size. The reason for determining hedge ratios was to see what ratio of futures position to cash position sufficiently reduces

price risk for weights of feeder cattle that do not meet feeder cattle futures specifications as a large portion of the feeder supply does not meet contract specs. The third objective was the construction of a model to describe some of the variables that affect the basis level for the Kentucky markets under study. The model was designed to give market participants an idea of some of the factors that affect Kentucky feeder cattle basis and the amount of impact. This model may also be used to form a forecast of basis as compared to historical basis levels. Having an accurate estimate of expected basis is essential to producers, order buyers, and broker/dealers attempting to lock in a profit with feeder cattle futures. The last objective is to present potential hedgers with advice on choosing a commodity broker and introduce some alternative hedging strategies. These strategies should be beneficial to producers, order buyers and dealers whether or not basis can be predicted within an acceptable range. The strategies section will focus on a technique using spreads in the live cattle market as a possible cross hedge for feeder cattle. Several different option strategies will also be presented that may be of lower cost than using short hedges.

CHAPTER TWO: LITERATURE REVIEW

Many economists use deferred futures as an estimate of the cash price for future time periods. As long as the basis remains predictable and the futures market is efficient this approach is an excellent way for producers to forecast cash prices (Kastens and Dhuyvetter). As far as actually being an accurate estimate of the cash price for some distant month in the future on any given day, it may not be that great because so many aggregate production decisions are not known and future demand is hard to predict. These issues make it especially difficult to forecast cash livestock prices.

A good forecast is one that incorporates all information available at that time and makes the best estimate of what prices should be in future if those conditions hold. Difficulty arises because there are many unknown factors that will almost certainly affect the accuracy of the forecast. Issues such as unexpected border openings/closings and the level of herd building certainly have made it hard to predict feeder cattle prices in recent years. While deferred futures may not be a good estimate of where cash prices will be at the time of expiry, they do incorporate all known information at a point in time. This makes them as good as any private forecast of prices. Deferred futures prices are commonly used by producers to help make production decisions. Extension professionals also use deferred futures prices in research (Kastens and Dhuyvetter).

Previous studies on Basis Variability in Kentucky

Bobst did a similar study of basis variability in the fed cattle market and slaughter hogs in 1974. His study dealt with location basis variability. Bobst defined location basis variability as a distortion in hedging results that occurs because of a hedger's location at some point distant from a futures contract delivery point (Bobst). While price is hard to

predict at any given market, the difference between markets should be stable over time and be approximately equal to transfer costs when perfect spatial competition exists. Spatial market efficiency holds when markets have perfect information, sufficient liquidity in buyers and sellers, no rigidity in transportation costs and relatively homogenous products (Bobst). In reality these conditions do not hold perfectly, so imperfect spatial competition is expected to exist. Location basis variability may or may not be present however. Each individual market must be examined to see if price variance is truly different across markets. If location basis variability exists, it is an empirical question whether it has a significant effect on hedging results. If cash prices and futures prices are not correlated enough with each other, hedging can be rendered ineffective as a price risk management tool. It can actually reduce the net price received and increase the variability of those prices. The way of testing for significant location basis variability is through testing for equality of variance across markets. Bobst explains that while mean prices can and should vary across markets because of transportation costs the variance of those means should be statistically equal if location basis variability is not a problem. The Bobst study used 11 different hedge lengths and 4 different grade/sex combinations for fed cattle. The markets studied were Kentucky, Georgia, and the Southern Plains area of Texas and Oklahoma. Currently there is no defined fed cattle market in Kentucky or Georgia. The Southern Plains area is still a very important cattle feeding region in the US. Hedging efficiency was impacted by location basis variability for all the markets studied. Although hedging was deemed to increase variability of returns for some classes of cattle, Bobst argues that hedging with futures may still be a viable strategy because it transfers price risk away from the hedger (Bobst).

O’Bryan did a similar study of basis variability and hedging efficiency in 1977 for Kentucky feeder cattle. O’Bryan chose several set hedge lengths based on standard feeder cattle back grounding procedures. He used 16, 20, 24, and 32 week hedging intervals for simulated hedges. He examined location basis variability between the Bluegrass market, Bowling Green market, Louisville market, and the Oklahoma City market. Of these the Louisville market is no longer in operation, but at the time was the largest auction market in Kentucky. In all markets hedging reduced the variability of returns and reduced the average net return for feeder steers that met contract specifications as could be expected. In some weight classes and certain markets hedging actually increased the variability of returns and reduced the average returns. Six to seven hundred pound heifers at the Lexington market and Louisville market showed lower returns and higher variability for 16 and 24 week hedging programs. Four to five hundred pound heifers at the Louisville market had more variable returns and lower average returns also. These results were harmful to hedgers because they were worse than simply taking the cash price at the time of sale. Hedging totally defeated the intended goal of reducing price risk in this case. This indicated that it was not worth doing a short hedge for those classes of cattle sold at the Lexington or Louisville markets. It is expected that hedging will reduce the net price, but it is also expected to reduce the variability of those prices resulting in more stable returns for the hedger. It is possible that these results happened because lightweight heifers are far from feeder futures specifications. It could also have been the case that the number of lightweight heifers was too small to have an efficient market test.

As a second goal of his thesis O’Bryan did observe downward bias or “backwardation” in the feeder cattle futures market similar to what Kolb, Kastens and

Schroeder found. He offered an explanation of low open interest and trading volume in the feeder futures market as a possible cause. The major problem faced by the 32 week interval was a lack of liquidity in the deferred feeder futures contract. Some days would pass without a single trade in the contract 8 months out. Open interest was much less in 1977 than it is today. For example in March of 1977 open interest averaged between 4000 and 5000 contracts. In March of 2006 open interest has averaged between 34,000 and 37,000 contracts. Volume and open interest are much higher now in feeder cattle futures than when O'Bryan did his study and it should be easier for a hedger to place a hedge in one of the deferred months now.

Discussion of Market Efficiency in Livestock Markets

Market efficiency can be defined as a market that does not offer arbitrage opportunities. The issue of market efficiency in cattle futures has been debated in the literature several times in the past (Kolb, Kastens and Schroeder). Studies have been performed to test various trading programs to see if they can repeatedly extract profits from the market. (Kastens and Schroeder) The results show that the trading programs were able to provide consistent positive returns from a set of historical data, but were unable to show profits when applied to out of sample data. This adds credibility that the cattle futures market is efficient. Market efficiency generally increases as open interest increases. Open interest in cattle futures has grown substantially in recent years due to increased involvement of both commodity funds and commercial hedgers. Open interest in both live and feeder cattle futures are more than double what they were when many of the market efficiency tests were performed including the Kastens and Schroeder in 1995. Based on the increased liquidity and information availability it is likely that live cattle

and feeder cattle futures are more efficient than they were five to ten years ago. It is more likely now that there is little to no bias in both feeder and live cattle futures. They provide good opportunity to hedgers of all sizes due to the increased liquidity and efficient pricing.

On the other hand Kolb tested for “normal backwardation” and found significant statistical evidence of its presence in feeder and live cattle futures. The term normal backwardation was developed by John Keynes and refers to the idea that long speculators earn a premium from short hedgers over time in futures markets (Kolb). The futures price would consistently stay below the cash price until the contract moved close to expiration. This caused futures contracts to gain into expiry as they adjusted to converge with the cash price. Under this scenario it is assumed short hedgers’ main goal was risk aversion. They would be willing to sell futures at a discount to the current cash price in order to have price protection. Kolb did not consider the case of differing risk aversion levels for individuals on a risk efficient frontier. Keynes developed this theory in the 1930’s and didn’t have the tools that are available today to test for market efficiency. His theory used the simple assumption that all speculators were long and hedgers were short. Keynes did not address the situation when there are both long hedgers and short hedgers and the case of speculators on both sides of the market. It would seem that as markets have become more diverse and information is cheaper to acquire that backwardation would not hold in any commodity market. However, the question of whether backwardation is normal or not is still unsatisfactorily answered sixty years after Keynes developed his theory according to Kolb.

Some commodities such as Cattle, hogs, and feeders exhibit strong evidence of backwardation (Kolb). Kastens and Schroeder found similar results in their test of market efficiency in live cattle futures. On the other hand, energy futures showed strong statistical evidence against backwardation (Kolb). Other commodities such as grains and metals did not show strong statistical evidence either way (Kolb). It makes sense intuitively that livestock futures would gain into expiry. Since production decisions made each day by producers affect future cash prices it is hard to predict where cash will be two or three months in the future and extremely difficult six or eight months out. Due to this type of uncertainty it may be possible that there is a discount built into livestock futures.

It is feasible that no discount or premium would exist for some commodities such as grain because production decisions cannot be changed after planting season. It also makes sense that energy markets would show the opposite of backwardation. Since fossil-fuel energy is non-renewable and supply is constantly being depleted it is possible that premiums would be built into the market for future delivery. The results that Kolb found seem feasible even though no sweeping conclusion can be made about backwardation. It may be sufficient to say that backwardation is normal in some markets on average and not normal in others on average. In some commodities it may show up in some years and not in others. It is not a definitive answer, but may be of some use to the hedger for background information. In feeder cattle and live cattle futures the short hedgers may be risk adverse enough to be willing sellers at discounted prices. They may be willing to take a lower price in exchange for lower variability in returns. This is

consistent with Keynes theory, but does not address long hedgers such as beef packers and meat wholesalers.

CHAPTER THREE: HISTORY OF THE CME FEEDER CATTLE FUTURES CONTRACT

The CME started trading feeder cattle futures in 1971 which was two years after it introduced live cattle futures. These contracts differed from the contracts on storable commodities that had dominated for many years. These new contracts offered producers of cattle a way to manage risk and also offered speculators a chance to make profits from the cattle industry without having to actually purchase physical cattle. At the time the contract was 42,000 pounds in size. The contract has since changed to 50,000 pounds to more accurately reflect a semi truck load of feeder cattle.

Starting with the September 1986 contract, feeder cattle futures changed from a delivery contract to cash settlement (Elam). The change from delivery to cash settlement was made to eliminate grading disputes on delivered feeder cattle and lower basis risk, according to Kilcollin, Elam, Schroeder and Mintert. Studies performed after the change to cash settlement support the hypothesis of lower basis risk with cash settlement (Paul).

Cash Settlement Index

The calculation of the cash settlement index is important to ensuring an efficient market. USDA market reporters attend auction sales held in a twelve state region encompassing most of the Midwest and provide a description of cattle that sold as well as the price of those cattle. The twelve states are: Colorado, Iowa, Kansas, Missouri, Montana, Nebraska, New Mexico, North Dakota, Oklahoma, South Dakota, Wyoming, and Texas. The cash settlement feeder cattle index is calculated from data obtained from USDA market reports from those twelve states. Only feeder steers that meet the weight range and quality standards of the index are included. Currently the index includes #1

and #2 large and medium frame feeder steers from 650 to 849 pounds excluding any animals denoted as fleshy or value enhanced. The index is a seven business day average of the cash prices weighted by the weight of the cattle.

The index has two pieces and is calculated as follows:

(Total # head *average weight * average price = total dollars for each sale location). Seven days worth of total dollars is added together to get the numerator in calculating the index. The denominator of the index calculation is the total weight. It is calculated as:

(Total head * average weight = total weight for each sale location)

The total weight for each sale location is added together to get the cumulative total weight for that day. After seven days of data are collected and aggregated the formula then can be stated:

(Seven days total dollars/Seven days total weight).

The value that comes from this formula is used to cash settle the feeder cattle futures contract. The oldest day data is deleted out of the index when a new day is included. The published index is always for the previous day because generally it takes a day to get the market reports collected from each sale location. Some nimble traders can figure the index within 20 – 30 points before it is published, which keeps the spot feeder contract fairly priced going into expiry.

Recent Changes to the Cash Settlement Index

The CME staff has approved a measure that will include cattle that are denoted as calves by market reporters in the index starting with the March 2007 contract in order to provide a larger sample of cash feeder prices. The concern is that during certain times of the year the index may not accurately reflect cash feeder prices due to the small number

of feeder cattle included. At times the number of cattle in the index has fallen below 15,000 head. The maximum number of contracts allowed per trader in the spot feeder month for the last ten days of trading is 300 which represents about 20,000 head of feeder cattle. Many of the trading firms at the CME do not want to see the limit lowered, so including more cattle in the index is seen as a way to keep the 300 contract limit viable. Typically larger traders start reducing position size several weeks before the 300 limit takes effect. This results in orderly liquidation of the spot month. Typically less than 3000 contracts are left open at expiry to be cash settled with the feeder cattle index. Firms at the CME want to keep the limits large because it increases market liquidity and adds to exchange and trading firm profitability.

One issue that some market participants have raised is the possibility of expanding the cash index reporting area to more than the current twelve states. Although the CME opinion is that this is not necessary, it certainly would add more liquidity to the index. Adding states such as Kentucky to the feeder cattle index should decrease basis variability and improve hedging efficiency. In the future it may be necessary to include some Eastern and Southeastern states if the measure of adding “calves” fails to add enough feeder cattle to the index. Most feeder cattle produced in the Southeast are shipped to the Midwest and Plains states for finishing and it makes sense intuitively to include them in the calculation of the feeder cattle index.

Trading Environment

In the early days of trading cattle and feeder cattle futures the volume and open interest were small when compared to today. Information was not as widely or quickly available, which kept many people from trading or using these new products for risk

management. In those early days the main players were beef packers, professional floor traders and large feedlot operations. In the 1970's fortunes were made by professional traders with the help of inside information from sources in the beef packing industry (Bromagen). Many of the veteran traders of that era say that it is much harder to trade the market now because of the increased liquidity and transparency in the market (Bromagen). This is anecdotal evidence that the market has become more efficient over time as market information has become available quickly to anyone. Transaction costs have been reduced significantly due to the internet and discount trading firms and due to the wide number of participants in cattle and feeder cattle futures. Commodity hedge funds have dramatically added to the liquidity in many commodity futures markets. Gone are days when floor traders could team up with the large beef packers to force the market in the direction they wanted. Floor traders sometimes try to press the market into sell stops or buy stops in order to get the market moving in their favor when volume is light, but increased liquidity has made this strategy not as profitable as it once was (Brooks).

It has been said that the commodity funds manipulate the market and force it in the direction they want it to go, and that can be true for a while because they have so much capital to apply to their position, but the spot month will conform to the fundamental conditions of the market as expiry nears. Commodity funds sometimes referred to as hedge funds are today's "giant elephants" in the market that move at various times for a variety of reasons. Fund money comes into the market from various sources. Some major sources are pension plans, mutual funds, insurance companies, institutional endowments, a few wealthy individuals and proprietary trading firms. For the most part commodity funds do not seek the smaller individual investor. They do

distort prices and spread relationships at times, but this creates opportunities that professional floor traders exploit to their advantage. The end result is that prices and spreads return to levels that are justifiable given the fundamental conditions in the market. Market efficiency is achieved even with commodity funds as today's largest participants in cattle and feeder cattle futures. Some producers condemn the commodity fund traders as manipulators that hurt the cattle industry, but the funds really help by providing good hedging opportunities and extra liquidity to offset risk.

Electronic Markets and Liquidity Issues

The CME now offers electronically traded contracts on feeder cattle and live cattle (CME). They trade at the same time the pit traded products trade and are identical in all aspects to the pit traded contracts. The CME assigned five market makers to provide liquidity in these markets in January 2006 with the hopes of increasing the use of these markets. Their use has grown, but volume rarely exceeds one thousand contracts per day for both live and feeder contracts together. As long as the pit traded and electronic markets trade at the same times it is unlikely that the electronic markets will achieve much popularity. If the electronic markets traded during times when the pit traded markets were closed, (similar to the grains markets), a modest amount of interest in them could be stimulated.

Live cattle and feeder cattle futures are different from many of the financial and even other agricultural futures markets because they are smaller and the desire to move to an all electronic market has not arisen. In many of the currency, interest rate and stock index futures contracts the major market is the electronic market and in some cases it is the only market. One main advantage to the electronic markets is extremely fast order

execution and fill reporting, many times less than one minute. However, this aspect is more important to the speculator than the hedger in most cases. The floor traders at the CME also value their jobs and may be resistant to more electronic trading in the cattle and feeders. One floor trader described the situation as a small, close knit group of people that like things the way they are (Cawthorne). Of course if trading volume becomes overwhelming it may be necessary to execute more trades on the electronic platform in the future. This may be happening in the grains as volumes and open interest are much higher in those markets. With the current system it can take more than an hour to get filled orders reported to customers in the corn and soybean market when trading is heavy. The problem arises when floor brokers get a steady flow of orders to fill and don't have the time to stop and report fill prices. It is possible that cattle and feeders could get to that point, but the current system still functions well in most market conditions. Only when trading volume is extremely heavy it can take more than an hour to get fills reported.

Liquidity in the feeder cattle market is more of an issue than in the live cattle market. Open interest is almost eight times greater in the live cattle market. This would indicate that commercial interest in feeder cattle futures is not as good as it could be. According to Elam (1986), only a small portion of the US feeder cattle supply is hedged using feeder cattle futures. Elam blamed the lack of use on problems with the physical delivery contract. It has been 20 years since the contract switched to cash settlement and interest in the contract has increased, but still lags behind the live cattle market. It is possible that some feeder cattle are hedged with live cattle contracts, but unlikely that a large number are hedged this way. There could be a variety of reasons commercials are not fully utilizing the feeder cattle futures contract. Feeder cattle production is less

concentrated than live cattle production and as a result it may be less likely that smaller producers will use futures to hedge. Since the definition of feeder cattle includes more than just 650 to 849 pound #1 steers it could be possible that producers may be leery of using feeder cattle futures to hedge animals that do not fit the contract weight or grade specifications. Prospective hedgers may also feel that basis risk is too great for their individual market to make hedging a risk reducing activity. It may be possible to increase producer use of feeder cattle futures and options with education about the benefits of reducing price risk.

CHAPTER FOUR: DATA ANALYSIS AND METHODOLOGY

My hypothesis is that feeder cattle basis is predictable enough to make hedging with feeder futures a profitable and price risk reducing activity when dealing with load lots of feeder steers and heifers. A load lot is a group of cattle that is large enough to fill a semi truck trailer. This is the way cattle are transported from Kentucky to the major feeding areas in the Midwest. Selling cattle in load lots eliminates the need for order buyers to piece loads together. This can lead to more efficient bids because a load lot is immediately ready for shipment. In the case of small groups of cattle the buyer can't immediately ship them so bids may reflect a discount relative to the market for load lots. Also if a buyer needs to finish a load lot the bid may reflect a premium relative to the market for load lots. The end result is that the basis for smaller groups should be more volatile than the basis for load lots.

The method of analysis would be to calculate basis for regional Kentucky markets using individual groups of cattle sold at those locations. Then, short hedging simulations would be performed to see if price risk was reduced for producers selling in those various regional markets. This should help answer the question "Is hedging with feeder cattle futures efficient for the Kentucky producer?" with a certain degree of accuracy.

One consideration is the risk preference of an individual producer. A risk adverse individual may be willing to stay 100% hedged and attempt to adhere to the hedge ratio that represents the grade and weight cattle they will sell. Many others may opt to hedge only a portion of their cattle, leaving the rest open to benefit if prices rise. Others may evaluate the situation with each set of cattle they buy or raise and make a decision whether to hedge or not based on their own expectations or an expert forecast.

Data Description and Hedging Simulations

The data used in my model was collected from weekly Kentucky Livestock and Grain Market Reports from October 2000 to January 2005. The data are prices of feeder steers and heifers that sold in individual lots of at least 20 head. The markets included were Bluegrass, Bluegrass CPH, Ky-Tenn market in Guthrie, KY, Producers Owenton, Producers Paris and Paris CPH. The Bluegrass CPH and Paris CPH were special sales at those locations of weaned calves and feeder cattle that that had been through a quality enhancing program. Of special note is that the Ky.-Tenn. market in Guthrie, KY is an in-weigh market. The cattle are weighed as they arrive at the sale rather than when they enter the sale ring. Between the time the cattle arrive and are sold they will lose weight and knowing this, buyers will discount the price. This is a reason why the average price is lower at the Ky. Tenn. market.

The Oklahoma City market data came from the Livestock Marketing Information Center. It is compared to the Kentucky markets for illustrative purposes. The Oklahoma City market was chosen over other Midwestern markets because of the large volume of cattle that are sold there each week and the perception that it is an efficient market. The data for all futures prices originally came from the CME, but were obtained from the Livestock Marketing Information Center

The following tables show the results of hedging simulations for each Kentucky market and the Oklahoma City market. These simulations were performed by assuming producers hedged their cattle 4, 5, 6, or 8 months before the date of the cash sale. The choice of these time periods is consistent with various back-grounding lengths (O'Bryan). The short hedge was placed at the closing price of the day 4, 5, 6 or 8 months prior to the

cash sale. These hedges were then lifted on the date of the cash sale and the hedge revenue added to the cash price. The results for the no hedge strategy are presented for comparison purposes to show that hedging reduced price variability on average for the more liquid markets.

The Bartlett test was used to test for equality of variance across markets within each of the four strategies and the no hedge or cash price strategy. The Bartlett test is based on an approximation of the F-Distribution (Dixon and Massey).

Table 4.1 Cash and Short Hedging Results for 650-849 Pound Feeder Steers That Meet CME Contract Specifications

Market	**Bluegrass**	**BG CPH**	**Ky.-Tenn**	**Owenton**	**Paris**	**Paris CPH**	**OKC**	**F - Stat**
Cash Price								
Mean	89.82	92.69	88.66	87.44	90.71	100.58	94.73	
Variance	146.42	117.93	146.03	136.54	157.49	69.46	145.81	0.92
number of observations	1310	53	202	90	183	18	432	0.18*
Hedging revenue Statistics								
8 month								
Mean	84.69	85.69	82.87	85.03	86.37	88.31	90.32	
Variance	34.26	41.02	37.16	33.48	31.58	27.44	33.41	0.45 .35*
6 month								
Mean	85.23	87.73	83.8	85.2	86.64	95.26	90.82	
Variance	46.26	85.16	47.04	43.25	42.71	125.59	47.39	3.99 .23*
5 month								
Mean	85.81	88.92	84.4	85.74	87.09	98.6	91.28	
Variance	57.71	102.46	56.31	55.89	54.68	142.76	59.22	3.29 .13*
4 month								
Mean	86.41	90.43	84.99	86.01	87.59	98.64	91.81	
Variance	67.4	103.38	68.27	66.93	69.96	149.88	73.07	2.06 .28*

The F- critical value is 2.09 at the $\alpha = .05$ level

* These are the F – Stat values when Bluegrass CPH and Paris CPH are ommitted

The previous table represents prices for feeder steers that meet the contract specifications for the CME feeder cattle futures contract. There is no significant

difference in variances across markets for the no hedge strategy. This is consistent with the theory introduced by Bobst that variances should be equal across markets. It gives some credibility to the smaller Kentucky markets that they are efficient when groups of 20 head or more go through the sale ring. The variances for the 5 and 6 month hedging simulations do show statistical differences in variance of price across the seven markets. Without testing each variance individually against the other variances it is not possible to tell which variances are different and which are equal except that the high and low variance of the group are unequal (O'Bryan). The Paris CPH results show lower average price and higher variance for the 4, 5, and 6 month hedging simulations as compared to the no hedge strategy. These results indicate that hedging was ineffective at the Paris CPH market for those three hedge lengths. Both the Bluegrass and Paris CPH sales suffered from a small number of observations. It is likely that this had an impact on the results. The Bartlett test was run omitting the Bluegrass CPH and Paris CPH markets and the F-stat has a star beside it under the original test statistics. The results showed no significant difference in variance at the 95% confidence level for any of the hedging simulations across markets. These results favor the use of feeder cattle futures as a price risk management tool for Kentucky producers in the more liquid markets for feeder steers that weigh between 650 and 850 pounds.

Table 4.2 Cash and Short Hedging Results for 400-500lb. Stocker Steers

Market	Bluegrass	BG CPH	Ky.-Tenn	OKC	F - Stat
Cash Price					
Mean	108.28	111.49	101.97	113.48	
Variance	152.29	293.84	160.96	163.92	0.75
					0.18*
Number of observations	38	12	287	216	
Hedging revenue statistics					
8 month					
Mean	100.39	104.79	96.22	109.07	
Variance	91.08	167.72	95.49	70.38	1.79
					1.42*
6 month					
Mean	101.5	105.8	96.57	109.57	
Variance	103.71	280.47	112.69	96.01	3.07
					0.57*
5 month					
Mean	103.58	106.19	97.18	110.03	
Variance	134.97	320.1	125.79	110.89	2.84
					0.45*
4 month					
Mean	105.07	106.87	97.85	110.56	
Variance	137.39	325.64	133.76	122.84	2.57
					0.31*

The F- critical value is 2.09 at the $\alpha = .05$ level
* These are the F – Stat values when Bluegrass CPH and Paris CPH are ommitted

These results are similar to those for contract spec steers, but hedging was ineffective for the 4, 5, and 6 month hedge simulations at the Bluegrass CPH market. It is reasonable to believe that basis variability would be higher for cattle that do not meet the contract specifications and that is shown in this table. However, when Owenton and both CPH markets are left out, no significant difference in variance is present as indicated by the F-stats with stars beside them. The number of observations is small for Owenton and

both CPH markets which may exaggerate the variance. This is why they were left out of the table

Table 4.3 Cash and Short Hedging Results for 801lbs. and Greater Feeder Steers

Market	**Bluegrass**	**Owenton**	**Paris**	**OKC**	**F - Stat**
Cash Price					
Mean	85.58	84.97	84.88	87.97	0.98
Variance	149.2	114.98	122.58	130.96	
number of observations	1231	37	98	216	
Hedging revenue statistics					
8 month					
Mean	80.95	80.78	82.51	83.05	9.76
Variance	40.28	25.4	20.4	21.05	
6 month					
Mean	81.55	82.92	82.3	83.56	4.53
Variance	49.06	63.02	29.58	34.07	
5 month					
Mean	82.02	83.97	82.6	84.02	2.84
Variance	60.35	82.74	44.13	45.31	
4 month					
Mean	82.42	84.58	82.67	84.55	2.43
Variance	75.41	81.47	52.05	57.82	

The F- critical value is 2.09 at the $\alpha = .05$ level

The results for 800 pounds and greater feeder steers show differences in variance for all of the hedge simulations across markets. Even when Bluegrass CPH and Ky-Tenn. are excluded the hypothesis that the variances are equal is rejected. The Bluegrass CPH market had variances that were higher than the no hedge strategy for the 4, 5, and 6 month hedge strategies. However, it is hard to make any concrete statement about the true effectiveness of hedging 800 pounds and greater feeder cattle for the Bluegrass CPH market because of the small sample size.

Table 4.4 Cash and Short Hedging Results for 400-500lb. Stocker Heifers

Market	Bluegrass	BG CPH	Ky.-Tenn	Owenton	OKC	F - Stat
Cash Price						
Mean	95.12	101.3	92.85	93.4	100.6	0.85
Variance	177.44	234.2	156.8	107.87	153.8	
number of observations	63	16	451	11	216	
Hedging revenue statistics						
8 month						
Mean	88.94	92.92	88.27	90.45	81.56	21.84
Variance	87.49	133.31	83.2	144.87	20.69	
6 month						
Mean	89.61	95.34	88.63	90.64	96.7	2.96
Variance	118.71	213.33	96.45	149.09	88.73	
5 month						
Mean	91.19	96.46	89.33	91.33	97.16	2.74
Variance	156.61	236.66	111.03	166.28	102.5	
4 month						
Mean	91.43	98.24	89.7	91.88	97.68	2.26
Variance	163.21	236.92	116.58	190.94	114	

The F- critical value is 2.09 at the $\alpha = .05$ level

The results for lightweight heifers show significant difference in variance across all markets for the four hedging simulations. It is likely that the further the cattle are from contract specifications the greater the possibility that basis variability will be an issue. For the Bluegrass CPH market the price variance was higher for the 4 and 5 month simulations. Price variance was higher for all four hedge simulations for the Owenton market.

Table 4.5 Cash and Short Hedging Results for 501-600lb. Stocker Heifers

Market	Bluegrass	BG CPH	Ky.-Tenn	Owenton	Paris	OKC	F - Stat
Cash Price							
Mean	89.78	98.87	88.05	93.96	86.67	94.5	1.47
Variance	114.78	142.34	138.25	116.4	72.21	141.4	
number of observations	195	34	384	20	39	216	
Hedging revenue statistics							
8 month							
Mean	84.47	90.4	82.41	86.1	84.54	90.09	3.07
Variance	59.61	78.86	62.99	41.54	87.55	42.54	
6 month							
Mean	85.91	92.95	83.18	87.31	85.39	90.59	2.39
Variance	74.97	122.04	73.12	73.13	77.67	60.98	
5 month							
Mean	87.07	93.76	83.87	88.75	85.65	91.05	2.41
Variance	88.37	141.61	80.16	99.69	67.62	71.41	
4 month							
Mean	87.51	94.97	84.17	90.54	86.49	91.58	2.28
Variance	93.68	148.65	81.71	89.54	65.16	81.88	

The F- critical value is 2.09 at the $\alpha = .05$ level

The F-stats show difference in variance across markets for all four hedge strategies for 500-600 pound heifers. The Bluegrass CPH market showed more variable prices for the 4 month simulation. Price variance was higher for the six and eight month simulations at the Owenton market than for the no hedge strategy. Hedging was not effective for those two simulations.

Table 4.6 Cash and Short Hedging Results for 601-700lb. Feeder Heifers

Market	Bluegrass	Bluegrass CPH	Ky.-Tenn	Owenton	Paris	OKC	F - Stat
Cash Price							
Mean	86.11	88.71	84.25	88.86	82.59	90.02	0.458
Variance	109.23	120.53	120.11	106.8	101.9	131.3	
number of observations	322	23	229	20	39	216	
Hedging revenue statistics							
8 month							
Mean	81.6	82.13	78.11	85.04	81.99	85.61	2.52
Variance	38.21	44.54	35.97	40	43.06	24.62	
6 month							
Mean	82.45	83.91	78.82	86.81	82.49	86.11	3.23
Variance	50.59	103	46.23	61.28	45.37	38.36	
5 month							
Mean	83.09	85.23	79.64	87.99	82.36	86.57	2.81
Variance	56.08	130.01	56.74	62.19	60.83	49.13	
4 month							
Mean	83.69	86.21	80.08	88.83	82.73	87.1	1.76
Variance	66.31	126.38	65.59	71.76	52.03	60.8	

The F- critical value is 2.09 at the $\alpha = .05$ level

The results for 600-700 pound heifers are similar to those for 500-600 pound heifers. Significant difference in variance exists for all but the 4 month hedging simulation. Price variability was greater than cash price variability for the 4 and 5 month simulations at the Bluegrass CPH market.

Table 4.7 Cash and Short Hedging Results for 701-800lb. Feeder Heifers

Market	Bluegrass	Ky.-Tenn	Owenton	Paris	OKC	F - Stat
Cash Price						
Mean	85.08	83.58	82.51	79.51	85.97	0.99
Variance	137.67	118.92	76.21	84.91	126.58	
number of observations	308	49	23	16	216	
Hedging revenue statistics						
8 month						
Mean	79.97	73.64	78.74	78.17	81.56	0.85
Variance	25.61	29.18	23.08	30.36	20.69	
6 month						
Mean	80.66	74.53	79.95	78.94	82.06	0.87
Variance	35.17	49.62	44.74	26.66	34.51	
5 month						
Mean	81.45	75.68	80.53	79.74	82.53	1.22
Variance	46.8	71.57	49.97	30.33	45.35	
4 month						
Mean	81.71	77.08	81.46	79.54	83.05	0.46
Variance	56.16	76.6	62.81	55.15	57.38	

The F- critical value is 2.09 at the $\alpha = .05$ level

The results for heavier heifers show no significant difference in variance for any of the hedging simulations. The overall variance in prices is less as the feeder heifers get heavier. These are encouraging results that support the effectiveness of hedging for 700-800 pound heifers. The next table is for 800 pounds and greater heifers.

Table 4.8 Cash and Short Hedging Results for 801lbs. and Greater Feeder Heifers

Market	Bluegrass	Ky.-Tenn	OKC	F - Stat
Cash Price				
Mean	80.89	79.31	81.46	
Variance	135.53	154.43	113.6	0.76
number of observations	77	4	185	
Hedging revenue statistics				
8 month				
Mean	77.21	67.78	77.53	
Variance	23.58	6.61	20.74	0.45
6 month				
Mean	77.75	68.38	77.91	
Variance	32.3	7.21	32.19	0.76
5 month				
Mean	78.68	70.37	78.12	
Variance	38.49	4.56	37.7	1.19
4 month				
Mean	79.35	69.94	78.51	
Variance	53.51	0.99	45.6	2.81

The F- critical value is 2.09 at the $\alpha = .05$ level

The results for 800 pounds and greater heifers show significant difference in variance across markets only for the 4 month hedge simulation. Hedging achieved its purpose of reducing price variability at all markets for the four hedge lengths. The small sample size for these heavy heifers suggests the results may not be as valid as those for the lighter weight heifers and steers.

Of important note is that there was no significant difference in variance across markets for the cash price for any class of steers or heifers at the 5% significance level. This adds credibility that the cash markets are efficient. An efficient market does not provide significant arbitrage opportunities across space or time dimensions. In theory the difference in price across markets should be a result of transportation costs between

markets. Also, there are differences in quality of cattle across geographical areas that can cause differences in price to exist between markets.

It would appear that some location basis variability is present for feeder cattle weights that differ from the futures contract specifications. It is difficult to say that spatial inefficiency exists between markets because feeder cattle are not a homogenous commodity. Factors such as breed, weight, gender, health and perceived genetic quality help determine the value of an individual set of cattle (Eldridge). It is possible that these factors are influencing the smaller sample sizes for some of the markets. However, hedging achieved its purpose of reducing price variability for the larger markets in Kentucky. This was the case for all classes of feeder cattle for the Bluegrass market and for most classes at the Owenton and Ky.-Tenn market. The liquid Oklahoma City market results also showed efficient hedging results.

Description of the Model to Predict Kentucky Feeder Cattle Basis

A Generalized Least Squares model was used to describe the Kentucky feeder cattle basis to better explain some of the variables that are thought to affect the spread between futures and cash. Some data in the model not previously described is the data for cattle slaughter which came from the Livestock Marketing Information Center. It is the percentage of heifer slaughter in total cattle slaughter. The demand index data came from Kansas State University. It is a measure of beef demand using 1998 as the base year. It is important to note that there was an increase in beef demand over the study time period. The basis prediction model is presented on the following page.

Ky. Basis = f (corn price, deferred live cattle futures price, ratio of heifer slaughter, head count, marketings, beef demand index, black hided, dholsteins, dsteer, dummy variable for month, dummy variable for weight, dummy variable for market)

The variable for corn was expected to have a negative impact on Kentucky basis. This is because corn is an important input to the cattle feeding sector. As much as 80% of the grain fed to cattle during their lifecycle is corn (Eldridge). Changes in corn prices affect cattle feeders' demand for feeder cattle. As the price of corn increases, it becomes more expensive to feed cattle and as a result feeder cattle prices should fall and thus basis could be expected to weaken.

The variable for deferred live cattle futures named "deflcfut" in the model, is expected to have a positive effect on basis. The value of feeder cattle today is dependent on what cattle feeders expect the fed cattle market to be like when the feeder cattle are ready for slaughter. The choice of the deferred live cattle month assumes cattle will gain three pounds per day in a feedlot (Eldridge). As deferred live cattle futures move higher, it should cause feedlot operators to be more optimistic about the future and bid feeder cattle prices higher. As the supply of feeder cattle diminishes, the cash feeder market should lead feeder futures prices higher and the market will move towards inversion. That is when the cash price is higher than the futures prices and a producer has no incentive to hold cattle to a future time period. The basis should strengthen as a result.

The variable for ratio of heifer slaughter named "ratiohfsl" in the model is expected to have a negative impact on basis. As heifers make up a larger percentage of total slaughter it is expected that producers are either liquidating herds or at least not holding heifers back to expand the herd. This should weaken the basis with an emphasis

on heifer basis in particular. However, it is possible that late in the liquidation phase of the cattle cycle this variable may have a positive effect on basis as there may be a lag between the time when prices for feeder cattle start to firm due to the low supply of cattle and heifer slaughter falls significantly. The data came from the 2000 – 2005 time period, which was late in the liquidation phase of the cattle cycle.

The variable headcount named "headcnt" in the model captures the size of each lot of cattle that was sold. It is assumed that as headcount increases basis should strengthen as a result of buyers placing a premium on load lots of feeder cattle.

The variable marketings is expected to have a negative effect on basis. As the supply of feeder cattle coming to market increases, it should put pressure on the cash price in Kentucky relative to other areas and cause the basis to weaken.

The variable for the beef demand index, named "dmdindex" in the model, is expected to have a positive effect on the basis. As beef demand rises it should add strength to beef prices and work through the marketing chain to strengthen feeder cattle prices. This could strengthen the basis, but it is unclear how much of an effect it will have because it does not have a direct impact on feeder cattle prices. Even though a positive effect on prices is expected, it may be possible that basis levels wouldn't be affected significantly.

The dummy variable for black hided cattle, called "blacks" in the model, is expected to have a positive effect on basis. Black hided cattle have a reputation for grading better and superior performance in the feedlot. There may also be premiums associated with the Certified Angus Beef marketing program (Eldridge). If feedlots desire black hided cattle over other breeds it should cause the basis to be stronger as a result.

The dummy variable for Holsteins is expected to have a negative impact on basis. Holstein dairy cattle sell at a discount to beef cattle because they aren't as efficient in feedlots and don't produce as much beef. Since they are far from the contract specifications for feeder cattle futures the basis is expected to be weaker.

The dummy variable for steers is expected to have a positive effect on basis. Steers are more efficient than heifers in the feedlot and are expected to command a stronger basis as a result.

The dummy variables for month represent each month of the year with November as the base month. Feeder cattle basis is expected to be stronger in the spring months because of strong demand especially for lightweight calves to put on grass. In the fall, basis is expected to be weaker because that is when the majority of calves come to market. The demand for feeder cattle is less because fewer individuals have the means to background cattle through the winter and the cost of doing so is greater also. The months of March, April and May are expected to be positive for basis and the months of September, October and December are expected to be negative for basis.

The dummy variables for market represent the Kentucky markets studied. It is assumed that the larger markets will have a stronger basis due to increased competition from more buyers and cattle. It is also assumed that the CPH sales would generate a stronger basis because those cattle have been through a health preconditioning program that feedlots may view as an added value. The Ky.-Tenn. market is an in-weigh market meaning the cattle are weighed in advance of the sale. Since cattle are expected to lose weight when they are left in pens the actual weight purchased will be less than what is paid for. The cattle receive a discount in price relative to markets that are not in-weigh.

The cattle at the Ky.-Tenn market should also see a significantly weaker basis when compared to non in-weigh markets as a result.

The dummy variables for weights are assumed to have a negative impact on basis. The 800 and up weight class was used as the base. Lighter weight feeder cattle are expected to have a stronger basis simply because the price is higher relative to the futures price representing 650 – 849 pound feeder steers. As feeder cattle get closer to slaughter weight feedlots bid a discount because they are purchasing pounds that someone else has added to the cattle.

Diagnostics

The model was tested for multi-collinearity using a Variance Inflation test in SAS. All of the test statistics were less than ten meaning that multi-collinearity was not severe.

A RESET test was performed in SAS to see if a linear model was appropriate for the data. The model failed the test suggesting that a linear model may not be appropriate for the data. However, it is more likely that some important variable was omitted from the model as other model specifications were not more helpful in explaining the data.

The model was tested for auto-correlation with a Durbin-Watson statistic. Auto-correlation is a problem with time series data when errors from one time period are related to errors in the next time period. The Ordinary Least Squares model showed significant auto-correlation. This problem was corrected with a first order lag variable of the errors. The model is known as a Generalized Least Squares model after correcting for auto-correlation (Wooldridge).

Results from Basis Model

The following table shows the results from the basis prediction model. It is important to note the first column is the variable or parameter name. The second column is the parameter estimate, third column is the standard error of the estimate, and the fourth column denotes whether the parameter was significant at the 95% level. The total R^2 for the regression was 79%. This meant that 79% of the variation in basis was described by the independent variables.

Table 4.9 Regression Results: Factors Affecting Basis for Kentucky Markets

Variable name	parameter	std. error	Significant at 5% level
Intercept	-46.19	2.42	Yes
Corn	1.63	0.18	Yes
Deflcfut	0.22	0.014	Yes
ratiohfsl	0.32	0.049	Yes
headcnt	0.00046	0.0019	No
marketings	-0.086	0.012	Yes
dmdindex	0.0202	0.015	No
blacks	0.375	0.151	Yes
holsteins	-17.51	0.23	Yes
steer	8.0047	0.132	Yes
Jan	3.49	0.279	Yes
Feb	-1.12	0.29	Yes
Mar	6.37	0.269	Yes
Apr	7.27	0.282	Yes
May	5.95	0.307	Yes
June	1.26	0.285	Yes
July	1.63	0.31	Yes
Aug	1.756	0.304	Yes
Sep	-0.138	0.296	No
Oct	-1.494	0.265	Yes
Dec	-0.512	0.276	No
Owenton	-0.091	0.289	No
CPH	3.79	0.32	Yes
KYTenn	-3.08	0.163	Yes
Paris	0.091	0.254	No
Twosthrees	26.44	0.383	Yes
Fours	18.24	0.244	Yes
Fives	12.88	0.205	Yes
Sixes	8.22	0.19	Yes
Sevens	4.43	0.173	Yes

The variable for corn surprisingly showed a positive effect on Kentucky basis. This variable was significant at the 99% level. One explanation for this could be that as corn prices go up, feeder cattle futures go down more than the cash price in Kentucky. Under this scenario basis would strengthen for Kentucky feeder cattle. It was only a small effect however as a 1.00 per bushel increase in the price of corn resulted in a $1.63 per cwt. increase in the Kentucky basis on average.

The variable for deferred live cattle futures showed a positive effect on basis at the 99% level. This was an expected result, but the impact was small. For a $1.00 per cwt. increase in the price of the deferred live cattle futures price a $0.22 per cwt. increase could be expected in the basis on average.

The variable on ratio of heifer slaughter showed an unexpected positive relationship to the basis. It was significant at the 95% level, but had little economic impact on basis with an increase in basis $0.32 per cwt. for an increase of 1% in heifer slaughter on average. It is possible that this result could be because of the stage of the cattle cycle during the study period. However with less than five years worth of data it is not legitimate to make a statement about cattle cycle effects on this model because the cattle cycle is a longer term phenomenon.

The head count variable showed an insignificant positive relationship to basis. It was expected to be positive, but my hypothesis was that it would be significant. Since each observation was at least 20 head the positive effect of cattle sold in groups was probably already captured in the data.

The marketings variable showed a small but significant negative relationship with basis. For a 1000 head increase in marketings the Kentucky basis could be expected to

fall by $0.09 per cwt. on average. A negative result was expected, but the impact of the level of marketings was expected to have a larger impact on basis. It is possible that some of the effect of marketings was captured by the dummy variables for month.

The variable for the beef demand index had an insignificant positive relationship on Kentucky basis. One explanation for this is that beef demand is determined at the consumer level for beef. When that effect trickles back the marketing chain to feeder cattle prices it seems plausible that it may not have a significant effect on basis levels.

The variable for black hided cattle had a small but significant positive relationship on basis. The basis was expected to be $0.37 per cwt. higher if the cattle were black hided on average. The variable was significant at the 99% level. It was expected that black hided cattle would show a positive sign because they are viewed by feedlots as a premium grade of feeder cattle relative to other breeds and may be eligible for the Certified Angus beef program (Eldridge).

The variable on Holsteins had a large negative relationship to basis. If a feeder calf was classified as a Holstein the basis was on average $17.51 per hundredweight weaker. This variable was significant at the 99% level. This sign was expected for Holstein cattle.

The variable on steer was a large positive relationship to basis. It was significant at the 99% level. If a feeder calf is a steer on average the basis is expected to be $8.01 per cwt. higher. The sign and magnitude were expected for the steer dummy variable.

The variables for month showed positive values for January through August then negative values for September and October and then positive again for December. All of these variables were relative to November as that was the base month. With the exception

of September all of these variables were significant at the 99% level. If a feeder calf was sold in January the basis was $3.49 per cwt. higher than in November on average. If a feeder calf was sold in February the basis was $5.24 per cwt. higher than in November on average. If a feeder calf was sold in March the basis was on average $6.37 per cwt. higher relative to November. If a calf was sold in April the basis was on average $7.27 higher relative to November. If a feeder calf was sold in May the basis was on average $5.95 higher relative to November. If a feeder calf was sold in June the basis was on average $3.02 per cwt. higher than in November. If a feeder calf was sold in July the basis was on average $3.38 higher than in November. If a feeder calf was sold in August the basis was on average $1.75 higher than in November. If a feeder calf was sold in September the basis was on average $0.14 lower than in November. If a feeder calf was sold in October the basis was on average $1.49 lower than in November. If a feeder calf was sold in December the basis was on average $2.98 higher than in November. These results were expected except for the December time period. December is a shorter marketing month than the other months because of the Christmas holiday. Typically it has lighter marketings than the fall months, although the last sale of the year can bring large numbers of cattle as farmers sell cattle to be included on that tax year. The positive sign is most likely a result of the heavy fall supply is already gone by December. In general these variables follow the general seasonal trend based on supply and demand for feeders.

The dummy variables for markets showed expected results. All were significant except for the variables for Owenton and Paris. All of the markets are relative to the Bluegrass market as that was the base. The Ky.-Tenn. market showed its in-weigh status with a negative parameter. If a feeder calf sold at the Ky.-Tenn. market on average it

brought $3.08 per cwt. less than the Bluegrass market. If a feeder calf sold at the Paris market the basis was on average $0.09 higher than the Bluegrass market. If a feeder calf sold at the Owenton market it brought on average $0.09 less than the Bluegrass market. If a feeder calf sold at a CPH sale at the Bluegrass or Paris location it brought on average $3.79 more than the Bluegrass sale. These results were expected of these markets. It makes sense that there would be no significant difference in prices between the Bluegrass, Paris, and Owenton markets because they are in close proximity to one another.

The dummy variables for weight were all significant at the 99% level. All of the weight variables are compared to the eight hundred pound class and up of feeder cattle as that is the base. If a calf was between two and four hundred pounds the basis was on average $26.44 per cwt. higher than an eight weight feeder calf. If a feeder calf weighed between four and five hundred pounds the basis was on average $18.24 per cwt. higher than for eight weight feeder cattle. If a feeder calf weighed between five and six hundred pounds the basis was on average $12.88 per cwt. higher than for eight weight feeder cattle. If a feeder calf weighed between six and seven hundred pounds the basis was on average $8.22 higher than for an eight weight feeder calf. If a feeder calf weighed between seven and eight hundred pounds the basis was on average $4.43 higher than the basis for an eight weight feeder calf. These results were expected as the feeder cattle futures contract specifications are for 650 to 850 pound feeder cattle. The lighter feeder cattle prices are higher relative to the futures price and as the weight approaches the contract spec weight the price more closely reflects the futures price.

Out of Sample Testing With the Basis Model

For the basis model to be beneficial for producers to use as a forecasting tool it must do an acceptable job forecasting with out of sample data. The model was tested with out of sample data from Bluegrass Stockyards for seven and eight weight feeder steers. Individual load lots of cattle were chosen from January through the first week of June 2006. After using the model to forecast basis, those results were compared to basis table predictions of basis to see which did a better job of forecasting the actual basis. A Theil's inequality coefficient was used to determine whether the model did a good job of predicting basis. It is a ratio with root mean squared error in the numerator and the denominator is scaled such that the ratio is always between zero and one (Pindyck and Rubinfeld). A ratio closer to zero indicates there is not much difference between the predicted and actual values for basis and thus the model has good predictive power. A ratio closer to one indicates there is considerable difference between the actual and predicted values thus the model does not have good predictive power.

The Theil's coefficient for seven weight cattle was .74 indicating the model did not do a good job forecasting out of sample basis. The Theil's coefficient for eight weight cattle was .51 which was somewhat better than for seven weight cattle, but still indicated the model did not do a good job forecasting out of sample data. Apparently basis tables are still the best forecasting tools that a producer can use to arrive at an expected basis.

Hedge Ratio model and results

Cross hedging cattle of different weights and sex with feeder cattle futures can present a challenge for the producer. Myers and Thompson define a hedge ratio as the proportion of cash positions that should be covered by opposite positions in futures

contracts. The following example presents the definition of a hedge ratio as it applies to feeder cattle hedging. Light weight calves and stocker cattle prices are more volatile than feeder cattle that meet contract specifications and heavier weight feeder cattle prices tend to be less volatile than feeder cattle that meet contract specifications (Elam). The result is that more than one futures contract is needed to offset the price movements of 50,000 pounds of light weight stocker cattle in the cash market. On the other hand, for heavier feeder cattle it follows that less than one futures contract would be needed to offset the price movements for 50,000 pounds in the cash market.

Hedge ratios have been used when the certain class and weight of cattle don't match the contract specifications. Elam and Davis did a study and found that hedging risk could be reduced by applying a hedge ratio. An optimal hedge ratio minimizes the ratio of the covariance between cash and futures price to the variance of futures price for expected price movement (Stoll and Whaley). This ratio has been estimated with OLS regression in past studies. Elam and Davis simply regressed futures prices on cash prices over time to arrive at estimated hedge ratios. Myers and Thompson suggest that using price levels is too restrictive to get accurate estimates. Simple regression is also not the correct theoretical approach to optimal hedge ratio estimation according to Myers and Thompson. Simple OLS regression estimates a ratio of the unconditional covariance between futures price changes and cash price changes to the unconditional variance of futures prices (Myers and Thompson). This property makes simple regression unsuitable for estimating hedge ratios according to Myers and Thompson. The correct theoretical method for the optimal hedge ratio is a ratio of conditional covariance between cash and futures price levels to the conditional variance of futures price levels according to Myers

and Thompson. Only in special cases is a simple OLS model suitable for determining an accurate optimal hedge ratio. Using simple OLS requires the assumption that cash and futures price changes follow a random walk with no obvious pattern (Myers and Thompson). Given the scope of this research it was determined that OLS regressions using price changes would be appropriate for estimating optimal hedge ratios for data from the Bluegrass market. The OLS model used is as follows:

$\Delta Cash_t = \beta_0 + \beta_1 \Delta futures + \varepsilon_t$, where $\Delta Cash_t$ is the change in cash price, β_0 is an intercept, $\beta_1 \Delta futures$ is the change in futures prices, and ε_t is an error term.

The following tables contain estimated hedge ratios for non contract weight feeder steers and heifers sold at Bluegrass Stockyards. The hedge ratios for the spring months were a little higher than those for the fall months. The ratios on average were all close to one for steers and heifers with the exception of the four weight heifers with a ratio of 1.24. November is generally a light marketing month because of the Thanksgiving holiday and this could be part of the reason why the estimates are so much smaller than the rest. It could be possible that cash prices are less volatile in this time period as a result of the lower marketings.

Table 4.10 Estimated Hedge Ratios for Non-Contract Weight Stocker and Feeder Steers

	4 weights	Adj. R^2	5 weights	Adj. R^2	6 weights	Adj. R^2	8+ weights	Adj. R^2
January	0.872	68.90%	0.755	49.20%	0.872	50.50%	1.294	77.20%
March	1.251	39.15%	1.845	54.90%	1.057	50.18%	1.200	68.50%
April	N/A	N/A	1.223	75.80%	1.137	63.60%	1.136	83.40%
May	0.843	46.04%	0.950	71.70%	1.100	40.80%	0.998	77.90%
August	N/A	N/A	1.100	83.60%	0.998	84.70%	1.127	87.00%
September	N/A	N/A	1.222	93.10%	1.074	97.40%	1.056	92.50%
October	1.042	87.20%	0.944	81.10%	0.987	75.00%	1.030	90.30%
November	N/A	N/A	N/A	N/A	1.135	56.00%	1.239	76.80%
Average	1.002		1.039		1.045		1.135	

Table 4.11 Estimated Hedge Ratios for Non-Contract Weight Stocker and Feeder Heifers

	4 weights	Adj. R^2	5 weights	Adj. R^2	6 weights	Adj. R^2	8+ weights	Adj. R^2
January	0.777	11.60%	0.953	77.20%	1.046	71.10%	1.512	80.40%
March	N/A	N/A	0.838	16.40%	1.235	67.10%	1.261	68.80%
April	1.724	79.40%	0.994	58.40%	0.922	76.70%	0.916	88.00%
May	0.888	84.20%	0.722	47.90%	0.880	76.20%	1.389	59.60%
August	1.348	88.10%	1.110	79.70%	1.003	94.40%	1.067	97.70%
September	1.525	98.20%	1.024	89.00%	1.082	86.80%	0.815	85.50%
October	1.205	91.30%	0.937	82.20%	0.851	71.50%	0.677	64.00%
November	0.373	1.90%	0.713	50.50%	0.780	70.00%	N/A	N/A
Average	1.243		0.911		0.975		1.091	

These estimated optimal hedge ratios assume hedgers are risk adverse individuals. This is because a risk adverse individual seeks to minimize their exposure to adverse price movement. Many producers do not fit in this category and unless the producer has a large cash position a ratio hedge may be impractical. Some hedgers may want to leave a portion of their cash inventory open rather than stay 100% hedged. If a producer only has one load of cattle, selling .75 or 1.5 feeder cattle futures contracts is not possible. In the tables it is important to note that the average hedge ratio over the year for both steers and heifers is close to one. For all but the largest producers it is feasible to assume a hedge ratio of one. For most backgrounders and many cow-calf producers the calves and feeder cattle to be sold will be at least 600 lbs. According to the Elam and Davis study a hedge ratio of one would be sufficient for cattle that are of feeder cattle futures contract specification weight. It follows that most producers could use a hedge ratio of one and still be protected against unexpected price declines.

CHAPTER FIVE: PRACTICAL SITUATION FACING PRODUCERS AND HEDGING STRATEGIES

Choosing a Commodity Broker

The most important decision producers must make before they start hedging is the selection of a good futures and options broker. This step is the most crucial to having a successful hedging experience, but is often overlooked. Most people will simply choose a broker that is the closest to them or use the advice of others. Many commodity brokers earn their living by working on commission. The more trades they execute for their customers, the more income they earn. This introduces the potential for unethical behavior on the part of the broker. Several major stock and bond firms have faced penalties from the SEC due to commission related violations and unethical trading behavior on the part of brokers. The CFTC has not addressed the issue of unethical broker behavior due to commission compensation and anyone should keep this in mind before choosing a broker.

Prospective hedgers and traders alike should try to avoid “salesmen” or commission compensated brokers because it is hard to tell if they truly have clients’ best interests in mind. This is especially true for the inexperienced hedger. A broker may advise a trade or hedge just because they want to earn commission, not because they think it is a good time or price to hedge. This can result in a bad experience for the hedger and lead to not hedging in the future. It is often the case that one bad experience can make a person shy about using futures and options to hedge. It is important for the hedger to get unbiased advice and have a broker that puts the clients’ interests first.

It takes some research by individuals to find the best broker to suit their needs. There are basically two types of commodity brokers. The first is the full service firm and the second is the discount broker. Full service brokers generally charge higher commissions, but are expected to provide more personalized service and advice. This type of broker may be the best choice for a first time hedger. A main decision factor should be the broker's personality and knowledge of the livestock futures markets as many brokers are specialists in certain commodity markets. One benefit of a full service broker is they usually have access to research and advisory services that would cost more if the individual hedger or speculator were to purchase it on their own. The full service broker may be able to catch errors in a trader's account faster than a discount broker, which is an added benefit.

Discount brokerage firms generally charge lower commission rates and scale the rate down based on the amount of volume the trader does in a given month. For a trader that does a decent amount of volume the savings of a discount broker can add up quickly. The trade off is that discount brokers do not offer any type of market advice. Typically discount brokers use salaried compensation for their employees and this helps alleviate the problem of salesmen type brokers. For first time and inexperienced hedgers it is important to have an unbiased source or an experienced friend that can give market advice to make a discount brokerage a feasible choice. For experienced hedgers that do a substantial amount of volume, the discount broker could be the best choice.

The cost of hedging for a producer includes commissions paid, interest on margin money, and the cost of time spent researching the market and making hedging decisions. Commission rates are a small expense when compared to other variable costs faced by

feeder cattle producers. It is unlikely that commission costs alone would be a major determining factor in choosing a broker. The following table shows a range of commission costs and the small cost per cwt.

Table 5.1 Commission Costs: Cost per One Round Turn Futures Transaction and the Corresponding Cost per CWT.

commission	per cwt. cost
$30	0.060
$40	0.080
$50	0.100
$60	0.120
$70	0.140
$80	0.160
$90	0.180
$100	0.200

Interest paid on margin money would be equal to a short term loan rate if borrowed funds are used. Some producers may use their own money as margin so the cost would be the opportunity cost of investing the money in a money market account or US T- bill. In addition, most brokerages will let customers use a portion of the value of government bonds as margin, so the margin money can earn interest. The cost of doing market research and making hedging decisions is equal to the opportunity cost of the person's time. Time spent researching the market and attending extension meetings could be viewed as an educational investment for the producer that would lead to better management practices.

Private research and market advice can be helpful in making hedging decisions, but a hedger must keep his break even and profit objectives in mind when deciding when to buy or sell. Quality of order fills is identical for both discount and full service brokers. In the case of cattle and feeder cattle the order fillers in the pit fill orders for discount and full service brokers alike and no advantage is gained by paying a higher commission. For

smaller farmers, it is possible to open a joint account with one or two other farmers in order to split up hedges and initial margins. Especially for Kentucky producers this could be a good way to hedge. In larger grain farming regions of the country, groups of farmers have formed marketing clubs to help each other form marketing plans each year and help each other make hedging decisions. The same thing may be beneficial to Kentucky feeder cattle producers who want to get started hedging, but who are afraid to do it all alone. They could share ideas and hedging strategies for the upcoming year and hopefully make better marketing decisions for their cattle.

Spread Trading Using Live Cattle Futures

Based on the empirical evidence short hedging reduces the variability of average prices received by the producer. However, given the variability of actual basis faced by individuals, it was difficult to predict basis within an acceptable range to make short hedging an efficient strategy. The use of options strategies and possibly spreads are two techniques that could be more beneficial for Kentucky producers. Some of the benefits are low margins, limited risk exposure and reliable historical patterns.

A spread is when one contract month is bought and another month is sold. There are two basic spread types known as bull spreads and bear spreads. A bull spread is when a trader buys the near month contract and sells a further out month. In theory it should work when prices rise because price friendly information should be reflected to a larger degree in the near month relative to further out months. Thus, the long position in the near month should make more than the short position loses in the further out month. Bear spreads are just the opposite such that a trader sells the near month and buys a further out month. Bear spreads should work in periods of falling prices because unfriendly price

information should be reflected in the near month relative to more distant months. The short position in the near month should make more than the long position in the further out month. These spreads offer the investor some protection from large moves in one direction, but the potential reward is smaller with spreads as the investor is just trying to capture the widening or narrowing of the difference between two prices.

In general, bull spreads work during times of rising prices and bear spreads work during times of falling prices, but exceptions do occur frequently. A few factors can create opportunities in spreads and lower the perceived risk to the investor. Seasonality is a strong factor in the commodities markets. Due to the nature of production in the livestock industry, long term patterns have evolved that show supply to be higher at certain times of the year and lower at others. Some examples are weather, calving cycles in cattle, and certain export tariffs. Seasonality also occurs on the demand side with factors such as grilling season, various holidays and seasonal budget constraints. Looking at a spread over ten to fifteen years, it tends to be widest or narrowest at certain times of a given year partly based on seasonality.

Commodity Fund Involvement in Livestock Futures

Commodity fund involvement in cattle and hog markets has also caused the spread relationships to widen or narrow with a reliable frequency in recent years. The amount of money devoted to commodity investment has increased drastically in recent years as investors wish to capture the diversification and inflation protection qualities that commodities offer in a portfolio of assets. The first and smaller type of commodity fund is known in the futures industry as a short term fund or trading fund. These funds actively trade the market from the long, short and spread side at times trying to capture price

increases and declines and changes in the spread between months (Brooks). They are not trying to hedge anything, but play the role of speculators in the market. Although trading funds contribute a significant amount of liquidity to commodity markets, inflation fears and diversification have driven the majority of the capital inflows into commodity markets in recent years. Also, institutional investors have viewed commodities as having a chance of better returns than the stock market in recent years.

The second and largest type of fund is the long only or index commodity fund. Commodity prices can be expected to rise at the rate of inflation in the long term, so these funds attempt to capture the long term inflationary gains in commodity prices. These funds hedge inflation sensitive assets such as equities by maintaining a long position in the nearby month of a set of commodities (Brooks). This makes it more difficult to categorize commodity funds based on CFTC data because some are listed as large commercial traders rather than speculators. This type of fund will generally weight its holdings over a variety of commodities in order to capture a general picture of commodity prices. The funds will monitor the liquidity in a given commodity market and the prospect for inflation based on analysis of each individual market in order to determine how much to invest. This money has mainly moved into the market through managed money, creating the term “commodity index funds”.

The most prominent is the Goldman Sachs Commodity Index, but similar smaller funds exist. The Goldman Sachs Commodity Index is weighted over several commodities. The weight breakdown of the index as of 2004 is as follows: energy represents the largest part of the index at 73.58% followed by non-livestock agricultural at 11.48%, industrial metals 8.07%, livestock 4.68% and precious metals 2.18% (GS

website). The weighting of the index is of importance to Goldman Sachs. When emerging markets dominate world economic growth the energy and agricultural sectors tend to be the most responsive according to Goldman Sachs. On the other hand, when industrial nations drive world economic growth the agricultural sector tends to be the least responsive. It is evident from the index weightings that Goldman Sachs thinks world economic growth is driven to a large extent by developing or emerging nations. This currently is a widely held view among economists and investment professionals. Strong economic growth rates in the Chinese and Indian economies have been cited as major contributors to increases in commodity prices worldwide. The recent run up in energy prices has caused Goldman Sachs to allocate excess energy profits to the other commodities in order to keep the weightings at the stated values. This is one factor that has driven the large increases in the open interest of livestock futures (Brooks). Large commercial traders have used some of this increased interest in buying livestock futures to hedge cattle. The rest of the buying is largely countered by spreading from speculators rather than outright selling against index money like Goldman Sachs (Brooks). This has caused open interest to increase even more as a spread involves at least two positions.

All commodity funds must manage their large positions to avoid physical delivery of the product and comply with rules of the respective exchange concerning the size of positions as expiry for a particular trading month nears. In general, these large positions must be transferred or "rolled" to the next available trading month to avoid physical delivery and comply with position size limits in the month of expiry. Goldman Sachs has a set "roll" period of the 5^{th} to the 9^{th} business day of the month before expiry month is reached for the contract. For example if Goldman Sachs is long in the June contract they

will roll these positions forward to the August contract during the 5th through the 9th of May. This transfer of one month for another generally takes longer than the stated five day roll period as funds other than Goldman Sachs move positions before and after the stated period. The roll involves two individual trades and is most intense during the closing range of the day during the official roll period. On the floor, traders facilitating the roll sell the nearby month to offset the current long position. At the same time other traders will buy the next further out month to establish the new long position for the fund and thus a long position is maintained in the market. This large activity near the close can cause a distortion between the first two months by moving the spread to a large degree. This is an example of why commodity funds have been described as "giant elephants" by some traders. Their movements can create opportunities for the disciplined trader according to several market participants.

The Goldman Sachs Commodity Index roll period is the main focus of these spreads because it occurs during a set five day period and provides plenty of liquidity to take new trades and liquidate existing positions. Basically a trader will establish a bear spread position ahead of the roll, ideally during the previous roll to capture the spread distortion caused by the movement of thousands of long positions from the near month to the next month. These positions will be liquidated against the roll or earlier if a trader's profit objective is reached. The trader will then look to establish bull spreads by buying the first month and selling the second month against the roll or in the weeks after the official Goldman Sachs roll when smaller commodity index funds will be moving positions. The bull spread intends to capture a gain as the spread corrects after the roll and as the spot month liquidates late in the contract's life. The bull spreads may be

liquidated before first notice day if a set profit goal is met or basis levels favor deliveries. The trader may also decide to sell the second month and buy the third month in preparation for an arbitrage of the next roll. The trader would then have a bull spread and bear spread at the same time. The trader would be long one contract in the first month, short two contracts in the second month and long one contract in the third month. This is also known as a butterfly spread. The roll is most pronounced in live cattle futures and this is why the spread technique focuses on the use of live cattle futures rather than feeder cattle futures.

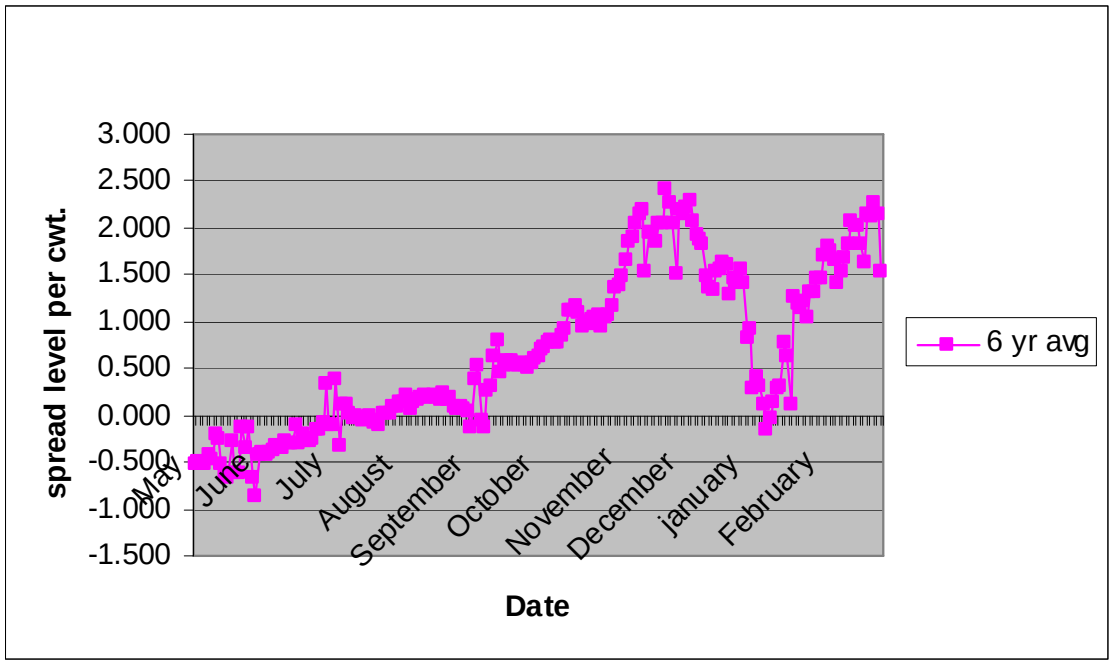
Fundamental factors will move the spreads in addition to the commodity fund activity. Sometimes it may be more risky to place a bull spread because of weak fundamental factors even though the roll is taking place and liquidation of the spot month will occur in the following month. The same is true for the bear spreads. The trader will look to establish positions only when the commodity fund activity and the market fundamentals point towards the same spread movement. The trader may choose only to trade the bull spread side of the roll when the fundamental outlook is for price strength and may choose only to trade the bear spread side of the roll when the outlook is for price weakness. The individual will have to decide when to forgo a spread due to disagreement between the fundamental outlook and the commodity fund activity.

Spread Trading Simulations

Trading simulations were run over the last five years to analyze how this trading strategy performed. The simulations were not modified to account for any changes in the fundamental outlook for cattle prices. A program of using the Goldman Sachs Commodity Index Fund roll period to enter all spreads and exit the bear spreads was used

throughout the simulations. The bull spreads were liquidated on or close to the fifteenth of the delivery month for every simulation. The charts and results of the simulations are presented below.

Figure 5.1 Six Year Average February – April Live Cattle Spread



The first set of trading simulation involves selling February and buying April on a spread during the November Goldman Sachs Commodity Index roll period. It occurs from the fifth through the ninth business day of November. The third day of the roll was used to enter trades in the simulations. Notice the five year average spread pattern tends to top in November and then work lower into January. The short February/long April attempts to capture this seasonal movement in the spread. This spread is liquidated on the third day of the January Goldman Sachs Commodity Index roll period. The next simulation involves buying February and selling April on a spread also on the third day of the January roll period. Notice how the five year average spread gains into February. The long February/short April attempts to capture this gain. This trade will be liquidated

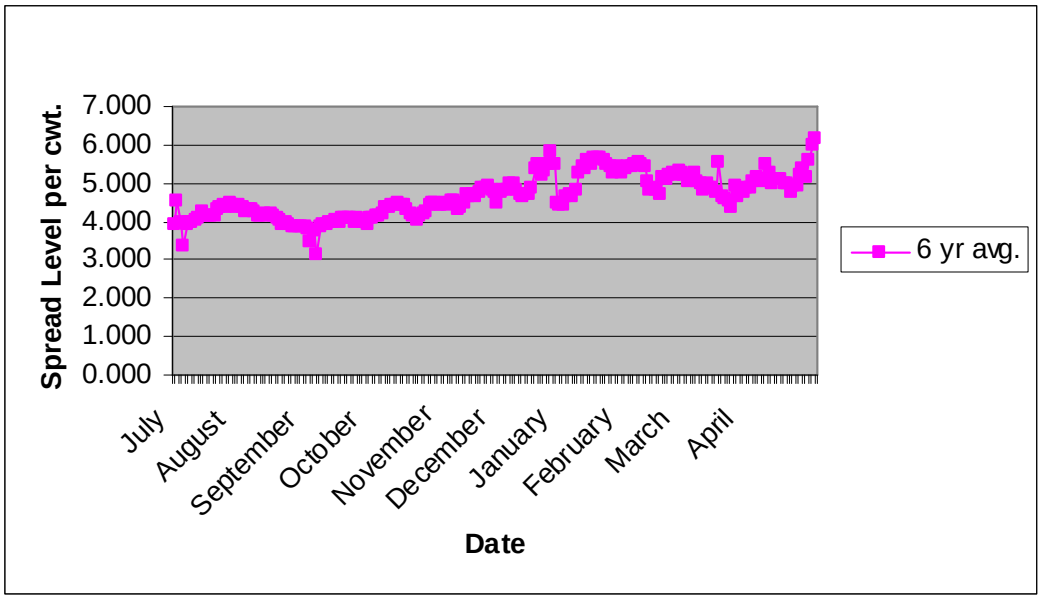
on February 15 for the simulation. The trading simulation was carried out for the period 2001 through 2006 and the results in cwt. are presented below.

Table 5.2 February - April Spread Trade Simulation Results

Long April/Short February bear spread					Long February/short April bull spread		
Year	Enter 11/9	Exit 1/9	Profit/(Loss)		Enter 1/9	Exit 2/15	Profit/(Loss)
2001	-0.775	-1.700	0.925		-1.700	2.075	3.775
2002	-2.100	-3.000	0.900		-3.000	-1.925	1.075
2003	1.125	0.875	0.250		0.875	2.825	1.950
2004	7.575	1.850	5.725		1.850	3.025	1.175
2005	2.500	2.000	0.500		2.000	3.275	1.275
2006	2.875	1.600	1.275		1.600	2.375	0.775
average	1.867	0.271	1.596		0.271	1.942	1.671

The second set of simulations involves selling April and buying June on a spread during the January Goldman Sachs Commodity Index roll period. It occurs from the fifth through the ninth business day of January. The third day of the roll was used to enter trades in the simulations. Unlike the Feb/April spread, the April/June does not show any large seasonal pattern other than a slight uptrend over the life of the spread. However, for consistency the same trading simulations are used throughout this strategy.

Figure 5.2 Six Year Average April – June Live Cattle Spread



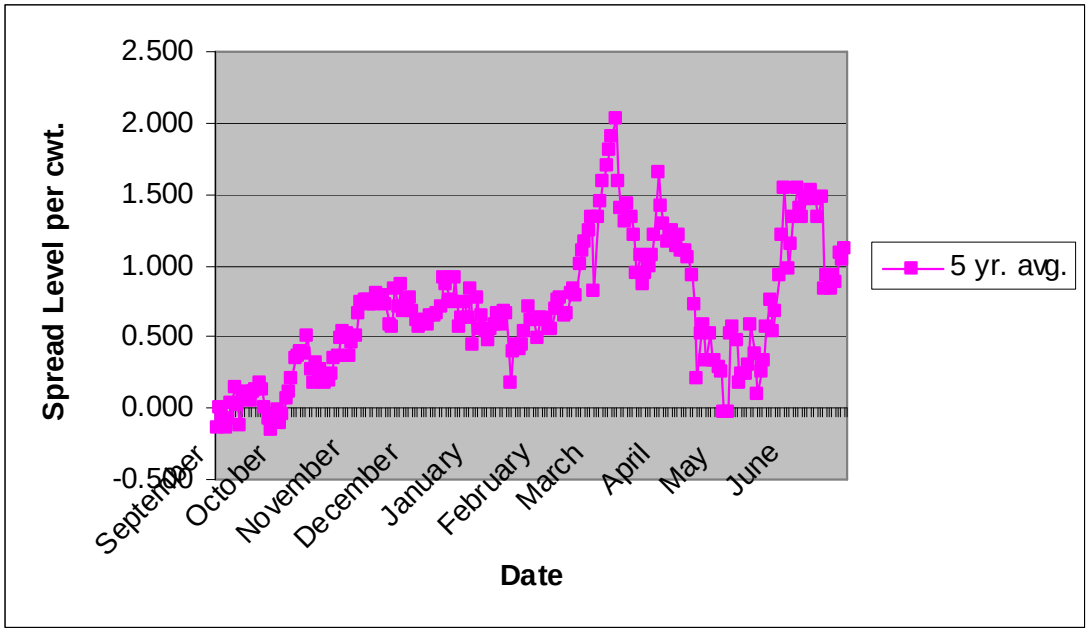
This spread is liquidated on the third day of the March Goldman Sachs Commodity Index roll period. The next simulation involves buying April and selling June on a spread also on the third day of the March roll period. Notice how the five year average spread gains into April. The long April/short June attempts to capture this gain. This trade will be liquidated on April 15 for the simulation. The trading simulation was carried out for the period 2001 through 2006 and the results are presented below. All numbers in the table are per cwt.

Table 5.3 April - June Spread Trade Simulation Results

Long June/Short April bear spread					Long April/Short June bull spread		
	Enter	Exit			Enter		
Year	1/9	3/9	Profit/(Loss)		3/9	Exit 4/15	Profit/(Loss)
2001	4.675	5.850	-1.175		5.850	5.075	-0.775
2002	3.425	5.875	-2.450		5.875	3.075	-2.800
2003	7.525	4.750	2.775		4.750	6.400	1.650
2004	2.375	4.475	-2.100		4.475	5.925	1.450
2005	6.200	3.950	2.250		3.950	5.075	1.125
2006	7.650	4.575	3.075		4.575	6.600	2.025
average	5.308	4.913	0.396		4.913	5.358	0.446

The third set of trading simulations involves selling June and buying August on a spread during the March Goldman Sachs Commodity Index roll period. It occurs from the fifth through the ninth business day of March. The third day of the roll was used to enter trades in the simulations. Unlike the April/June spread, the June/August does show a large seasonal pattern for a peak in early March. The five year average chart for the June – August is presented on the next page.

Figure 5.3 Five Year Average June – August Live Cattle Spread



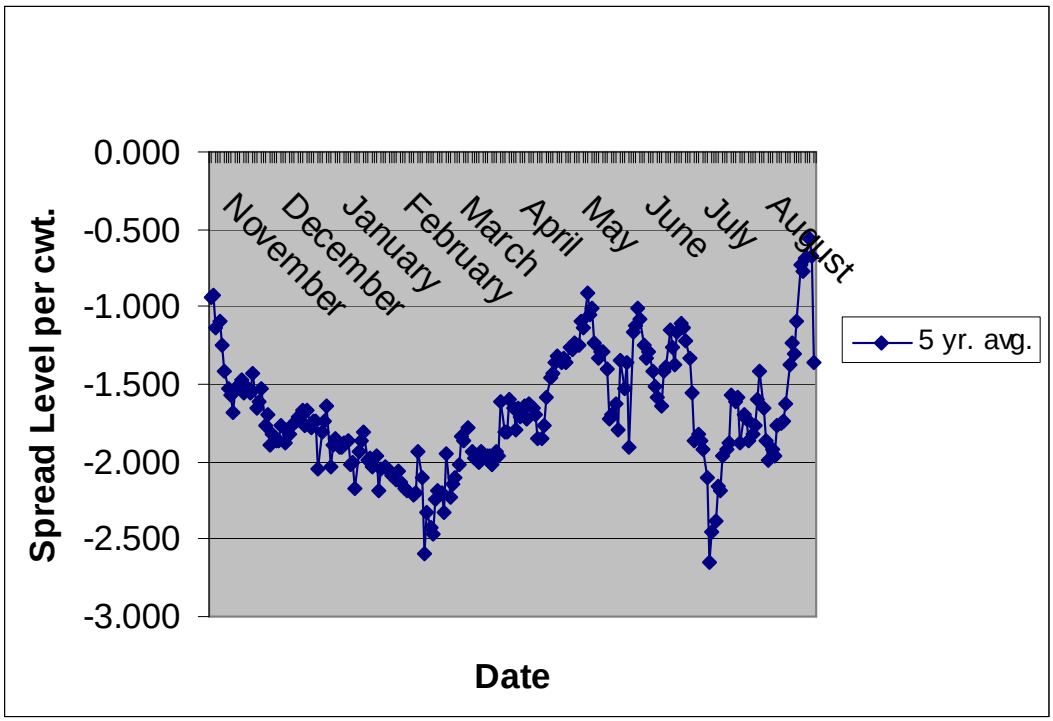
The short June/long August attempts to capture this movement. This spread is liquidated on the third day of the May Goldman Sachs Commodity Index roll period. The next simulation involves buying June and selling August on a spread also on the third day of the May roll period. Notice how the five year average spread gains into June. The long April/short June attempts to capture this gain. This trade will be liquidated on June 15 for the simulation. The trading simulation was carried out for the period 2001 through 2005 and the results are presented below. All numbers in the table are per cwt.

Table 5.4 June - August Spread Trade Simulation Results

Long August/Short June bear spread					Long June/Short August bull spread		
	Enter	Exit			Enter		
Year	3/9	5/9	Profit/(Loss)		5/9	Exit 6/15	Profit/(Loss)
2001	0.925	-0.300	1.225		-0.300	-0.100	0.200
2002	0.725	-0.875	1.600		-0.875	0.200	1.075
2003	2.725	4.450	-1.725		4.450	5.300	0.850
2004	1.400	-1.650	3.050		-1.650	-0.400	1.250
2005	3.775	-0.750	4.525		-0.750	1.700	2.450
average	1.910	0.175	1.735		0.175	1.340	1.165

The fourth set of trading simulations involves selling August and buying October on a spread during the May Goldman Sachs Commodity Index roll period. It occurs from the fifth through the ninth business day of May. The third day of the roll was used to enter trades in the simulations. This spread does show a large seasonal pattern for a peak in early May followed by a drop into early July.

Figure 5.4 Five Year Average August – October Live Cattle Spread



The short August/long October attempts to capture this movement. This spread is liquidated on the third day of the July Goldman Sachs Commodity Index roll period. The next simulation involves buying August and selling October on a spread also on the third day of the July roll period. Notice how the five year average spread gains into August. The long August/short October attempts to capture this gain. This trade will be liquidated on August 15 for the simulation. The trading simulation was carried out for the period

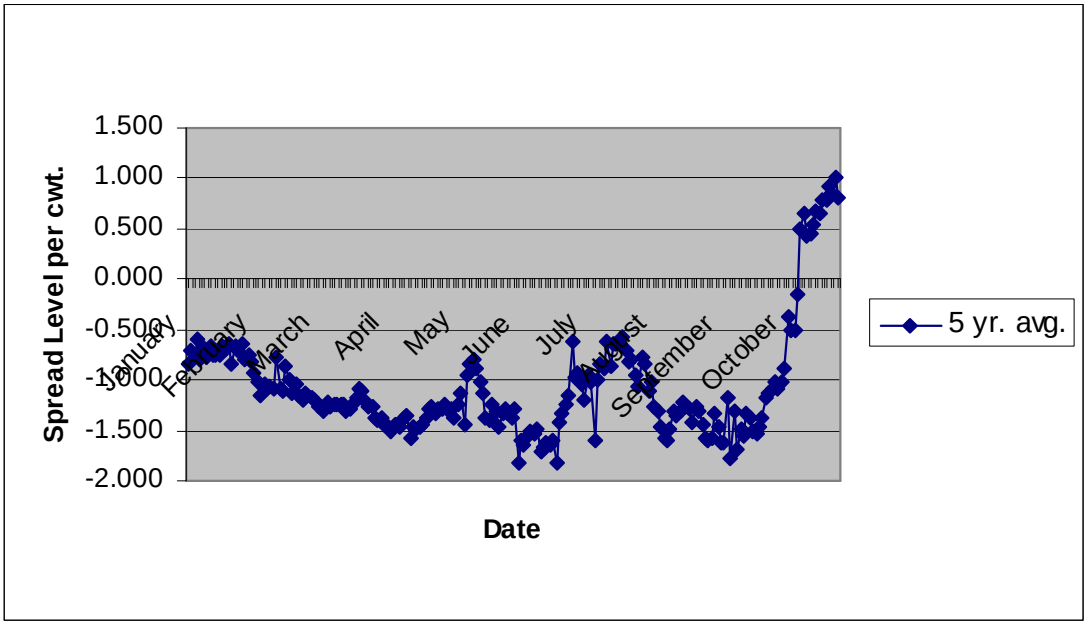
2001 through 2005 and the results are presented below. All numbers in the table are per cwt.

Table 5.5 August - October Spread Trade Simulation Results

Long October/Short Aug bear spread					Long Aug/Short October bull spread		
	Enter	Exit			Enter	Exit	
Year	5/9	7/10	Profit/(Loss)		7/10	8/15	Profit/(Loss)
2001	-1.725	-1.800	0.075		-1.800	-2.825	-1.025
2002	-3.125	-2.650	-0.475		-2.650	-2.800	-0.150
2003	-1.225	-1.300	0.075		-1.300	0.075	1.375
2004	1.975	-3.700	5.675		-3.700	-2.025	1.675
2005	-0.475	-3.800	3.325		-3.800	-1.075	2.725
average	-0.915	-2.650	1.735		-2.650	-1.730	0.920

The fifth set of trading simulations involves selling October and buying December on a spread during the July Goldman Sachs Commodity Index roll period. It occurs from the fifth through the ninth business day of July. The third day of the roll was used to enter trades in the simulations. This spread does show a seasonal pattern for a peak in July through August followed by a drop into September.

Figure 5.5 Five Year October – December Live Cattle Spread



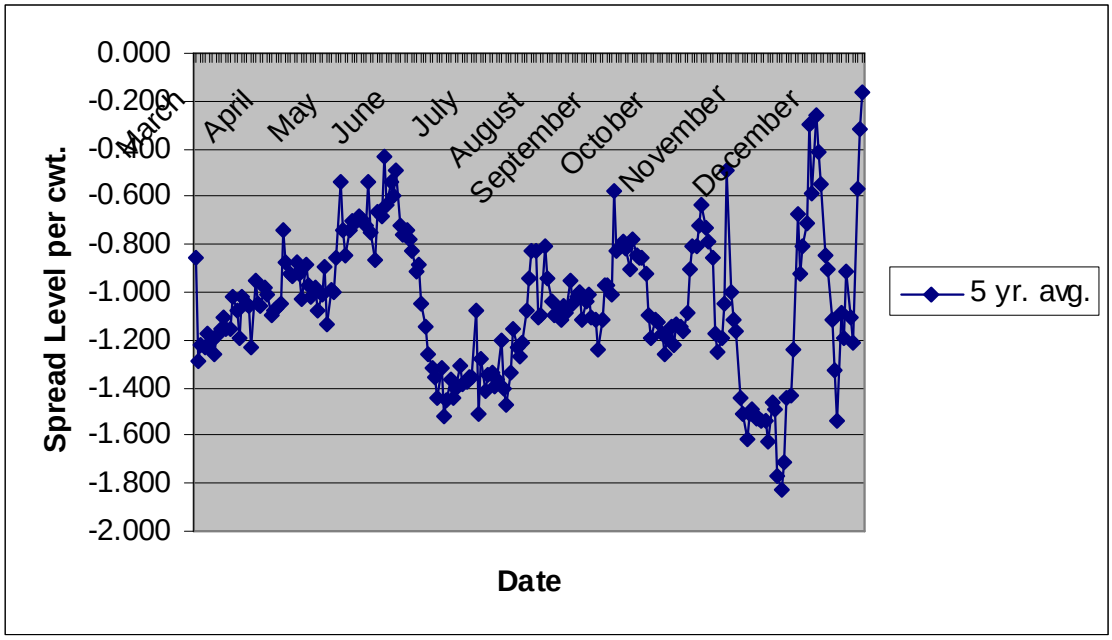
The short October/long December attempts to capture this movement. This spread is liquidated on the third day of the September Goldman Sachs Commodity Index roll period. The next simulation involves buying October and selling December on a spread also on the third day of the September roll period. Notice how the five year average spread gains into October. The long October/short December attempts to capture this gain. This trade will be liquidated on October 15 for the simulation. The trading simulation was carried out for the period 2001 through 2005 and the results are presented below. All numbers in the table are per cwt.

Table 5.6 October - December Spread Trade Simulation Results

Long Dec/Short October bear spread					Long October/Short Dec bull spread		
	Enter	Exit			Enter	Exit	
Year	7/10	9/11	Profit/(Loss)		9/11	10/15	Profit/(Loss)
2001	-0.075	-1.975	1.900		-1.975	-0.225	1.750
2002	-0.975	-2.275	1.300		-2.275	-2.700	-0.425
2003	-0.725	2.725	-3.450		2.725	9.275	6.550
2004	-0.125	-3.075	2.950		-3.075	-1.850	1.225
2005	-2.325	-2.675	0.350		-2.675	-0.600	2.075
average	-0.845	-1.455	0.610		-1.455	0.780	2.235

The sixth trading simulation involves selling December and buying February on a spread during the September Goldman Sachs Commodity Index roll period. It occurs from the fifth through the ninth business day of September. The third day of the roll was used to enter trades in the simulations. This spread shows more volatility than the other spread charts, but a drop into late November is noted.

Figure 5.6 Five Year Average December – February Live Cattle Spread



The short December/long February attempts to capture this movement. This spread is liquidated on the third day of the November Goldman Sachs Commodity Index roll period. The next simulation involves buying December and selling February on a spread also on the third day of the November roll period. Notice how the five year average spread gains into December. The long December/short February attempts to capture this gain. This trade will be liquidated on December 15 for the simulation. The trading simulation was carried out for the period 2001 through 2005 and the results are presented below. All numbers in the table are per cwt.

Table 5.7 December - February Spread Trade Simulation Results

Long Feb/Short December bear spread					Long December/Short Feb bull spread		
	Enter	Exit			Enter	Exit	
Year	9/11	11/11	Profit/(Loss)		11/11	12/17	Profit/(Loss)
2001	-1.450	-3.400	1.950		-3.400	-4.600	-1.200
2002	-1.075	-1.700	0.625		-1.700	-4.300	-2.600
2003	0.150	4.800	-4.650		4.800	4.200	-0.600
2004	-0.775	-1.475	0.700		-1.475	-1.575	-0.100
2005	-1.350	-3.000	1.650		-3.000	-1.550	1.450
average	-0.900	-0.955	0.055		-0.955	-1.565	-0.610

These six sets of spread trades were profitable over the past five year period. They can be broken down into bull spreads and bear spreads. The table below shows the average profit for both the bear spreads and bull spreads for the five year study period.

Table 5.8 Five Year Avg. Combined Results for All Spreads

Entry	Exit	Bear spreads			Entry	Exit	Bull spreads	
Nov. 9th	Jan. 9th	April/Feb	1.596		Jan. 9th	Feb. 15th	Feb/April	1.671
Jan. 9th	Mar. 9th	June/April	0.396		Mar. 9th	April 15th	April/June	0.446
Mar. 9th	May 9th	Aug/June	1.735		May 9th	June15th	June/Aug	1.165
May 9th	July 10th	Oct/Aug	1.735		July 10th	Aug. 15th	Aug/Oct	0.920
July 10th	Sep.11th	Dec/Oct	0.610		Sep. 11th	Oct. 15th	Oct/Dec	2.235
Sep. 11th	Nov 9th	Feb/Dec	0.055		Nov. 9th	Dec. 15th	Dec/Feb	-0.610
		average	1.021				average	0.971

The average profit for the bear spreads were $ 1.021 per cwt. for the 2001-2005 time period. The average profit for the bull spreads were $ 0.971 per cwt. for the 2001-2005 time period. The average profit for the butterfly spread would be $1.992 per cwt. or the average for the bull spreads added to the average for the bear spreads. This is because a butterfly strategy simply uses both the bull and bear spreads.

For hedgers trying to protect against price declines, using butterfly spreads would have increased the average net price received, but would have increased the variability of those prices substantially. This result indicates that cattle spreads are not a hedging strategy, but rather a speculative investment. Prices were more variable when spreads

were used than simply taking the cash price with no hedge. The following table compares using spreads with short hedging and no hedging. Of important note is how the variance in price increases dramatically as each additional spread is added.

Table 5.9 Mean-Variance Comparisons of Using No Hedge, Short Hedging, and 1-5 Spreads for 650-849lb Steers at Bluegrass Stockyards

Length		Cash	Short hedge	1 spread	2 spreads	3 spreads	4 spreads	5 spreads
8 months	mean price	89.82	84.69	92.36	96.64	100.93	105.21	109.49
	variance	146.42	34.26	308.24	513.01	787.95	1133.04	1548.31
6 months	mean price	89.82	85.23	91.99	95.89	99.79	103.69	107.6
	variance	146.42	46.26	297.53	478.09	715.28	1009.11	1359.59
5 months	mean price	89.82	85.81	91.32	94.55	97.79	101.03	104.27
	variance	146.42	57.71	278.66	431.34	631.66	879.64	1175.27
4 months	mean price	89.82	86.41	90.72	93.36	95.99	98.63	101.27
	variance	146.42	67.4	262.86	387.88	548.72	745.35	977.79

Options Strategies

The options on both live cattle and feeder cattle have suffered a lack of liquidity for some time, and commodity funds are not major traders in those products. It is a smaller market made up mainly of commercial traders and various speculators (Brooks). The liquidity is most lacking in the deferred month options market. The difference in bid and ask prices can be large for deferred options contracts. Open interest is usually small for the strike prices offered on these contracts, most of the time less than 100 contracts and many times less than 50. Generally a “liquidity premium” has to be paid in order to get someone to take the other side of a trade in the deferred options. This is why some options strategies look good on paper, but in reality they can be difficult to execute. Limit orders are a good idea when trying to place positions in the deferred options. With the

lack of liquidity it may take days for the order to be filled so patience is a good quality when hedging in those markets.

A put option contract gives the buyer the right to sell a futures contract at a specified (strike) price anytime the futures price closes at or below the specified price. The buyer is not obligated to go short at the strike price, but can if they choose to. A premium is paid by the buyer for this right to go short at the specified price. The amount of premium is determined by three things. The first is the difference between the strike price and the current futures price (Stasko). The second is the amount of time before the contract expires (Stasko). The third is the amount of volatility in the futures market (Stasko). Generally premiums get higher the further the strike price is above the futures price. The more time that exists until expiry, the higher the premium will be and the more volatile the futures market is the higher the premium will be. The seller collects this premium, but is obligated to take the long side of the futures contract if the buyer elects to exercise the option. The buyer can elect to sell the put option to take profit rather than convert it into a futures contract. Both ways of offsetting the option are commonly used and generate similar hedge profits. Selling the profitable put will result in a small reduction in commissions paid as there will be no futures position to offset.

If the underlying futures contract closes above the put strike price on the option expiry day the option can be said to expire worthless. The buyer will simply lose the premium paid plus commission. Calls are exactly the opposite of put options meaning that the buyer of a call has the right, but not obligation to go long a futures contract if the price closes at or above the specified strike price. The call seller must take the short side of this position, but collects a premium from the buyer just like in the case of a put

option. Using outright option positions to hedge cattle price is similar to using insurance to protect any other asset. The following table compares the cost and net price received of using a put option to that of using a short futures hedge. It is important to note how the substantial cost of the put option reduces the expected net price.

Table 5.10 Comparison of Using a Put Option or a Short Futures Contract to Hedge October 700-800lb. Feeder Steers

	futures	$102 strike price put option
Action on May 8	sell at 102.90	buy at $3.50 per cwt.
Initial margin or cost	$1,000.00	$1,750.00
additional cost if market goes up	$500 for each $1 per cwt.	None
Expected basis est. from table	-0.73	-0.73
expected net cash price formula	futures-basis 102.90-0.73	strike-premium-basis 102.00-3.50-0.73
net cash price in October	$102.17	$97.77

The next options strategies are similar to futures spreads. They are the bull and bear option spreads. They are known as the bull call spread and bear put spread. The bear put spread is for hedgers who want protection from falling prices. It involves buying a put with a reasonably close to the money strike price and then selling a more out of the money put to offset some of the price of the more near the money put. The maximum profit from this hedge is the difference between the two strike prices less the net premium paid and commissions. This strategy leaves unlimited upside potential for the producer

which is an advantage. The bull call spread is for producers who need upward price protection. It involves buying a near the money call and selling a more out of the money call. It is similar to the bear put spread in that the maximum expected profit is the difference between the strike prices less the net premium paid and commissions. The goal with put and call spreads is to get the largest difference in strike price for options that are as close to the money as possible for the least amount of net premium paid. The following table shows an example of a bear put spread.

Table 5.11 Bear Put Spread Strategy for Hedging October 700-800lb. Feeder Steers

	$102 strike price put option	$94 strike price put option
Action	Buy at 3.50 per cwt.	sell at 1.25 per cwt.
Initial margin or cost	$1,750.00	($625)
net cost	$1,125.00	
per cwt.	$2.25 per cwt.	
Max profit formula	long put-short put-net cost 102-94-2.25 = $5.75 per cwt.	
If futures prices go to:		
$110.00	Futures-basis-net cost 110-0.73-2.25 = $107.02	
$94.00	Futures-basis+net hedge profit 94-0.73+5.75 = $99.02	
$90.00	Futures-basis+net hedge profit 90-0.73+5.75 = $95.02	

The next strategy would be bull and bear options fence strategies. For the cattle producer this would involve a bear fence comprised of buying a near the money put option and selling an out of the money call option. Selling the call reduces the purchase price of the put. It is a cheaper way to get downside protection than simply buying a put option. This would lock in a range of expected prices. The short call would limit the

upside potential in price, but the long put would provide unlimited downside protection. As long as the upward price ceiling is high enough, this strategy has the benefit of lower cost over simply buying a put for a producer. The ceiling will be determined by the call strike price minus the expected basis and net cost. The lower bound will be determined by the put strike price minus the basis and net cost. A producer looking to hedge stocker cattle purchases could use the bull fence by buying a near the money call and selling an out of the money put option. This is a cheaper way to establish upside protection than simply buying a call option. It establishes a range of purchase prices rather than sale prices compared to the previous example. An example of a bear options fence is presented in the table below. It is important to note that a price ceiling and floor are established with this strategy.

Table 5.12 Bear Option Fence Strategy for Hedging October 700-800lb. Feeder Steers

	$102 strike price put option	$112 strike price call option
Action	Buy at 3.50 per cwt.	sell at 0.85 per cwt.
Initial margin or cost	$1,750.00	($425)
net cost	$1,325.00	
per cwt.	2.65 per cwt.	
price ceiling	Short call-basis-net cost 112-0.73-2.65 = $108.62	
price floor	long put-basis-net cost 102-0.73-2.65 = $98.62	
If futures prices go to:		
	futures-basis-net cost-loss on short call	
$115.00	115-0.73-2.65-3.00 = $108.62	
	futures-basis-net cost	
$112.00	112-0.73-2.65 = $108.62	
	futures-basis+put profit-net cost	
$90.00	90-0.73+12.00-2.65 = $98.62	

These option strategies may be good hedging alternatives for small and large Kentucky producers alike. The only expense for purchasing options is the premium and broker commission which makes them a better choice for individuals who do not want to risk margin calls with short futures positions. Usually the initial margin for short options positions is some proportion of the initial margin for a futures contract depending on how far out of the money the option is. Market volatility is also factored into the formula for determining initial margin for short options positions. They can be viewed as price insurance policies for the producer. In most cases options strategies provide less price protection than holding a short futures position, but they do protect against unexpected price movements. This definitely makes option strategies a better alternative than simply not hedging at all.

The only downside to using options strategies is the premiums that they sell for can be a significant cost for the hedger. For example the $102.00 strike price put option on the October futures contract used in the examples above would cost approximately $28.00 per head to purchase. This assumes the producer will have 63 head of 800lb. feeder steers for sale sometime in October. For individuals that can tolerate more risk it may be possible for a producer to offset some of the premium paid for an options strategy by using some of the live cattle spread techniques mentioned previously. However, this may not be preferable for a risk adverse individual.

CHAPTER SIX: CONCLUSIONS AND IMPLICATIONS

Conclusions

Using feeder cattle futures as a hedge reduced variability in prices and thus variability in income. To that end short hedging achieved its purpose. The other important aspect of hedging was whether an individual actually locked in a profit from hedging. It was dependent on their breakeven price, overall quality of cattle and the accuracy of their expected basis estimate. The key would have been to know a likely range that the actual basis would fall in and then be able to lock in a sufficient margin that would account for the actual basis if it fell in the weak end of the range. The following tables show the high, low average, and standard deviation for basis at Bluegrass Stockyards. Bluegrass was chosen because it had the most data of any of the markets. The 600-700 and 700-800 pound weight ranges were chosen because of the large numbers of data and these weights are most likely to be the end product that Kentucky producers, order buyers and dealers will market. The steer and heifer data in the tables includes beef cattle only.

Table 6.1 Five Year Average Basis for 600-700 lb. Steers at Bluegrass Stockyards

Month	High	Low	Average	Std. Deviation
January	12.02	-4.8	2.32	3.83
February	10.02	-1.45	4.39	3.68
March	15.3	-1.25	7.29	4.17
April	18.35	0.5	8.95	4.99
May	13.65	-0.17	6.71	3.71
June	16.7	-5.43	6.49	6.53
July	12.6	-0.23	5.74	4.72
August	11.63	-10.17	2.62	5.24
September	7.8	0.43	3.09	2.15
October	9.47	-13.75	0.07	5.72
November	6.38	-7.92	-0.38	3.08
December	11.17	-6.2	1.49	3.84
Average	12.09	-4.20	4.06	4.30

Table 6.2 Five Year Average Basis for 700-800 lb. Steers at Bluegrass Stockyards

Month	High	Low	Average	Std. Deviation
January	9.27	-4.73	0.02	2.65
February	5.78	-6.45	-0.23	2.74
March	7.35	-4.55	-0.28	2.16
April	6.75	-5.3	0.87	2.84
May	6.68	-3.77	0.34	2.49
June	6.67	-9.98	-0.67	4.29
July	11.55	-3.3	1.57	3.45
August	7.65	-7.47	0.64	2.73
September	4.1	-5.5	-1.15	2.57
October	7.2	-7.12	-0.04	2.92
November	8.38	-15.42	-0.73	3.76
December	8.17	-7.5	1.45	3.67
Average	7.46	-6.75	0.15	3.02

Table 6.3 Five Year Average Basis for 600-700 lb. Heifers at Bluegrass Stockyards

Month	High	Low	Average	Std. Deviation
January	5.32	-11.8	-2.81	3.18
February	5.8	-9.78	-1.79	3.53
March	4.85	-6.73	-2.33	2.74
April	6.45	-4.78	-0.01	2.69
May	6.42	-8.67	-0.74	3.01
June	3.32	-9.73	-2.41	3.48
July	3.47	-7.17	-2.16	2.4
August	2.8	-9.22	-2.66	2.87
September	2.65	-7.25	-2.25	3.01
October	-0.63	-17	-6.82	5.09
November	0.08	-16.67	-7.11	4.28
December	3.25	-11.5	-4.09	3.32
Average	3.65	-10.02	-2.93	3.30

Table 6.4 Five Year Average Basis for 700-800 lb. Heifers at Bluegrass Stockyards

Month	High	Low	Average	Std. Deviation
January	-1.6	-10.8	-5.78	2.04
February	2.12	-12	-5.69	3.7
March	-0.75	-7.23	-4.73	1.78
April	3.1	-9.78	-4.58	2.64
May	-2.07	-9.37	-5.09	1.63
June	0.02	-14.93	-4.72	3.46
July	-0.52	-9.82	-4.53	2.35
August	-0.3	-11.22	-5.52	2.46
September	-0.5	-8.15	-5.45	2.65
October	-3.42	-11.42	-8.26	2.1
November	2.27	-10.02	-6.75	3.11
December	3.15	-8.03	-1.86	4.05
Average	0.13	-10.23	-5.25	2.66

Of important notice is the range of basis in all of these tables. There is a substantial difference between the high or stronger than average basis and the low or weaker than average basis. For example the 95% confidence interval for April 700-800lb. feeder heifers is [.59 per cwt. to -9.75 per cwt.]. This means that 95% of the time the actual basis will be from .59 per cwt. over April futures to 9.75 per cwt under April futures in the month of April. This is an obstacle to using naive short hedges because the 95% confidence interval of expected basis is so wide. Basis variability is less than price variability but both are substantial, which demonstrates the risk faced by producers, backgrounders, and order buyers. Hedgers would have to be offered large profit margins in order to feel confident they could actually overcome basis risk and net a profit at the end of the hedge period. At times the market may offer substantial profit opportunities that a potential hedger can capture. Another strategy may be preferable in this case.

Options strategies may be the best alternative for most producers. Even when the producer has less than a full load of cattle, it may be justifiable to use a put option or an option spread strategy. The reason is that while it may not be possible to lock in a profit,

protection against an unexpected decline in prices can be achieved. This price risk reduction makes using options strategies an efficient choice for producers and dealers.

Producers and order buyers must keep in mind the mean-variance tradeoff when choosing a hedging strategy. For example the coefficient of variation can be used to compare the relative variability between strategies. It is simply the standard deviation divided by the mean expressed as a percentage. It is a measure of dispersion around the respective sample mean. The coefficient of variation for no hedge at Bluegrass Stockyards was 13.47% compared to a six month naive hedge of 7.97% and a six month three spread strategy at 26.79%. Hedging did reduce price variability while spreads increased price variability relative to simply taking the cash price.

Implications

The model used to describe Kentucky basis was unable to give an accurate estimate that could be used as an expected basis in forming a cash price forecast. Future work in this area should focus on developing a more accurate forecast of basis three to six months in the future. Modeling price risk from producers and backgrounders decision making framework is another potential area for further work. It is likely the case that visible factors such as the various breeds of cattle and the condition of the cattle when they are marketed have a large impact on basis levels. If a more accurate forecast of basis could be obtained it should increase the use of feeder cattle futures and options contracts as hedging strategies. Kentucky cattle producers, back-grounders and dealers would certainly benefit as a result.

Livestock insurance is another price risk management strategy that is available in some Midwestern states that someday may be applicable to Kentucky producers. It is

basically a put option on the cash feeder cattle index. The insurance policies may be cheaper than a comparable put option on feeder cattle futures because of a 13% subsidy. One major benefit of these policies is that producers can buy a policy that matches the size of their herd (Barnaby). This makes insurance a more cost effective strategy for smaller producers as compared to simply using CME feeder cattle put options. Given that Kentucky has a large number of small producers, livestock insurance could turn out to be a viable risk management strategy.

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