RESEARCH ON IMPLICATIONS OF IRS POLICIES TO THE EFFECTIVENESS OF CATTLE FUTURES MARKETS

Part II, Impact of Different Types of Traders

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In February 1992, the Research Institute on Livestock Pricing published Part I in a planned series of publications dealing with the implications of IRS policies to the effectiveness of cattle futures markets. Part I dealt with a simple survey of cattle feeders in Texas and Kansas with the objective of determining whether IRS policy influences feeders' participation in the markets. The results clearly indicate the policy does keep some cattle feeders out of the price discovery process in the cattle futures.

In the aftermath of the *Arkansas Best* ruling, all of this becomes increasingly important. This publication, Part II of the series, examines the influence of different groups of traders in the price discovery process. In general, the results show that it is large speculators that stop the major departures from some underlying equilibrium and turn the market back toward a proper trading range. This result raises the possibility that the markets might be more effective if cattle feeders were allowed to participate in "correcting" the market, especially when the market is offering only $50-100 per head losses for cattle that could be bought and placed on feed on any particular day. Interested observers will, I believe, find this publication very useful.

Longer term, we are working on the influence on market performance of policies that block participation of cash-connected firms such as cattle feeders. It is possible that everyone in the system--from the cow-calf producer to the consumer--is bearing the costs of a flawed policy position because producers, feeders, packers, and processors are carrying exposure to price risk that could be transferred outside the sector. Such exposure imposes costs over time, and someone has to pay for it. We will also, through the Institute, analyze the revenue implications of allowing or encouraging broader participation in the markets. The current notion that allowing cash-connected firms to deduct losses on futures trades will be a drain on the Treasury is not necessarily correct. More widespread participation in the markets will generate profitable trades as well, especially when participants are moving the market back after a wide swing away from the underlying equilibrium. The intent, then, is to move on to increasingly sophisticated analyses of the cost/benefit of the current and possible IRS policies. Other publications in the series are projected for 1994 dates.

Wayne D. Purcell, Director
Research Institute on Livestock Pricing
June 1993

RESEARCH ON IMPLICATIONS OF IRS POLICIES TO THE EFFECTIVENESS OF CATTLE FUTURES MARKETS

Part II, Impact of Different Types of Traders

Introduction

Over time, cattle prices will always be determined by forces of supply and demand. If there are cyclical or long-run imbalances between supply and demand, the market will eventually correct the imbalances. Most short-run price variations are not caused by cyclical or long-term developments in supply or by shifts in demand, however. Short-run variability in fed cattle prices is primarily a result of fluctuations in earlier placements of cattle into feedlots. Koontz and Purcell (1988) show that cattle feeders respond to changes in the distant live cattle futures by changing the level of placements. To the extent the futures markets are ineffective or inaccurate in discovering prices for future time periods, variability in placements, in beef supplies, and in prices can result. Any excessive and needless price variability imposes costs on everyone in the system from producer to consumer.

Cattle feeders are in a position to incorporate the influence of current and specific cost and performance information on cattle feeding into the discovered prices for live cattle and feeder cattle futures. How trades in the cattle futures markets are treated by the Internal Revenue Service (IRS) in terms of defining the trades as hedging or speculation has the potential to influence participation by cattle feeders. To the extent that cattle feeders are blocked by IRS policy from trading in cattle futures in any capacity other than trades that meet a narrowly defined criterion, the correction of market imbalances may be impeded. The price discovery process might be less effective than it could be with more active participation by cattle feeders. The economic well-being of all system participants can be influenced in a significant and negative way by prolonged market imbalances. An earlier publication released by the Research Institute on Livestock Pricing indicates IRS policies do influence and constrain participation in cattle futures (Purcell, 1992).

Cattle feeders face a complex exposure to production and price related risks. Even capable market analysts and astute managers of hedging programs are confronted with uncertain market situations. Cattle feeders can seldom secure forward prices above the projected break-even price for cattle to be bought and placed into feedlots (Hayenga, DiPietre and Skadberg, 1984). Cattle feeders are price takers in the procurement market for feeder cattle and in the selling market for fed cattle. Also, individual cattle feeders have little or no ability to influence feed prices. A routine hedging strategy will seldom offer a positive net margin, via forward pricing opportunities being offered, when a feeding program is begun.

There are economic reasons that the futures market seldom offers profitable forward pricing or hedging opportunities when cattle are being placed. The sector is competitive, with no significant barriers to entry. Thus, only the most efficient producers would be expected to cover average total production costs in the long run. In the short run, however, market imbalances between projected costs and available pricing opportunities can and do persist. Examination of the pricing opportunities being offered by the midpoint of the appropriate distant live cattle futures contract, in comparison to production costs projected by the USDA, shows the imbalances. During the month the cattle were placed, there were periods of 10-15 consecutive months during the 1980s in which not even the variable costs were being covered by the forward prices being discovered in the distant live cattle futures (Purcell, 1992, p.5).

Such imbalances may be seen as evidence of inefficient markets.[1] However, that view may be too narrow and too restrictive. What appears to be an inefficient market may be a result of IRS policies that block well-informed participants from being directly involved in the price discovery process. Specifically, it could be the policy position by the IRS that constrains the effectiveness of the price discovery process in the markets and generates pricing patterns with non-independent daily changes that are seen as evidence of market inefficiency.

Research reported in this bulletin examines the actions of different groups of large traders in the price discovery process in the live cattle futures markets. The objective is to determine which traders start the process of correcting the often significant imbalances between costs and forward pricing opportunities. *Special attention is paid to the role of large speculators, the group that might most nearly parallel the trading behavior of cattle feeders if feeders were allowed, or encouraged, by policy changes to get directly involved in the price discovery process.*

Procedurally, the bulletin reviews IRS policy and how it might influence market performance and then looks briefly at the limited literature dealing specifically with the role of different groups of traders. A conceptual framework is then offered to describe how and why different traders would tend to react to the feeding margins (forward prices less costs) being offered by the markets. An empirical analysis of the role of alternative traders is then presented and inferences are drawn as to the possible impact on market performance of policy changes to allow cattle feeders to be fully involved in the price discovery process.

IRS Policy

The enactment of the *Economic Recovery Tax Act* of 1981 (ERTA) changed the taxation of transactions in commodity futures contracts. The new provisions were designed to eliminate abusive tax sheltering arrangements. Prior to the enactment of ERTA, there were few provisions in the Internal Revenue Code dealing with the intricacies of commodity futures transactions (Ernst and Tyrrell, 1984).

In general, commodity futures contracts that are not part of hedges are treated as capital assets. The gain or loss from the sale or exchange of such contracts will receive capital gain or loss treatment, and the deductibility of capital losses for tax purposes is restricted. In the recent case of *Arkansas Best Corp* (1988), the U.S. Supreme Court held that: (1) a tax-payers motivation for purchasing an asset is irrelevant to the question of whether the asset is a "capital asset," (2) the sole exceptions to the capital asset definition are those exceptions listed specifically in the *Internal Revenue Code*, and (3) stock purchased by a company is subject to capital loss (rather than ordinary loss) treatment at sale regardless of whether it was held for a business purpose.

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[1]The literature on "market efficiency" is extensive. In general, a market is efficient if it captures, in the discovered price, all available information on supply and demand. Various levels of efficiency are identified, with the levels depending on whether public or private information or both is being reflected in the price. In the research literature, the presence of non-independent day-to-day price changes is often used to indicate an inefficient market. If there exists prolonged departures from, and then corrections back toward, some underlying equilibrium level, then it would appear that price on day t+1 will often be statistically related to price on day t, day t-1, or even day t-n as the market makes a sustained correction. Thus, it would appear most sustained corrections would generate evidence of market efficiency, and this <u>is</u> the source of some of the findings in the literature that the cattle futures markets are inefficient.

The lack of a clear definition of "hedging" has been a long-standing concern among users of the futures markets. The concerns were accentuated by the *Arkansas Best* ruling. The word "hedge" has been used in a variety of ways by futures traders, accounts managers, and regulators, and there appears to be no generally accepted definition. Producers using risk management tools are concerned that IRS auditors might disallow losses resulting from what the producers see as hedging strategies if the strategy involves trades other than the most simple "hedge and hold" strategy. The IRS has historically tended to apply a very rigid definition of what is seen as hedging and what is seen as speculative activity in futures markets. A primary criterion of hedging for the IRS has been the "equal and opposite" requirement. The futures position must never exceed the actual or expected position in the cash market (the "equal" requirement) and must be the reverse of the cash position (the "opposite" requirement). For cattle feeders, this criterion would appear to restrict them to being long feeder cattle futures (a "long" hedge) and being short live cattle futures (a "short" hedge) in order to benefit from the tax treatment of a hedge. Being short the nearby feeder cattle futures and long the distant live cattle futures, reflecting what might be seen as logical business reactions if only excessive negative feeding margins are being offered, would be speculative trades given historical treatment of such actions by the IRS.

Losses on speculative trade in futures are not deductible as business deductions for tax purposes. Cattle feeders will therefore be reluctant to take positions that might be ruled as speculative by the IRS. When feeder cattle prices and/or projected costs are high relative to the distant live cattle futures prices and no profitable hedge is being offered, cattle feeders who are reluctant to accept the risk that any futures losses will be treated as speculative cannot be involved in the price discovery process. They must essentially eliminate their involvement in the futures markets and act as speculators in the cash market. The result is that they limit any impact on the price discovery process to the changing placements of cattle on feed, and they must wait for other traders who are not in the cash business to restore a market balance and, possibly, more attractive hedging opportunities.[2]

Such a situation accentuates variability in fed cattle supplies. This results in unstable and unprofitable prices to producers, unstable margins to processors, more volatile prices of beef to consumers, and the potential for higher average prices to consumers than might otherwise be possible. Exposure to risk is costly, and the costs will eventually be passed on to the consumer in the form of reduced supplies and higher beef prices. The economic viability of investments in cattle feeding and the beef sector as a whole could be threatened and the well-being of consumers impacted negatively by policy positions that keep well-informed cash businesses out of the futures markets. The net result, perhaps unintended, of current and developing IRS policy could thus be the imposition of unnecessary restraints on who can trade cattle futures and, thereby, a less efficient and less effective price discovery process than might otherwise be possible.

Literature Review

This study is concerned with the tax treatment of trade in the live cattle futures market by the IRS and the possible implications of that treatment to market efficiency and price stability. Specifically, the relationship between the trading activities of large hedgers and large speculators and the margins offered

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[2]Developing opinions of experts in the wake of the *Arkansas Best* ruling suggest the situation may be even worse than suggested here. Some observers feel that only long hedges in feeder cattle futures will now be seen as a legitimate hedge because this is the only position cattle feeders can take that is related to inventory management, the type of risk management that appears to be still legitimate under *Arkansas Best*.

by the distant live cattle futures prices will be examined. There exists only a limited body of literature in this specific field of study. There are a number of related references, however.

In an early study by Purcell, Hague and Holland (1972), selective use of the live cattle futures market is shown to stabilize feedlot incomes relative to relying only on cash markets. The authors demonstrate that routine hedging strategies can reduce risks or the variability of returns, but usually at the cost of reducing incomes below acceptable levels for most producers. The study assumed that production costs are fixed at the beginning of the feeding period. The findings of this study have since been confirmed by a number of similar analyses (Menzie and Archer, 1972; Leuthold, 1975; McCoy and Price, 1975; Erickson, 1978).

Leuthold and Mokler (1980) demonstrated that feedlot operators can use the futures markets in livestock and feedgrains to manage risk and improve profit potentials. The authors simulated a cattle feedlot typical of the Midwest for the period 1972-1976. The analysis showed that using an expected profit margin of $5.00 per cwt. and a three-way hedge (corn, fed cattle, feeder cattle), producers could average profits of $3.00 per cwt., or about $35 a head.

Hayenga, *et al.* analyzed profitable hedging opportunities for livestock producers. The authors paid specific attention to the behavior of live cattle and live hog futures during 1972-1981 and 1974-1981, respectively. The authors concluded that livestock futures markets offer frequent profitable hedging opportunities during the time the livestock are on feed. The frequency of profitability hedges was higher for the hog futures market. Neither the cattle nor the hog futures, however, were found to offer frequent profitable forward prices at the time the livestock were being purchased and placed into feeding programs.

Kenyon and Clay (1987) examined whether producers can increase average profits and reduce the variance of the profits using selective hedging in hogs. A production unit was simulated. The analysis indicated that selective hedging strategies can improve average returns and reduce the profit variance compared to cash speculative programs.

The studies dealing with the impact of specific groups of traders are fewer in number. One measure of speculation in the futures markets is the speculation index developed by Working (1960) and refined by Peck (1980, 1981). The speculation index measures the amount of speculation relative to the amount of hedging. The speculative index is:

$$T = 1 + [SS / (HL + HS)] \text{ when } HS \geq HL, \text{ or}$$
$$T = 1 + [SL / (HL + HS)] \text{ when } HL > HS$$

where SS and SL are short and long reporting (large) speculators, respectively, and HL and HS are long and short reporting (large) hedgers, respectively. Working suggested that the average speculative index is $T=1.15$. He noted that it is important to provide more speculation than is required to meet hedging needs. Working indicates that long hedging serves only partially to balance the simultaneously placed short hedging positions, and long hedging is mostly absorbed by short speculation. Peck (1981) reaffirmed Working's argument. She examined the major grain and oilseed markets during 1974-1978. According to Peck, short and long hedging markets were nearly balanced after 1972-1973. The efforts by Working and by Peck confirm the need for active participation by speculators and hedgers in the markets and in the price discovery process.

Petzel (1981) examined a unique data set developed by the USDA for the May 1925 wheat futures contract. This study uses the aggregate positions of a small group of very large traders from a period

predating speculative position limits to represent large-scale speculation. A lead-lag causality framework was used. The results indicated that there is no statistically measurable causal link between speculation and price variability.

Leuthold (1983) examined the relationship between trader behavior, price behavior, and cash-related market activities (placements of cattle, cattle inventory, supply of livestock, etc.). Leuthold hypothesized that if futures markets are speculative markets, a higher correlation between speculative activity and price movements is to be expected. This hypothesis was examined by means of simple correlation analysis. Futures market activity, the findings indicate, is more related to price level than to market movements. That is, both speculators and hedgers are attracted by higher prices. The author also suggested that speculators respond more to hedging pressures than to prices. Leuthold adopted Peck's 1981 model to analyze the relationship between price variability and speculation. The results indicated that speculator activity is positively related to price stability in futures markets.

Oellermann and Farris (1986) examined open interest held by the four largest short and long traders on a daily basis in live cattle futures markets during 1977-1981. The results suggested that any relationship between price and concentration levels is tenuous at best. For some contract months, there was some evidence of price leading, in a time context, increases in the four-firm concentration of holders of long positions.

Rowsell (1991) identified the relationship between price behavior in the live cattle futures market and changes in different traders' positions. A time interval analysis indicated that different trading groups have a significant influence on the price changes across selected time periods up to 20 days in length. Causality analysis indicated that price change leads changes in trading group activities, not vice versa. Traders tend to respond, with some time lag of one day or more, to changes in futures prices. Rowsell also found that the volatility of futures prices, in terms of daily high-low ranges, is constrained by higher levels of speculating. In terms of overall impact, Rowsell concluded that hedgers are not as sensitive to market and price developments as speculators and that speculators are playing an important role in the price discovery process. Rowsell's work provides a basis for hypothesizing that allowing cattle feeders to enter the markets to correct market imbalances would reduce the frequency and magnitude of those imbalances and improve the overall effectiveness of the cattle markets.

The Conceptual Issues

A conceptual framework is needed to help in understanding (1) the relationship between different traders' expected activities, futures price behavior, and the behavior of the margin offered by the futures price, and (2) traders' behavior for different levels of the expected margin.

Drawing on developments by Garbade (1982) and Rowsell (1991), Figure 1 presents a conceptualization of a market performance pattern. A "balance" or equilibrium position prevails at a feeding margin of zero where the forward price being offered by the distant live cattle futures equals the cost of feeding cattle. At time (A), where excess profits are being offered, or time (B), where large losses are being offered, traders would be expected to increasingly take positions that exert an influence on futures prices and thereby on the margins being offered by the market. At (A), short hedgers and short speculators would tend to sell distant live cattle futures. At (B), the behavioral patterns will show a response to the opportunities that exist when analyses suggest the market has moved away from the underlying equilibrium and is showing very significant negative margins. Long hedgers and/or speculators would tend to buy the distant live cattle futures and/or sell the nearby feeder cattle futures, and the margin would move back toward the zero baseline.

The pattern in Figure 1 implies a range around the zero-level baseline within which trading behavior would not be expected to show highly definitive patterns, the range EXPM1 to EXPM2 (where EXPM refers to "expected margin"). Speculators, for example, will typically operate with some risk/reward objective and will take positions only when the market is seen to be sufficiently out of equilibrium to merit the risk exposure associated with their entry. Too, there will be variations in the type of analyses brought to the markets and in the analytical abilities of the traders. Because information is imperfect and because analyses differ, the bounds of the trading range in the margins will be difficult to identify precisely, even with empirical analysis.

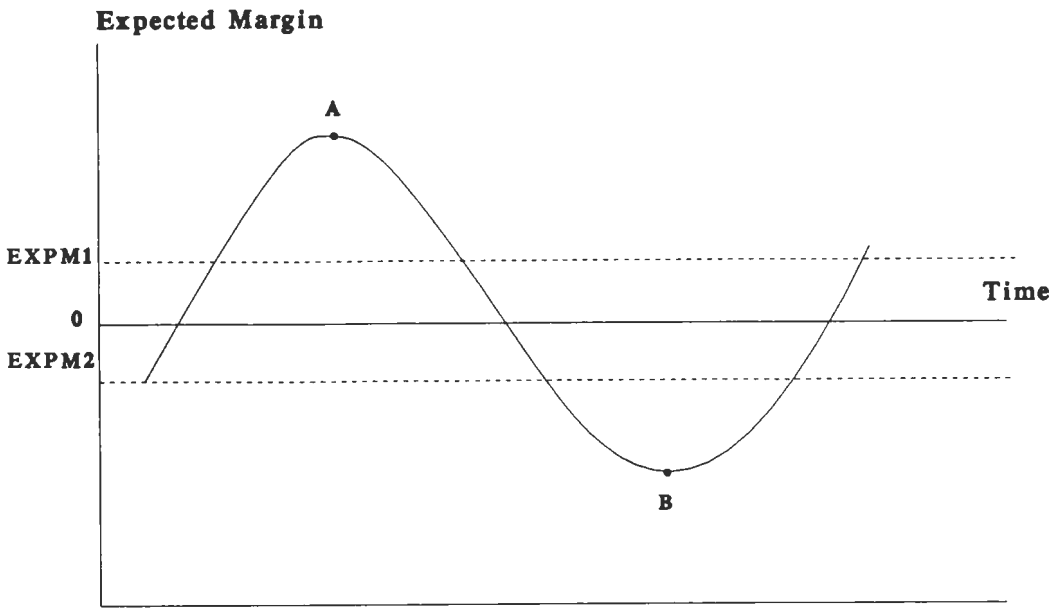

Figure 1. A Conceptualization of Market Performance Patterns

Conceptually, then, traders would be hypothesized to demonstrate identifiable and predictable trading behavior when the margins move significantly away from the zero level long-term expectation or equilibrium. Above EXPM1 in Figure 1, hedgers would be expected to place short hedges and speculators would be expected to liquidate long positions and/or place short speculative positions. Below EXPM2, hedgers would be expected to place long hedges and those holding short hedges might liquidate those positions if they are selective hedgers. Speculators would be expected to liquidate short positions and/or initiate long positions.

At a higher level of specificity, traders would be expected to show somewhat different behavioral patterns depending on whether the margins are approaching a maximum (or minimum) and are moving to extreme levels. Consider, to illustrate, the decision process of the potential short hedger who is watching the distant live cattle futures contract trade higher and, with costs now largely established, is watching the margin being offered move up toward some still unestablished maximum which reflects a "top" in the futures market. Some hedgers will opt to place short hedges on a "scale-up" basis with more

short positions being established as the margins increase. Other hedgers might wait for visible or empirical evidence that the market, and the margins, have topped before placing short positions. This latter case clearly fits the potential short hedger who waits for moving averages, an oscillator, an overbought/oversold index or some other technical indicator to demonstrate that the market has topped.

There is thus reason to hypothesize that response to positive margins will be different for positive and increasing versus positive and decreasing margins. This means that how traders respond could be different just prior to (A) in Figure 1 as compared to just after (A). Short hedges placed on a scale-up basis would occur before point A. Short hedges placed after evidence of a market top starts to emerge would occur after point (A). Similar reasoning can be developed for behavior around (B). If potential long hedgers or potential long speculators fit the pattern of traders who wait for some empirical indication, such as moving averages, of a bottom in the market before buying, then behavior will differ prior to and just after (B).

Conceptually, therefore, behavior of trading groups will be a function of whether the margins being offered by the market are positive or negative, the level of the margins or how far they are from equilibrium, and whether they are increasing or decreasing. Any empirical measures of the margins being offered by the markets should be disaggregated and analyzed accordingly. This creates possible data subsets of positive, negative, positive and increasing, positive and decreasing, negative and increasing, and negative and decreasing margins. Based on the conceptual framework developed above, Table I shows the expected signs of beta coefficients if a measure of change in margins were to be regressed on changes in the open interest held by the identified groups of large traders. Since behavior is expected to vary with the direction of change as well as the level, four subsets of the data are employed.

Table I. Expected Signs of Estimated Beta Coefficients for Margins Regressed on Changes in Trading Positions

	Trader Groups			
Margins	Long Hedge	Short Hedge	Long Spec.	Short Spec.
Positive/Increasing	(-)	(+)	(-)	(+)
Positive/Decreasing	(+)	(-)	(+)	(-)
Negative/Decreasing	(-)	(+)	(-)	(+)
Negative/Increasing	(+)	(-)	(+)	(-)

For positive and increasing margins, to illustrate, long hedgers and long speculators would be expected to start closing out or offsetting long positions as the margins get larger. They will have varying measures of the projected magnitude of margins around area (A), but long traders who are inclined to anticipate or try to predict market tops will start to decrease their positions. The correlation would thus be expected to be negative. Short hedgers and short speculators would tend to increase their positions as the margins increase, and the correlations between increasing positive margins and changes in short hedge positions would be positive. For the positive and decreasing margins, traders holding long positions and who have waited to see evidence (technical and otherwise) of a market top will now start

to offset long positions. Declines in margins will be associated with declines in open positions and the correlation will be positive. For short hedgers and short speculators, of course, the correlations will be negative. The market has shown evidence of a top, the margins start to decrease, and the hedgers and speculators move to increase their short positions.

In expanding on the justification for the expected signs, the negative margins are perhaps most interesting for illustrative purposes. When negative margins are decreasing, long hedgers and long speculators would be expected to initiate or add to long positions and this means the beta coefficient will be, theoretically, negative. But the caveat introduced above is important. If both groups of potential buyers wait for some threshold level, some risk/reward ratio, or some other measure of the emerging disequilibrium, and/or confirmation of a price "bottom" before taking action, then statistically significant and theoretically consistent relationships may not emerge until the extremes near (B) in Figure 1 are approached. If patterns of differentiated behavior are in fact present, the expected signs in Table I may evolve only when the data are disaggregated still further and a margin interval near the extreme negative levels is identified and brought into the analysis. Margin intervals were, in fact, employed in the analysis, and the results shown later confirm the importance of this refinement of the margin data.

In presenting conceptually the possible improvements to market performance if well-informed cattle feeders were involved in all phases of the price discovery process, it is useful to look at the frequency, amplitude, and duration of the imbalances of disequilibria that do emerge. Figure 2 shows the margins offered to a typical large Southern Plains cattle feeder during the 1980s and into the early 1990s, the situation shown in Purcell (1992, p. 5). Costs are based on the *variable* costs of a typical feedlot for that region as published in the USDA's *Livestock & Poultry Situation and Outlook Reports*. The margins were calculated using the midpoint of the range of the appropriate distant live cattle futures contract during the month the feeding program was to be started. The plot shows quite clearly that the margins fluctuate a great deal around the zero-margin baseline. Late in the 1980s, there was a period of 13 consecutive months during which this particular measure of the discovered price in the distant futures contract did not cover variable costs of feeding.

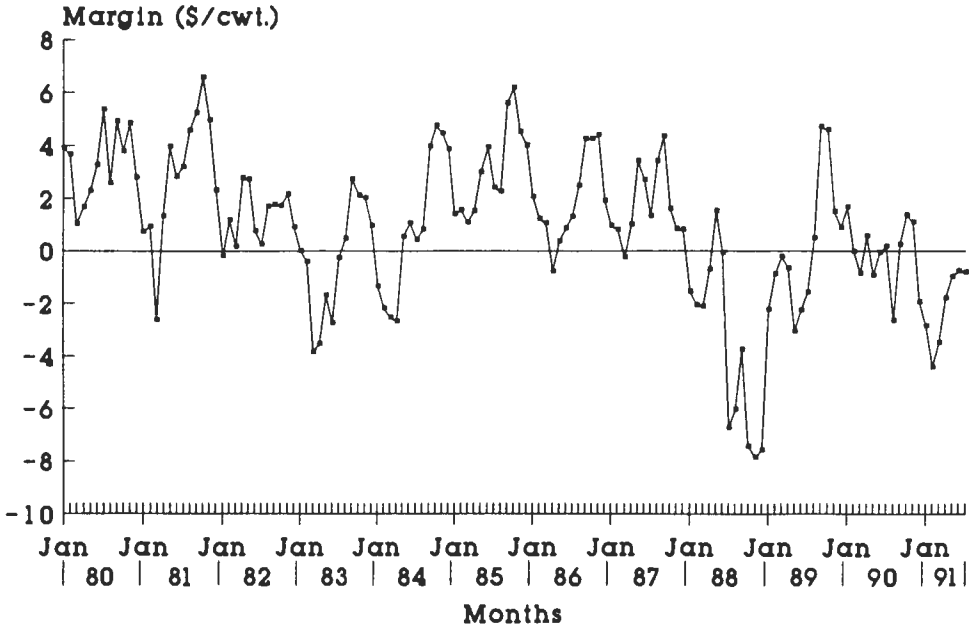

Figure 2. Margins Over Variable Cost Offered by the Midpoint of Distant Live Cattle Futures, Southern Plains Custom Feeding Operations, 1980-1991

Including fixed costs would shift the zero line up, of course, and the vast majority of all the margins offered by the distant live cattle futures would then be negative. Even if a particular feedlot could reduce costs by $1.00 to $2.00 per hundredweight relative to these USDA-calculated levels, the margins would show the same variability and would typically be negative when all costs are included.

A number of margin/costs alternatives were examined, but the midpoint of the price range for the distant live cattle contract and the variable costs of production were used in calculating the margins in the plot in Figure 2. There is excess capacity in the feeding industry with total cattle numbers down from more than 132 million head in 1975 to the 100 million head area in recent years. Rational decision makers will feed cattle so long as variable costs are covered. Too, there is always the chance that feeding as a cash market speculator will turn out to be profitable if the entire price structure moves higher. This possibility is often used as justification by cattle feeders who continue to place and feed cattle, even when only variable costs are being covered by prevailing futures prices, and who hope the price levels will get better during the feeding period.

If the amplitude and/or duration of the departures from equilibrium could be reduced, market performance would be improved. Figure 3 shows the conceptual possibilities. Reducing the magnitude or duration of either the excess profits or the losses would reduce the supply-side responses and subsequent reactions in margins that are primarily the result of moves in the discovered prices for distant live cattle futures. The type of extreme fluctuations that can emerge was noted as recently as 1991. A price decline for fed cattle from above $80 in the first half of the year to just above $60 in mid-year prompted a dramatic decline in placements of cattle into feedlots during calendar quarters 2 and 3. The economic well-being of producers and feeders was threatened, packers' margins were volatile and often negative, packers' return on investment was impacted negatively, and consumers were exposed to more product and price variability and eventually to higher prices than might have been possible in a more

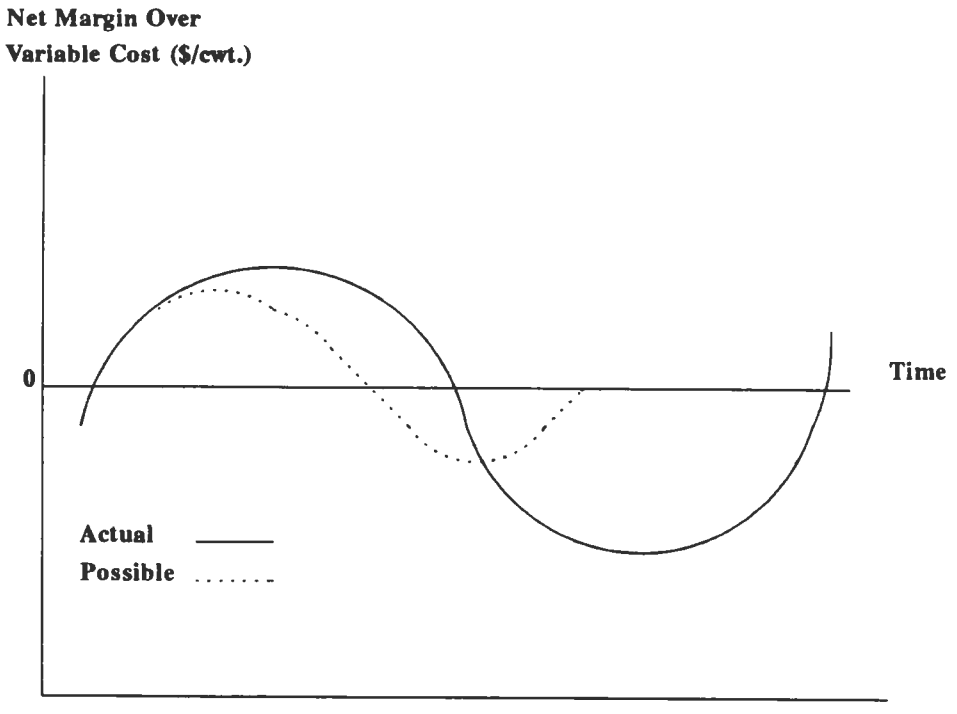

Figure 3. Presentation of Actual vs. Possible Market Performance Patterns

stable marketplace. Cattle feeders responded to the large negative feeding margins by reducing placements, but it took months for the start of any move back toward equilibrium. Cattle feeders were apparently not active participants in the price discovery process in the futures complex that moved the feeding margins being offered away from extreme negative levels.

It is thus hypothesized that a policy change that would allow cattle feeders to be more fully involved in the price discovery process would improve the efficiency of the price discovery process, stabilize the margins offered in the cattle feeding complex, and improve the economic performance of the entire sector. Since cattle feeders have been discouraged from that participation, there is no empirical data base that demonstrates precisely how expanded activities by cattle feeders would influence price discovery. There is, however, a conceptual parallel between the expected pattern of behavior of large reporting speculators and cattle feeders. Both would be motivated to respond to disequilibrium positions in the markets and to take market positions that would be held across one or more trading days. The specific objectives of the two groups would differ. Speculators seek profits from the return of the market to an equilibrium. Cattle feeders would have a profit motivation, but would also be interested in seeing a market balance restored to improve the opportunities in their cash business. When only large negative margins are being offered, for example, speculators would tend to buy distant live cattle futures and/or sell nearby feeder cattle futures and seek to profit from moves in the margin back toward zero or to even a positive level. Cattle feeders, when the margins are extreme negatives, might prefer to leave pens empty and take similar positions--long in the distant live cattle futures and short in the nearby feeder cattle futures. If the margins improve, cattle feeders could benefit in the form of revenue to cover fixed costs they must absorb since they could not rationally participate in feeding cattle, and they would also benefit in the form of better forward pricing opportunities and the opportunity to get back into their primary business of feeding stable numbers of cattle.

Since feedlots hold high-quality, proprietary information on costs, gains, and cattle performance, their more active participation might be seen as a necessary condition for the cattle futures markets to reach the strong-form efficiency levels, discussed in the research literature, where discovered prices reflect both publicly and privately held information. Testing that implicit hypothesis is beyond the scope of this investigation, however. The first step is to see whether it is hedgers or speculators, or both, that are active at the "turning points" in the markets and to thereby establish a base for inferences on what impact cattle feeders might have on price discovery processes if they were allowed or encouraged via changes in policy to get actively involved in the price discovery process.

Margin Calculation

To examine the response in traders' positions to margins being offered by live cattle futures price, expected margins over variable costs for 1983-87[3] were computed. All production costs were assumed to be known and fixed at the time of placement of feeder cattle on feed. Feedlots were assumed to operate a four-month feeding program which involves feeding feeder steers weighing 750 pounds into fed steers weighing 1,150 pounds which are then sold with a 4 percent shrink, a "pay weight" of 11.04 hundredweight. This scenario represents the typical Great Plains (Texas-Oklahoma-New Mexico-Kansas) custom cattle feeding program.

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[3]The time period for the analysis was dictated by the availability of a unique and coded data set provided by the Commodity Futures Trading Commission in 1988. Large trader data (trader holding 100 contracts or more) were coded to prevent identity of traders and provided to Rowsell for his analysis of the impact of different traders in the markets. The data provided the unique opportunity in this analysis.

Daily futures prices for live cattle were obtained from either the *Chicago Mercantile Exchange Year Book* or the *Wall Street Journal*. Cash feeder-cattle prices were weekly average prices for 700- to 800-pound Choice feeder steers at Amarillo. This series was obtained from weekly issues of the USDA's *Livestock, Meat and Wool Market News*.

The feed ration used for each animal was 43 bushels of corn, 0.16 tons of soybean meal, and 640 pounds of alfalfa hay. Weekly corn and soybean meal prices were obtained by averaging the midpoints of daily price ranges. Alfalfa hay prices were held constant during each month, then updated monthly.

The expected margins (EXPM) over variable costs on a per hundredweight basis were calculated weekly using the following formula:

$$EXPM = [FLC4*11.04 - CAFC*7.5 - (CACORN*43 + CASM*0.16 + CAHAY) - \text{Other Variable Costs} - TB6MN*(\text{Feeder Cattle and Feed Prices})] / 11.04^{4}$$

where:

FLC4	=	Distant live cattle futures price for each Wednesday, $/cwt.;
CAFC	=	Weekly average feeder cattle price, $/cwt.;
CACORN	=	Weekly average cash corn price, $/bu.;
CASM	=	Weekly average soybean meal price, $/ton;
CAHAY	=	Monthly average cash alfalfa hay cost plus $30/ton handling and transportation expenses, $/head; and
TB6MN	=	U.S. Treasury Bills' yields on 6-month issue per annum, percent.

This formula subtracts the actual variable costs from the expected gross revenue in the numerator to estimate a margin per head. The result, when divided by the sale or pay weight of 11.04 hundredweight, is the expected margin per hundredweight. In order to approximate capital charges, an interest rate was multiplied by the actual costs of the feeder animal and the feed. This rate was an annual cost of borrowing capital, adjusted for time. Commission fees, interest on margin money, and futures transaction costs were not included in the costs of the feeding operation.

The trader positions represented the grouped trading activities of large (reporting) hedgers and speculators. These large traders are responsible for reporting their trading records to the Commodity Futures Trading Commission (CFTC). Each hedging and speculative account reported to the CFTC was divided into long and short positions. These data were used to construct several variables measuring trading activity for each group. For the analysis reported here, the data employed were open positions by trading group relative to open interest for all live cattle futures contracts being traded on each Wednesday.[5]

The choice of which contract to use to match expected margins is always problematic. The contracts for live cattle futures expire every other month. Live cattle contracts on the Chicago Mercantile Exchange are traded for the months of February, April, June, August, October and December. The

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[4]Sale weight is assumed to be 1,104 pounds (1,150 less 4 percent shrink).

[5]Weekly averages were also analyzed, but the results were not significantly different. Using a mid-week measure as representative of the week simplified the analysis with no significant sacrifice of relevancy and avoided the need for aggregation.

pertinent futures contracts, by time of placement, were selected so that the cattle would always be sold prior to the closing dates of the particular futures contract.

The Analysis

Initially, correlation analysis was used to confirm whether trader behavior is in fact related to changes in the margins offered by the distant live cattle futures price in ways consistent with the conceptual reasoning presented earlier. Changes in the expected margin and changes in positions held (weekly first differences for both) by the various categories of traders were examined. Lagged impacts of changes in the expected margin were examined by analyzing correlations involving the differenced margin variable lagged up to 5 weeks. Correlation analysis was also used to provide insight into the existence of a possible "trading range," a range around zero, within which no highly specific patterns of trading behavior would be expected. Conceptually, as noted earlier, speculators or hedgers would tend to wait to act until their price expectations are significantly different from the current distant futures prices, as reflected in the margin being offered by the market, before taking action.

The correlation analysis was conducted on the complete data set as well as disaggregated subsets. Table II records the correlations between first differences of the trading groups' open positions and differences in the margin lagged up to 5 weeks for positive and negative margins, positive and increasing, positive and decreasing, negative and increasing, and for the negative and decreasing margins. Statistical correlations of differenced data generally do not show highly significant relationships. Any correlation with a probability or P-value less than 0.20 is shown. The letter "H" refers to hedgers, the letter "S" to speculators, CHLONG refers to change in long positions, and CHSHORT refers to change in short positions.[6]

The correlations suggest that changes in the large speculators' positions are, in fact, associated with changes in the margins being offered by the markets. This is especially true when the margins are negative. There exists statistically significant correlations with changes in trader group positions for both concurrent and lagged changes in the price-related margins.

The signs on the statistically significant correlations are generally consistent with the conceptualizations of how traders would be expected to behave, especially near the extremes. When the margins are positive and increasing, for example, both short hedgers and short speculators tend to reduce their positions given the negative correlations of -0.530 and -0.297 respectively. Such liquidation will tend to increase discovered futures prices and the margins. As the changes in the still positive margins turn negative, at the extremes, long speculators reduce their long positions which tends to help move the margin back toward zero. Positive correlations (0.563, 0.536) are shown for both the 3- and 4-week lags in the positive but decreasing margins and are highly significant with a P-level less than .02. Short speculators are also a factor. As the market turns and the still positive margins start to decline, with a 3-week time lag, the short speculators increase their positions. The correlation coefficient is negative, relatively large at -0.500, and it is highly significant. This finding is consistent with the hypothesized behavior pattern that suggests some short speculators and short hedgers might wait for confirmation of a top in the market to place short positions.

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[6]The CHSHORTH is calculated by subtracting short hedge positions in week t-1 from week t. The CH1EXPM is calculated the same way. Thus, any significant correlation between CHSHORTH and CH1EXPM suggests the short hedge positions are associated with changes in the margins within the same 5-day period. The CH2EXPM is calculated by subtracting the margin in week t-2 from week t, the CH3EXPM by subtracting the margin in week t-3 from week t, etc.

Table II. **Correlation Matrix for Changes in EXPM and Trader Positions By Level, Direction of the Margins[a,b]**

	CHLONGH	CHSHORTH	CHLONGS	CHSHORTS
Over the subset of Positive EXPMs:				
CH1EXPM		-0.38062 0.0032		
CH2EXPM		-0.21606 0.1033		
CH3EXPM				
CH4EXPM				
CH5EXPM				
Over the Subset of Positive/Increasing EXPMs:				
CH1EXPM		-0.53018 0.0005	-0.24423 0.1340	-0.29739 0.0660
CH2EXPM		-0.28023 0.0840		
CH3EXPM				
CH4EXPM				
CH5EXPM				
Over the Subset of Positive/Decreasing EXPMs:				
CH1EXPM				
CH2EXPM				
CH3EXPM		0.56277 0.0121	0.56371 0.0119	-0.50012 0.0292
CH4EXPM		0.50715 0.0267	0.53659 0.0179	
CH5EXPM		0.40384 0.0864	0.35532 0.1355	
Over the Subset of Negative EXPMs:				
CH1EXPM			0.27521 0.0002	-0.27533 0.0002
CH2EXPM		0.16672 0.0253	0.24815 0.0008	-0.45157 0.0001
CH3EXPM		0.14064 0.0604	0.20961 0.0049	-0.36218 0.0001
CH4EXPM		0.14141 0.0597	0.21792 0.0035	-0.31889 0.0001
CH5EXPM			0.17076 0.0231	-0.20922 0.0052

Table II. Correlation Matrix for Changes in EXPM and Trader Positions By Level, Direction of the Margins[a,b] (Continued)

	CHLONGH	CHSHORTH	CHLONGS	CHSHORTS
Over the Subset of Negative/Increasing EXPMs:				
CH1EXPM				-0.18154 0.1005
CH2EXPM		0.20079 0.0687	0.17729 0.1088	-0.43251 0.0001
CH3EXPM		0.17731 0.1110		-0.36568 0.0007
CH4EXPM		0.24767 0.0258		-0.34267 0.0017
CH5EXPM				-0.21055 0.0608
Over the Subset of Negative/Decreasing EXPMs:				
CH1EXPM			0.26134 0.0090	
CH2EXPM		0.19796 0.0519	0.14584 0.1540	-0.37850 0.0001
CH3EXPM		0.14756 0.1492	0.16958 0.0968	-0.27029 0.0074
CH4EXPM			0.17500 0.0864	-0.22141 0.0293
CH5EXPM			0.15403 0.1320	

[a]In the notations, "1" refers to the change in the margin from week t-1 to week t. Thus, CH2EXPM refers to the change in the margin lagged one week and is calculated by subtracting the margin in week t-2 from the margin in week t, etc.

[b]The P-value is shown below the correlation coefficients.

When the margins are negative, the identifiable patterns of behavior by the speculators are even more pronounced. So long as the margins are still decreasing, the long speculators reduce their positions as indicated by the consistently positive correlations. With 2- to 4-week lags, short speculators continue to increase their positions. Eventually, however, the margins reach some "threshold" and the speculators start to respond. The short speculators move aggressively to reduce their positions in association with increasing but still negative margins. The 2-week lag shows a correlation of -0.423 and a P-value of 0.0001. Lags of 3 to 5 weeks also show negative correlations and are highly significant in a statistical context. The long speculators concurrently start to increase their positions, and the move back toward equilibrium is underway.

Hedgers are also a factor. With 2- and 3-week lags, short hedgers start to buy back or lift their hedges while the negative margins are still declining. The correlation for the 2-week lag is relatively small at .1979, but it is positive and shows a P-value of .0519. As the still negative margins start to increase, short hedgers start to add to their short positions with lags of 2 to 4 weeks. This result would not be expected and might represent hedging designed to protect the financial position from disaster as the market stages a brief rally. There are no statistically significant actions by long hedgers. Thus, the net impact of hedgers around the negative extremes is not clear and is, arguably, less important to market performance than that of the speculators.

More sophisticated analysis and/or further disaggregation of the data set were needed to identify more specific trader group behavior and to identify the "thresholds" or the ends of the "trading range" around zero discussed earlier. The margin data were divided into $1 and $2 intervals within the broader division into positive and negative subsets. The range of the margins was from -$8.18 to +$4.11 per hundredweight. Correlations between changes in trader positions and changes in the margins, by intervals, started to identify the zones within which action by traders, especially speculators, start to turn the market. For example, for positive margins above $3.00 per hundredweight, the correlations for long speculative activity in the same week and lagged 1 week were negative and statistically significant. The coefficients were relatively large at -0.752 and -0.843 respectively. Long speculators thus start to reduce long positions as the margins approach positive extremes. With a time lag of 2 weeks, short speculators start to increase their short positions as the margins continue to increase. The correlation is a strong 0.744 with a P-value of 0.1488. Action by speculators appears to dominate the price discovery process as positive extremes are approached. Analysis of the margin intervals shows that none of the changes in hedging positions, long or short, show significant correlations as the positive margins get larger.

On the negative end of the continuum, long hedge position changes were negatively correlated with margin changes for the range of -$4.00 to the minimum level of the margin, especially in the -$4.00 to -$6.00 interval. Long hedges were thus being established with reductions in margins at those rather extreme negative levels. Short hedgers reduced positions in association with positive changes in the still negative margins and thus helped to move the margins back up toward zero. This result is consistent with the expected behavior of short hedgers who lift short hedges after some evidence of a market bottom appears. Speculators again play a very important role. Short speculative positions are reduced in association with positive changes in the still-negative margins. Long speculators buy the market aggressively in the -$4.00 to -$6.00 range as the still negative margins increase.

Overall, it appears long hedgers establishing positions, short hedgers covering positions, speculators starting to buy back short positions, and aggressive buying by long speculators "turn" the market at the extreme and negative margin levels. Any inference that the -$4.00 margin is something of a threshold is reinforced by examination of the correlations for the -$3.00 to -$4.00 subset of margins. There were no correlation coefficients in this subset with a P-value of less than 0.20 for activity by hedgers. Speculators were still active in a statistical context in this range, however. Below -$4.00, both speculators and hedgers were involved in turning the market.

A regression model was employed to further explain variation in the expected margins being offered by live cattle futures. The simple correlations are revealing, but the regression format allows examination of the impact of each trader group in the presence of activity by the other trader groups. The model was:

CHEXPM = f(CHLONGH, CHSHORTH, CHLONGS, CHSHORTS)

where:

CHEXPM = The difference in expected margins over variable costs offered by distant live cattle futures prices ($ per cwt.);

CHLONGH = The difference in total long positions for commercial purpose (hedging) held by large traders for all live cattle futures contracts traded each Wednesday (actual positions);

CHSHORTH = The difference in total short positions for hedging purposes held by large traders for all live cattle futures contracts traded each Wednesday (actual positions);

CHLONGS = The difference in total long positions for non-commercial purposes (speculating) held by large traders for all live cattle futures contracts traded each Wednesday (actual positions); and

CHSHORTS = The difference in total short positions for speculative non-commercial purposes held by large traders for all live cattle futures contracts traded each Wednesday (actual positions).

The regression analysis was conducted first on the entire data set. Then, sub-samples of the data were selected based on whether the expected margin was positive, positive/increasing, positive/decreasing, negative, negative/increasing or negative/decreasing and these sub-samples were analyzed. Also, drawing on the results of the correlation analysis, the complete data set was decomposed into two subsets which represent upper and lower extremes outside of a "trading range" where no definitive patterns of behavior would be expected. In establishing the possible trading ranges, the following criteria were used: (1) expected margins belonging to a range within which there is a relatively significant correlation between CHEXPM and changes in various trader positions (as identified in the correlation analysis), and (2) expected margins belonging to a range which is outside of a 68 percent confidence interval of the mean of the margins.

Table III shows coefficient estimates. The results presented are the functions estimated over the complete data set plus the subsets discussed earlier. Given the way the data were entered ($ per cwt. for margin, actual positions for changes in open interest which could be in the 100s or 1,000s from week to week), the coefficients are not large in absolute terms. To illustrate, when the CHEXPM dependent variable is negative and increasing, the coefficient of -.00023 suggests a 1,000 decrease in short speculative open positions (CHSHORTS) would bring a $.23 per cwt. increase in the margin, other things equal. Short speculators held as many as 19,228 open contracts during the data period, with the mean level in excess of 7,768. One standard deviation was 3,395 contracts, so a 1,000 unit change across a 5-day trading period would not be improbable.

More importantly, perhaps, the estimated parameter signs of the four trading groups accord well with theoretical expectations. The variables are not always statistically significant, however. A review of the broad division into positive and negative margins suggests trading group behavior has a slightly greater impact on the behavior of negative margins. Signs on the beta coefficients are usually consistent for both subsets but the t-ratios are generally larger for the negative margins. R^2 measures are often low with differenced data, but the adjusted R^2 for the positive subset is slightly lower than for the negative subset and the F-value for the regression on positive margins is much smaller. There is some basis, therefore, for a conclusion that both hedgers and speculators are more responsive to moves in the market when the margins being offered are negative.[7]

The further division of the data facilitates interpretation of the estimated coefficients. Focusing on the positive/increasing and positive/decreasing subsets, the estimated coefficients appear to be consistent with theoretical expectations and the results of the correlation analysis. Short hedgers and speculators are liquidating their positions as the margins increase relative to the zero baseline, and the short hedgers liquidate positions at a statistically significant rate, t-ratio = -2.978. When a "threshold"

[7]There were more negative observations (182) than positive observations (58), and this difference helps to explain the difference in the statistical measures such as R^2.

Table III. Changes in Expected Margin Regressed on Changes in Positions over Margin Subsets

Dependent Variable: Change in Expected Margin (CHEXPM)						
All	**Positive**	**Positive/ Increasing**	**Positive/ Decreasing**	**Negative**	**Negative/ Increasing**	**Negative/ Decreasing**
Constant:						
.03393 (.359)*	.64728 (2.871)	1.55208 (6.930)	-.93685 (-4.024)	-.15959 (-1.531)	.95247 (7.926)	-1.11341 (-9.355)
Lagged CHEXPM (LGCHEXPM):						
-.26206 (-4.351)	-.20011 (-1.467)	-.03154 (-.226)	-.16054 (-1.376)	-.32336 (-4.943)	-.21193 (-2.737)	-.09614 (-1.467)
Change in Long Hedging Positions (CHLONGH):						
.00016 (2.297)	.00025 (1.875)	.00002 (.150)	.00005 (.407)	.00011 (1.365)	.000046 (.525)	.00013 (1.580)
Change in Short Hedging Positions (CHSHORTH):						
-.00019 (-3.105)	-.00040 (-3.551)	-.00029 (-2.978)	-.00018 (-1.187)	-.00008 (-1.205)	.000046 (.633)	-.00004 (-.611)
Change in Long Speculative Positions (CHLONGS):						
.00027 (5.312)	.00028 (2.157)	.00006 (.566)	.00016 (1.053)	.00021 (3.806)	-.000042 (-.639)	-.00015 (-2.677)
Change in Short Speculative Positions (CHSHORTS):						
-.00039 (-4.878)	-.00021 (-1.284)	-.00019 (-1.280)	-.00009 (-.463)	-.00045 (-5.038)	-.00023 (-2.587)	-.00019 (-1.847)
Regression Statistics:						
F Value:						
14.465	4.368	3.104	.970	12.285	2.359	2.880
P-Value for F:						
.0001	.0021	.0210	.4712	.0001	.0479	.0185
Adjusted R^2						
.221	.228	.216	-.008	.239	.076	.089
Degrees of Freedom:						
237.000	57.000	38.000	18.000	179.000	82.000	96.000

*Numbers in ( )s are t-ratios.

is reached, however, activity around that conceptually established upper end of a trading range turns the prices being discovered in the distant live cattle futures, the market tops, and the margins start to decrease. The negative coefficients on CHSHORTH and CHSHORTS indicate that increasing short hedge and short speculative positions are a force in prompting decreases (negative first differences) in the still positive margins, in moving the market back toward equilibrium, and away from what could be excessive profit margins. The negative signs are consistent with actions that would move the markets back toward equilibrium, but the positive/decreasing subset is a relatively small data set (19 observations) and the coefficient estimates are not highly significant. Only the coefficient on CHSHORTH has a t-ratio greater than 1.1.

For positive margins, when the market is moving out of balance to extreme levels, it therefore appears short hedgers might be the most important force in restoring a balance. This is not surprising. Forward prices are being offered that are above variable costs, and profit maximizing decision makers who have any aversion to risk would be inclined to start to establish short hedges as the margins reach levels they feel will be at or near a maximum.

The patterns of behavior for the negative margins mirror those for the positive subset, but the speculators are more important. As the negative margins decrease toward extreme levels, long speculators decrease their positions given the positive and highly significant coefficient of 0.00015. Long hedgers do the same, but the coefficient estimate is less significant in a statistical sense. Short speculators are still adding to their positions, and the t-ratio of -1.847 would be statistically significant at the .10 level. All these actions would tend to move the market discovered price down and lead to still more negative margins given that costs are largely fixed in the very short run.

At some more extreme level, however, the margins have moved to negative levels outside the implicit "trading range," the market bottoms, and the margins turn higher. Buying by short speculators to liquidate short positions appears to be the dominant behavioral pattern at this turning point. The coefficient of -0.00023 is relatively large given the way the data are coded, and is highly significant with a t-ratio of -2.587. There is no evidence that hedgers are active in recognizing the developing and extreme imbalances and in turning the market back toward the zero-base equilibrium margin. At the negative extremes, it appears the large speculators are the dominant force in starting the correction of market imbalances. This finding parallels and confirms the results of the correlation analysis.

The data set was also analyzed for sub-samples corresponding to upper and lower thresholds that define a possible trading range. As noted earlier, two criteria were used to generate data subsets. First, sub-samples were selected based on the results of the correlation analysis. According to the correlation analysis, there was some basis for upper and lower ranges from $2.00 per cwt. to maximum value of the margin and from -$3.00 per cwt. to the minimum value of the margin. It was above $2.00 that actions by hedgers and speculators were associated with moves by the margins back toward zero. Speculators showed statistically significant reactions to negative margins from -$3.00 to the minimum level, and hedgers also tended to be involved for levels below -$4.00.

The second criterion for selection was the ranges outside a 68 percent confidence interval of the mean margin. The criterion of a 68 percent confidence level generated upper and lower segments from $0.67 per cwt. to the maximum margin and from -$4.28 per cwt. to the minimum margin. The coefficient estimates from the models for the margin ranges are reported in Table IV. These regression results are generally consistent with those of the correlation analysis and the regression results in the previous section. In the $2.00-to-maximum range, short speculators join short hedgers to exert a significant influence on the market as it turns. The negative coefficients on CHSHORTH and CHSHORTS indicate both hedgers and speculators are selling the market as it tops and the margins turn

Table IV. **Changes in Expected Margin Regressed on Changes in Positions over Upper and Lower Ranges of the Margin**

Dependent	Change in Expected Margin (CHEXPM)		
Criterion (1): Upper Range $2 to Max.	**Lower Range Min. to -$3**	**Criterion (2): Upper Range $0.67 to Max.**	**Lower Range Min. to -$4.28**
Constant:			
1.32751 (3.943)*	-.38055 (-2.050)	.81441 (2.918)	-.60763 (-2.080)
Lagged CHEXPM (LGCHEXPM):			
-.04851 (-.231)	-.20771 (-1.745)	-.22653 (-1.337)	-.19364 (-.969)
Change in Long Hedging Positions (CHLONGH):			
.00017 (.945)	-.00007 (-.486)	.00026 (1.376)	-.00007 (-.307)
Change in Short Hedging Positions (CHSHORTH):			
-.00030 (-1.962)	-.00009 (-.923)	-.00036 (-2.864)	.00001 (.090)
Change in Long Speculative Positions (CHLONGS):			
.00020 (.845)	.00027 (3.218)	.00023 (1.473)	.00030 (2.257)
Change in Short Speculative Positions (CHSHORTS):			
-.00061 (-2.461)	-.00027 (-1.725)	-.00026 (-1.230)	-.00011 (-.458)
Regression Statistics:			
F Value:			
2.530	4.466	3.123	1.851
P-Value for F:			
.0871	.0015	.0196	.1292
R^2:			
.513	.255	.308	.213
Adjusted R^2:			
.310	.198	.209	.098
Degrees of Freedom:			
17.000	70.000	40.000	39.000

*Numbers in ( )s are t-ratios.

back toward an equilibrium. The coefficient on CHSHORTS is larger in absolute value than the one on CHSHORTH and the t-ratio is larger, suggesting that short speculators add significantly to the activities of short hedgers in turning the market. This was not apparent when the analysis was restricted to only positive/increasing and positive/decreasing data subsets. For this margin range, the unadjusted R^2 is 0.513, a large level for the small subset of data and for differenced data. Given the emphasis in the entire analysis on speculative trading patterns, this result serves to confirm the hypothesis that speculative behavior is very important in turning the markets and starting the restoring of an equilibrium.

At the other end of the continuum, in the -$3.00-to-minimum range, speculative activity dominates the correction process. The positive and highly significant coefficient on CHLONGS confirms that long speculators are active in buying the market at the extremes and, thereby, pushing the margin back up toward zero. Short speculators buy to liquidate short positions at the extremes, and the number of open short speculative positions decreases as the negative and extreme margins turn and start to increase. Neither the long nor the short hedgers are significant factors at the extreme negative margins. The t-ratios for both groups are below 1.0 in absolute value.

For the $0.67-to-maximum criterion based on the statistical confidence interval, the signs are generally consistent but the statistical significance varies compared to the smaller $2.00-to-maximum range. Short speculators are relatively less important and short hedgers are relatively more important in this broader price range, but those findings are consistent with theoretical expectations. Hedgers might be more inclined to sell the market on those brief surges that carry the margin just above zero, to perhaps $1.00, than would the speculator. As discussed earlier, their objectives are somewhat different. The speculator is looking for profit potential, not price risk management, and a market that appears to be $1.00 "out-of-balance"" is less attractive than a market that is $3.00-4.00 "out-of-balance".

The -$4.28-to-minimum range identified by the 68 percent confidence interval shows results very similar to the -$3.00-to-minimum range. The coefficient on CHLONGS is the only highly significant coefficient, and it is positive and relatively large at 0.00030. A 1,000 week-to-week increase in the long positions held by speculators would prompt a $.30 increase in the margins. Long speculators are again seen to buy the extremes and are associated with changes in the negative margins turning to the positive side and in moving the offered margins back up toward zero.

Conclusions and Implications

Cattle feeders have direct access to high-quality and timely information on cattle feeding. Feeding costs, gains, performance of the cattle, impact of weather on performance, and the relationship between degree of "finish" or selling weights and carcass-level performance are immediately accessible to the cattle feeder. In addition, cattle feeders are in a position to use this proprietary information without time delay. Cattle feeders are therefore in a position to inject the influence of very current and specific information on costs of feeding, number of cattle on feed, when cattle will be ready for market, etc. into the price discovery process for cattle futures.

Well-informed cattle feeders can establish forward prices by hedging their slaughter cattle when profitable prices are being offered. Selling the distant futures to place short hedges helps to prevent the market from showing extreme positive margins and to keep it around the underlying equilibrium. Also, since they have a strong business-related interest in the markets, cattle feeders could act to minimize the duration and magnitude of negative market imbalances when no profitable hedges are being offered or can be reasonably anticipated. Instead of selling the distant live cattle futures, they would be motivated to buy that distant contract and/or sell the nearby feeder cattle futures. Such actions would help the markets to restore a balance or an equilibrium. At the extreme negative margins, the analysis shows that

large speculators are the primary catalysts in turning the market back toward equilibrium. If cattle feeders were allowed to participate, they would be motivated to take positions comparable to those of the large speculators and should be even more effective given their immediate access to high quality and proprietary information.

In spite of the immediate availability of the information and the readily apparent incentives to participate in the price discovery process, cattle feeders are effectively denied the opportunity to get involved in the markets to correct market imbalances and disequilibrium situations. This is true especially in those instances when truly extreme negative margins are being offered and feeders cannot feasibly enter the markets as short hedgers. The obstacles to participation, of course, arise from the tax treatment of what would be seen as speculative trades by the IRS. If feeders avoid the risk of having losses in the futures market being denied for tax purposes, cattle feeders can exert influence only by reducing the number of cattle on feed and waiting for that information to be registered in the discovered price by other participants in the price discovery process. This indirect process of adjustment can be very slow. As recently as 1991, extreme negative margins appeared near mid-year and monthly placements in the seven major feeding states were down 21.1, 15.0, 16.3, and 17.5 percent relative to year-earlier levels from June through September. Such supply-side distortions impose economic costs on everyone in the system from producer to consumer.

This research has shown that there exist relationships between activities of groups of traders and the expected margins offered by the futures markets. Given that discovered prices and the expected margins offered by the prices are positively correlated, the results are consistent with past research. Rowsell, for example, found that the activities of identifiable trading groups do in fact provide significant explanatory power for price discovery in the live cattle futures markets.

The conclusion drawn from these results is that actions by hedgers and arbitrage and profit motivated activity by speculators will eventually correct any and all market imbalances. Regression models to explain margins being offered by futures prices as a function of trader behavior confirm this conclusion. When the feeding margins being offered are unusually positive or unusually negative, speculative activity in particular exerts a constraining influence on the futures prices and on the expected margins offered by the futures prices, and turns the market back toward an equilibrium position.

The analysis also indicates that speculative activity is somewhat more sensitive to the margin changes when negative margins are present than when positive margins are being offered. For hedgers, the opposite result prevails. These findings are perhaps predictable. When the markets cannot provide producers with profits through hedging via short hedges, hedgers are not significantly involved in the price discovery process. Long hedgers are restricted primarily to packers, and surveys have shown packers are not heavily involved in the markets. Cattle producers are being forced to speculate in the corresponding cash markets rather than take positions in futures to move the market back toward equilibrium, positions that what would be seen as speculative positions given prevailing IRS policy. Speculators eventually turn the negative margins back toward zero, but only after risk/reward thresholds are met at price/margin levels that can be economically damaging to the cattle feeder who has been forced to function as a cash market speculator in a market that is far from equilibrium levels.

If cattle feeders were able to participate in the price discovery process with trading objectives similar to those of large speculators and by taking positions that might be more sensitive to margin levels than are speculators' actions, they would tend to establish positions that would push the market showing negative margins back toward equilibrium positions more quickly. It could be rationally argued that cattle feeders will be able to recognize the departure from equilibrium more quickly than speculators as the feeding margins become more negative and that cattle feeders would in fact, therefore, engage in more

sensitive trading activities. Cattle feeders have immediate access to proprietary information. When extreme negative margins are being offered and cash cattle programs do not appear economically viable, cattle feeders would be highly motivated to sell nearby feeder cattle futures and/or buy the distant live cattle futures if they could be fully involved in the price discovery process. Unlike the speculator, cattle feeders have an investment in a commodity-based cash business to protect. These actions by cattle feeders would tend to block continued moves to negative margins and could decrease the frequency and/or the magnitude of any pattern of negative margins.

Prolonged imbalances between feeder cattle costs and the pricing opportunities offered by live cattle futures can be seen as evidence of inefficient markets. But that view is narrow and perhaps overly restrictive. As prices are being discovered, the quality of the information base and the effectiveness of the traders as market analysts are closely related to the measurable efficiency of the cattle futures markets. What appears to be an inefficient market may result from a policy position, such as the IRS position, that blocks activities of well-informed participants like feedlot owners/managers in correcting market imbalances. Policy can thus constrain the effectiveness of the price discovery process in the cattle futures markets, give the appearance of market inefficiency, and impose largely unrecognized costs--at least to date--on the entire industry.

To the extent that cattle feeders are effectively blocked from trading in futures other than hedging trades ruled by the IRS position, they are not allowed to participate in correcting the market imbalances. A 1991 survey by Purcell suggests that IRS policies do, in fact, constitute a significant barrier to cattle feeder participation in the price discovery process (Purcell, 1992). An important policy issue is involved. To the extent that the IRS position has a *chilling impact* on cattle feeders' participation in the price discovery process, legislative or administrative action to correct the current policies of the IRS should be considered. The possibility and merits of such corrective actions should be brought into the dialogue on this issue and emphasis in future research should be placed on research designed to more specifically identify the possible impacts of more active and more complete participation by cattle feeders in the price discovery process. The 1988 Supreme Court ruling in the *Arkansas Best* case makes the issue even more important. Court rulings are pending in mid-1993, but the consensus of many informed observers is that the only legitimate hedge remaining to the cattle feeder is the long hedge on feeder cattle designed to manage future inventory needs. If this is the correct interpretation and if it is allowed to stand, the costs to the cattle industry (and other industries, of course) could be of staggering proportions. Work is needed to measure the costs and benefits of policy alternatives, including the impact on tax revenues at the Treasury Department level, and to guide enlightened policy in this area.

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