TAX TREATMENT OF TRADE IN CATTLE FUTURES:

POSSIBLE IMPLICATIONS TO MARKET EFFICIENCY

AND PRICE STABILITY

by

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(ABSTRACT)

Prolonged imbalances between feeder cattle costs and the pricing opportunities being offered cause highly variable placements of cattle into feedlots and variability in fed cattle prices. Such variability imposes costs on everyone in the system, from producer to consumer.

Cattle feeders are in a position to exert the influence of very current and highly specific information on costs of feeding into trading levels for live cattle and feeder cattle futures. The tax treatment of speculative trades in the cattle futures markets has the potential to block participation of cattle feeders. To the extent that cattle feeders are effectively blocked from trading in futures in any capacity other than trades that meet the IRS "*equal and opposite*" criterion of a hedge, the correction of market imbalances may be impended. The economic viability of investments in cattle feeding can be influenced in a significant way by those market imbalances.

This research examines the interaction of traders in the risk transfer and price discovery process in the live cattle markets. Econometric models over disaggregated data sets were developed to explain expected margin behavior in response to the changes in the positions held by identifiable and specific trader groups. In addition, trader behavior reactions to the levels of the feeding margins offered by the distant live cattle futures were examined.

A weekly data series was constructed using the daily records of reporting trader positions in the live cattle futures at the *Chicago Mercantile Exchange*. Feeding margins offered by the futures were calculated using cash prices for feeder cattle and feed fixed at the time of placements of feeder cattle on feed. The analysis was for the 1983-1987 period.

The analysis indicates that increases in large long (short) trading activity were associated with increases (decreases) in the expected margin offered by the futures. More importantly, the behavior of large speculators were found to exert a constraining influence on margin changes and to start the market correction at extreme levels of negative margins. This implies that cattle feeders, trading as large traders, could contribute to correcting the market imbalances if they were allowed to fully participate in the price discovery process.

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CHAPTER ONE: INTRODUCTION

1.1 Introduction

Cattle prices are highly variable. Price changes of $10-15 per hundredweight are common within a 12-month time period. As Purcell states (1991), variability of that magnitude imposes costs on producers, processors, and consumers in the form of exposure to volatile prices.

Over time, cattle prices will be determined by long-term supply and demand forces. If there are cyclical and long-run imbalances between supply and demand, the market will eventually correct the imbalances. However, short-run price variations are not caused by the cyclical developments on the supply side or by shifts in demand. Short-run fluctuations in placements of cattle into the feedlots essentially cause the short-run variability in fed cattle prices.

The high variability in the placements leads to predictable variability in the marketings of fed cattle, given that the exact weight of feeder cattle placed on feed influences the length of the feeding program. The variability in the marketing of fed cattle leads to variability in the supply of fed cattle and to variable prices and variable quantities of beef at the consumer level. Highly volatile prices of feeder and slaughter cattle, in turn, lead to highly variable placements of cattle on feed.

The volatility of prices is thus related to the predictable variability on the supply side. Both the volatility of prices and the related variability of supply may increase the uncertainty of profitability of investment in cattle feeding. In addition to this, the price instability means producers face the risk of highly variable revenues.

Most analyses indicate a highly inelastic demand for fed cattle at the feedlot level of approximately -0.5 (Chang, 1977; Huang and Haidacher, 1983). This highly inelastic demand means that changes in supply will prompt extreme price movements. Thus, for producers, a highly variable supply of fed cattle implies that it is harder to ensure profits from cattle feeding.

For consumers, a highly variable supply leads to highly volatile prices of beef or meat products at perhaps higher average prices. Exposure to price risk by cattle feeders and processors carries with it a cost and, over time, that cost will be transferred to consumers in the form of higher prices.

Taken together, these two types of losses (producer and consumer), in whatever form they exist, consist of social losses which may be impossible to measure explicitly. It may be argued that the social losses could be reduced and the economic viability of the entire beef sector could be enhanced by stabilizing the prices of feed, feeder cattle, and finished cattle.

1.2 Price Stabilization via Placement Adjustments

Purcell (1991) demonstrates an inverse relationship between placements and fed cattle prices four months later: when placements increase significantly, prices four months later tend to decline. Conversely, when placements are reduced, cattle prices in later months tend to be higher. Purcell suggests that future prices in cash markets reflect the supply-side information inherent in the changes in placements.

Based on the inverse relationship above, Purcell argues that, conceptually, any public policy change that reduces the variation in placements of cattle on feed would reduce fed cattle price variations. Reductions in fed cattle prices would, in turn, help ensure the viability of investments at the producer and processor levels and offer the consumer at the retail counter more stable prices.

Koontz and Purcell (1988) demonstrate that the live cattle futures market is more sensitive in registering the impact of increased placements (to prevent excessive placements) than in registering the impact of decreased placements (to help stimulate more placements). Concerning the analytical technique used to examine short-run behavior (e.g., placement adjustments), Koontz and Purcell point out the inappropriateness of the use of monthly data from cattle-on-feed reports. Significant changes can occur within the month, thus monthly average prices are not adequate.

Hudson and Purcell (1985) suggest that the efficiency of alternative agricultural market mechanisms in the price discovery process is affected by the periodic release of information. The authors argue that even weekly average data may not completely capture changing expectations and market information. Many decisions in the livestock sector, such as placements and hedging actions, are influenced by daily information.

Based on the above arguments, it could be argued that any impediments to a cattle feeder's opportunity to react to market-related incentives will accentuate the short-run variability in placements, fed cattle supplies, and prices. Specifically, any policy position (the IRS position) which may be a deterrent to maintaining balance between the fed cattle market, the feeder cattle market, and feed and other costs of feeding cattle will threaten the efficiency of the involved markets and could prolong market imbalances. As a result, the fed cattle supplies and cattle prices are expected to be more variable.

1.3 Cattle Feeders' Economic Environment

Cattle feeders turn feeder cattle of varying weights and grades into fed steers and heifers using their facilities and management skills. Part of the feedlot capacity can be utilized for custom feeding. In return for providing its facilities and management services, the operator of the (custom feeding) feedlot is paid by the owners of cattle.

The decision to place cattle depends on feeder cattle costs, potential selling prices for fed cattle, and the related profit expectations. Figure 1.1 demonstrates the realized net margins on Great Plains feeding activities from 1983 through 1987.

In the calculation of these margins, the cattle feeders are assumed to be cash market speculators, implying no forward pricing is being employed. The net margins are calculated by subtracting the total costs of feeder cattle, corn, soybean meal, hay and interest on the investment in feeder cattle, corn, soybean meal and hay from actual cash prices for fed cattle four months later. The margins are on a per head basis. The

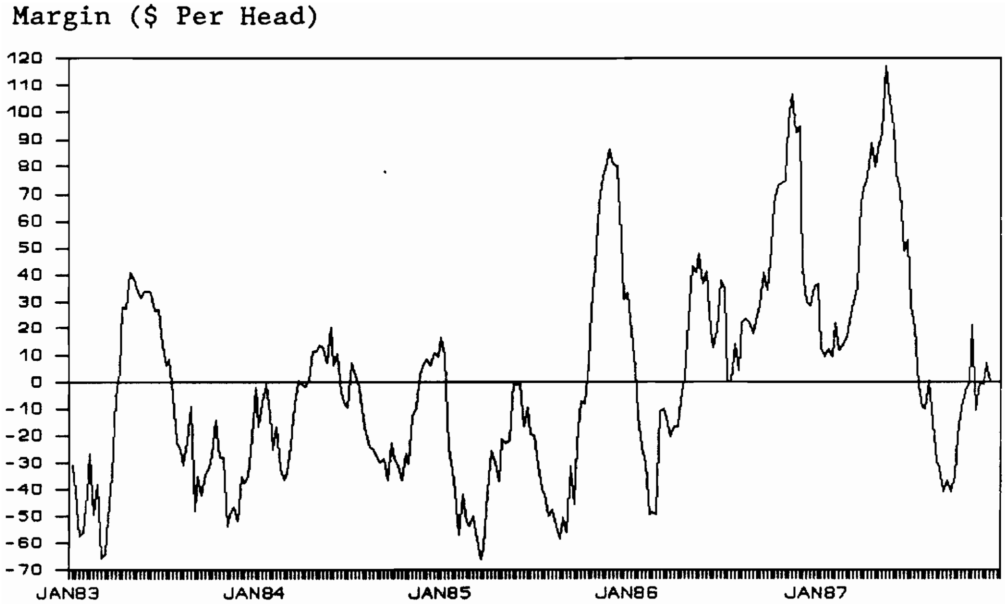

Figure 1.1 Net Profits Per Head in the Great Plains Feeding Area by Weeks, January 1983-December 1987

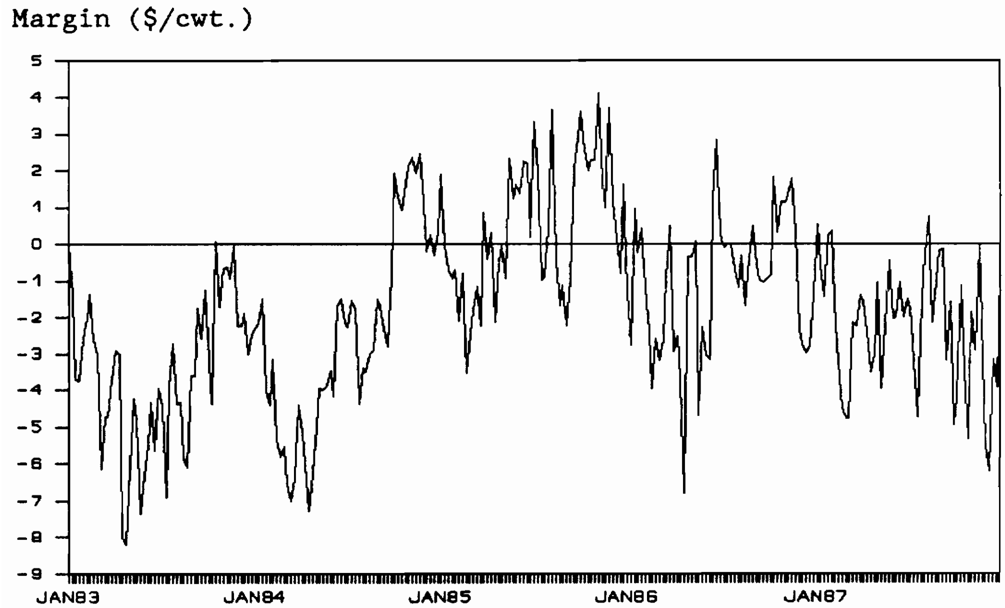

Figure 1.2 Margin over Variable Costs Offered by the Closing Price of Distant Futures, 1983-87

cash prices of feeder cattle, corn, soybean meal and hay, and interest rates are assumed to be fixed at the beginning of the feeding program. The average four-month feeding program involves turning feeder cattle weighing 750 pounds into fed cattle weighing 1,150 pounds.

As shown in figure 1.1, the net profit series exhibits pronounced variability. The losses may exceed $65 per head. If fixed costs are included in the net margin calculation, the illustrations would look even worse. The decision to place cattle into feedlots is apparently accompanied by high levels of risk and uncertainty.

Past research has shown that effectively managed hedging, such as selective hedging, could reduce the variation in profits without significantly reducing average per head profit over time (Kenyon and Clay, 1987). But even capable market analysts and astute managers of hedging programs are faced with complex and uncertain market situations. Cattle feeders, as potential traders in futures markets, seldom can secure sales prices above the prevailing daily price for fed cattle of a particular grade and weight in a market area. They are price takers in the cash market for fed cattle. Also, individual cattle feeders have little or no ability to influence feeder cattle prices and feed prices. In such a case, a routine hedging strategy may not offer any opportunity for a positive net margin when a feeding program is begun.

Figures 1.2 and 1.3 show the difficulties facing the cattle feeders. The available or expected margins are computed by subtracting the feeding costs from the closing quotes for the relevant distant live cattle futures contracts each Wednesday. The distant (four months) live cattle futures

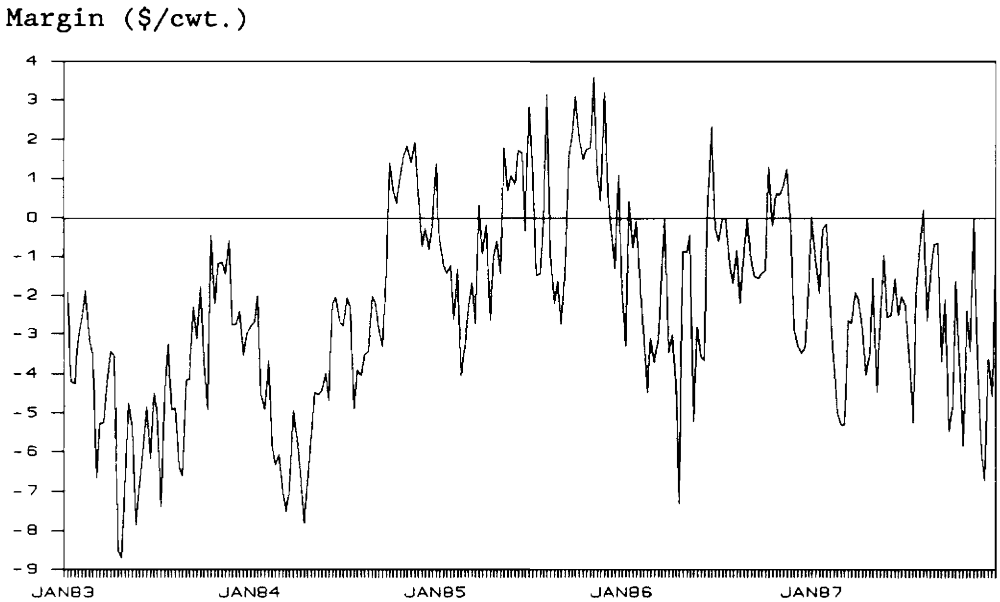

Figure 1.3 Margin over All Costs Offered by the Closing Price of Distant Futures, 1983-87

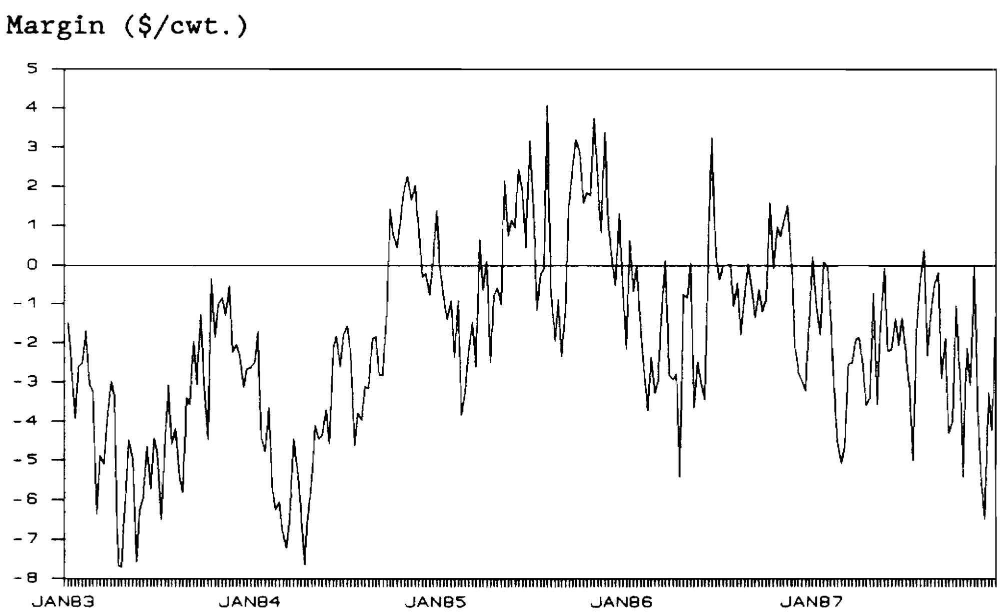

Figure 1.4 Margin over All Costs Offered by the High Price of Distant Futures, 1983-87

prices are not adjusted for a basis allowance.The feeding costs used in Figure 1.2 are the same as in the calculation of the realized net margins defined in Figure 1.1. Figure 1.3 illustrates the case where fixed costs, along with variable costs (feeder cattle, corn, soybean meal, hay and interest rates) are included.

Some cattle feeders might be able to achieve costs below those estimated in the calculations of the realized net margins (Figure 1.1) and the expected margins offered by the distant futures prices (Figure 1.2). Also, they might be able to sell futures at prices above the closing quotes. Figure 1.4 demonstrates the case using the highest price offered by the relevant distant futures contract during the month the cattle are placed. From January 1983 to December 1987 (261 weeks in total), the futures prices covered all feeding costs only about 20 percent of the time.

According to these results, therefore, the cattle feeders are faced with a situation in which cattle can seldom be placed and hedged at a profit. Often, even the variable costs (feeder cattle, feed, and interest on those and other variable costs) cannot be covered. In such a case, the cattle feeders must leave the feedlots empty or place the cattle and hope the situation will improve. As a result, placements of cattle on feed are volatile. The volatility in the placements leads to highly variable prices for fed cattle.

There are economic reasons that the futures market will not always offer profitable hedging opportunities to the cattle feeders. The market is extremely competitive, implying no significant barriers to entry.

Thus, only the most efficient producers would be expected to cover average total production cost in the long run. However, in the short run, market imbalances between projected costs and available pricing opportunities can persist, resulting in variable supplies of fed cattle and variable prices. The fluctuations at the feedlot level may, in turn, affect the variability at the consumer level over time. It could therefore be argued that the shorter the duration of the market imbalances, the more efficient is the entire system.

Cattle feeders as traders of cattle futures can exert little influence on feed prices (corn prices, soybean meal prices and hay prices). In addition, cattle feeders cannot dominate the price discovery process for feeder cattle and fed cattle. Thus, the market imbalances cannot be corrected in the short run by changing the costs of feed and/or feeder cattle.

Imbalances may be seen as evidence of inefficient markets. However, that view may be too narrow and too restrictive. An efficient market is defined as a market that discovers a price that reflects all the available supply and demand information. The efficiency of the feeder cattle and live cattle futures markets is based primarily on the quality of the information base and the effectiveness of the traders.

Publicly available series of price-related information are often weekly or monthly. Series are available from the USDA and some private services and extension personnel. They reflect some average conversion rates for average cattle under average feedlot conditions. Obviously, the cattle feeders will have access to better (more timely, more accurate, more specific) information on costs of cattle feeding and the related opportunities offered by the futures market. They are directly involved in cattle feeding and have access to proprietary information. They are, perhaps, in a better position to practice any needed arbitrage than are other traders in feeder cattle and fed cattle futures.

The length of response lags to information is closely related to information quality. The following factors may decide the length of time needed for a market to incorporate the relevant information: 1) the time interval between publications and the time lag between collection and receipt by traders, and 2) the perceived accuracy and integrity of the information. Purcell and Hudson (1985) suggest that the futures prices are capable of reflecting the information intraday or with a time lag of one day or less.

What appears to be an inefficient market may result from any policy position, such as the IRS position, that blocks well-informed participants from being directly involved in the futures markets. As a result, the policy could constrain the effectiveness of the price discovery process in the markets, generating pricing patterns and market behavior that seem to be evidence of market inefficiency.

1.4 IRS Positions

The enactment of the *Economic Recovery Tax Act* of 1981 (ERTA) changed significantly 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 Tyrell, 1984).[1]

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, the deductibility of which 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 listed 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.

The *Arkansas Best* court thus rejected the broad interpretations of the earlier 1955 *Corn Products* case. The *Corn Products* doctrine stood for the narrow proposition that hedging transactions that are an integral part of a business inventory purchase system fall within the exclusion from the capital asset definition (Moran, 1988). The IRS has failed to provide detailed guidance on its interpretation of what is and is not hedging. The uncertainty engendered by Arkansas Best has raised questions about taxpayers' use of futures markets in controlling the risk of commodity

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[1] Prior to the enactment of ERTA, the sale or exchange of a "*long*" commodity futures contracts, held for more than 6 months, would generate a long-term capital gain or loss. The sale or exchange of a "*long*" commodity futures contract, held for less than 6 months, or the sale or exchange of any "*short*" commodity futures contracts would result in short-term capital gain or loss.

price fluctuations.

Hedging is a legitimate business practice and therefore, fully deductible as an ordinary business expense. On the other hand, speculation is not a legitimate business expense and loss deductions are limited to $3,000 for the individuals and zero for most corporate entities.

A growing concern among users of the futures markets is the lack of a clear, appropriate hedge definition. The word "*hedge*" is used in a variety of ways by futures traders, accounts managers, regulators, and there appears to be no generally accepted definitions that is useful in making practical decisions (Financial Accounting Standard Board, 1984). The IRS has not defined hedging. Although three sections of the *Internal Revenue Code* explicitly exempt hedging transactions from general tax rules, only one section describes the tax rules that apply to a hedging transaction. Even that provision fails to define a hedging transaction beyond a transaction that reduces risk (Harris and Slavin, 1991).

Farmers and ranchers using risk management tools should be concerned that IRS auditors may disallow losses resulting from hedging strategies if the strategy involves positions other than the most simple and basic "*hedge and hold.*" The *Internal Revenue Service* (IRS) applies a very rigid definition of what is seen as hedging and what is seen as speculative activity in futures markets.[2] A primary criterion of hedging ruled by the

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[2] The *Internal Revenue Code* defines hedging as a transaction entered into by the taxpayer in the normal course of the taxpayer's trade or business, primarily:
(1) To reduce risk of price change or currency fluctuations with

IRS is the "*equal and opposite*" requirement. In other words, 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 restricts 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 current tax treatment of a hedge. According to this requirement, being short the nearby feeder cattle futures and being long the distant live cattle futures, perhaps reflecting cattle feeders' reactions to large negative feeding margins, would be speculative trades.

Losses on speculative trade in futures are not deductible for tax purposes. Cattle feeders will therefore be reluctant to take positions that might be ruled as speculative by the IRS.[3] When the nearby feeder cattle futures and cash prices are high relative to the distant live

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respect to property which is held, or to be held, by the taxpayer; and

(2) To reduce risk of interest rate or price changes or currency fluctuations with respect to borrowing made, or to be made, or obligations incurred, or to be incurred, by the taxpayer.

[3] A special survey conducted by the *Commodity Futures Trading Commission* (CFTC) on March 13, 1987 indicates feedlots held 4.5 percent of the short open interest in feeder cattle futures and 4.0 percent of the long open interest in live cattle futures. Since the average open interest for all holders of live cattle futures represented only about 30 percent of the on-feed count, it is clear the feedlots are not heavily involved in the markets. Involvement would be much less in the feeder cattle futures where open interest averaged 17,923 contracts (Kuserk, 1988). In a survey of Kansas and Texas cattle feeders in September of 1991, there was clear implication that many cattle feeders do not enter the cattle futures markets in any but a very basic hedge because of concerns over the IRS treatment of any losses that might occur. Purcell concludes that cattle feeders are therefore blocked from participating in the price discovery process (Purcell, February 1992).

cattle futures prices and no profitable hedge is being offered, cattle feeders must reduce or eliminate their involvement in the futures markets. They must then act as speculators in the cash market and wait for other forces, and other traders, to restore a market balance and, possibly, more attractive hedging opportunities.

The current situation will accentuate variability in fed cattle supplies. This results in unstable and unprofitable margins offered to producers, more volatile prices of beef to consumers, and higher average prices paid by consumers than might be otherwise. Someone must pay for the variability. As a result, the economic viability of investments in cattle feeding and the beef sector as a whole could be threatened. Purcell (1991) states: "*The market relationships between feeder cattle and distant live cattle futures are critically important to the economic viability of feedlot owners' business on a day-to-day basis, but the only legitimate course of action is to wait for the imbalances to be corrected by other participants in the futures markets*" (p.7).

1.5 Problem Statement

Above, it was argued that cattle prices are highly variable and that this variability imposes costs on producers, processors, and consumers in the form of exposure to variable input/product supplies and volatile prices. The short-term variability is not caused by cyclical developments in supply or shifts in demand, but short-run fluctuations in placements of cattle into the feedlots.

Live cattle futures markets incorporate emerging information of changed placements efficiently (Koontz and Purcell, 1988). That is, the market is performing a forward pricing role effectively given the periodic releases of supply side information. This efficieny helps producers to make production decisions, primarily via adjusting placements of feeder cattle into feedlots. Related to this issue, Purcell (1991) suggests that the average four-month feeding program shows a significantly inverse relationship between placements and cash prices four months later.

According to the *Internal Revenue Service* (IRS) requirement, the only legitimate hedged positions for cattle feeders would be long feeder cattle futures and short live cattle futures. Cattle feeders, as potential traders in the futures market, are assumed to have access to better information on the costs of cattle feeding and the related opportunity presented by the market. If IRS policies deny cattle feeders the opportunity to deal with the market imbalances between feeder cattle and live cattle futures, corrections of the imbalances will be delayed until the changed placements are recognized completely and publicly. Even then, the corrections in the futures are made primarily by traders (speculators) in futures from outside the cattle feeding complex. As a result, it is argued that the IRS position constrains the effectiveness of the price discovery process in the live cattle futures market by denying market access to highly relevant and proprietary information in the hands of cattle feeders.

The imbalances defined above could be corrected by selling the nearby feeder cattle futures and buying the distant live cattle futures. Cattle feeders might take such actions when no profits are offered via traditional hedges that involve buying cash feeder cattle and selling distant live cattle futures. In spite of their advantageous and well-informed positions, however, cattle feeders are facing strong obstacles to participation in the markets in this type of arbitrage activity given current IRS policy.

1.6 HYPOTHESES

Research into the nature of trading activities in live cattle futures markets could provide the information necessary for a more complete understanding of the behavior of the expected margins offered by the distant live cattle futures. The issue of differential impact by type of trader is closely related to the issue of correcting market imbalances. An assumption in this study is that cattle feeders have access to superior information and would be able to use that information without extended time delay. The following general hypotheses are offered:

1. The *Internal Revenue Service*'s (IRS) position that blocks cattle feeders' access to the cattle futures markets interferes with the effective and efficient workings of the futures markets and tends to perpetuate and accentuate short-run price variability in the cash and futures markets for cattle;

2. If cattle feeders were to participate fully in the price discovery process, the duration and magnitude of the imbalances between feeder cattle costs and the pricing opportunities offered by the futures markets would be shortened and reduced; and

3. Futures traders' reactions to the expected margins offered by the distant live cattle futures will depend on the level of those margins and futures traders will react to imbalances or disequilibrium positions in the markets by taking positions that will move the markets back toward equilibrium.

1.7 Objectives

The primary objective of this research is to analyze the impact of the trading activity of various groups of large reporting traders on the price discovery process, the margins being offered by the futures complex, and the effectiveness of the cattle futures markets in correcting market imbalances or disequilibrium situations. More specific subobjectives are:

1. To develop a conceptual framework to analyze the relationship between reporting traders' activities and the expected margin offered by distant live cattle futures;

2. To describe the impacts of differential behavior across types of traders on the process of restoring market equilibrium;

3. To demonstrate the possible impact of denying cattle feeders' participation in correcting the imbalances between feeder cattle costs and the pricing opportunities in the live cattle futures markets; and

4. To suggest possible implications to the price discovery process and to market efficiency of the IRS policies on hedging versus speculation.

1.8 Overview

Chapter 1 outlines cattle feeders' economic environment, the adjustment process of placements of cattle on feed, and the IRS policies and interpretations. Hypotheses and objectives are also documented. The literature review in Chapter 2 presents the theory and empirical knowledge concerning market efficiency and the price discovery process in the live cattle futures market. Related to the issue of trading activity and the expected margin behavior, Chapter 2 deals with the function of traders in futures markets.

In Chapter 3, a conceptual framework for understanding the relationship between different trading positions and the margins offered by the live cattle futures market is developed. Specifically, this chapter describes the relationship between traders' activity and futures price behavior, and between traders' activity and expected margin behavior. At the end of Chapter 3, implications to market efficiency are presented.

In Chapter 4, the economic variables affecting the expected profit margin are discussed. Empirical models are specified based on the conceptual and theoretical ideas, developed in Chapters 2 and 3. The models are estimated using the data set which include weekly reported hedge and speculative positions in the CME distant live cattle futures contract for the period January 1983 through November 1987.

In Chapter 5, the results are discussed, and trader activity is analyzed with respect to identifiable groups of traders in the futures market. Chapter 6 emphasizes the conclusions concerning the importance of speculative activity in correcting the market imbalances. Based on the conclusions, the policy implications of this research are then identified.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

This study is concerned with the tax treatment of trade in the live cattle futures market and its possible implications to market efficiency and price stability. Specifically, the relationship between speculative activity and the expected margin offered by the distant live cattle futures price will be examined. Due to this specific field of study, there exists only a limited body of literature. Therefore, the review of literature includes a broader spectrum of related topics. This broader review provides a base to develop a framework for analyzing the relationship between reported positions of speculators and the expected margin offered by the distant futures price.

The literature reviewed includes empirical analyses of profitable hedging, futures price behavior, and the function of traders in futures markets. In addition, empirical analyses of adjustment in placements to price movements will be reviewed. These various areas of research will help to establish a conceptual link between trader positions and the expected margin behavior.

2.2 Profitable Hedging Analysis

According to Purcell, Hague and Holland (1972), selective use of the live cattle futures market can 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 at the cost of reducing incomes below acceptable levels for most producers. The study assumes that production costs are fixed at the beginning of the feeding period. The findings of this study are confirmed by a number of analyses (Menzie and Archer, 1972; Leuthold, 1975; McCoy and Price, 1975; Erickson, 1978).

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

Hayenga, DiPietre and Skadberg (1984) analyze profitable hedging opportunities for livestock producers. The authors specifically examined the behavior of both live cattle and live hog futures during 1972-1981 and 1974-1981, respectively. The authors conclude that livestock futures markets offer frequent profitable hedging opportunities. The frequency of profitability is higher for the hog futures market. The authors also argue that there is no significant risk premium for cattle futures, which is consistent with Martin and Garcia's (1981) and Kolb and Gay's (1983) studies. But, according to their study, live hog futures exhibit large risk premiums four to nine months before contract expiration. Also, the risk premiums vary seasonally, which is attributable to the smaller trading volume, the less liquidity in the hog market, and the presence of competition with the pork belly futures market.

Kenyon and Clay (1987) examine whether producers can increase average profits and reduce the variance of the profits using selective hedging in hogs. A production unit is simulated. Selective hedging strategies are based on fixed margin strategies and variable margin strategies. The analysis indicates that selective hedging strategies can improve average returns and reduce the profit variance compared to cash programs. While fixed margin strategies perform well, variable margin strategies can still increase average returns and reduce the variance of those returns.

Peterson and Leuthold (1987) use either fully-hedged or unhedged positions but do not allow for the use of partial hedges. Thus, it is impossible for them to determine how much of the cash position should be hedged and how many futures contracts would be required to achieve some desired level of risk reduction. The authors treat the optimal hedging problem as a special case of a general portfolio problem. The Peterson and Leuthold study shows that fully-hedged positions on all of the cash commodities are seldom optimal at any stage in the feeding process. The authors suggest that if multiple cash commodities are considered and if the primary concern is risk reduction, routine use of fully-hedged positions may be neither necessary nor advisable.

2.3 Futures Price Behavior

The analysis of futures price behavior deals with the issues of the existence of a bias in the prices and the random character of the prices.

In addition, the price discovery process, market efficiency, and forward pricing mechanism are matters of concern.

According to Kolb and Gay (1983), the terminologies of market efficiency, hedging effectiveness, and price discovery are all related. The three issues have the factor of expected price in common. Further, price discovery and market efficiency are associated with hedging effectiveness in that for hedges to be effective, a predictable relationship between futures prices and future cash prices must be present.

Price discovery refers to a process by which buyers and sellers arrive at a specific price. A buyer or seller may have no, little, or great control over the price arrived at, but in all cases the process will involve an attempt to discover the best price for particular conditions, including those of place and time, under which the buyer and seller find themselves. In contrast, price determination deals with the theory of pricing and the manner in which economic forces influence prices under various market structures and over various periods of time (Forker, 1975).

According to Hudson and Purcell (1985), price determination refers to combining the economic forces in the available information set and generating a market clearing price. Price determination emphasizes a price level generated, whereas price discovery focuses on the dynamic process by which the price is generated. The price determination process is analyzed by a multivariate framework. In contrast, the price discovery process requires a bivariate framework to examine both the dynamics and timing of price discovery.

Hudson and Purcell use the live cattle market to clarify the distinction between price determination and price discovery. Price determination deals primarily with the factors affecting live cattle prices and the net impact of these factors in generating a market clearing price. The analysis of price discovery measures and compares the informational efficiency in the markets studied. The (relative) informational efficiency is determined by the speed with which the alternate markets handle information in arriving at a market clearing price. As the authors state, price determination is independent of the particular market to be examined. On the other hand, price discovery deals with the relative efficiency of the process in cash, futures, and carcass markets in generating the market clearing price.

In his literature review, Rowsell (1991) suggests that there is a connection between efficient markets and the price discovery process. According to Rowsell, "*Market efficiency is not a requirement for the price discovery process, but efficient markets can be a performance measure of price discovery*" (p.36). This statement implies that the market which is most "*informationally efficient*" will lead (in a time sense) the other markets in discovering the market clearing price.

In reviewing the theoretical and empirical literature on the efficient markets model, Fama (1970) categorizes the forms of market efficiency. Fama's developments provide a base for the analysis of the informational efficiency of market prices. More recently, Blank (1989) has defined the criteria for evaluating price efficiency in futures markets. The forms of pricing efficiency are as follows:

1. Weak Form Efficiency, in which current futures prices reflect all information contained in past price series.

2. Semi-Strong Form Efficiency, in which current futures prices reflect all currently available public information.

3. Strong Form Efficiency, in which current futures prices reflect all currently available public and private information.

The objective of a study by Tomek and Querin (1984) was to demonstrate the possibility of the coexistence of random walks of futures prices and the profitability of technical analysis applied to the prices. They conclude that both logic and empirical results are supportive of the possibility of a profitable technical analysis based on historical data. However, for the technical analysis to be consistently successful, the price series must have systematic components, and the systematic pattern must occur continuously. The authors state: "*The speculator clearly should be skeptical of claims that technical analysis of past prices can successfully forecast forthcoming prices*" (p.22).

Garcia, Leuthold, Fortenbery and Sarassoro (1988) evaluate the pricing efficiency of live cattle futures market using out-of-sample forecasts from an econometric model, an ARIMA model, and composite forecasting procedures. The relative performance of the forecasting models is compared in terms of a mean-squared error (MSE) criterion. The authors also analyze the pricing efficiency of the live cattle futures market via market simulation procedures. The authors conclude that using only MSE in evaluating pricing efficiency is not a sufficient criterion. In terms of a necessary condition for pricing inefficiency, the overall higher MSE of futures imply that the live cattle futures market is not reflecting all current public information---suggesting semi-strong form inefficiency. The final conclusion made by the authors, after simulation analyses, is that there is no strong evidence of inefficiency in the live cattle futures market.

According to the efficient market theory, if a market is discovering prices efficiently by registering new information quickly, the price changes in the market follow a random walk. In an efficient market, then, it is impossible to predict future prices. Accordingly, if a researcher found any mechanical technique to forecast the future prices with a certain degree of accuracy, it might give strong evidence that the price discovery process in a market is not efficient and that the predictability comes from a systematic bias.

A systematic downward bias in live cattle futures prices might lead to underestimates of the corresponding cash prices and hence to cash returns. Consequently, when the expected margins offered by the distant futures are negative, profitable hedges cannot be triggered. Helmuth (1981) initiates a debate on efficient market theory by claiming to have discovered a trading technique which "*predicted certain live cattle futures price movements with 100-percent accuracy* . . ." (p.353). Helmuth thus concludes that the futures prices have a consistent, predictable, and systematic downward bias. The major causes of systematic downward bias in the live cattle futures prices stem from larger selling-side relative to buying-side pressure.

Although selling pressure is larger than buying (short hedges greater in number than long hedges) in cattle futures and short speculating adds even more selling pressure when futures price reaches the signal price, long speculative and long hedge positions might be placed when the futures prices are low enough to suggest a return toward a normal level. These kinds of buying pressure could form support for futures prices to sustain a normal range.

Palme and Graham (1981) argue that the report on the systematic downward bias in live cattle futures prices by Helmuth contains unsound economic analysis and offers no acceptable evidence to support his arguments. Palme and Graham emphasize four critical factors. First, the evidence of inefficiency of the live cattle futures market is not supported by the data studied. Second, in contrast to the conclusion made by Helmuth, the futures market provides profitable hedging opportunities to the vast majority of cattle feeders at some point during the feeding period. Third, the signal price estimated by Helmuth is not valid because of the unavailability of revised cost data to the feeders. Finally, there is no way to evaluate Helmuth's claim of correlated trading activity among large traders.

Pluhar, Shafer and Sporleder (1985) re-evaluated Helmuth's findings. The authors used USDA reported unrevised cost data and a basis adjustment. They expanded the period studied. They hypothesize that if Helmuth's trading technique (HTT) using the unrevised USDA expense estimates and an additional basis adjustment could yield significant gross profits, it could be concluded that the HTT is a robust, useful tool for predicting price changes and that there exists a weak-form inefficiency in live cattle futures markets.

Based on the results in their analysis, Pluhar et al. discuss Palme and Graham's criticisms on the Helmuth trading technique. According to the authors, the success of the HTT implies modest evidence of the existence of weak form inefficiency in live cattle futures.

Kolb and Gay (1983) develop a methodology to evaluate the performance of live cattle futures market in price discovery process. The authors examine lag-link relatives for 38 live cattle contracts maturing between December 1976 and December 1980. The authors do not focus specifically on the arguments made by Helmuth. But, based on the results of their study, the authors disagree with Helmuth's findings.

Concerning the mixed results made by other authors, Kolb and Gay attribute the conflicting arguments to a variety of methodologies and the periods used in different analyses. The high volatility and strong trend of the live cattle futures prices, the authors suggest, provide good reasons for the variable findings made by the authors. The authors conclude that all of three statistical tests indicate that futures price is a good predictor of future spot price. These test results support the evidence of no bias in live cattle futures prices.

When related to the live cattle futures markets, the biased futures price debate is covered by several articles concerning the forecasting performance of the futures price (Leuthold 1974; Just and Rausser 1981; and Martin and Garcia 1981). The agreement among these studies is the existence of a bias in the live cattle futures prices beyond four months prior to maturity. They also find there is some seasonality in the predictive accuracy of the market.

Kofi (1973) concludes that futures markets perform their price forecasting role well, and that the performance test statistic, r^2, measures the degree of relative predictability between the various commodity markets. Also, the author notes that the predictive reliability of a futures market improves as more accurate information on supply-demand conditions becomes available.

Koppenhaver (1983) presents several studies by Leuthold (1972), Cox (1973), Cargill and Rausser (1975), and Helmuth (1981). According to Koppenhaver, the articles reviewed essentially argue that if the live cattle futures market operates efficiently in the context of the random walk model, the futures price must be an unbiased predictor of later cash prices.

According to Koppenhaver, however, there is a confusion between the theory of efficient market and the hypothesis of forward prices as unbiased estimates of future spot prices. The author argues that although there is a bias in live cattle futures prices, it is not inconsistent with certain types of market efficiency. Unbiasedness is not a necessary condition for market efficiency.

Koppenhaver notes that the presence of a risk premium in live cattle futures market can be explained in terms of the nonstorable nature of live cattle. The author also argues that the long speculators play an important role in price discovery. Any risk premium that does exist is necessary to induce the speculators who help to restore market balances.

2.4. The Function of Traders in Futures Markets

There has been considerable discontent with trading in the futures markets, especially in the livestock futures markets. Charges of manipulation, concentration of market power, and insider trading can be documented. In order to understand the overall performance of futures markets, it is important to distinguish the roles performed by the various traders in the market.

This section reviews articles concerning the relation between trading activity and market performance. Special emphasis is given to the empirical evidence that speculative activity is positively related to price stability. Specifically, this section deals with the following issues: 1) possible measures of speculation in a market, 2) composition of trading activity, and 3) price effects of changes in speculation.

One of the measures of speculation on the futures market is the speculation index developed by Working (1960) and refined by Peck (1980, 1981). The speculation index measures the relationship of the amount of speculation to the amount of hedging in relative terms in a market. The hedge and speculative ratios are:

$$\text{Hedge ratio} = HL/HS \text{ if } HS \geq HL, \text{ and}$$

$$\text{Speculative ratio} = SL/HS \text{ if } HS \geq HL$$

The speculative index then is

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

$$T = 1 + [SL / (HL + HS)] \quad \text{when } HL > HS.$$

where SS and SL are short and long reporting speculation, respectively, and HL and HS are long and short reporting hedgers, respectively. The formula for the index changes depending on whether short hedging dominates or long hedging dominates. T takes on values greater than or equal to 1.0. T would be unity in a market where speculation is just capable of covering hedging use.

Working suggests that the average speculative index is T=1.15. He notes that it is important to provide more speculation than is required to meet hedging needs. Long hedging serves only partially to balance the simultaneously placed short hedging positions, and long hedging is mostly absorbed by short speculation.

Peck (1981) reaffirms Working's argument. She examines the major grain and oilseed markets during 1974-1978. According to Peck, short and long hedging markets have been nearly balanced since 1972-1973. Since it is total hedging and not net hedging which better reflects the hedgers' commercial needs, speculation is required to offset both short and long hedging.

In analyzing speculative and hedge positions in frozen concentrated orange juice (FCOJ) futures, Ward (1974) develops an alternative speculative index. Ward's index is as follows:

$$i = SL / (HS - HL) \text{ if } HS \geq HL, \text{ or}$$

$$i = SS / (HL - HS) \text{ if } HL > HS$$

where the variables have the same definition as those in Working's speculative index. Ward recognizes the important liquidation function that speculators provide. He notes that as his speculative index increases, the spot-futures price spread decreases. Ward's index assumes that any speculation beyond that required to offset unbalanced hedging is excessive.

Peck (1980) notes that Ward's index is inherently unstable since it approaches infinity as long and short hedging become balanced. Employing the Working's speculative index, Peck analyzes speculative activity and price variability in the wheat, corn, and soybean futures markets over the period 1964-1978. The results show that speculator activity is positively related to price stability in futures markets. Price variability increased with the level and the uncertainty of information. Volume (relative to open interest) has a positive influence on the price variation.

Peck suggests that the three markets are considered to be well-established, developed futures markets. The growth in hedging use in the 1970's seems to have severely strained the capacity of each market. Inadequacy in the availability of speculation appears to be associated with increased price variability. Peck attributes the constrained speculative activity and the related inadequacy of speculation to the position limits designated by the CFTC.

The Nathan Associates (1967) study uses Working's speculation index to measure excessive speculation. The index is calculated for corn, wheat, and soybeans traded on the Chicago Board of Trade (CBT) during the period 1956-1966. This study shows that while the high values of the speculative index are most often associated with stable price behavior, low values correspond to more volatile price behavior.

Petzel (1981) re-examines 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 is used. The results indicate that there is no statistically measurable causal link between speculation and price variability.

In addressing the Exchange's viewpoint regarding speculation, Wilmouth (1980) suggests that speculators are net sellers when prices are rising, and net buyers when prices are falling. Thus, speculators temper rather than aggravate the price movement. Wilmouth states: ". . . *the participation of speculators in commodities futures markets can be compared to the use of engine oil in an automobile. Automobiles do not run on lubricating oil, but neither do they run very long nor very well without it; and neither do commodity markets run very long nor very well without speculators. Essentially, that is the best argument for their presence*" (p.6).

Leuthold (1983) examines the relationship between trader behavior, price behavior and physical market activities (placements, inventory, supply of livestock). Leuthold hypothesizes that if futures markets are speculative markets, a higher correlation between speculative activity and price movements is expected. This hypothesis is examined by means of simple correlation analysis. Futures market activity, the findings indicate, is more related to price level than to commercial market movements. That is, both speculators and hedgers are attracted by higher prices. The author suggests that speculators respond more to hedging pressures than to prices. Thus, hedging is considered to be a dominant factor in trading.

Using the Granger causality method, Leuthold examines the cross relationships between futures market movements, commercial market movements, and price. For cattle, there is no relationship between numbers in the cash market and futures market activities. The same is true for feeder cattle, but there is a modest relationship between prices and cattle movements. For hogs there is a simultaneous, inverse relationship between hog slaughter and price.

Leuthold adopts Peck's model (1981) to analyze the relationship between price variability and speculation. To measure speculative activity, the speculation index (Working 1960; Peck 1980,1981) is used. The results show that speculator activity is positively related to price stability in futures markets. Price variability increases as uncertainty in information increases. Also, relative volume has a positive influence on price variation.

Oellermann and Farris (1986) examine open interest held by the four largest short traders and long traders on a daily basis in live cattle futures markets during 1977-1981. The study results suggest that any relationship between price and concentration levels is tenuous at best. For some contracts months, there is some evidence of price leading, in a time context, increases in four-firm concentration of longs[4]. Additional evidence indicates that instantaneous causality exists between price and four-firm concentration of shorts only for the August contract. The changes in concentration level seem to have no influence on price or on basis. The authors suggest that if the 1977-1981 period studied can be representative of live cattle futures, concentration of traders will not be a serious problem in the market.

Rutledge (1972) examines the behavior of hedgers in commodity futures markets. The analysis shows that hedgers have an elastic demand for futures with respect to expectations of the basis but inelastic with respect to flat price expectations. Also, anticipated basis and cash price variability appear to affect the behavior of (short or long) hedging.

According to Rutledge, risk is inherent in all marketing and processing strategies, implying that futures markets facilitate risk management rather than risk transferral. Rutledge suggests that hedging is in fact an essential part of the merchandising or commercial operation, not just for purpose of reducing business risks. Also, futures markets have influence on the allocation of resources over time. Thus, the author states: ". . . *the welfare effects of these markets go far beyond those of simple risk reduction*" (p.256).

Rowsell (1991) tries to identify the relationship between price

[4] Levels of four-firm concentration, as a percent of open interest, were computed for three dates selected to represent the pattern of concentration for a given contract in its final two months of trading.

behavior in live cattle futures market and changes in different trading positions. The data from the **CFTC Commitment of Trader Report** is daily large (reporting) positions, and nearby live cattle futures prices from January 1983 through January 1987.

In the analysis of subdivided strings of positive and negative prices, there was no evidence of a strong relationship between price changes and trading position changes. No unidirectional flows from trader group categories to price changes were identified, but contemporaneous relationships between price behavior and trading group changes within the trading session were found. A time interval analysis indicates that different trading categories have significant influence on the price changes. In spite of the significant relationships found, that influence is extremely small. And, the causality analysis indicates that price change leads changes in trading activities, not *vice versa*.

Concerning the relationship between price volatility and speculative level, Rowsell finds that the volatility of price in terms of daily high-low ranges is constrained by higher levels of speculating. In contrast, alternative estimates[5] of volatility that are presumably more efficient than the high-low range, suggest that there is no significant correlation between price volatility and speculative activity.

In conclusion, Rowsell argues that hedgers are not as sensitive as

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[5] The use of two price volatility measures estimated as suggested by Garman and Klass (1980) were employed in this analysis. The alternative measures are found to have significantly higher relative efficiency than a measure such as the high-low price ranges.

speculators and that speculators are playing an important role in the price discovery process. The evidence of price changes leading changes in trader activities indicates that the live cattle futures market is not manipulated and that no specific trading group is influencing the market adversely.

2.5 Chapter Summary

This chapter has investigated selected areas of interest with respect to futures markets. Specifically, the literature reviewed here covers the aspects regarding profitable hedging, futures price behavior, and the function of traders in futures markets. Emphasis is placed on what is available in the literature with regard to whether the cattle markets are efficient or inefficient and on the impact of different groups of traders.

The literature reviewed shows that futures markets are efficient in that the markets reflect all available information on the changes in supply-demand conditions. Also, futures markets are assumed to provide forward prices. Large speculators seem to respond to hedging needs. Speculators stabilize price movement and contribute to the price discovery process. Speculative activity thus is needed to allow for hedging.

CHAPTER THREE: TRADER ACTIVITY AND EXPECTED MARGIN BEHAVIOR IN LIVE CATTLE FUTURES MARKETS

3.1 Introduction

In order to identify the relationship between different traders' activities and market performance, it is important to provide conceptual frameworks for understanding the following issues:

(1) The relationship between different traders' activities and futures price behavior;

(2) The relationship between different traders' activities and the behavior of the expected margin offered by the futures price; and

(3) Traders' behavior depending on the level of expected margin.

3.2 Relationship of Trader Activity and Price Behavior

In Chapters 1 and 2, the concern was articulated that traders in the futures market have the ability to influence the expected margin. In the context of a price discovery process, it may well be that economic agents who are motivated by the distant futures price will influence the expected margin by impacting the futures price. As Rowsell argues (1991), this does not imply that individual agents can control price, but in an aggregate context, the behavior of trader groups may affect the direction prices follow in the price discovery process. As a result, the discovered price will impact the expected margin being offered.

In explaining the equilibrium in futures markets, Garbade (1982) illustrates the relationship between trader activity and price behavior.

As Rowsell points out, these representations have some limitations. The graphics can only represent the behavior of a single trader.

In contrast to the cases of long hedgers and short hedgers, speculators are not offsetting risk exposure but are accepting a risk in return for profits from adverse price movements. At prices above their expectation (E(p)), speculators would not demand long positions. Rather, they would be expected to be suppliers of long positions. On the other hand, as prices drop below their expected price, E(p), the speculators would buy long positions.

Based on the presentations by Garbade, Rowsell provides a more realistic representation of a possible speculators' behavior. Figure 3.1 demonstrates the fact that speculators can be either long or short and also can be a supplier or demander of long positions. At prices above E(p), long hedgers' demand for long positions will be zero. At prices above their expected price, E(p), speculators will offer an increasing quantity of positions. By selling or going short, the speculator provides positions for the long hedgers or for potential long speculators with price expectations $E^*(p)$ where $E^*(p) > E(p)$.

Conversely, the supply of long positions offered by short hedgers will be zero at prices below E(p). At prices below their expected price, E(p), speculators will offer an increasing quantity of positions as current futures prices decline. By buying or going long, the speculator absorbs the selling of short hedgers or of potential short speculators whose price expectations are below E(p).

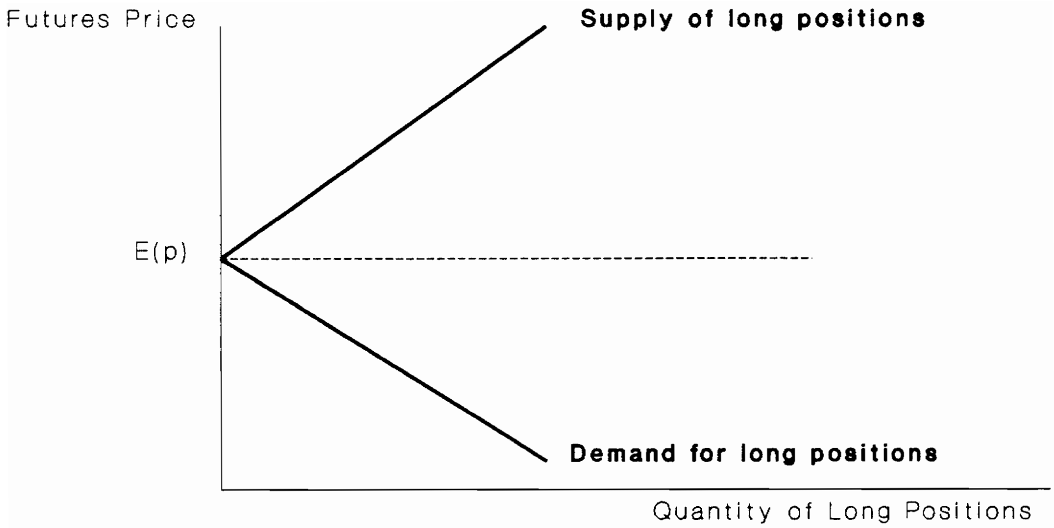

Figure 3.1 Expected Behavior of Speculators :Rowsell's Presentation

3.3 Relationship between Trading Activity and Expected Margin Behavior

Based on the representations by Rowsell, the relationship between trading activity and expected margins can be conceptualized. The collective behavior of traders, especially speculators, in future markets will influence the price discovery process. The discovered prices will, in turn, affect the margins offered by the distant futures prices.

Figure 3.2 presents a conceptualization of a possible market performance pattern. A "*balance*" or equilibrium position prevails at a margin of zero. No excess profits are being earned and costs are being covered. In order to reduce the magnitude or duration of the imbalance at time (A), where excess profits prevail, or time (B), where losses prevail, identifiable groups of traders would be exerting a moderating influence on futures prices. The net relationship between the expected margins and changes in the traders' positions would need to be as follows:

(1) The net relationship between expected margin and the number of long (short) hedgers' and/or long (short) speculators' positions needs to be negative (positive) when margins are increasing at time (A), or decreasing at time (B); and

(2) The net relationship between expected margin and the number of long (short) hedgers' and/or long (short) speculators' positions needs to be positive (negative) when margins are decreasing at time (A), or increasing at time (B).

Figures 3.3 and 3.4 are integrations of Figure 3.1 and Figure 3.2. The expected behavior of speculators implies that at prices above their expected levels, E(p), they would take short positions and become

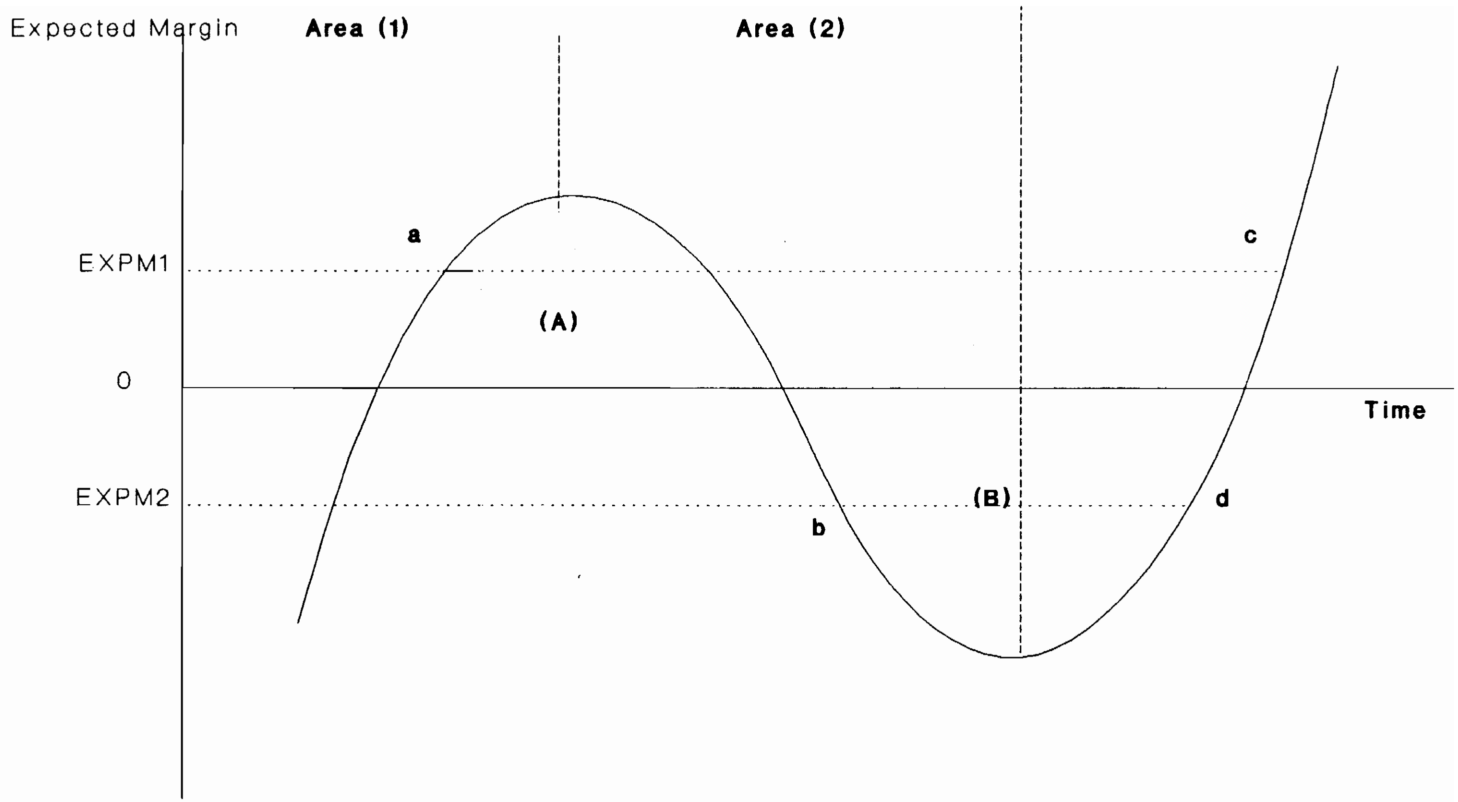

Figure 3.2 A Conceptualization of Possible Market Performance Pattern

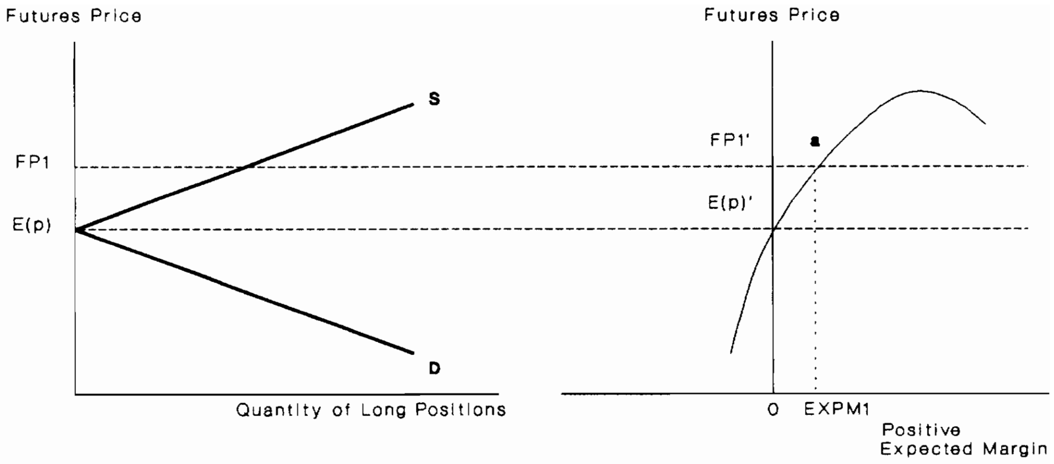

Figure 3.3 Relationship of Speculative Activity and Increasing Positive Expected Margin

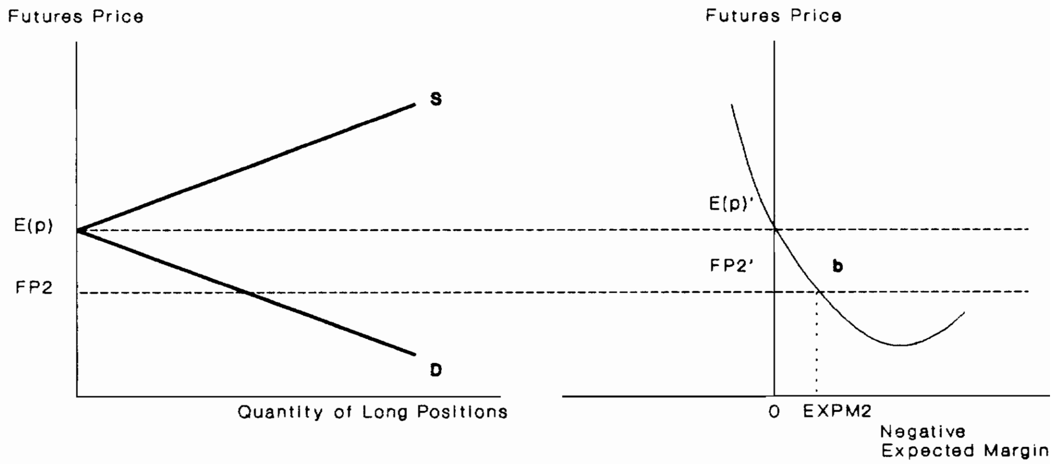

Figure 3.4 Relationship of Speculative Activity and Decreasing Negative Expected Margin

suppliers of long positions for hedgers, S in Figure 3.3. When the futures price drops below the expected cash price, they would become long speculators and become buyers or demanders of long positions, D in Figure 3.3.

The slope of the curves S and D for speculators depends on the degree of the profitability from adverse price movements. Increased profit opportunities would attract speculators into the market.

It is postulated that all traders have uniform price expectations. This implies that all traders would seek to hold the same position. This postulation is likely to be unrealistic. But, in practice, speculators are influenced by many of the same factors that influence hedgers (Palme and Graham, 1981). It might be reasonable, then, to assume that large traders, including hedgers and speculators, have similar price expectations and follow somewhat similar trading patterns.

Traders' reactions, as suggested above, may depend on the level of the expected margin, not just on the sign of the margin being offered by the futures. In order to examine traders' reactions to different levels of expected margins, the right-hand side of Figure 3.3 demonstrates only the case of increasing expected margins when the margins are expected to be positive. It corresponds to area (1) and the first part of (2) in Figure 3.2.

As shown in Figure 3.3, although the expected margin offered by futures is positive above E(p)', speculators might still hold long positions or take new long positions because they feel the level of futures price can still increase. They would reduce the placing of new positions as the futures price increases toward FP1' above E(p)'. When the price increases above the futures price level FP1', speculators would be expected to liquidate (sell) the long positions and start to take short positions. In Figure 3.2, this action corresponds to EXPM1 and the point "a" on the pattern curve. Theoretically, speculators would take long positions at a decreasing rate until the price reaches a certain price exceeding their expectation level even though the margin has become positive.

Figure 3.4 demonstrates the relationship between trading activity and expected margin behavior in the case where the expected margin is decreasing and the short hedging opportunity is not profitable. The right-hand side of Figure 3.4 corresponds to the area (2) in Figure 3.2. The horizontal axis represents negative expected margins. The further it deviates from the origin, the more negative the expected margin is.

For reasons analogous to those described above for positive and increasing expected margins, speculators hold their short positions until the current futures price drops toward some level FP2' well below their expected levels. That is, when the expected margin offered by the price is forced down sufficiently (say, to EXPM2), speculators start to cover their short positions and start to take long positions. In Figure 3.2, the point at which they start to buy long positions corresponds to EXPM2 and the point "b" on the curve.

Based on the arguments above, the following statements can be inferred. For speculators, an equilibrium state can be defined as the situation where the current futures price falls within a price range around their expected price level in a cash market (E(p)). Market equilibrium, then, is defined as the case where the expected margin offered by futures is zero. In such a case, the market can be described to be efficient in the price discovery process. The points a, b, c and d (in Figure 3.2) form upper and lower boundaries which form an "*equilibrium band*" around the zero margin, representing the equilibrium state in the market. Within some such band or range, traders would tend to be relatively inactive. As the margin moves outside of the band or range, a market imbalance develops that reflects, perhaps, high cash prices for feeder cattle and/or poor pricing opportunities in the live cattle futures market. As the margin moves further from the zero equilibrium level, and moves outside of a band around that equilibrium, trader groups could be expected to respond to the developing opportunities.

By regressing expected margins on numbers of open positions by groups of traders, it should be possible to determine whether or not the behavior of identifiable groups of traders (such as large reporting speculators) are helping to correct the imbalances between feeder cattle and live cattle futures by pushing the expected margin back toward zero. Speculators may not participate in correcting the imbalance, however, until they see an acceptable risk/reward ratio. The willingness to enter the market as long speculators, for example, would be expected to increase as the margins become even more negative and move outside of the equilibrium band where the risk/reward ratio is acceptable to the speculator.

3.4 Speculators' Dependence on Level of Expected Margin

In the above section, the aggregate behavior of speculators is assumed to influence distant futures price and, as a result, the expected feeding margin offered by the futures price. Further, the traders are expected to be motivated by the level of the expected margin, not just the (positive or negative) signs of the margins projected by the futures. This hypothesis may be tested by examining the relationship between the expected margins (as one of several independent variables) and traders' behavior (as a dependent variable). A well-defined model may also be estimated over the four disaggregated subsets which correspond to (1) increasing/positive, (2) decreasing/positive, (3) increasing/negative, and (4) decreasing/negative margins, respectively.

At this point, the following questions may be raised. Given that traders' behavior is dependent on the level of expected margins (1) are the degrees of dependence on level of the margin in the cases of increasing/positive and decreasing/negative expected margins identical? (2) Are the duration and magnitude of positive and negative expected margins the same? The first question is related to the issue of the elasticity of speculators' demand for and supply of long positions with respect to the futures price presently available. The second question is related to the issue of the size of area (A) in Figure 3.2 compared to area (B) in the same graph.

Concerning the first question above, at prices well above speculators' cash price expectation E(p) at which they are expected to take short positions, traders would be expected to have more elastic supplies of long positions. A small percentage increase in price might bring a large increase in short positions, the source of supply of long positions. Conversely, speculators would have less elastic demand curves for long positions if price were below their expectations. That is, short speculators may have relatively flat supply curves for long positions above E(p), and long speculators may have relatively steep and inelastic demand curves for long positions below E(p). Thus, Rowsell's representation of expected behavior of speculators (Figure 3.1) would be modified to allow for the different sensitivity of speculators to current futures prices compared to their expectations.

There may be several reasons for different attitudes of a single trader toward futures prices when compared with his expectation. Assume that the current futures price moves far above speculators' expected price level in a cash market. There is, then, an elastic supply of long positions from speculators, and speculators start to offset their long positions and go short relatively quickly. That is, in Figure 3.2, the starting point to offset long positions (point "a") will be located below the level of "a" shown in Figure 3.2. The relative distance of the original point "a" and a new level of "a" may be dependent on the elasticity of supply of long positions from speculators. The more elastic the supply is, the greater the gap number of positions between the original point and the new level.

On the other hand, when current futures price drops far below the expected price level, short speculators start to offset (cover) their positions. However, in Figure 3.2, it would take more time to approach the starting point to offset the short positions (point "b"). This is due to the relatively inelastic demand for long positions from speculators. As a result, in Figure 3.2, the moves to positive levels in area (A) may be less sustained than moves to negative levels in area (B).

The finding of Koontz and Purcell may be related to the issue of the different duration and magnitude in the areas (A) and (B) in Figure 3.2. When placements of cattle on feed are decreasing, there may be a time lag between a real market situation and the one reflected in the prevailing futures price. That is, although placements decrease, indicating a reduced supply of fed cattle in the later months, the distant futures price today may not reflect that information until the cash or spot prices start to increase. This may result in prolonged negative expected margins offered by the distant futures price which is reflecting incorrect or delayed placement information.

Figure 3.5 presents a modified conceptualization of a possible market performance pattern and relationship between speculative activity and the expected margin behavior. This pattern reflects the sometimes prolonged non-profitable hedging opportunity offered by the live cattle futures. Also, it demonstrates an unbalanced situation for potential hedgers and feedlot operators.

The longer duration of expected margins in the negative levels may be explained by the two factors: (1) The difference in the elasticity of demand for and supply of long positions from speculators, and (2) the possibility of a less effective forward pricing market mechanism when placements of cattle are decreasing. However, this situation does not

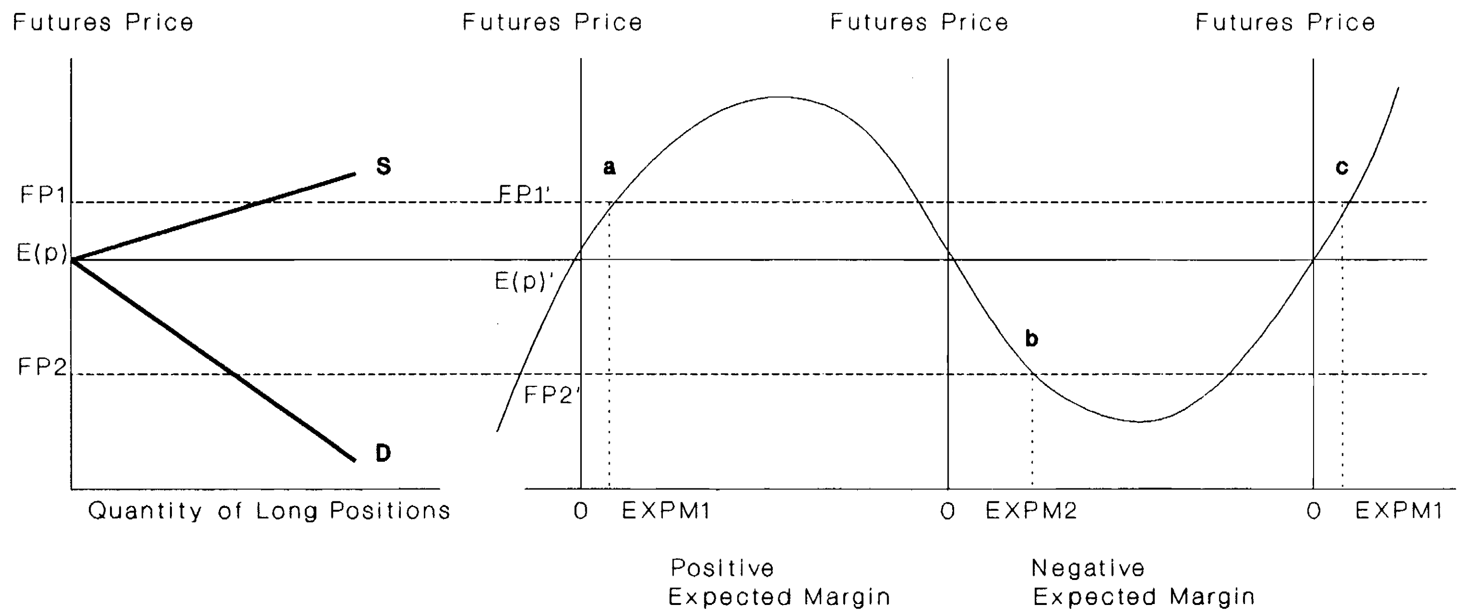

Figure 3.5 Modified Relationship between Speculative Activity and Expected Margin Behavior

necessarily imply inefficiency in the live cattle futures market.

As shown in the problem statement, it may be argued that the IRS policy position tends to prolong the moves to negative margins and/or to accentuate price moves. In other words, the IRS policy effectively keeps cattle feeders from dealing with the imbalances directly via taking positions in the futures market. Cattle feeders are not involved in all phases of the price discovery process. Thus, the imbalances are not corrected until emerging information of changed placements is essentially publicly available and is recognized completely by virtually all traders. Even then, only speculative traders in the futures market and the occasional long hedger participate in correcting the negative imbalances.

3.5 Implications to Market Efficiency

Concerning market efficiency, the following issues are related to this research: (1) market efficiency may be related to who is trading the futures, and (2) market efficiency may be impacted by the IRS policy which blocks well-informed potential traders (cattle feeders) from participation in the price discovery processes in the cattle futures markets.

Cattle feeders have access to high-quality and proprietary market information concerning feeder cattle prices, conversion rates, feed prices, cash fed cattle prices, and current profit margins on cattle. They know precisely the attitudes of lending agencies toward extending loans for cattle feeding and they have firsthand knowledge of interest rates and equity requirements. Also, they are able to have detailed and computerized analyses of feeding costs and projected break-even prices for finished cattle. In addition, they have a strong business-related interest in correcting market imbalances, especially negative imbalances, which threaten the viability of investments in cattle feeding programs. If cattle feeder are reluctant to enter the market due to concerns over tax treatment of trades which would likely be ruled as speculative by the IRS, the market cannot incorporate the high-quality and relevant information in the hands of cattle feeders.

Conceptually, the markets would be expected to offer margins that cover variable costs most of the time (Purcell, 1991). In its simplest form, the markets are more nearly in a state of balance when:

$$FCC + FC = LCP$$

where:

FCC = Cost of feeder cattle that could be placed using cash prices or the nearby futures ($ per head);

FC = Cost of inputs other than feeder cattle during the period, reflecting variable and fixed costs where fixed costs include a return on the capital investment ($ per head); and

LCP = Per head value of the finished steer using projected weights and available live cattle futures prices ($ per head).

The above equality implies that prices would be expected to approach the average total cost of production for the most efficient producer in the long run.[6] That is, this is the equilibrium position toward which the markets would be expected to move.

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[6] The most efficient producers refer to efficient buyers of feeder cattle and feedlot managers who are well informed and do a good job in managing their feeding programs.

The markets are in a state of relative imbalance when:

$$FCC + FC > LCP, \text{ or } FCC + FC < LCP$$

where the variables have the same definition as defined above. Empirical evidence shown in Chapter 1 suggests that the inequality (FCC + FC > LCP) is present in a majority of the cases and often persists over several months.[7] For example, as shown in Figure 1.2, the market seems to be relatively inefficient in that it takes considerable time for the market to restore an equilibrium when the margins being offered are negative. There is a string of 23 consecutive months during which the margins were negative in 1983 and 1984. An imbalance which persists across several months suggests that there may be little or no influence from cattle feeders in discovering feeder cattle and live cattle prices.

According to Purcell, the economic reasons behind the prolonged market imbalance are as follows:

(1) Corn prices are largely beyond the influence of cattle feeders;

(2) Cattle feeders cannot dominate the price discovery process for feeder cattle and fed cattle; and

(3) Economic forces external to the cattle feeding and packing subsectors play an important role in moving the markets away from equilibrium.

More than half of the total corn usage (55–75 percent) is feed usage.[8]

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[7] See Section 1.3 of Cattle Feeders' Economic Environment in Chapter 1.

[8] See **Feed Situation and Outlook Reports** from USDA's Economic Research Service. In the U.S., hogs and poultry are a major users of corn.

The variability in total disappearance or use in corn is influenced mainly by export movement, however. Thus, cattle feeders' activities in the cash or futures markets for corn are assumed to exert only marginal influence on the market imbalances. That is, the imbalance cannot be corrected by forcing feed costs, especially corn prices, down.

Feeder cattle futures will adjust to the following changes: (1) to projected feeding costs, especially corn prices; and (2) to the distant live cattle futures prices. Live cattle futures will adjust to short-run changes in fed cattle numbers, short-run changes in expectations of pork and poultry prices, overall developments in the economy, and changes in consumer incomes. Cattle feeders may have some influence on feeder cattle prices but they face competition for light cattle from stocker operators and there is a significant seasonal pattern in the available supply of feeder cattle. Any negative imbalance cannot, therefore, be easily corrected in the short run by pushing the costs of feeder cattle down.

Cash prices for light steers and heifers tend to increase during March-May as stocker operators buy for grazing programs. As the light cattle prices get bid up, prices of the yearling steers and heifers, ready for the feedlot, tend to move up as well. Feeder cattle futures prices move up with an increase in the feeder cattle prices since the cash price movements are positively related to the futures price movements. As a result, feeder cattle prices in the cash and in the nearby futures markets can become too high to allow profitable hedges given prevailing distant live cattle futures prices. The imbalance may persist across several weeks or months.

When forward pricing opportunities cannot provide cattle feeders with margins covering variable costs, they must either (1) leave the feeding pens empty and absorb the fixed costs, or (2) place the cattle in the hope that profitable prices will be offered during the feeding period. Purcell states: "*The net result is often a sporadic pattern of placements and the highly variable prices that comes from volatile placements*" (p.5). From the viewpoint of society, any disequilibrium situation should be short lived and quickly corrected, but such is not the case.

Figure 3.6 portrays the possible policy issue. More efficient producers are assumed to cover variable costs over time. That is, the net margins offered above variable costs for efficient producers tend to be positive or zero over time. As previously mentioned, the moves to positive levels (A to D) may be less sustained than the moves to negative levels (D to G). Any policy position, such as the IRS position, which blocks participation of well-informed participants tends to prolong the moves to negative margins and/or accentuate the price moves over time. As a result, there is a possible social loss which could take the form of excessive variation in fed cattle supplies and in beef prices (Purcell, 1991).

If the market is effective in correcting the imbalances associated with both negative margins (losses) and positive margins (excessive profits), any social loss can be avoided or reduced. The area EFG in Figure 3.6 can be used to represent the loss which may be due to market inefficiency. Excess profits or economic rent, associated with the positive imbalances, is characterized by the area BCD. Consistent with

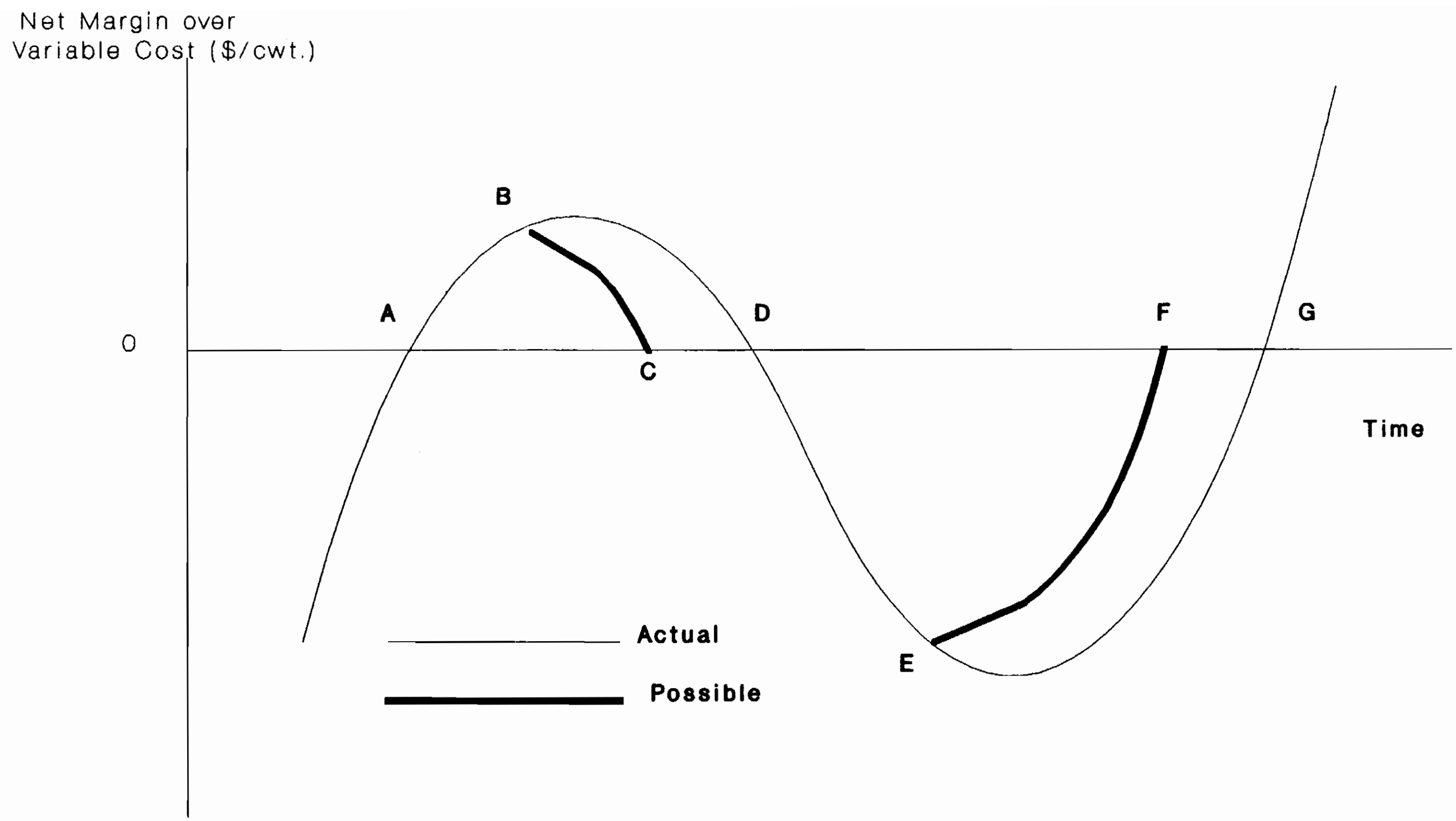

Figure 3.6 Presentation of Actual Vs. Possible Market Performance Patterns

the empirical evidence, Figure 3.6 suggests that the imbalances involving losses are larger than those involving economic rent.

Purcell suggests that it takes more time to correct the market imbalances by changing placement patterns in the cash markets than might be the case by dealing directly in the futures market. When economic rents appear, cattle feeders can be involved in correcting the situation by selling distant live cattle futures and placing short hedges. But when the negative margins appear, the cattle feeder may not take short positions in the nearby feeder cattle or long positions in the distant live cattle futures prices for fear they will be ruled as speculative and any losses in futures cannot be deductible. The cattle feeders cannot be a full participant and must wait for the situation to correct itself. If the empirical evidence supports the hypothesis that cattle feeders would be highly effective market participants, then the markets are less effective than they could be.

3.6 Evidence of Market Inefficiency

Earlier discussion has implied that IRS policies which discourage cattle feeders from getting involved in the price discovery process block the markets access to important information. Cattle feeders are in a position to know about inventories in the feedlots, how difficult it is to get financing, feed and feeder cattle costs in the cash markets, and other economic factors that will influence supply response in the industry. If all such information is reflected in the discovered price in the distant live cattle futures, then the market is efficient. One way to test the implicit assumption that allowing cattle feeders to participate fully in the price discovery process would improve market efficiency is to examine whether the market responds to periodic releases of public and private reports.

Earlier studies[9] have investigated the response of live cattle futures to the monthly 7-state and/or the quarterly 13-state cattle on feed reports (Koontz and Purcell, 1988). The often significant price responses to those reports suggest non-independent day-to-day moves in price following the report, and such non-independent moves are evidence of market inefficiency. To further explore the issue of whether cattle feeders might have access to important information that is not being used in the price discovery process, the relationship between margins being offered by the distant live cattle futures and information in ***Cattle Fax*** reports was examined. The feeding margins being offered by distant live cattle futures were regressed on weekly data series such as placements into ***Cattle Fax*** member feedlots. If the estimated beta coefficients on the explanatory variables such as placements are statistically significant and consistent with *a priori* theoretical expectations, such results reinforce the implications that the markets are being denied access to important information from the cattle feeding complex.

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[9] Koontz and Purcell analyzed the lead-lag relationship between variations in live cattle futures prices and changes in the numbers of cattle placed into feedlots. They contended that cattle feeders represented by ***Cattle Fax*** members respond to changes in the price levels of distant live cattle futures by adjusting the number of cattle placed on feed. These results were drawn from the strong evidence that live cattle futures prices quickly reflect changes in placements of cattle on feed.

According to the results, the placement variables in various model specifications are found to have consistently negative signs and to be statistically significant across the models with a significance level of at least 0.10. That is, the changes in placements of cattle on feed as reported weekly by ***Cattle Fax*** have a negative effect on feeding margin changes. The expected margins react to changes in placements of cattle on feed in the weekly ***Cattle Fax*** reports, suggesting the reports provide "*new*" information not yet incorporated into the distant live cattle futures prices. An increase in placements of cattle on feed brings a predictable increase in fed cattle supplies, and prices of distant live cattle futures decline. The expected margins offered by the distant futures decrease, other things being as given. Given that the expected margins are positively correlated with the distant futures prices, these results are consistent with those of Koontz and Purcell's study.

3.7 Chapter Summary

This chapter has investigated the important concepts necessary for the study of the relationships between traders' activities and margin behavior. Hypotheses were developed about trader behavior, given different levels of margins offered by the futures price. The relationship between the behavior of traders and the level of expected margin was discussed. An effort was made to conceptualize possible trader behavior at times when markets are in a state of relative imbalances.

Consequently, the Chapter provides a conceptual framework for modeling and analyzing the relationship between traders' activities and expected margin behavior. The last section of the Chapter dealt with the implications of the IRS policy to market efficiency and described some evidence of market inefficiency.

CHAPTER FOUR: EMPIRICAL METHODS

4.1 Introduction

This chapter provides a basic introduction to the data used in this analysis. The procedure to compute the expected margin offered by the distant futures price is discussed. Based on the conceptual framework developed in the previous chapter, a correlation analysis is performed to measure the relationships between trading activity and expected margin behavior. With this base, the Chapter then presents the empirical models to test the hypotheses presented in Chapter 1.

Two general forms of empirical models are specified to examine the relationships between expected margin and trader activity. One is the expected margin regressed on changes in trader positions. The other is a trading activity model which regresses changes in trader positions on the level of expected margin. Attention then turns to the hypotheses concerning expected trader behavior and expected margin change. The hypothesized behavior is based on the review of theoretical and empirical issues discussed in Chapter 2.

The model estimation procedure is provided. The assumptions underlying a regression model are reviewed and a description of misspecification tests is presented.

4.2 Expected Margin Calculation

To examine the relationship between traders' positions and expected margins offered by live cattle futures price, the expected margins over variable costs are computed. All production costs are assumed to be known and fixed at the time of placements of feeder cattle on feed. Also, feedlots are assumed to operate a four-month feeding program which involves feeding feeder steers weighing 750 pounds into fed steers weighing 1,150 pounds. This scenario represents Great Plains (Texas-New Mexico) custom cattle feeding.

Daily futures prices for live cattle are obtained from either the **Chicago Mercantile Exchange Year Book** or the **Wall Street Journal**. The cash fed-cattle price represents the weekly average for 900- to 1,100-pound Choice slaughter steers, direct Kansas trade. The cash feeder-cattle price is the weekly average price for 700- to 800-pound Choice feeder steers at Amarillo. Both of these latter prices are obtained from weekly issues of **Livestock, Meat and Wool Market News——A Weekly Summary and Statistics**.

The feed ration used for each animal is 43 bushels of corn, 0.16 tons of soybean meal, and 640 pounds of alfalfa hay.[10] Weekly corn and soybean meal prices are obtained by averaging the midpoints of daily price ranges. Alfalfa hay prices are held constant during each month, then

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[10] The feed ration and expense items do not necessarily coincide with experience of individual feedlots. Steers are assumed to gain 400 pounds in 120 days at 2.8 lb. per day with a feed conversion of 8.4 lb. per pound of gain.

updated monthly. The specific data for the feed costs are as follows:

(1) Corn prices ——No. 2, yellow, "*truck bid*" spot F.O.B. elevator, daily quoted at Omaha, $ per bushel;

(2) Soybean meal——44% "*rail bid*" daily quoted at Decatur, $ per ton; and

(3) Alfalfa hay ——Average price received by farmers plus $30 per ton handling and transportation to feedlots, $ per head.

Other variable costs are obtained from monthly issues of **Livestock and Poultry Situation and Outlook Report.**[11] These costs are held constant during each month, then updated monthly. They are comprised of the following expenses:

(1) Feed handling and management charge;

(2) Veterinary and medicine;

(3) Interest on feeder cattle and feed;

(4) Death loss as a percentage of the cost of the 750- pound feeder steer;

(5) Marketing expenses; and

(6) Transportation to feedlot (300 miles) using a 44,000-pound haul and a commission fee, which is associated with the purchase of feeder cattle.

When cattle feeders place animals on feed, the expected margin (EXPM) over variable costs on a per hundredweight basis can be calculated weekly using the following formula:

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[11] The report represents only what expenses would be if all selected items were paid for during the period indicated. According to different feedlots, expenses and prices for management, production, and locality of operation should be adjusted.

EXPM = [FLC4*11.04 - CAFC*7.5 - (CACORN*43 + CASM*0.16 + CAHAY) - Other Variable Costs - TB6MN*(Feeder Cattle and Feed Prices)] / 11.04[12]

where:

FLC4 = Distant live cattle futures price quoted 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 to determine an expected margin per head. The result, when divided by the sale or payout weight, is EXPM per hundredweight. Note that commission fees, interest on margin money, and futures transaction costs are not included with the costs of feeding operation. Also, in order to approximate capital charges, an interest rate is multiplied by the actual costs of the feeder animal and feed. This rate is an annual cost of borrowing capital, adjusted for time.

This formula can be modified to determine an expected margin over all costs (variable and fixed costs) by including fixed costs with the other variable costs. Assuming a 15-year expected life of the feedlot and

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

30,000 head capacity, the capital investment of facilities and loan amortization results in a fixed overhead cost of $5.77 per head (Leuthold and Mokler, 1979).[13] Another modification of the formula allows the calculation of realized net cash margins over variable costs or fixed costs after feeding is completed. This is done by substituting actual prices paid or received for fed cattle (four months later) for the distant live cattle futures prices (FLC4).

4.3 Modeling Relationships between Trading Activity and Expected Margin Behavior

The issues of interest are, "*Does trader activity change with changes in the margin*?" and "*Do the traders respond to changes in, and levels of, the margins*?" Related to the latter issue, it will be examined as to whether or not the market imbalances are identified by the traders. This will be done by analyzing differential traders' behavior in response to the states of equilibrium[14] and disequilibrium, respectively.

[13] In their study, the authors simulated a cattle feedlot typical of the Midwest and examined 234 feeding periods during 1972-1976. The study used the data for the nonfeed cost items which were taken from either **Beef Cattle Feeding in Iowa 1974: Evaluation of Feedlot Systems**, Iowa State University, or **Farm Management Manual**, issues for 1973-1977, University of Illinois,.

[14] As defined in section 3.5, an "*equilibrium*" is a state in which distant futures prices would be expected to approach the average cost of production for the most efficient producer in the long run. With all costs included, the equilibrium level of the margin would be near zero. A "*disequilibrium*" is referred to as a state in which the prices either exceed or do not cover the production costs over time.

Initially, correlation analysis[15] is performed to confirm that trader behavior is related to changes in the expected margin offered by the futures price (EXPM). For this purpose, changes in expected margin and changes in positions held (weekly first differences) by the various categories of traders are examined. Lagged impacts of changes in the expected margin are examined by analyzing correlations involving the first differenced margin variable lagged up to 5 weeks.

Correlation analysis is also used to provide insight into the existence of a possible "*feeding margin range*" within which, in simplest terms, trading in the futures markets is less active. Conceptually, within some range around the equilibrium margin as discussed in Chapter 3, speculators would tend to wait to act until their cash 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 is conducted first on the complete data set. The next step involves disaggregating the data set of the expected margins (EXPM) as follows:

(1) the set of all EXPM;

(2) the subset of positive EXPM;

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[15] Correlation measures the closeness of a "*linear*" relationship between variables. If one variable x can be expressed exactly as a linear function of another variable y, then the correlation is 1 or -1, depending on whether the two variables are directly related or inversely related. A correlation of zero between two variables means that each variable has no "linear" predictive ability for the other. If the values are normally distributed, then a correlation of zero means that the variables are independent of one another (Kmenta, 1986).

(3) the subset of positive and increasing EXPM;

(4) the subset of positive and decreasing EXPM;

(5) the subset of negative EXPM;

(6) the subset of negative and increasing EXPM; and

(7) the subset of negative and decreasing EXPM.

Table 4.1 shows the frequency of expected margins belonging to each subset defined above.

Dummy Variables (D1-D12) are constructed by segmenting the data set of the expected margins by one dollar per hundredweight. As shown below, the last segment (D12) of the expected margins ranging from minimum value of EXPM to -$7 per cwt. serves as the base group and thus is omitted from the relevant regressions. The omission of this last dummy variable

Table 4.1 The Frequency of Disaggregated Subsets of Expected Margins

Segment	Frequency
All Data	240
Positive	58
Positive/Increasing	39
Positive/Decreasing	19
Negative	182
Negative/Increasing	83
Negative/Decreasing	99

allows for avoiding a complete linear combination among the independent variables. Specifically, the dummy variables are defined as follows:

D1 = 1 if 3 < EXPM <= Maximum value of EXPM[16], otherwise D1=0;

D2 = 1 if 2 < EXPM <= 3, otherwise D2 = 0;

D3 = 1 if 1 < EXPM <= 2, otherwise D3 = 0;

D4 = 1 if 0 < EXPM <= 1, otherwise D4 = 0;

D5 = 1 if -1 < EXPM <= 0, otherwise D5 = 0;

D6 = 1 if -2 < EXPM <= -1, otherwise D6 = 0;

D7 = 1 if -3 < EXPM <= -2, otherwise D7 = 0;

D8 = 1 if -4 < EXPM <= -3, otherwise D8 = 0;

D9 = 1 if -5 < EXPM <= -4, otherwise D9 = 0;

D10 = 1 if -6 < EXPM <= -5, otherwise D10 = 0;

D11 = 1 if -7 < EXPM <= -6, otherwise D11 = 0; and

D12 = 1 if Minimum value of EXPM <= EXPM <= -7, otherwise D12=0.

An alternative set of dummy variables are defined by segmenting the expected margins by $2 per cwt. The last segment (D6') serves as the base group. The dummy variables (D1'-D6') are defined as follows:

D1' = 1 if 2 < EXPM <= Maximum value of EXPM, otherwise D1=0;

D2' = 1 if 0 < EXPM <= 2, otherwise D2 = 0;

D3' = 1 if -2 < EXPM <= 0, otherwise D3 = 0;

D4' = 1 if -4 < EXPM <= -2, otherwise D4 = 0;

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[16] The value of computed EXPM ranges from -$8.1808 per cwt. to $4.1099 per cwt. The mean value is found to be -$1.8040 per cwt with a standard deviation of 2.4763.

Table 4.2 The Frequency of Expected Margins of Each Segment by $1 per cwt. and $2 per cwt.

$1.00 per cwt.		$2.00 per cwt.	
Segment	Frequency	Segment	Frequency
D1	5	D1'	18
D2	13		
D3	19	D2'	41
D4	22		
D5	39	D3'	77
D6	38		
D7	42	D4'	74
D8	32		
D9	21	D5'	32
D10	11		
D11	11	D6'	15
D12	4		

D5' = 1 if -6 < EXPM <= -4, otherwise D5 = 0; and

D6' = 1 if Minimum value of EXPM <= EXPM <= -6, otherwise D6=0.

Table 4.2 reports the number times the expected margin falls into each of these segments of $1.00 per cwt. and $2.00 per cwt., respectively. Using the $2.00 segments reduces the problem of the small numbers of observations in the $1.00 segments shown in Table 4.2.

4.4 Specification of Expected Margin Model

The following model is specified to explain the expected margins offered by live cattle futures:

CHEXPM = f(CHLONGC, CHSHORTC, CHLONGN, CHSHORTN)

where:

CHEXPM = The difference in expected margins over variable costs offered by distant live cattle futures prices at week t and t-1;

CHLONGC = The difference in total long positions of commercial purpose (hedging) held by large traders for all live cattle futures contracts traded each Wednesday at week t and t-1;

CHSHORTC = The difference in total short positions of commercial purpose held by large traders for all live cattle futures contracts traded each Wednesday at week t and t-1;

CHLONGN = The difference in total long positions of non-commercial purpose (speculating) held by large traders for all live cattle futures contracts traded each Wednesday at week t and t-1; and

CHSHORTN = The difference in total short positions of non-commercial purpose held by large traders for all live cattle futures contracts traded each Wednesday at week t and t-1.

This model allows one to examine the direction and magnitude of the changes in the endogenous or dependent variable when one of the exogenous or explanatory variables in the model changes, the other independent variables being held fixed. So, each coefficient of the estimated model could be expressed as the partial derivative of the expected margin change (CHEXPM) with respect to each of the independent variables in the model.

The regression analysis is conducted first on the entire data set. Then, subsamples of the data are selected based on whether the expected margin is positive, positive/increasing, positive/decreasing, negative, negative/increasing or negative/decreasing and these subsamples are analyzed. Also, based on the correlation analysis, the complete data set is decomposed into two subsets which represent an upper and a lower "*margin range*", respectively. In decomposing these margin ranges, the following criteria are set: (1) expected margins belonging to a range within which there is a relatively significant correlation between CHEXPM and changes in various trader positions, or (2) expected margins belonging to a range which is outside of a 95% (or 90%) confidence level of the mean of the expected margin.

The various trader positions represent the grouped trading activities such as large (reporting) hedging and speculative activities. By definition, the large traders refer to those with more than 100 open contracts of a specific commodity. These large traders are responsible for reporting their trading records to the *Commodity Futures Trading Commission* (CFTC). Each hedging and speculative account is divided into long and short positions. These data are used to construct several variables measuring trading activity in each group. These include weekly averages by group and the number in each group each Wednesday for all futures contracts being traded and for the particular futures contract that would be used to hedge the cattle.

The choice of which contract to use to match expected margins is problematic. The contracts for live cattle futures expire every other month. The live cattle contracts on the *Chicago Mercantile Exchange* (CME) are traded for the months of February, April, June, August, October and December. The pertinent futures contracts by time of placement are presented in Table 4.3.

Assume, then, that feeder cattle are placed into feedlots during the period from the third week of December, 1984 to the second week of February, 1985. The closing quotes and open interest of the June, 1985 futures contract are used to calculate expected margins and open interest

Table 4.3 Pertinent Futures Contracts for Placement of Cattle During Specific Calendar Periods

Placement	Contract
DEC. 3rd Week - FEB. 2nd Week	JUN.
FEB. 3rd Week - APR. 2nd Week	AUG.
APR. 3rd Week - JUN. 2nd Week	OCT.
JUN. 3rd Week - AUG. 2nd Week	DEC.
AUG. 3rd Week - OCT. 2nd Week	FEB.
OCT. 3rd Week - DEC. 2nd Week	APR.

for a specific contract during the day.[17]

Concerning the relationship between changes in EXPM and trading position changes, it is worthwhile to review the research by Rowsell (1991). The author tried to identify the relationship between price behavior in live cattle futures market and changes in different trading positions. The futures prices used by Rowsell are from nearby contracts and are therefore different from those of the distant futures used in the current research. In spite of the differences in the data, some implications suggested by Rowsell lend support for the assumptions adopted in modeling EXPM.

According to the Rowsell analysis, different trading categories have significant influence on price changes. Long hedging and long speculating form buying pressure and tend to have a positive impact on price. Short speculating and short hedging represent selling pressure and influence the price negatively.

An increase in the distant futures price will have a positive influence on the expected margin offered by that futures price, other things being held fixed. The relationships between the expected margin and trader activities could be identified via an *ex post* analysis. For this purpose, a regression analysis can be considered. Through this

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[17] For reference, in **Livestock and Poultry Situation and Outlook** from the USDA, Choice feeder steers are assumed to gain 500 pounds in 180 days at 2.8 pounds per day with a feed conversion of 8.4 pounds per pound of gain. The feeder steer prices are from the Amarillo market area weighing 600-700 pound. Choice slaughter steer prices are for the Texas-Mexico direct weighing 900-1,100 pound.

analysis, positive or adverse impacts of traders' activities on the expected margin could be inferred.

For example, when a positive margin is present (EXPM > 0), a positive correlation between the expected margin and long speculative positions would tend to push the market to larger positive levels of EXPM and away from an equilibrium, other things equal. Conversely, a negative correlation between long speculators' activity and positive levels of EXPM would help correct any positive margin market imbalance. Similarly, when a negative margin is present (EXPM < 0), a positive correlation between the expected margin and long speculative positions would help the market return toward equilibrium. A negative correlation between the expected margin and long speculative positions would accentuate the market imbalance, pushing the EXPM to larger (in absolute terms) negative levels.

The expected influence of the explanatory variables on distant live cattle futures and the expected margin follows.

(1) Long Speculative Activity (CHLONGN)

Positive values of CHLONGN at time T lead to buying pressure. An increase in LONGN will increase the distant live cattle futures prices. CHLONGN would thus have a positive influence on EXPM. When positive margins are being offered, an increase in LONGN will tend to cause the market to move farther from equilibrium. In the case of negative margins, an increase in LONGN for positive values of CHEXPM will help the market restore the equilibrium.

(2) **Short Speculative Activity (CHSHORTN)**

Short speculating activity at time T tends to decrease the distant live cattle futures price. Positive values of CHSHORTN will then have a negative influence on the expected margins offered by the distant live cattle futures prices. When positive margins are being offered, the increase in SHORTN will help the market return toward equilibrium. When the margins are negative, the increase in SHORTN or positive values of CHSHORTN will push the market farther from equilibrium.

(3) **Long Hedging Activity (CHLONGC)**

Table 4.4 shows the widely recognized imbalance between short hedging and long hedging. Long hedging is presented in the literature as being important to effective price discovery processes. Positive values of CHLONGC would tend to push the market away from equilibrium when EXPM is positive, however. When EXPM is negative, positive values of CHLONGC would tend to help restore the equilibrium.

Table 4.4 The Ratio of Different Trading Positions over Total Open Interest of All Futures Contracts in Average Terms

POSITION	MEAN	STANDARD DEVIATION
Long Speculation	0.1955	0.0752
Short Speculation	0.1289	0.0367
Long Hedging	0.2042	0.0464
Short Hedging	0.4022	0.0557

(4) **Short Hedging Activity (CHSHORTC)**

Large (reporting) short hedging represents selling pressure. Short hedging will impact EXPM negatively by decreasing the distant futures prices. When margins are positive, positive values of CHSHORTC would constrain moves to extreme profits. When margins are negative, however, positive values of CHSHORTC would accentuate the imbalance, decreasing EXPM even further.

In order to examine different impacts of various trading activities on the behavior of expected margins, the following alternative subsets of trading activities are introduced:

(1-1) **CHWDLN** The change in long speculative positions held by large traders for a specific contract each Wednesday at week t and t-1.

(1-2) **CHWATLN** The change in weekly average long speculative positions held by large traders for all contracts at week t and t-1.

(1-3) **CHWASLN** The change in weekly average long speculative positions held by large traders for a specific contract at week t and t-1.

(2-1) **CHWDSN** The change in short speculative positions held by large traders for a specific contract each Wednesday at week t and t-1.

(2-2) **CHWATSN** The change in weekly average short speculative positions held by large traders for all contracts at week t and t-1.

(2-3) **CHWASSN** The change in weekly average short speculative positions held by large traders for a specific contract at week t and t-1.

(3-1) **CHWDLC** The change in long hedging positions held by large traders for a specific contract each Wednesday at week t and t-1.

(3-2) **CHWATLC** The change in weekly average long hedging positions held by large traders for all contracts at week t and t-1.

(3-3) **CHWASLC** The change in weekly average long hedging positions held by large traders for a specific contract at week t and t-1.

(4-1) **CHWDSC** The change in short hedging positions held by large traders for a specific contract each Wednesday at week t and t-1.

(4-2) **CHWATSC** The change in weekly average short hedging positions held by large traders for all contracts at week t and t-1.

(4-3) **CHWASSC** The change in weekly average short hedging positions held by large traders for a specific contract at week t and t-1.

Table 4.5 summarizes the expected signs of the changes in various trading positions influencing the expected margins being offered by the distant live cattle futures prices.

4.5 Specification of Trading Activity Model

Related to the current research on relationships between the expected margins and trading activities, findings by Rowsell (1991) are again of interest. A causality test by Rowsell indicates that there is a causal flow from price to the long and short speculative activities, but no causal flow from price to the hedging categories. Price in time t influences the speculators in time t+1, t+2, *etc*. This result suggests that speculating is motivated by price and price changes.

Table 4.5 Summary of Expected Signs of CHEXPM Regressed on Changes in Trading Positions

Dependent Variable: CHEXPM	Explanatory Variable: Long Hed.	Short Hed.	Long Spec.	Short Spec.
Positive/Increasing	(-)	(+)	(-)	(+)
Positive/Decreasing	(+)	(-)	(+)	(-)
Negative/Decreasing	(-)	(+)	(-)	(+)
Negative/Increasing	(+)	(-)	(+)	(-)

More importantly, the evidence of price changes leading, in a time context, changes in trader activities indicates that the live cattle futures market is not being manipulated or that any specific trading group is influencing the market adversely.

In the current analysis, the following trading activities are expected. First, when a positive margin is present or is being offered, the responses of the trader groups are hypothesized to be as follows:

Hedgers will decrease long positions;
Hedgers will increase short positions;
Speculators will decrease long positions; and
Speculators will increase short positions.

In case a negative margin is expected, traders would tend to respond in these ways:

Hedgers will increase long positions;
Hedgers will decrease short positions;
Speculators will increase long positions; and
Speculators will decrease short positions.

The above expectations imply that when a negative margin is being offered during a placement month, no profitable hedging opportunity is present. The reverse trading practice of being long in distant (live cattle) futures and/or being short in nearby (feeder cattle) futures might contribute to the restoring of a market equilibrium.

One thing to remember is that futures traders' reactions to predictable margins depends on the level of the expected margins, not just on the sign (positive or negative) projected by the futures. For example, although a negative margin is being offered, hedgers and/or speculators in the futures market have a tendency to wait until the margins are more extreme, more negative, before taking any action. The long speculator, for example, will not be quick to buy the distant live cattle futures when the margin is -$1.00 per hundredweight if the speculator expects the margin to go to -$5.00 before it turns.

Related to the reactions by different traders in futures market, the following question may be raised: *How low should the futures price and the margin be to attract attention and be reversed by the traders?* This question may be answered by doing a reverse regression of the basic model used in this analysis.[18] That is, each of the various trading activities is regressed on expected margins and/or the other factors explaining the variations in the trading activities.

The following models are estimated to examine the expected margin effects on different trading activity. The Ordinary Least Square (OLS) procedure is employed to estimate the models.

(1) LONGC = f(LONGC1, CHEXPM, TREND);

(2) SHORTC = f(SHORTC1, CHEXPM, TREND);

(3) LONGN = f(LONGN1, CHEXPM, TREND); and

(4) SHORTN = f(SHORTN1, CHEXPM, TREND).

where:

LONGC1 = Long hedging positions lagged by one week;

SHORTC1 = Short hedging positions lagged by one week;

LONGN1 = Long speculative positions lagged by one week;

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[18] The potential issue of simultaneity is ignored in this analysis.

SHORTN1 = Short speculative positions lagged by one week;

CHEXPM = Change in expected margin, EXPM(t) - EXPM(t-1); and

TREND = Trend variable which is constructed by using the observation numbers in the weekly data set, from 1 to 261.

LONGC, SHORTC, LONGN and SHORTN have the same definition as those in the previous section, except that these variables are levels of various trader positions, not changes in the levels.

Each of the trading activity models will be estimated over the disaggregated subsets of the expected margins. That is, the complete data of EXPM are decomposed into the subsets of positive, positive/increasing, positive/decreasing, negative, negative/increasing and negative/decreasing. Through this segmenting procedure, it is possible to examine traders' behavior as a function of level of expected margins.

4.6 Alternative Models of Trading Activity

Alternative models are specified to test the hypotheses defined above. These models are estimated using the full sample. Differences in reaction to expected margin by levels are captured by including dummy variables. The models are as follows:

(1) LONGC = f(LONGC1, EXPM, Dummy Variables);

(2) SHORTC = f(SHORTC1, EXPM, Dummy Variables);

(3) LONGN = f(LONGN1, EXPM, Dummy Variables); and

(4) SHORTN = f(SHORTN1, EXPM, Dummy Variables).

where the dummy variables are those defined in section 4.3 and the other variables have the same definition as those defined earlier.

4.7 Model Estimation Procedure

The following iterative procedures are used to estimate the expected margin and trader behavior models:

(1) The functions are estimated via ordinary least squares (OLS);

(2) Misspecification tests[19] are performed by means of informal checks and the formal testing of the assumptions underlying the specified linear regression model;

(3) An alternative model is considered, and step (2) is repeated when the one chosen is found to be inappropriate for the data in hand;

(4) All coefficients are examined to see if they have the hypothesized sign; and

(5) All variables are examined for significant differences from zero using a 0.10 significance level as a cut-off.

Related to the model estimation steps of (2) and (3), the following explanation is necessary. Linear regression models like the ones specified in the earlier section are simply a set of assumptions related to the probabilistic structure of the data in question (Spanos, 1986). The testable assumptions underlying the probability model are normality, linearity, homoskedasticity, independence and parameter stability.

Linear regression models can be viewed as summarizations of the sample information. Thus, they can be very useful or very misleading depending on whether the postulated assumptions are appropriate or

[19] Misspecification tests were programmed by Spanos, McGuirk and Robertson using "*Gauss Econometric Software*." The test program is called 'mojo.'

inappropriate. It is very important to ensure statistical adequacy of the estimated regression as a statistical model before one attempts to make statistical inference based on R^2 (coefficient of determination) or t-ratios. This is because all of the statistical inference results depend crucially on the validity of these assumptions. For example, a high R^2, high t-ratios, and theoretically correct signs and magnitude for the estimated coefficients have very little to do with statistical adequacy (Spanos, 1990). In other words, if the assumptions underlying an estimated model are invalid, the R^2, as a statistical measure of fit, is meaningless. The R^2 can be artificially inflated if the data for the dependent variable exhibits a trend.

4.8 Misspecification Tests

Concerning the misspecification tests defined in the step (2) in the above section, the following tests are considered to assess the statistical adequacy of the assumptions defined above in relation to the information provided by the observed data. The tests are performed by examining the residuals after a regression model is estimated.

(1) Assessing Normality

Normality refers to the distributional assumption for the conditional density of probability model. Departures from the normality assumption come in two forms: 1) Asymmetry of the implied empirical frequency distribution---A skewness test is required; and 2) Fat-tails in the implied empirical frequency distribution---A test for kurtosis is required. The normality distribution assumes that the third and fourth central moments (the skewness and kurtosis coefficients, respectively) of conditional distribution are constant (Jargue and Bera, 1987). Thus, the closer to zero and three the skewness and kurtosis coefficients are respectively, the more valid the normality assumption is. As Spanos (1990) notes, it may be misleading to consider the normality assumption before heterogeneity and memory is modeled out.

When the assumption of normality is invalid, the results based on the sampling distributions of estimated coefficients and variance are no longer valid for a finite sample size. While the results based on the asymptotic distribution of estimated coefficients are valid, those based on the asymptotic distribution of estimated variance are invalid (Spanos, 1990). In other words, t-tests and F-tests for linear restrictions on the coefficients are asymptotically valid. But, tests relating to variance are invalid.

(2) Assessing Homoskedasticity

It is necessary to distinguish between the conditional variance being t-dependent (t-heterogeneity) and being heteroskedastic. The latter refers to the assumption that the conditional variance is a function of regressors. Thus, the errors do not have a constant variance. Specifically, using Ramsey's RESET test which involves regressing the residual on some function of dependent variables, it can be determined whether or not the coefficients are significant (Ramsey, 1969).

When the assumption of homoskedasticity is invalid, estimated coefficients are unbiased and consistent. But, the OLS estimators are no longer minimum variance. That is, the estimators are not the most efficient, since OLS is ignoring information about the errors. Also, the estimated variances of the parameters and residual are biased. So, statistical tests and confidence intervals will be incorrect (Spanos, 1990).

(3) Assessing Homogeneity (Identical Distribution / Stationarity)

Time-homogeneity refers to the assumption that the parameters in an estimated model do not vary over time. The time-homogeneity can be assessed by considering the behavior of the first two moments, the mean and variance. There are two kinds of t-heterogeneity: one is mean t-heterogeneity and the second is variance t-heterogeneity. The former refers to the assumption that the average of the data changes with t in some systematic way. The latter implies that the variation around the data average change with t in a systematic way. The mean heterogeneity comes in two forms. One is due to trend. The mean appears to increase monotonically with t. The second occurs because of seasonality. The mean changes in a systematic regular pattern (Spanos, 1990).

Departures from parameter time-invariance are assessed by using the recursive least-squares estimation method. The method estimates the coefficients of regressors using m observations ($m > 3$) first, and then estimates them recursively by increasing the sample size progressively by one. If the confidence interval around these recursive estimates narrows as the sample size increases, this indicates that the precision of these estimates increase with the sample size.

(4) Assessing Independence (Memory / Autocorrelation Test)

T-independence refers to the non-independence of successive observation in a t-plot. That is, the error at t is correlated with the errors at previous times or serial correlation. Departures from the t-independence appear as two primary patterns: one is positive dependence (memory) with long cycles over t, and the second is negative dependence exhibiting alternating signs.

The tests for the temporal independence are based on temporal correlation (autocorrelation) among the residuals. The most commonly used test for serial correlations is the Durbin-Watson test (Durbin and Watson, 1950, 1951). Despite its popularity, the Durbin-Watson test has several limitations (Maddala, 1988). First, it tests only for first-order serial correlation. Second, the test is inconclusive if the computed value lies between the lower Durbin-Watson (DW) statistic, d_L , and the upper DW statistic, d_U. Third, the test cannot be applied in models with lagged dependent variables.

Another way to test the serial correlations in the errors is called the Lagrange Multiplier (LM) test, which allows for testing for the presence of higher-order serial correlations (Breusch, 1978). It also allows for testing for autocorrelation when regressors include lagged dependent variables (Godfrey, 1978).

When the independence assumption is invalid, estimated coefficients and variance are biased and inconsistent. As a result, the t-tests and F-tests and prediction intervals are no longer valid (Spanos, 1990).

(5) Assessing Linearity

Linearity refers to the functional form of the conditional expectation in terms of the observed values of regressors. If the joint distribution of a regression model is normal, the conditional expectation is linear in the regressors and the parameters of the conditional distribution. However, it is non-linear in the primary parameters, the parameters of the joint distribution of dependent and independent variables (Spanos, 1990). In looking for departures from linearity, the cross-plot of the residuals against powers of regressors are used to see if the fitted least-squares line is horizontal, showing no systematic departures. An F test can be applied to formally examine the departures from linearity.

When the assumption of linearity is invalid, estimated coefficients and variance are both biased and inconsistent. None of the results based on them are generally valid. However, these estimators can be used as the linear least-squares approximation of the non-linear conditional mean (Spanos, 1990).

(6) Tests for Stability

In multiple regression analysis, there is concern about the stability of the estimated relationships across two samples of sizes n_1 and n_2. When a multiple regression equation is estimated and used for prediction at future points of time, it is assumed that the parameters are constant over the entire time period of estimation and prediction. In this sense, the tests for stability are called the parameter structural change tests.

To test this hypothesis of parameter constancy (or stability), the following two tests are considered: the analysis-of-variance test (AV test) and the predictive test (Chow test). In practice, it is desirable to use both tests (Maddala, 1988). If either n_1 or n_2 is not greater than the number of regression parameters estimated, the AV test cannot be used but the Chow test can be. However, in this case the Chow test is not a test for stability. It is merely a test for unbiasedness of predictions.

In the Chow test, the first n_1 observations are used to estimate a regression equation and then used to make predictions for the next n_2 observations. Then, the hypothesis that the prediction errors have mean zero is tested via general F-test procedures (Chow, 1960).

Specifically, in this analysis, 'split-sample' parameter structural change test is used to see if there is a structural change in parameters. Stability of the coefficients on the regressors and the variance of regression are both examined.

4.9 Chapter Summary

This chapter has introduced the variables in the data set and the procedure by which the expected margin offered by the futures was calculated. The analysis to be conducted on the expected margins and trading groups was outlined. Based on the conceptual frameworks developed in Chapter 3, empirical models were formulated to identify the impact of behavior of trader positions on expected margin changes. The models are to be estimated over disaggregated subsets of expected margins. Efforts are made to examine a differential and identifiable influence of trader groups, especially speculators, on the margin changes when markets are in a state of relative imbalance.

In addition, models to examine trader behavior depending on the level of margin were formulated as a method of examining whether margin changes exert influence on the changes in trader's positions. Alternative models were also estimated to allow tests of whether trading activities are influenced by the signs and/or the level of margins. The Chapter concluded with a presentation of model estimation procedure, followed by a discussion of misspecification tests.

CHAPTER FIVE: RESULTS

5.1 Introduction

In the previous chapter, three general forms of analyses were specified. This chapter begins with a correlation analysis in order to confirm that changes in trader positions are related to changes in the margin offered by futures. The models of expected margin behavior in response to trading activity are then discussed. The discussion is focused on the margin behavior when the market is in a state of relative imbalance. Following this discussion is a presentation of the statistical analysis of trading activity depending on the level of expected margin. The empirical results of the models are reported over different subsamples of expected margin along with the complete data set during the 1983-1987 period. An attempt is made to identify the "*feeding margin range*" defined in the previous chapter. The chapter concludes with a summary of the statistical findings.

5.2 Correlation Analysis of Trader Activity and Expected Margin Behavior

The objective is to determine whether trader behavior changes with the margin offered by futures and whether the expected margin (EXPM) changes with trader behavior. These correlations are examined over different expected margin levels to gain evidence of the existence of a possible "*feeding margin range*." The upper limit and lower limit of this range could be boundaries outside of which differential and identifiable behavior of traders, especially speculators, would be expected to develop.

Table 5.1 reports the correlation coefficients between change in various positions and change in expected margins lagged up to 5 weeks. Table 5.2 summarizes the correlation coefficients between speculative activity and margin change over different subsamples. The trading positions are the numbers of futures contracts (not offset) held by various traders' groups each Wednesday for all contracts during the day.[20] The number beneath each correlation coefficient is the p-value associated with the coefficient. A significance level of 0.10 is used to determine whether or not the corresponding coefficients are statistically significant.[21]

As shown in Table 5.1, a consistent relationship is evident. In general, the weakest correlation is between expected margin changes (CHEXPM) and hedge positions, especially long hedge positions (CHLONGC). For the complete data set, changes in long speculators' positions are found to be positively correlated with changes in expected margin over specific time intervals. Changes in short speculators' positions, on the other hand, are found to be negatively related to expected margin changes.

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[20] The results of the correlation analyses for the other definitions of trading positions are reported in Appendix A. Since the results were similar in significance and sign, they are not reported.

[21] As mentioned in a previous footnote, a significant correlation coefficient implies that there exists a "*linear*" relationship between variable x (say, change in positions) and variable y (say, change in expected margin). An insignificant coefficient is not to imply that there is not any relationship, such as a quadratic relationship, between the corresponding variables, but that just a "*linear*" correlation does not exist.

Table 5.1 Correlation Matrix for Change in EXPM and Positions for Every Wednesday/All Contract

	CHLONGC	CHSHORTC	CHLONGN	CHSHORTN
Over the Set of All EXPMs:				
CH1EXPM	0.05873	-0.06913	0.25340	-0.23765
	0.3650*	0.2861	0.0001	0.0002
CH2EXPM	0.01681	0.09051	0.24638	-0.36683
	0.7964	0.1640	0.0001	0.0001
CH3EXPM	-0.02200	0.12831	0.25195	-0.28755
	0.7362	0.0485	0.0001	0.0001
CH4EXPM	-0.01155	0.13088	0.26096	-0.25159
	0.8600	0.0446	0.0001	0.0001
CH5EXPM	-0.01123	0.10251	0.23238	-0.15692
	0.8640	0.1171	0.0003	0.0161
Over the subset of Positive EXPMs:				
CH1EXPM	0.15165	-0.38062	-0.00015	-0.14368
	0.2558	0.0032	0.9991	0.2819
CH2EXPM	0.03972	-0.21606	-0.01152	-0.14643
	0.7672	0.1033	0.9316	0.2727
CH3EXPM	0.07553	-0.01464	0.10706	-0.13746
	0.5731	0.9131	0.4238	0.3035
CH4EXPM	0.09514	-0.02680	0.09960	-0.11013
	0.4774	0.8417	0.4570	0.4105
CH5EXPM	0.10152	0.10739	0.10659	-0.03729
	0.4483	0.4223	0.4258	0.7811
Over the Subset of Positive/Increasing EXPMs:				
CH1EXPM	-0.10927	-0.53018	-0.24423	-0.29739
	0.5079	0.0005	0.1340	0.0660
CH2EXPM	-0.11024	-0.28023	-0.17202	-0.17395
	0.5041	0.0840	0.2950	0.2896
CH3EXPM	0.01579	-0.09535	-0.08204	-0.07261
	0.9240	0.5637	0.6195	0.6605
CH4EXPM	0.02796	-0.15518	-0.11695	-0.08481
	0.8658	0.3455	0.4783	0.6077
CH5EXPM	0.00262	0.04717	-0.04093	0.02512
	0.9873	0.7755	0.8046	0.8794
Over the Subset of Positive/Decreasing EXPMs:				
CH1EXPM	0.09064	-0.20609	0.17501	-0.11128
	0.7121	0.3973	0.4736	0.6502
CH2EXPM	-0.08424	0.07027	0.12317	-0.23510
	0.7317	0.7750	0.6154	0.3326
CH3EXPM	-0.15737	0.56277	0.56371	-0.50012
	0.5200	0.0121	0.0119	0.0292
CH4EXPM	0.02390	0.50715	0.53659	-0.23218
	0.9226	0.0267	0.0179	0.3388
CH5EXPM	0.12485	0.40384	0.35532	-0.21753
	0.6106	0.0864	0.1355	0.3710

Table 5.1 Continued

	CHLONGC	CHSHORTC	CHLONGN	CHSHORTN
Over the Subset of Negative EXPMs:				
CH1EXPM	0.02010	0.01962	0.27521	-0.27533
	0.7877	0.7927	0.0002	0.0002
CH2EXPM	0.00544	0.16672	0.24815	-0.45157
	0.9422	0.0253	0.0008	0.0001
CH3EXPM	-0.06927	0.14064	0.20961	-0.36218
	0.3569	0.0604	0.0049	0.0001
CH4EXPM	-0.05866	0.14141	0.21792	-0.31889
	0.4367	0.0597	0.0035	0.0001
CH5EXPM	-0.06153	0.04345	0.17076	-0.20922
	0.4159	0.5658	0.0231	0.0052
Over the subset of Negative/Increasing EXPMs:				
CH1EXPM	0.01470	0.04194	-0.08093	-0.18154
	0.8951	0.7066	0.4670	0.1005
CH2EXPM	0.11486	0.20079	0.17729	-0.43251
	0.3011	0.0687	0.1088	0.0001
CH3EXPM	-0.08031	0.17731	0.08364	-0.36568
	0.4732	0.1110	0.4550	0.0007
CH4EXPM	0.07395	0.24767	0.11905	-0.34267
	0.5118	0.0258	0.2898	0.0017
CH5EXPM	-0.03131	0.11056	0.07266	-0.21055
	0.7828	0.3289	0.5218	0.0608
Over the Subset of Negative/Decreasing EXPMs:				
CH1EXPM	0.10916	0.07296	0.26134	-0.11473
	0.2821	0.4729	0.0090	0.2582
CH2EXPM	-0.03583	0.19796	0.14584	-0.37850
	0.7275	0.0519	0.1540	0.0001
CH3EXPM	-0.05104	0.14756	0.16958	-0.27029
	0.6195	0.1492	0.0968	0.0074
CH4EXPM	-0.13040	0.09829	0.17500	-0.22141
	0.2030	0.3381	0.0864	0.0293
CH5EXPM	-0.06799	0.00931	0.15403	-0.12851
	0.5081	0.9279	0.1320	0.2097

CHLONGC = Change in Positions held by Long Hedgers over 1 Week
CHSHORTC = Change in Positions held by Short Hedgers over 1 Week
CHLONGN = Change in Positions held by Long Speculators over 1 Week
CHSHORTN = Change in Positions held by Short Speculators over 1 Week
CH1EXPM = Change in Expected Margin over 1 Week
CH2EXPM = Change in Expected Margin over 2 Weeks
CH3EXPM = Change in Expected Margin over 3 Weeks
CH4EXPM = Change in Expected Margin over 4 Weeks
CH5EXPM = Change in Expected Margin over 5 Weeks

*** P-Value = Prob > |R| under Ho: Rho=0**

Table 5.2 Correlation between Speculative Trading Groups and Margin Change and Direction of Movement For every Wednesday/All Contract

	Positive/ Increasing	Positive/ Decreasing	Negative/ Increasing	Negative/ Decreasing
Long Speculation:				
CH1EXPM	-0.24423 (S)**	0.17501 (S)	-0.08093 (D)***	0.26134 (D)
	*0.1340	0.4736	0.4670	0.0090
CH2EXPM	-0.17202 (S)	0.12317 (S)	0.17729 (S)	0.14584 (D)
	0.2950	0.6154	0.1088	0.1540
CH3EXPM	-0.08204 (S)	0.56371 (S)	0.08364 (S)	0.16958 (D)
	0.6195	0.0119	0.4550	0.0968
CH4EXPM	-0.11695 (S)	0.53659 (S)	0.11905 (S)	0.17500 (D)
	0.4783	0.0179	0.2898	0.0864
CH5EXPM	-0.04093 (S)	0.35532 (S)	0.07266 (S)	0.15403 (D)
	0.8046	0.1355	0.5218	0.1320
Short Speculation:				
CH1EXPM	-0.29739 (D)	-0.11128 (S)	-0.18154 (S)	-0.11473 (D)
	0.0660	0.6502	0.1005	0.2582
CH2EXPM	-0.17395 (D)	-0.23510 (S)	-0.43251 (S)	-0.37850 (D)
	0.2896	0.3326	0.0001	0.0001
CH3EXPM	-0.07261 (D)	-0.50012 (S)	-0.36568 (S)	-0.27029 (D)
	0.6605	0.0292	0.0007	0.0074
CH4EXPM	-0.08481 (D)	-0.23218 (S)	-0.34267 (S)	-0.22141 (D)
	0.6077	0.3388	0.0017	0.0293
CH5EXPM	0.02512 (S)	-0.21753 (S)	-0.21055 (S)	-0.12851 (D)
	0.8794	0.3710	0.0608	0.2097

* P-Value = Prob > |R| under Ho: Rho=0

** "S" means the corresponding traders' reaction to change in EXPM over 1 to 5 weeks would be expected to Stabilize the market.

*** "D" means the corresponding traders' reaction to change in EXPM over 1 to 5 weeks would be expected to Destabilize the market.

These relationships between speculative positions and expected margins are consistent across the selected subsamples.

More specifically, when changes in the expected margins are positive, the changes in short speculators' positions are negatively correlated and statistically significant over one week. Although the coefficients are statistically insignificant, the relationship between the changes in long speculators' positions and expected margin changes is found to be negative. Considering the positive/decreasing expected margins, the correlation coefficients between expected margin changes and long speculators' position changes have positive signs over lags of three to four weeks. For CHSHORTN, the coefficients are negative for all five weeks and only significant for a four-week lag.

Unlike the case of positive expected margins, the relationship between speculative activity and expected margins is statistically significant when the margins are negative. These results are consistent with those found in the regression analysis reported later in this chapter (section 5.4 and 5.5). That is, speculative activity is more active when negative margins are present than when positive margins are being offered by the distant futures prices.

In the case of negative/increasing expected margins, the changes in short speculators' positions are found to be negatively correlated and statistically significant over two to five weeks. In such a case, CHLONGN has a positive but statistically insignificant association with the changes in EXPM over two to five weeks. For negative/decreasing expected margins, the net relationship between expected margin and short speculation is found to be negative over two to four weeks. This would mean that short speculative positions increase as the margin decreases to more negative levels. In such a case, long speculating is found to be positively correlated with the expected margin changes over one, three and four weeks with a significance level of 0.10.

Based on the correlation analysis over the disaggregated data sets, the following conclusions can be inferred. For positive/decreasing expected margins, long speculative activity has a positive correlation with the expected margin changes over all five weeks with highly significant correlations for lags of three and four weeks. This implies that speculators tend to reduce their long positions with decreases in the still positive expected margins. This reduced long speculative activity tends to decrease futures prices as the traders sell futures to close out long positions. Other things being equal, this reduces the expected margins offered by the futures prices, which leads to moves back toward an equilibrium. In the cases of positive/increasing and negative/increasing margins, the signs of the coefficients (though not statistically significant) indicate that long speculative activity will also help to restore the market balances.

The consistent negative correlation coefficients between short speculation and expected margin changes indicates that short speculators will contribute to correcting the market imbalances. The positive margin changes will be constrained by the increasing short speculative positions. For example, in the case of positive/decreasing margins, an increase in short speculative positions represents increased selling pressure. This selling pressure constrains futures price increases and the margin offered by the futures price. These results are also consistent with those of the regression analysis discussed in section 5.3.

The correlation matrices for selected intervals over the subsamples of expected margins segmented by $1 and $2 per hundredweight are presented in Tables 5.3 and 5.4, respectively. In general, the signs of the correlation coefficients between speculating and expected margin changes are consistent with those of the above analysis. One thing to note is that the coefficient signs of long speculation with respect to expected margin changes are found to be negative over the segments of positive margins ranging from $3 per cwt. to the maximum (over two weeks) and from -$6 per cwt. to -$7 per cwt. (over one, two and four weeks). This implies that if margins are increasing toward maximum positive levels, the reduced long speculative activity may help the market correct the imbalances. The same is true for the range from -$6 per cwt. to -$7 per cwt. if the margins are decreasing. That is, as negative margins become more extreme, long speculative activity increases and this helps to "*turn*" the futures market back up and move the margins back toward equilibrium.

Within the margin ranges from $0 per cwt. to $1 per cwt. (over four weeks) and -$3 per cwt. to -$6 per cwt. (over one to two weeks), the changes in long speculators' positions are found to be positively correlated with the expected margin changes. For the negative -$3 to -$6 range, these results indicate that speculators respond to negative expected margins by taking long positions. This speculative activity forms buying pressure and increases the futures prices, which improves the

Table 5.3 Correlation Matrix for Change in EXPM and Positions over Subsamples Segmented by $1 per cwt.

	CHLONGC	CHSHORTC	CHLONGN	CHSHORTN
For $3/cwt. < EXPM <= Maximum Value of EXPM:				
CH1EXPM	0.29405	-0.18751	-0.75287	-0.30957
	0.6311*	0.7627	0.1419	0.6122
CH2EXPM	0.36104	-0.31581	-0.84398	-0.05542
	0.5505	0.6047	0.0722	0.9295
CH3EXPM	0.48392	-0.55401	-0.31832	0.74462
	0.4088	0.3326	0.6017	0.1488
CH4EXPM	-0.21362	-0.47709	0.35068	0.56747
	0.7301	0.4164	0.5628	0.3184
CH5EXPM	-0.42744	-0.42381	0.46577	0.38568
	0.4728	0.4770	0.4292	0.5214
For $2/cwt. < EXPM <= $3/cwt.:				
CH1EXPM	0.02582	-0.40264	0.02614	-0.51433
	0.9333	0.1726	0.9324	0.0721
CH2EXPM	-0.26613	-0.15287	-0.00198	-0.77663
	0.3795	0.6181	0.9949	0.0018
CH3EXPM	-0.25728	-0.08250	-0.07103	-0.76002
	0.3961	0.7887	0.8176	0.0026
CH4EXPM	-0.26335	-0.17459	-0.14682	-0.39818
	0.3847	0.5684	0.6322	0.1778
CH5EXPM	-0.29151	-0.04415	-0.00018	-0.35923
	0.3339	0.8861	0.9995	0.2280
For $1/cwt. < EXPM <= $2/cwt.:				
CH1EXPM	0.32806	-0.49053	-0.06348	0.07501
	0.1838	0.0388	0.8024	0.7674
CH2EXPM	-0.13384	-0.46403	-0.06613	-0.20443
	0.5965	0.0524	0.7943	0.4158
CH3EXPM	-0.17714	-0.19605	0.21626	-0.37143
	0.4820	0.4356	0.3887	0.1291
CH4EXPM	0.28415	-0.25079	-0.09787	-0.11735
	0.2531	0.3155	0.6992	0.6428
CH5EXPM	0.39558	-0.08812	-0.18123	-0.10845
	0.1042	0.7281	0.4717	0.6684
For $0/cwt. < EXPM <= $1/cwt.:				
CH1EXPM	0.06864	-0.40015	0.10049	-0.11417
	0.7615	0.0650	0.6564	0.6129
CH2EXPM	0.19225	-0.18951	0.22481	0.14141
	0.3914	0.3983	0.3145	0.5302
CH3EXPM	0.28473	0.17238	0.20709	-0.00061
	0.1990	0.4430	0.3551	0.9979
CH4EXPM	0.19605	0.24192	0.37907	-0.10424
	0.3819	0.2781	0.0819	0.6443
CH5EXPM	0.28322	0.23646	0.29082	-0.00589
	0.2015	0.2894	0.1892	0.9793

Table 5.3 Continued

	CHLONGC	CHSHORTC	CHLONGN	CHSHORTN
For -$1/cwt. < EXPM <= $0/cwt.:				
CH1EXPM	0.17748	0.09005	0.12082	-0.21097
	0.2933	0.5961	0.4763	0.2101
CH2EXPM	0.21275	0.31787	0.19667	-0.31230
	0.2062	0.0552	0.2433	0.0599
CH3EXPM	0.14123	0.31679	0.20359	-0.17087
	0.4044	0.0561	0.2268	0.3120
CH4EXPM	0.12698	0.44545	0.22428	-0.21287
	0.4539	0.0057	0.1821	0.2059
CH5EXPM	0.15835	0.27060	0.22669	-0.04210
	0.3492	0.1053	0.1773	0.8046
For -$2/cwt. < EXPM <= -$1/cwt.:				
CH1EXPM	0.09996	-0.24747	0.03738	-0.36982
	0.5678	0.1518	0.8312	0.0288
CH2EXPM	0.12642	0.10488	-0.05497	-0.56310
	0.4762	0.5550	0.7575	0.0005
CH3EXPM	0.20195	0.27107	0.16668	-0.44796
	0.2521	0.1210	0.3461	0.0079
CH4EXPM	-0.00443	0.15890	-0.00043	-0.45917
	0.9802	0.3694	0.9981	0.0063
CH5EXPM	-0.13157	0.00945	0.00548	-0.28802
	0.4583	0.9577	0.9755	0.0986
For -$3/cwt. < EXPM <= -$2/cwt.:				
CH1EXPM	0.15587	-0.07374	-0.05405	-0.02563
	0.3501	0.6599	0.7472	0.8786
CH2EXPM	0.35431	0.28506	0.20386	-0.19837
	0.0291	0.0828	0.2196	0.2325
CH3EXPM	0.24137	0.11803	0.13837	-0.12918
	0.1443	0.4803	0.4074	0.4395
CH4EXPM	0.15414	0.04692	0.19082	0.06500
	0.3624	0.7828	0.2579	0.7023
CH5EXPM	0.03999	-0.13693	-0.14329	0.02653
	0.8169	0.4258	0.4045	0.8779
For -$4/cwt. < EXPM <= -$3/cwt.:				
CH1EXPM	-0.10262	-0.01368	0.49190	-0.41104
	0.6033	0.9449	0.0078	0.0298
CH2EXPM	-0.19241	0.08476	0.16521	-0.27674
	0.3363	0.6742	0.4102	0.1623
CH3EXPM	-0.34503	0.06712	0.09363	-0.14317
	0.0843	0.7446	0.6492	0.4853
CH4EXPM	-0.50293	0.11003	0.29627	-0.40143
	0.0088	0.5926	0.1417	0.0421
CH5EXPM	-0.46118	-0.08659	0.20760	-0.30494
	0.0177	0.6740	0.3089	0.1298

Table 5.3 Continued

	CHLONGC	CHSHORTC	CHLONGN	CHSHORTN
For -$5/cwt. < EXPM <= -$4/cwt.:				
CH1EXPM	-0.38806	0.16330	0.45463	-0.26380
	0.0909	0.4915	0.0440	0.2611
CH2EXPM	-0.31790	0.11427	0.38810	-0.59304
	0.1720	0.6314	0.0909	0.0059
CH3EXPM	-0.48963	0.01800	0.19583	-0.42463
	0.0284	0.9400	0.4080	0.0620
CH4EXPM	-0.20431	0.16532	0.16826	-0.25844
	0.3876	0.4861	0.4783	0.2713
CH5EXPM	-0.12498	0.12969	0.19086	-0.11187
	0.5996	0.5858	0.4202	0.6387
For -$6/cwt. < EXPM <= -$5/cwt.:				
CH1EXPM	-0.21861	0.44927	0.57701	-0.34757
	0.5440	0.1927	0.0807	0.3251
CH2EXPM	-0.40569	0.40889	0.50626	-0.38358
	0.2448	0.2407	0.1354	0.2739
CH3EXPM	-0.56561	0.31007	-0.04358	-0.29517
	0.0884	0.3833	0.9049	0.4077
CH4EXPM	-0.05835	0.25197	-0.10153	0.11219
	0.8728	0.4825	0.7802	0.7577
CH5EXPM	0.13660	-0.02747	-0.06476	0.02998
	0.7067	0.9400	0.8589	0.9345
For -$7/cwt. < EXPM <= -$6/cwt.:				
CH1EXPM	-0.10055	-0.17787	-0.67422	-0.03979
	0.7822	0.6230	0.0325	0.9131
CH2EXPM	-0.32061	-0.32332	-0.74698	-0.25218
	0.3664	0.3622	0.0130	0.4821
CH3EXPM	-0.25533	-0.24753	-0.48295	-0.20819
	0.4765	0.4905	0.1574	0.5638
CH4EXPM	0.14543	-0.14418	-0.63119	-0.20049
	0.6885	0.6911	0.0503	0.5786
CH5EXPM	0.00328	-0.12924	-0.39820	0.06028
	0.9928	0.7220	0.2544	0.8686
For Minimum Value of EXPM <= EXPM <= -$7/cwt.:				
CH1EXPM	0.78674	-0.02985	0.93601	0.76458
	0.2133	0.9702	0.0640	0.2354
CH2EXPM	0.49024	-0.95096	0.08625	-0.24056
	0.5098	0.0490	0.9137	0.7594
CH3EXPM	0.44893	-0.92944	-0.05540	-0.71785
	0.5511	0.0706	0.9446	0.2822
CH4EXPM	0.46383	-0.95699	-0.04083	-0.67493
	0.5362	0.0430	0.9592	0.3251
CH5EXPM	0.59564	-0.97669	0.11962	-0.50777
	0.4044	0.0233	0.8804	0.4922

* P-Value = Prob > |R| under Ho: Rho=0

Table 5.4 Correlation Matrix for Change in EXPM and Positions over Subsamples Segmented by $2 per cwt.

	CHLONGC	CHSHORTC	CHLONGN	CHSHORTN
For $2/cwt. < EXPM <= Maximum Value of EXPM:				
CH1EXPM	0.16819	-0.49044	-0.24792	-0.52013
	0.5047	0.0388	0.3212	0.0269
CH2EXPM	-0.09475	-0.22953	-0.19736	-0.52884
	0.7084	0.3596	0.4325	0.0240
CH3EXPM	-0.00626	-0.21691	-0.17931	-0.21077
	0.9803	0.3873	0.4765	0.4012
CH4EXPM	-0.20822	-0.26545	-0.07090	-0.10796
	0.4070	0.2870	0.7798	0.6698
CH5EXPM	-0.33766	-0.03068	0.13545	-0.03166
	0.1706	0.9038	0.5920	0.9007
For $0/cwt. < EXPM <= $2/cwt.:				
CH1EXPM	0.14743	-0.41212	0.07346	-0.03022
	0.3640	0.0082	0.6524	0.8531
CH2EXPM	0.10419	-0.27388	0.06085	0.00795
	0.5223	0.0872	0.7092	0.9611
CH3EXPM	0.11401	0.07350	0.21638	-0.11102
	0.4836	0.6522	0.1799	0.4952
CH4EXPM	0.24122	0.07662	0.16417	-0.11531
	0.1337	0.6384	0.3114	0.4786
CH5EXPM	0.33278	0.14353	0.10080	-0.04706
	0.0359	0.3769	0.5360	0.7731
For -$2/cwt. < EXPM <= $0/cwt.:				
CH1EXPM	0.12173	-0.05152	0.11373	-0.26804
	0.3084	0.6674	0.3415	0.0228
CH2EXPM	0.16662	0.20975	0.11524	-0.41689
	0.1649	0.0792	0.3386	0.0003
CH3EXPM	0.15955	0.29464	0.19379	-0.30428
	0.1838	0.0126	0.1054	0.0099
CH4EXPM	0.03782	0.31913	0.18212	-0.29561
	0.7542	0.0067	0.1285	0.0123
CH5EXPM	0.00120	0.16671	0.18455	-0.13623
	0.9921	0.1647	0.1234	0.2573
For -$4/cwt. < EXPM <= -$2/cwt.:				
CH1EXPM	0.05399	-0.04636	0.25964	-0.19926
	0.6668	0.7116	0.0353	0.1087
CH2EXPM	0.13043	0.18460	0.16762	-0.23658
	0.3004	0.1410	0.1820	0.0578
CH3EXPM	-0.00104	0.08680	0.11621	-0.13239
	0.9935	0.4952	0.3605	0.2970
CH4EXPM	-0.05728	0.06815	0.23022	-0.11059
	0.6556	0.5956	0.0695	0.3882
CH5EXPM	-0.15328	-0.11408	0.05761	-0.12297
	0.2343	0.3773	0.6565	0.3410

Table 5.4 Continued

	CHLONGC	CHSHORTC	CHLONGN	CHSHORTN
For -$6/cwt. < EXPM <= -$4/cwt.:				
CH1EXPM	-0.32275	0.21551	0.43895	-0.28303
	0.0819	0.2527	0.0152	0.1296
CH2EXPM	-0.34546	0.18223	0.41862	-0.53273
	0.0615	0.3351	0.0213	0.0024
CH3EXPM	-0.49519	0.06791	0.13615	-0.38904
	0.0054	0.7214	0.4731	0.0336
CH4EXPM	-0.18314	0.18130	0.11359	-0.17532
	0.3327	0.3377	0.5501	0.3541
CH5EXPM	-0.06663	0.09480	0.12569	-0.06216
	0.7265	0.6183	0.5081	0.7442
For Minimum Value of EXPM <= EXPM <= -$6/cwt.:				
CH1EXPM	0.27018	0.10157	0.18145	0.20555
	0.3502	0.7297	0.5347	0.4808
CH2EXPM	0.01832	-0.09214	-0.02949	-0.15878
	0.9504	0.7541	0.9203	0.5877
CH3EXPM	0.09289	-0.25029	-0.02295	-0.30297
	0.7521	0.3881	0.9379	0.2924
CH4EXPM	0.24588	-0.51578	-0.41647	-0.35004
	0.3968	0.0590	0.1385	0.2199
CH5EXPM	0.19987	-0.42961	-0.22067	-0.09327
	0.4933	0.1253	0.4484	0.7511

* P-Value = Prob > |R| under Ho: Rho=0

expected margins offered by the prices, other things as given. The market imbalances would be corrected.

For short speculative activity, the corresponding ranges are from \$2 per cwt. to \$3 per cwt. (over one to three weeks), from \$0 per cwt. to -\$2 per cwt. (over one to five weeks) and from -\$3 per cwt. to -\$5 per cwt. (over one to four weeks). The sign of the correlation coefficient over these ranges is consistently found to be negative. For reasons analogous to the above, this net negative relationship between short speculation and expected margin changes indicates that short speculators help to restore an equilibrium when negative margins are present.

Based on the results over the segmented subsamples, it could be concluded that speculative activity is more sensitive to expected margin changes with respect to negative margins than to positive margins. This conclusion is consistent with those of the trading activity models (section 5.4 and 5.5) and the above analyses over the disaggregated data sets. In addition, speculators are found to react more frequently to the expected margin changes with an interval of two weeks or more. One of the possible reasons is that the data for the various traders' positions represent position trading (overnight) activity, rather than day traders' or scalper' activities.[22]

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[22] "*Position trading*" refers to an approach to trading in which the trader either buys or sells contracts and holds them for an extended time, as distinguished from a "*day trader*" who initiates and offsets positions within a single trading session or the same trading day. A "*scalper*" refers to a speculator who trades in and out of the market on very small price fluctuations. Both day traders and scalper seldom carry a position overnight. By definition, then, the data employed in the analysis tend to be representative of position traders rather than day traders or scalpers.

Concerning the possible "*feeding margin range*" defined in section 4.3, the above results do not explicitly isolate an expected margin band. However, considering only long speculative activity, the "*margin range*" could be defined as the range from -$3 per cwt. to $3 per cwt. Within this range, however, short speculative activity is still found to respond significantly to the expected margin changes. The identification of a specific and consistent range within which no unique trader behavior occurs is thus difficult.

5.3 Analysis of Expected Margin Behavior in Response to Trader Activity

As described earlier, four regression models are estimated to examine the relationship between expected margin and activities of groups of traders. Specifically, the expected margin models are used to determine if the behavior of large traders in the live cattle market identified as either speculators or hedgers exert influence on the observed behavior of the margin offered by futures. The analysis is focused on the behavior of speculators[23] who would be expected to exert a constraining impact on the margin moves. In addition, specific subsamples of expected margins belonging to the upper and lower ranges representing disequilibrium states, defined in section 4.2, are isolated and the behavior of traders over these ranges are examined. The point of

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[23] If the live cattle futures markets could not offer profitable opportunities to cattle feeders, they are forced to participate in the markets by taking long positions in the distant live cattle futures and/or short positions in the nearby feeder cattle futures. Alternatively, they may speculate on the cash markets. Such a trading action in the futures markets is treated as speculative trades by the current IRS positions.

emphasis here is to test the following hypothesis, defined in section 1.6:

> If cattle feeders were to participate fully in the price discovery process, the duration and magnitude of the imbalances between feeder cattle costs and the pricing opportunities offered by the futures markets would be shortened and reduced.

The following equation is used to test this hypothesis:

CHEXPM = f(LGCHEXPM, CHLONGC, CHSHORTC, CHLONGN, CHSHORTN)

where the variables have the same definition as those in the previous chapter.

Four preliminary models were estimated using Ordinary Least Squares (OLS). The results of misspecification tests for the four preliminary models are summarized in Table 5.5. The detailed results of misspecification tests and the coefficient estimates from the preliminary models are presented in Appendix B.

The order of the misspecification tests is arbitrary. Normality tests are followed by linearity tests, homoskedasticity tests, and autocorrelation tests for each of the four preliminary models. Then, parameter structural change tests are performed to test for coefficient and variance equality over different subsamples. The sample (T=238) is partitioned into two parts 1-80 and 81-238. This partition is arbitrary.

These models estimate the relationship between expected margins and four identifiable trading group activities each Wednesday for all contracts open at the end of the day. The right-hand side of each model equation includes different trading positions as explanatory variables.

Table 5.5 The Summary of Misspecification Results of Preliminary Models to Explain Margin Behavior in Response to Trading Activity

Model Specifications:

(1) Every Wednesday / All Contracts;
(2) Every Wednesday / Specific Contract;
(3) Weekly Average / All Contracts; and
(4) Weekly Average / Specific Contract.

Models	**(1)**	**(2)**	**(3)**	**(4)**
Misspecification Tests:				
Normality	R**	R	R	R
Linearity	A*	A	A	A
Hetero-skedasticity	A	A	A	A
Auto-correlation	R	R	R	R
Stability Tests:				
Coefficient Equality	A	A	R	A
Variance Equality	R	A	R	R

* 'A' means the corresponding assumption is accepted at a significance level of 0.01.
** 'R' means the corresponding assumption is rejected at a significance level of 0.01.

A significance level of 0.01 is used to test the null hypotheses. P-values for each of the tests are reported, indicating the smallest significance level for which a null hypothesis will be rejected.

As shown in table 5.5, the normality assumption underlying these models is rejected with a significance level of 0.01. Also, the modified-LM residual autocorrelation F-test of order 3 shows that the no memory assumption is strongly rejected. Both the linearity assumption and homoskedasticity assumption are valid with a significance level of 0.01. According to the parameter structural change tests, the assumptions of coefficient equality and variance equality are invalid for the four preliminary models. These test results imply that, overall, the models are not well specified.

The models were therefore modified or respecified by including a lagged dependent variable.[24] The modification is needed because the preliminary models exhibit serial correlations in the residuals. For simplicity, the lag variables of trading activities are not included in these modified models. The inclusion of a lagged dependent variable allows for incorporating the overall economic information that is relevant to expected margin behavior. This approach should isolate the impact of

[24] Concerning the use of a lagged dependent variable, the following facts should be noted: (1) the Durbin Watson (DW) statistic cannot be used to test the null hypothesis of no serial correlation and (2) the possibility of multicollinearity increases by including a lagged dependent variable into the group of explanatory variables. Either the Lagrange Multiplier (LM) test or the analysis of residual distribution allows for testing for autocorrelation when regressors include a lagged dependent variable(s). The multicollinearity problem can be monitored through the use of variance inflation factors (VIF).

the trading groups in the presence of the factors that have influence on expected margin behavior. The change in trader positions are thus just part of the factors that explain expected margin behavior. As previously mentioned, the issue of interest in this analysis is the influence that identifiable groups of traders exert on expected margin behavior through changes in positions.

The specific procedures for misspecification tests defined above are applied to these modified models. Table 5.6 shows the summary of the misspecification test results of the modified models. The more detailed results of misspecification tests are presented in Appendix C.

As shown in Table 5.6, both the Bera-Jarque normality test and D'Agostino-Pearson normality test indicate that the normality assumption is valid across the modified models with a significance level of 0.01.[25] The skewness and kurtosis coefficients confirm the acceptance of normality assumption. The linearity RESET test of order 3 shows that the linearity assumption is not rejected at a significance level of 0.01. According to the result of the RESET test for heteroskedasticity of order 3, the homoskedasticity assumption is valid at a significance level of 0.01 (also a significance level of 0.05).

However, autocorrelation tests indicate that the error at time T is

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[25] Strictly speaking, before these normality tests are performed, it is necessary to examine if the moments involved (the third and fourth central moments) are constant. This is because the skewness-kurtosis test for normality implicitly assumes that the moments involved are constant (Spanos, 1990). There are two ways to test for the assumption of constant moments: one is to use auxiliary regression which allows for both T-non-invariance and dependence on regressors; and the other is to achieve a more balanced equation by log transformation.

Table 5.6 The Summary of Misspecification Results of Modified Models to Explain Margin Behavior in Response to Trading Activity

Model Specifications:
(1) Every Wednesday / All Contracts;
(2) Every Wednesday / Specific Contract;
(3) Weekly Average / All Contracts; and
(4) Weekly Average / Specific Contract.

Models	**(1)**	**(2)**	**(3)**	**(4)**
Misspecification Tests:				
Normality	A*	A	A	A
Linearity	A	A	A	A
Hetero-skedasticity	A	A	A	A
Auto-correlation	A	R	R	R
Stability Tests:				
Coefficient Equality	A	A	R	A
Variance Equality	R**	A	R	R

* 'A' means the corresponding assumption is accepted at a significance level of 0.01.
** 'R' means the corresponding assumption is rejected at a significance level of 0.01.

correlated with the errors at previous times, i.e., serial correlation.[26] The no memory assumption is valid with a significance level of 0.01 only for the Every Wednesday/All Contract model. The F-tests for coefficient equality indicate that there is no significant evidence of structural change in parameters except for the Weekly Average/All Contract model. The F-test (based on the split sample) for variance equality shows constant variance over the two sub-samples. In contrast, considering the Every Wednesday/All Contract and Weekly Average/All Contract models, the variance equality test indicates unstable variance over sub-samples.

Based on the above misspecification test results, the modified expected margin models across different subsets of trading activities are found to be well specified. However, note that several variables are statistically insignificant and the estimated parameters vary in magnitude across models. Even though they are statistically insignificant, many coefficients have the expected signs.

Tables 5.7 shows the coefficient estimates from the modified models. The initial results presented are the functions estimated over the complete data set. Since the dependent variable is a change in the expected margin offered by the distant futures price, this variable can be either positive or negative. This complicates the interpretation of the impact of the changes in positions of traders on expected margin behavior. Thus, the entire data set is divided into the subsamples of positive,

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[26] Despite the weak evidence of serial correlation, this model is not respecified again. This is because correction for autocorrelation in small samples may not substantially improve predictive ability. Rather, it complicates prediction procedures (Wonnacott and Wonnacott, 1979).

Table 5.7 Changes in Expected Margin Regressed on Changes in Positions over Selected Subsets of EXPM

(1) All (2) Positive (3) Positive/Increasing (4) Positive/Decreasing (5) Negative (6) Negative/Increasing (7) Negative/Decreasing

Every Wednesday/All Contract Model:

Dependent	Change in Expected Margin (CHEXPM)					
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Constant:						
.03393	.64728	1.55208	-.93685	-.15959	.95247	-1.11341
(.359)*	(2.871)	(6.930)	(-4.024)	(-1.531)	(7.926)	(-9.355)
Lagged CHEXPM (LGCHEXPM):						
-.26206	-.20011	-.03154	-.16054	-.32336	-.21193	-.09614
(-4.351)	(-1.467)	(-.226)	(-1.376)	(-4.943)	(-2.737	(-1.467)
Change in Long Hedging Positions (CHLONGC):						
.00016	.00025	.00002	.00005	.00011	.000046	.00013
(2.297)	(1.875)	(.150)	(.407)	(1.365)	(.525)	(1.580)
Change in Short Hedging Positions (CHSHORTC):						
-.00019	-.00040	-.00029	-.00018	-.00008	.000046	-.00004
(-3.105)	(-3.551)	(-2.978)	(-1.187)	(-1.205)	(.633)	(-.611)
Change in Long Speculative Positions (CHLONGN):						
.00027	.00028	.00006	.00016	.00021	-.000042	.00015
(5.312)	(2.157)	(.566)	(1.053)	(3.806)	(-.639)	(2.677)
Change in Short Speculative Positions (CHSHORTN):						
-.00039	-.00021	-.00019	-.00009	-.00045	-.00023	-.00019
(-4.878)	(-1.284)	(-1.280)	(-.463)	(-5.038)	(-2.587)	(-1.847)
Regression Statistics:						
F Value:						
14.465	4.368	3.104	.970	12.285	2.359	2.880
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

Every Wednesday/Specific Contract Model

Dependent	Change in Expected Margin (CHEXPM)					
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Constant:						
.00668	.44664	1.62533	-1.01533	-.19649	.99886	-1.22984
(.066)*	(1.674)	(6.519)	(-4.141)	(-1.746)	(8.074)	(-10.563)
Lagged CHEXPM (LGCHEXPM):						
-.22822	-.20260	-.04108	-.15471	-.24079	-.15732	-.07917
(-3.690)	(-1.381)	(-.290)	(-1.171)	(-3.615)	(-2.097)	(-1.250)
Change in Long Hedging Positions (CHWDLC):						
.00053	.00119	.00039	-.00022	.00024	.00011	.00015
(3.117)	(2.852)	(1.206)	(-.172)	(1.312)	(.485)	(.930)
Change in Short Hedging Positions (CHWDSC):						
-.00010	-.00048	-.00058	.000008	.00006	-.00006	.00002
(-.970)	(-1.996)	(-2.342)	(.016)	(.499)	(-.386)	(.230)
Change in Long Speculative Positions (CHWDLN):						
.00039	.00016	-.00029	-.00007	.00032	.00015	.00010
(2.310)	(.431)	(-.921)	(-.110)	(1.696)	(.788)	(.536)
Change in Short Speculative Positions (CHWDSN):						
-.00020	-.00010	-.00010	-.00005	-.00024	-.00015	-.00010
(-1.172)	(-.244)	(-.281)	(-.094)	(-1.350)	(-.619)	(-.654)
Regression Statistics:						
F Value:						
6.650	2.859	3.432	.619	5.868	1.044	1.047
Adjusted R^2:						
.106	.140	.242	-.118	.119	.002	.002
Degrees of Freedom:						
237.000	57.000	38.000	18.000	179.000	82.000	96.000

* Numbers in ( )'s are t-ratios.

Table 5.7 Continued

(1) All (2) Positive (3) Positive/Increasing (4) Positive/Decreasing (5) Negative (6) Negative/Increasing (7) Negative/Decreasing

Weekly Average/All Contract Model:

Dependent: Change in Expected Margin (CHEXPM)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Constant:	-.00461	.72708	1.59176	-.86956	-.19454	1.03257	-1.12842
	(-.046)*	(3.296)	(6.531)	(-3.452)	(-1.727)	(8.832)	(-9.643)
Lagged CHEXPM (LGCHEXPM):	-.22647	-.26765	-.09363	-.18114	-.24702	-.11784	-.11635
	(-3.581)	(-2.004)	(-.631)	(-1.586)	(-3.616)	(-1.550)	(-1.771)
Change in Long Hedging Positions (CHWATLC):	.00014	.00053	.00007	.00017	.00001	.00001	.00015
	(1.501)	(3.135)	(.398)	(1.041)	(.111)	(.132)	(1.461)
Change in Short Hedging Positions (CHWATSC):	-.00015	-.00035	-.00023	-.00017	-.00006	.00007	-.00007
	(-2.007)	(-2.642)	(-1.783)	(-1.031)	(-.804)	(.915)	(-.916)
Change in Long Speculative Positions (CHWATLN):	.00029	.00030	.00006	-.00020	.00025	-.00005	.00016
	(4.542)	(1.965)	(.394)	(1.198)	(3.670)	(-.633)	(2.573)
Change in Short Speculative Positions (CHWATSN):	.00001	-.00044	-.00029	-.00016	.00002	.00003	-.00026
	(.647)	(-2.401)	(-1.560)	(-.692)	(1.143)	(1.938)	(-2.057)
Regression Statistics:							
F Value:	7.068	4.628	1.762	1.199	5.765	1.700	2.690
Adjusted R^2:	.113	.241	.091	.052	.117	.040	.080
Degrees of Freedom:	237.000	57.000	38.000	18.000	179.000	82.000	96.000

Weekly Average/Specific Contract Model:

Dependent: Change in Expected Margin (CHEXPM)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Constant:	-.00375	.43174	1.60435	-.97274	-.21908	1.00434	-1.23913
	(-.037)*	(1.705)	(6.317)	(-4.156)	(-1.944)	(8.402)	(-10.823)
Lagged CHEXPM (LGCHEXPM):	-.22465	-.23099	-.04085	-.17504	-.22462	-.12523	-.08229
	(-3.605)	(-1.659)	(-.299)	(-1.529)	(-3.356)	(-1.711)	(-1.296)
Change in Long Hedging Positions (CHWASLC):	.00047	.00202	.00058	.00277	.00005	.000057	.00018
	(2.463)	(3.476)	(1.182)	(2.161)	(.262)	(.186)	(.947)
Change in Short Hedging Positions (CHWASSC):	-.00004	-.00070	-.00047	-.00121	.00016	-.000052	.00004
	(-.322)	(-2.461)	(-1.680)	(-2.289)	(1.144)	(-.265)	(.344)
Change in Long Speculative Positions (CHWASLN):	.00021	.00044	-.00056	.00107	.00012	-.00010	.00005
	(1.110)	(1.028)	(-1.428)	(1.703)	(.573)	(.444)	(.249)
Change in Short Speculative Positions (CHWASSN):	.00004	-.00077	-.00003	-.00157	.00004	.00003	-.00016
	(1.611)	(-1.538)	(-.066)	(-1.791)	(1.853)	(2.069)	(-.909)
Regression Statistics:							
F Value:	6.255	3.884	3.693	1.849	5.779	1.841	1.072
Adjusted R^2:	.099	.201	.261	.190	.117	.048	.003
Degrees of Freedom:	237.000	57.000	38.000	18.000	179.000	82.000	96.000

* Numbers in ( )'s are t-ratios.

positive/increasing, positive/decreasing, negative, negative/decreasing and negative/increasing expected margin moves. The estimated functions over these subsamples are also presented in Table 5.7.

As defined in the model estimation procedure, a 0.10 significance level and a t-ratio of 1.645 is used as a guideline to examine if variables are statistically significant.[27] Concerning the significance of estimated coefficients, some of the trading activity variables have insignificant t statistics.[28] The R^2 and adjusted R^2, the measure of statistical significance of the models, indicates that the explanatory variables, such as changes in trading positions and changes in expected margin over one week, do not fully explain the expected margin moves. The overall rather weak significance levels are not uncommon for models using differenced data. Both the dependent and explanatory variables are changes over one week.

The equations estimated are the changes in expected margin as functions of changes in numbers of positions. Given the way the data were coded, the coefficients are not very large in absolute terms. More importantly, the estimated parameter signs of the four identifiable trading positions accord quite well with those of prior expectations. However, the corresponding variables are frequently statistically

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[27] Using a 0.10 significance level for a two-sided test with more than one-hundred-twenty degrees of freedom results in the statistic $|t| > 1.645$.

[28] For simplicity, the results on the lagged dependent variables' estimations are not discussed here. The analysis of these coefficient estimates involves explaining the concerned model with the partial adjustment model theory.

insignificant or their estimated coefficients vary in magnitude across models. Long (short) speculation and hedging are found to have positive (negative) influence on the expected margin. An increase in either long speculative positions (positive CHLONGN[29]) or long hedging positions (positive CHLONGC) leads to more buying pressure. It, in turn, increases the distant futures prices. So, the expected margins offered by the distant futures are expected to increase, other things being as given. Similarly, short hedging and/or short speculating form selling pressure, which leads to decreases in the distant futures prices. Then, the expected margin offered by the prices is expected to move down. When markets are in a state of relative imbalance, these kinds of buying and/or selling pressure could keep the futures prices within a normal range around the underlying equilibrium price. Therefore, the expected margins offered by the futures prices would be expected to move toward levels that cover the prevailing costs of feeder animal and feed (variable costs).

As noted in the model specification, the models are classified according to seven subsets of expected margins. That is, the data set of expected margins are decomposed into the following subsets:

(1) all expected margins which are combined by subset (2) and (5);

(2) positive expected margins;[30]

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[29] The interpretation needs to be careful with the "*change in*" variables. To say 'CHLONGN is positive' means an increase in long speculative positions (LONGN).

[30] The positive expected margins are defined as the available margins above zero (offered by distant live-cattle futures prices), which covers the prevailing costs of feeder animal and feed (variable costs). The

(3) positive and increasing expected margins;

(4) positive and decreasing expected margins;

(5) negative expected margins;

(6) negative and decreasing expected margins; and

(7) negative and increasing expected margins.

With expected margins being either positive and negative, the interpretation of the influence of the various trader categories exert on the changes in the margins is more explicit than the case of the entire data set. When the data set was divided, based upon the margin changes being greater than or less than zero with respect to either positive or negative margins, the explanation of the measured relationships is difficult in that the coefficients vary in signs and significance levels. For exposition purposes, Figure 5.1 is drawn to explain the results of estimation of the expected margin models over disaggregated subsets by reproducing Figure 3.2 with some modification.

In order to reduce the magnitude and/or duration of the imbalance at either time (A) or time (B) in Figure 5.1, various trader categories should be exerting a restraining influence on futures prices and thereby on the available margins offered by the prices. This implies that the changes in long positions held by either hedgers or speculators need to be positively related to the changes in the expected margins when margins are decreasing at time (A) and increasing at time (B). For margins increasing

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variable costs include the other costs defined in the section of expected margin calculation (4.1).

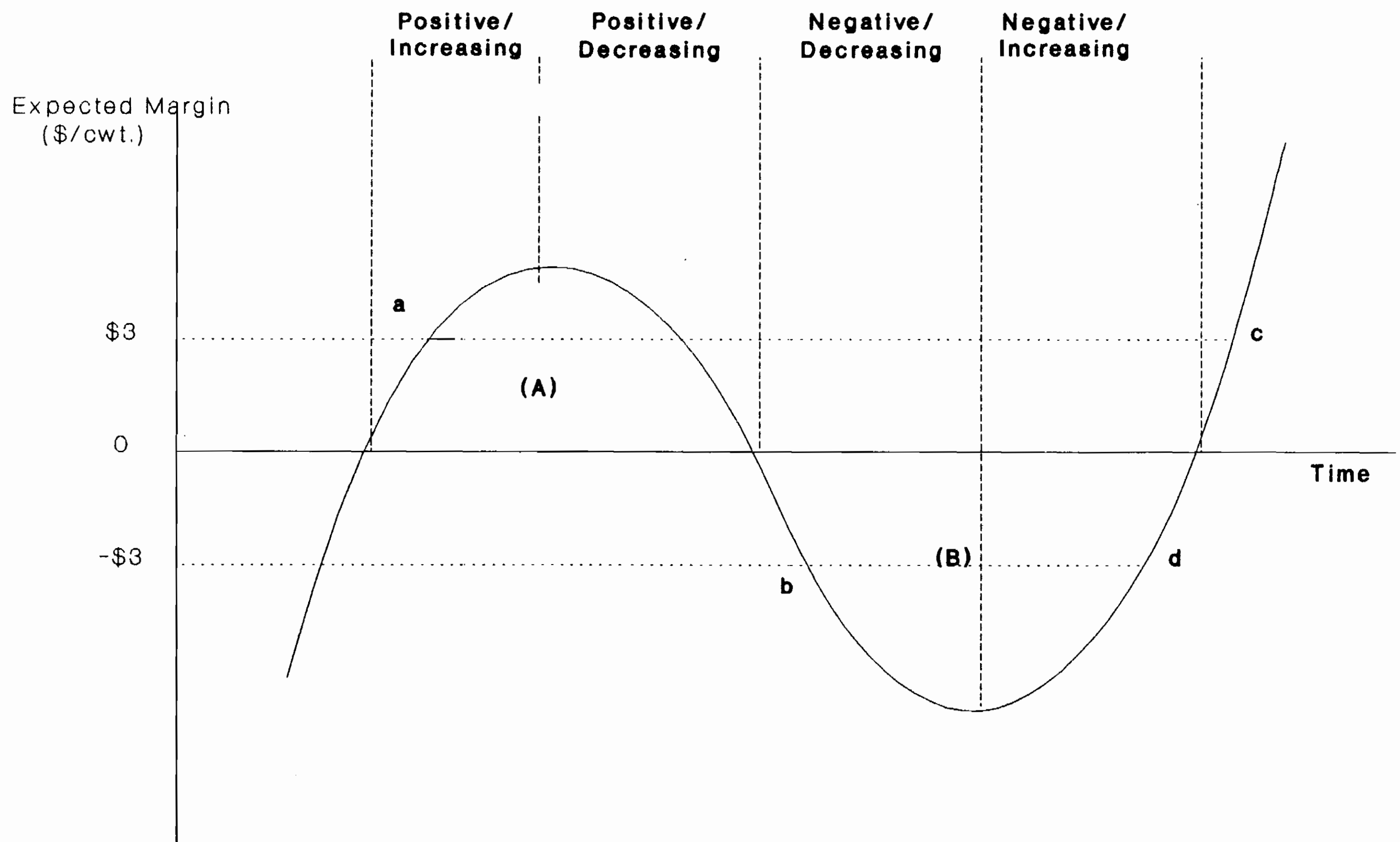

Figure 5.1 An Illustration of Possible Market Performance Pattern

at time (A) and decreasing at time (B), the changes in long positions should be negatively related to the margin changes. For short hedgers and/or short speculators, the net relationship between the changes in positions and the changes in the expected margins needs to be positive when the margin changes are positive at time (A) and negative at time (B). Similarly, the signs on CHSHORTN and CHSHORTC need to be negative as the margin changes are negative at time (A) and positive at time (B).

Considering the subsets of positive and negative expected margins in the Every Wednesday/All Contract model, the CHLONGN and CHSHORTN variables are found to be statistically significant, except for the CHSHORTN over positive margins, and have positive and negative signs, respectively. These results are consistent over the complete data set, and are consistent with *a priori* expectations. The positive sign of CHLONGN indicates that the magnitude of margin changes is decreasing as long speculative positions are decreasing at time (A). The negative sign of CHSHORTN, on the other hand, implies that the margin changes tend to be more positive as short speculative positions are decreasing at time (B).

The above findings confirm the notion that long positions represent buying pressure so that the increase in long positions is expected to increase futures price and the margins offered by the prices. Similarly, since short positions represent selling pressure, the increase in short positions constrains price increases. As mentioned above, these kinds of buying and/or selling pressure could exert constraining effects on the market imbalances, illustrated as time (A) or (B) in Figure 5.1.

With margin changes being both positive and negative either at time

(A) or at time (B), the above arguments do hold in general. However, the signs and significance levels vary across the disaggregated subsets of EXPM. In the cases of positive/increasing and negative/increasing margins, the negative signs of CHSHORTN indicates that the magnitude of the margins is increasing as short speculative positions are decreased. In such a case, the CHLONGN variable is found to be statistically insignificant, and has the opposite sign over the negative/increasing margins. This may be due to insufficient numbers of observations in the corresponding subsets.

Considering positive/decreasing, the coefficients (though not statistically significant) have the expected signs. For negative/decreasing margins, the CHLONGN and CHSHORTN variables are found to have the expected signs and to be significant with a significance level of 0.10. That is, margin changes tend to be more negative as long speculative positions are decreased.

The above conclusions are most apparent when considering the Every Wednesday/All Contract model over the complete data set. Also, the conclusive results do hold good with respect to the Every Wednesday/All Contract model over positive and negative EXPM, the Weekly Average/All Contract over positive EXPM, and the Weekly Average/Specific Contract over positive and positive/decreasing EXPM models. The less conclusive results for the other models over specific subsamples may be associated with the possible presence of multicollinearity and/or the lack of sufficient observations in the corresponding subsamples.

The data set is also examined for the subsamples corresponding to the upper and lower ranges defined in section 4.3. Two criteria are used to decompose the data base into the subsamples belonging to the ranges. First, the subsamples are selected based on the results of correlation analysis. According to the correlation analysis, the upper and lower ranges correspond to the ones from \$3.00 per cwt.to maximum value of expected margin (EXPM) and from -\$3.00 per cwt. to the minimum value of EXPM, respectively.[31] The second criterion for selection is that a range is outside of a 95% (or 68%) confidence level of the mean of the EXPM. Based on the criterion of a 95% confidence level[32], the upper and lower segments range from \$3.15 per cwt. to maximum EXPM and from -\$6.76 per cwt. to minimum EXPM, respectively. Considering a 68% confidence level, the corresponding segments range from \$0.67 per cwt. to maximum EXPM and from -\$4.28 per cwt. to minimum EXPM, respectively.

The coefficient estimates from the models are reported across various segments defined in Table 5.8. Considering the segments corresponding to the 95% interval, the trading activity variables across the models have expected signs in general with a significance level of 0.10. For the subsample of the upper range, the changes in short speculative positions (CHSHORTN, CHWDSN and CHWATSN) have a negative association with the changes in EXPM (CHEXPM) at a significance level of

[31] For the upper range, from -\$3.00 per cwt. to maximum EXPM, the estimated model is found to be not full rank. In order to solve this problem, the range is incremented by \$1.00 per cwt. That is, the modified upper segment ranges from \$2.00 per cwt. to maximum EXPM.

[32] Considering the upper range, the estimated models are not full rank. For this reason, the reports of the coefficient estimates are deleted in this paper.

Table 5.8 Changes in Expected Margin Regressed on Changes in Positions over Upper and Lower Ranges of EXPM

Every Wednesday/All Contract Model:

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

Every Wednesday/Specific Contract Model:

Dependent: Change in Expected Margin (CHEXPM)	Criterion (1): Upper Range $2 to Max.	Criterion (1): Lower Range Min. to -$3	Criterion (2): Upper Range $0.67 to Max.	Criterion (2): Lower Range Min. to -$4.28
Constant:	1.17682	-.59965	.43734	-.72529
	(2.827)*	(-3.191)	(1.472)	(-3.038)
Lagged CHEXPM (LGCHEXPM):	-.07566	-.13667	-.18805	-.16284
	(-.364)	(-1.146)	(-1.160)	(-1.010)
Change in Long Hedging Positions (CHWDLC):	.00173	.00036	.00191	.00117
	(2.033)	(.751)	(3.487)	(1.968)
Change in Short Hedging Positions (CHWDSC):	-.00021	.00013	-.00058	.00013
	(-.403)	(.557)	(-2.052)	(.413)
Change in Long Speculative Positions (CHWDLN):	-.00042	.00022	.00047	-.00007
	(-.563)	(.685)	(1.009)	(-.164)
Change in Short Speculative Positions (CHWDSN):	-.00191	-.00025	-.00058	-.00186
	(-1.897)	(-1.060)	(-1.038)	(-3.714)
Regression Statistics:				
F Value:	3.062	2.076	3.963	4.281
R^2:	.560	.137	.361	.386
Adjusted R^2:	.377	.071	.270	.296
Degrees of Freedom:	17.000	70.000	40.000	39.000

* Numbers in ( )'s are t-ratios.

Table 5.8 Continued

Weekly Average/All Contract Model:

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:			
1.45018	-.39009	.85799	-.64994
(4.948)*	(-2.020)	(3.333)	(-2.128)
Lagged CHEXPM (LGCHEXPM):			
-.10770	-.23557	-.23228	-.25008
(-.595)	(-1.935)	(-1.455)	(-1.293)
Change in Long Hedging Positions (CHWATLC):			
.00022	.00004	.00048	-.00008
(1.089)	(.219)	(2.232)	(-.267)
Change in Short Hedging Positions (CHWATSC):			
-.00051	-.00010	-.00053	.00001
(-2.486)	(-.816)	(-3.449)	(.075)
Change in Long Speculative Positions (CHWATLN):			
.00026	.00025	.00032	.00027
(1.046)	(2.425)	(1.967)	(1.699)
Change in Short Speculative Positions (CHWATSN):			
-.00085	-.00043	-.00052	-.00019
(-3.615)	(-2.009)	(-2.377)	(-.570)
Regression Statistics:			
F Value:			
4.527	3.560	4.760	1.541
R^2:			
.653	.215	.404	.184
Adjusted R^2:			
.509	.154	.319	.064
Degrees of Freedom:			
17.000	70.000	40.000	39.000

Weekly Average/Specific Contract Model:

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:			
1.32697	-.60098	.50448	-.69965
(2.497)*	(-3.240)	(1.612)	(-2.916)
Lagged CHEXPM (LGCHEXPM):			
-.13793	-.12595	-.24172	-.14488
(-.546)	(-1.071)	(-1.465)	(-.905)
Change in Long Hedging Positions (CHWASLC):			
.00159	.00070	.00200	.00095
(1.271)	(1.232)	(3.116)	(1.532)
Change in Short Hedging Positions (CHWASSC):			
-.00026	.00008	-.00062	.00030
(-.390)	(.290)	(-1.920)	(.882)
Change in Long Speculative Positions (CHWASLN):			
-.00055	.00017	.00044	-.00040
(-.544)	(.462)	(.841)	(-.714)
Change in Short Speculative Positions (CHWASSN):			
-.00246	-.00038	-.00105	-.00189
(-1.525)	(-1.425)	(-1.529)	(-3.699)
Regression Statistics:			
F Value:			
1.491	2.319	3.549	4.171
R^2:			
.383	.151	.336	.380
Adjusted R^2:			
.126	.086	.241	.289
Degrees of Freedom:			
17.000	70.000	40.000	39.000

* Numbers in ( )'s are t-ratios.

0.10. For the subsample of the lower range, the changes in long speculative positions (CHLONGN and CHWATLN) are found to have a significant positive influence on the margin moves. For the ranges corresponding to the 68% interval, the relationships identified for the upper and lower ranges are the same.

These regression results are consistent with those of the correlation analysis in the previous section. The changes in long speculative positions have a positive influence on the expected margin changes when a negative margin drops below the lower boundary of the "*feeding margin range*." When a positive margin moves beyond the upper boundary, the speculative groups are found to exert a negative influence on the margin moves through increasing short positions. Based on the correlation and the regression analyses, the upper and the lower boundaries may be around a range of $1.00 to $3.00 per cwt. and a range of -$3.00 to -$4.00 per cwt., respectively.

5.4 Analysis of Trader Activity Depending on Expected Margin Level

Using the Ordinary Least Square (OLS) procedures, trading activity models are estimated to examine the reporting traders' behavior in response to the changes in the expected margin.[33] Specifically, the models are used to test the following hypothesis, defined in section 1.6:

[33] In this analysis, only every Wednesday/all contract data for trading positions are considered. In practice, the regression estimates showed similar results in sign and/or magnitude across the other classifications of trading positions. The results of the other classification are reported in Appendix D.

Futures traders's reactions to the expected margins offered by the distant live cattle futures will depend on the level of those margins and futures traders will react to imbalances or disequilibrium positions in the markets by taking positions that will move the markets back toward equilibrium.

The empirical models to test this hypothesis are as follows:

(1) LONGC = f(LONGC1, CHEXPM, TREND);

(2) SHORTC = f(SHORTC1, CHEXPM, TREND);

(3) LONGN = f(LONGN1, CHEXPM, TREND); and

(4) SHORTN = f(SHORTN1, CHEXPM, TREND).

where the variables have the same definitions as those in the previous chapter.

The trading activity models were also tested to see whether the assumptions underlying the models are statistically valid. An additional and informal graphical check of estimated residuals was made to test for appropriateness of model specifications. The misspecification test results from the trading activity models over various definitions of trading positions are presented in Appendix E. The specific procedures for the tests are identical with those of expected margin models specified in the previous section.

As shown in Appendix E, the corresponding assumptions seem to be valid in general. The results of autocorrelation tests indicate that the no memory assumption underlying the models are valid with a significance level of 0.10 (sometimes, a significance level of 0.01). Using the linearity RESET test of order 3, the linearity assumption is not rejected across the models at a significance level of 0.10. The F-tests for coefficient equality show that there is no significant evidence of structural change in parameters. However, both the normality and homoskedasticity assumptions are frequently invalid across the models. In spite of the rejection of the corresponding assumptions, the models are not respecified or modified. The occurrence of invalid assumptions is not consistent but sporadic. Thus, these misspecification tests results do not limit the significance of the overall estimated models but the specific parameter estimates can be unstable and inefficient.

As shown in the model specification, the models are classified based upon the margin changes being greater than or less than zero with respect to either positive or negative margins.[34] Traders' position estimates are tabulated by different subsets in Table 5.9. The coefficient estimates of expected margin change (CHEXPM) are summarized by different traders' positions in Table 5.10.

(1) Long Hedging Activity

The pattern of long hedgers' trading behavior in response to expected margin change (CHEXPM) is summarized in Table 5.9. All estimated coefficients of CHEXPM are found to be insignificant with a significance level of 0.10. Considering only the coefficient signs, the results do indicate that long hedging activity contributes to correcting the market

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[34] As defined in the previous chapter, the complete data set was divided into the subsets of positive/increasing, positive/decreasing, negative/increasing and negative/decreasing expected margins offered by the distant futures prices.

Table 5.9 Traders' Position Regressed on Change in Expected Margin over Different Subsets of Expected Margins for Every Wednesday/All Contract Model

(1) All (2) Positive (3) Positive/Increasing (4) Positive/Decreasing (5) Negative (6) Negative/Increasing (7) Negative/Decreasing

Dependent	Reporting Long Hedgers' Position (LONGC)					
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Constant:						
1083.163	-291.939	552.538	-1520.861	1171.125	799.301	1457.028
(3.278)*	(-.274)	(.437)	(-.691)	(3.302)	(1.506)	(2.957)
Lagged LONGC (LONGC1):						
.895	.915	.895	1.007	.892	.925	.867
(31.648)	(14.438)	(12.163)	(7.669)	(28.104)	(19.715)	(19.201)
Change in EXPM (CHEXPM):						
46.298	135.817	-80.429	273.710	12.917	52.692	47.154
(.901)	(1.174)	(-.426)	(.575)	(.219)	(.371)	(.384)
TREND:						
1.432	9.091	8.112	8.588	.778	-.117	1.397
(1.153)	(1.903)	(1.482)	(.783)	(.612)	(-.063)	(.783)
Regression Statistics:						
F Value:						
391.570	72.775	51.362	20.570	315.465	157.574	153.480
R^2:						
.832	.801	.814	.804	.841	.856	.829
Adjusted R^2:						
.830	.790	.799	.765	.839	.851	.823
Degrees of Freedom:						
239.000	57.000	38.000	18.000	181.000	82.000	98.000

Dependent	Reporting Short Hedgers' Position (SHORTC)					
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Constant:						
639.821	2239.306	2414.046	5757.319	380.002	777.548	-214.902
(1.888)*	(1.535)	(1.218)	(3.354)	(1.099)	(1.582)	(-.404)
Lagged SHORTC (SHORTC1):						
.964	.897	.947	.755	.981	.981	.995
(53.835)	(13.072)	(10.783)	(9.784)	(52.775)	(38.820)	(37.508)
Change in EXPM (CHEXPM):						
-79.923	-478.986	-975.643	-886.041	22.077	159.047	132.469
(-1.156)	(-3.135)	(-3.649)	(-2.403)	(.285)	(.909)	(.843)
TREND:						
1.938	5.197	3.616	-4.742	-.039	-5.165	3.498
(.909)	(.738)	(.411)	(-.561)	(-.018)	(-1.596)	(1.142)
Regression Statistics:						
F Value:						
1841.809	80.506	59.120	48.423	1973.820	1129.864	958.454
R^2:						
.959	.817	.835	.906	.971	.977	.968
Adjusted R^2:						
.958	.807	.821	.887	.970	.976	.967
Degrees of Freedom:						
239.000	57.000	38.000	18.000	181.000	82.000	98.000

* Numbers in ( )'s are t-ratios.

Table 5.9 Continued

Dependent	Reporting Long Speculators' Position (LONGN)					
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Constant:						
187.506	-720.922	-1104.822	2018.787	196.930	461.747	500.353
(.682)*	(-.803)	(-.954)	(1.263)	(.671)	(1.135)	(1.023)
Lagged LONGN (LONGN1):						
.953	1.100	1.161	.907	.959	1.013	.913
(44.567)	(16.906)	(14.001)	(8.664)	(39.992)	(31.595)	(27.006)
Change in EXPM (CHEXPM):						
295.802	52.421	-117.804	154.070	354.884	-131.165	495.503
(3.703)	(.369)	(-.479)	(.313)	(3.743)	(-.650)	(2.477)
TREND:						
3.157	3.939	4.814	-3.443	1.338	-1.392	4.559
(1.364)	(.567)	(.598)	(-.278)	(.518)	(-.402)	(1.240)
Regression Statistics:						
F Value:						
1841.809	145.002	123.641	31.188	1023.280	667.775	452.066
R^2:						
.959	.889	.913	.861	.945	.962	.934
Adjusted R^2:						
.958	.883	.906	.834	.944	.960	.932
Degrees of Freedom:						
239.000	57.000	38.000	18.000	181.000	82.000	98.000

Dependent	Reporting Short Speculators' Position (SHORTN)					
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Constant:						
359.481	-514.610	335.398	-1789.860	414.273	238.219	644.869
(1.871)*	(-.829)	(.403)	(-1.725)	(1.916)	(.704)	(2.190)
Lagged SHORTN (SHORTN1):						
.911	.868	.896	.872	.913	.883	.945
(29.940)	(8.944)	(6.759)	(6.483)	(25.975)	(15.913)	(20.441)
Change in EXPM (CHEXPM):						
-159.379	-72.934	-267.215	.301	-179.351	-158.979	-130.209
(-3.456)	(-.776)	(-1.597)	(.001)	(-3.191)	(-1.068)	(-1.273)
TREND:						
3.184	10.435	6.060	18.274	2.728	5.751	-.287
(2.283)	(2.098)	(.909)	(2.436)	(1.733)	(2.386)	(-.140)
Regression Statistics:						
F Value:						
599.894	60.595	36.922	26.749	523.891	236.786	291.743
R^2:						
.884	.771	.759	.842	.898	.899	.902
Adjusted R^2:						
.882	.758	.739	.811	.896	.896	.899
Degrees of Freedom:						
239.000	57.000	38.000	18.000	181.000	82.000	98.000

* Numbers in ( )'s are t-ratios.

Table 5.10 The Coefficient Estimates of Expected Margin Change by Different Traders' Positions for Every Wednesday/All Contract

Explanatory Variable:	Change in Expected Margin (CHEXPM)					
			Subset Decompositions:			
(1) All	(2) Positive	(3) Positive/ Increasing	(4) Positive/ Decreasing	(5) Negative	(6) Negative/ Increasing	(7) Negative/ Decreasing
Dependent Variables:						
LONGC:						
46.298	135.817	-80.429	273.710	12.917	52.692	47.154
(.901)*	(1.174)	(-.426)	(.575)	(.219)	(.371)	(.384)
-	-	Better**	Better	-	Better	Worse***
SHORTC:						
-79.923	-478.986	-975.643	-886.041	22.077	159.047	132.469
(-1.156)	(-3.135)	(-3.649)	(-2.403)	(.285)	(.909)	(.843)
-	-	Worse	Better	-	Better	Worse
LONGN:						
295.802	52.421	-117.804	154.070	354.884	-131.165	495.503
(3.703)	(.369)	(-.479)	(.313)	(3.743)	(-.650)	(2.477)
-	-	Better	Better	-	Worse	Worse
SHORTN:						
-159.379	-72.934	-267.215	.301	-179.351	-158.979	-130.209
(-3.456)	(-.776)	(-1.597)	(.001)	(-3.191)	(-1.068)	(-1.273)
-	-	Worse	Worse	-	Worse	Better

* Numbers in ( )'s are t-ratios.

** 'Better' means the corresponding traders' reaction to CHEXPM would be expected to help restore the market imbalances.

*** 'Worse' means the corresponding traders' reaction to CHEXPM would be expected to prolong the market imbalances.

imbalances. When negative expected margins are increasing, long hedging activity increases, which forms buying pressure and increases futures prices and moves expected margins back toward zero. Therefore, this long hedging activity is found to have a positive effect on correcting market imbalances. The results hold when analyses are performed over the subsets of positive/increasing and positive/decreasing expected margins. For example, the positive sign of CHEXPM for the subset of positive/decreasing margins implies that when EXPM is positive but decreasing, the number of futures contract positions held by long hedgers decreases. The decreased buying pressure or the selling to offset long positions leads to decreased futures prices and reduces the expected margins offered by the futures prices, other things being as given.

(2) Short Hedging Activity

The regression results of short hedging activity models across the seven subsets of expected margins are reported in Table 5.9. The CHEXPM variables across the subsets of positive margins including positive/increasing and positive/decreasing are significant. However, the other CHEXPM variables have overall poor t statistics, and their estimated coefficients vary in magnitude. The estimation over the subset of positive/decreasing expected margins results in a negative and significant coefficient of the CHEXPM variable. The negative sign implies that when expected margins are positive and decreasing, the number of short hedgers' positions increases. This short hedging activity will help correct the market imbalances when positive margins are present. In contrast, for positive/increasing expected margins, their activities are found to accentuate the market imbalances. This is because when positive expected margins are increasing, short hedgers tend to reduce their positions. Their action results in increased prices and increased expected margins offered by the prices, other things being as given.

(3) Long Speculative Activity

The estimation results of long speculative activity models are presented in Table 5.9. The CHEXPM variables are frequently statistically insignificant or the estimated parameters vary in sign or magnitude across models. Considering the model estimated over the complete data set of all expected margins, the CHEXPM variable is strongly significant with a t-ratio of 3.703. The estimated signs of the CHEXPM variables do tend to consistently indicate that long speculators react to changes in the expected margins in such a way that the markets restore equilibrium. This result tends to hold for specifications where the coefficients are not significant. For example, when the positive expected margins are either increasing or decreasing, large speculators reduce their long positions.

For the subsets of negative margins, the positive sign of the LONGN variable confirms the above results. That is, when the feeding margins are expected to be negative, speculators would tend to increase their long positions. This helps correct the market imbalances.

The cases of negative/increasing and negative/decreasing margins are different. Long speculative activity is found to prolong the market imbalances. For example, speculators respond to negative/decreasing expected margins by reducing or offsetting their long positions. That would suggest that speculators would tend to reduce long positions as the feeding margin becomes more negative. This decreased buying pressure leads to a decreased live cattle futures prices and to decreases in the expected margins.

Considering the set of all expected margins, long speculators are found to follow similar trading pattern as long hedgers in response to CHEXPM. The activity of long hedgers is not as sensitive to CHEXPM activity as that of long speculators, however. These results may be interpreted in the following way. Hedgers seek to transfer price risk, reducing their exposure to adverse impacts of price changes. For speculators, there is no risk exposure before they enter futures markets. As soon as they take a position, they may well become very sensitive to price changes since they then assume a risk exposure (Rowsell, 1991). Following the notion that the CHEXPM is positively correlated with price changes, the above results confirm the conceptual explanations for hedging and speculative activity. The conclusion to be drawn from these results is that speculators respond to expected margin changes. Their reactions are found to help the markets restore a equilibrium when positive margins are expected. They are playing an important role in the price discovery process.

On the other hand, long hedgers' reaction to CHEXPM is found to differ from that of long speculators when negative margins are increasing. Considering the cases of positive expected margins including positive/decreasing margins, hedging activity is found to be more sensitive to CHEXPM activity. That is, when positive margins are expected, hedgers are trading more actively than speculators. This is contrary to the conventional thinking that hedgers trade less often than speculators. These findings are consistent with those of Helmuth's study. In analyzing the trading behavior of large traders in the livestock futures for the period of January 1978 through April 1979, Helmuth (1980) suggested that, contrary to the conventional thinking, some large hedge traders participate in the markets as actively as some large speculators.

(4) Short Speculative Activity

Table 5.9 presents the results of analyzing short speculators' behavior in response to CHEXPM. Based on the signs of coefficient estimates, it is suggested that, overall, the trading pattern of large short speculators is different from that of large short hedgers. In addition, large short hedgers are found to respond to CHEXPM more actively with respect to positive margins than to negative margins. In contrast, large short speculators are more sensitive to CHEXPM when a negative margin is present than when a positive margin is offered by the distant futures. These results accord quite well with those found above.

Using a significance level of 0.10, short speculative activity is found to be negatively related to the CHEXPM variable when the model is estimated over the set of all expected margins. When negative margins are expected to decrease, the decreased speculative activity is exerting a constraining influence on futures prices. When positive margins are increasing, however, the decreased speculative activity would be expected to influence CHEXPM adversely. The positive margins would be allowed to increase as short speculators reduce their positions.

The analysis of long and short speculative activities shows that the CHEXPM variable is more significant for negative expected margins than for positive expected margins. In contrast, for the models of long and short hedging activities, the CHEXPM variable has better t statistics when positive margins are present than when negative margins are being offered. These results confirm the theoretic underpinnings of hedging and speculation activity. When the futures prices provide profitable hedging opportunities to producers as potential traders in the markets, producers as hedgers participate in trading futures contracts actively. When the markets cannot provide profits through hedging, producers would be expected to be reluctant to trade futures contracts. In such a case, producers are forced to speculate in cash markets. This is because they are concerned about the tax treatments by IRS over the losses incurred from speculation.

When the futures prices are low enough to prompt actions that cause them to return toward a more nearly normal level[35], speculators take a position in the futures markets. One of the possible reasons is that

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[35] Conceptually, a normal level refers to a price level which is equal to speculator's price expectation in cash markets. As discussed in Chapter three, speculators are expected to take a position when current futures price differ from their expectation (E(p)). In other words, when the current futures price equals the expected cash price there is no incentive to speculate. The difference between the current price and expectation is considered as "*risk premium.*" Related to the existence of risk premium, past studies have shown that on average futures prices do not contain a significant risk premium (Ross, 1975; and Rockwell, 1976).

hedgers pay a risk premium for transferring their price risks. Note that speculators are assumed to take a position not only for the risk premium, but also for the returns to their forecasting ability. In analyzing the issues in futures markets, Kamara (1982) stated: ". . . *speculation should be regarded as a skilled occupation and not merely as risk bearing, in which the returns vary greatly with the ability and knowledge of the speculators*" (p.273).

Prior to taking a position, speculators have no risk exposure. Once accepting price risk by taking a position, they have to be very sensitive to price changes. Therefore, when negative margins are present, speculative activity is found to be more sensitive to the changes in the expected margins as affected by changes in distant futures prices.

5.5 Analysis of Alternative Specification of Trading Behavior Depending on Expected Margin Level

Two general forms of alternative models are specified to examine the trading behavior depending on the levels of expected margins. The models are specified to test the hypothesis previously presented. The models are as follows:

(1) LONGC = f(LONGC1, EXPM, Dummy Variables);

(2) SHORTC = f(SHORTC1, EXPM, Dummy Variables);

(3) LONGN = f(LONGN1, EXPM, Dummy Variables); and

(4) SHORTN = f(SHORTN1, EXPM, Dummy Variables).

where the variables have the same definitions as those defined previously.

One kind of model is estimated over current expected margin and dummy variables which correspond to the segments by $1 per hundredweight. The other kind of models contains the same explanatory variables as those in the former models, except for the segments by $2 per hundredweight. The estimation results of the two models are presented separately in Table 5.11.

As shown in Table 5.11, all the dummy variables are statistically insignificant with a significance level of 0.10. However, considering the model segmented by $2 per cwt., there are statistically significant dummy variables. Confining the discussion to speculative activity, the estimations of both long and short speculation result in coefficients of expected signs. That is, the estimated signs of dummy variables for long speculation have positive signs across the two models. The signs of dummy variables for short speculation are found to be negative. These results are consistent with those found in the above analyses of trader activity depending on expected margin level. As shown in Table 5.9, considering the set of all expected margins, the net relationship between CHEXPM and long (short) speculation was found to be positive (negative) with a significance level of 0.10.

The positive relationship between long speculation and disaggregated expected margin levels represented by dummy variables implies that when margins are expected to increase, long speculation increases. The increased long speculation forms buying pressure so that the expected margins offered by the increased prices will move up. Thus, this will help correct the market imbalances when negative margins are offered by

Table 5.11 Results of Estimation of Model to Explain Traders' Positions over Expected Margin Level Segmented by $1 and $2 per cwt. for Every Wednesday/All Cotracts

Dependent	Long Hed	Short Hed	Long Spec	Short Spec
Constant	3989.114	-1417.689	818.060	2620.572
	(1.656)*	(-.454)	(.235)	(1.253)
Lagged Dependent	.900	.977	.968	.953
	(32.602)	(71.465)	(57.660)	(39.981)
EXPM	290.073	-130.567	443.892	147.560
	(1.003)	(-.341)	(1.032)	(.574)
D1	-3054.092	1846.919	-1967.503	-3424.463
	(-.897)	(.409)	(-.387)	(-1.129)
D2	-3391.934	3552.171	-511.391	-2310.701
	(-1.132)	(.894)	(-.114)	(-.866)
D3	-2877.128	2194.682	-1040.426	-2626.346
	(-1.040)	(.601)	(-.253)	(-1.069)
D4	-3097.796	2297.139	812.519	-2181.389
	(-1.258)	(.706)	(.222)	(-.998)
D5	-2582.728	1594.416	-302.656	-2592.528
	(-1.181)	(.554)	(-.093)	(-1.340)
D6	-2557.481	2122.930	946.888	-2178.824
	(-1.325)	(.836)	(.331)	(-1.418)
D7	-1999.204	1636.633	422.950	-1719.812
	(-1.198)	(.746)	(.171)	(-1.165)
D8	-1891.163	1634.148	602.410	-1585.715
	(-1.341)	(.882)	(.289)	(-1.275)
D9	-1588.306	739.463	563.898	-1422.315
	(-1.352)	(.477)	(.324)	(-1.371)
D10	-1820.713	575.670	2046.473	-966.436
	(-1.812)	(.433)	(1.369)	(-1.087)
D11	-299.231	1486.104	1614.959	16.535
	(-.347)	(1.304)	(1.261)	(.002)
Regression Statistics:				
F Value	91.496	439.418	284.643	139.628
R^2	.839	.961	.942	.888
Adjusted R^2	.830	.959	.938	.882
D.F.	241.000	241.000	241.000	241.000

Dependent	Long Hed	Short Hed	Long Spec	Short Spec
Constant	3947.060	-1363.506	-2597.658	774.862
	(3.643)*	(-.964)	(-1.631)	(.832)
Lagged Dependent	.901	.978	.972	.957
	(33.699)	(73.090)	(58.273)	(41.633)
EXPM	317.059	-275.794	-222.501	-121.941
	(2.232)	(-1.442)	(-1.017)	(-.955)
D1'	-3343.377	3397.248	4281.409	-66.182
	(-2.343)	(1.767)	(1.946)	(-.052)
D2'	-2993.753	2307.019	3970.251	-312.437
	(-2.564)	(1.467)	(2.207)	(-.297)
D3'	-2513.146	1623.414	3000.304	-846.876
	(-2.777)	(1.330)	(2.153)	(-1.038)
D4'	-1844.232	1134.041	1928.809	-628.607
	(-2.746)	(1.254)	(1.866)	(-1.040)
D5'	-1505.366	-95.990	1200.249	-760.816
	(-2.991)	(-.141)	(1.545)	(-1.667)
Regression Statistics:				
F Value	173.521	812.481	507.861	261.263
R^2	.838	.960	.938	.886
Adjusted R^2	.833	.959	.936	.883
D.F.	241.000	241.000	241.000	241.000

* Numbers in ( )'s are t-ratios.

the distant futures prices. Similarly, the net negative relationship between short speculation and expected margin level indicates that an increase in the expected margin brings a decrease in short speculation. The decreased short speculative activity will help the markets restore equilibrium when negative expected margins are offered by the distant futures prices.

In addition, speculative activity is found to be more active when negative margins are expected than when positive margins are offered by the distant futures prices. This phenomenon is more pronounced for short speculation than for long speculation. These results imply that, again, speculators are found to be more sensitive to the negative expected margin than to the positive margin level.

The results of alternative specifications of trading activity do not explicitly explain how speculators react to changes in the expected margins. However, these results may answer the question on how low or high the expected margin level must be to attract speculators to take a position in the markets. For the first model, the results show that long speculators' reaction to margin levels is statistically insignificant. Long speculation becomes less active as the margin level is expected to reach one dollar per hundredweight (D3). That is, when the expected margin amounts to $1.00 per hundredweight (D3), the speculators would be expected to reduce or offset[36] their long position. Other things being equal,

[36] Offsetting is selling the same number of contracts for the same delivery month for which other contracts were bought, or buying the same number of contracts for the same delivery month for which other contracts were sold. The term "*liquidation*" is sometimes used to denote offsetting

this may reduce the futures prices and the expected margins offered by the prices, with the margins returning toward a normal range. However, these results do not hold for the model segmented by $2 per hundredweight.

On the other hand, short speculators are found to be significantly sensitive to the margin level ranging from -$4 per cwt. to -$6 per cwt. (D5'). For the model segmented by one dollar per hundredweight, the corresponding dummy variables are D9 and D10 which are not significant, but they do have the same signs with those of D5'. These results indicate that when negative expected margins are expected to increase, speculators would be expected to reduce or cover[37] their short positions. Contrary to prior expectations discussed in Chapter 3, when the margins are expected to be positive, the net relationship between short speculation and margin level is found to be negative. This negative relationship implies that when positive margins are expected to increase, speculators would reduce or cover their short positions. This may prolong the market imbalances since the decreased short speculation leads to an increase in the futures prices and the expected margins offered by the prices, other things being held fixed.

5.6 Chapter Summary

The purpose of this chapter was to test the hypotheses developed in Chapter 2. Three general forms of analyses were specified.

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a long position.

[37] Offsetting a short position is also referred to as "*covering*".

Misspecification tests were performed to examine the appropriateness of the specified regression models. Based on these test results, the alternative models were respecified and tested. The findings are not totally conclusive in that some coefficient estimates are frequently insignificant, and vary in magnitude. However, the results provide consistency in terms of coefficient signs which accord quite well with *a priori* expectations in general.

The highlighted results are presented according to the analysis performed in this chapter.

Correlation Analysis:

- Long speculative positions are consistently positively correlated with change in expected margins offered by futures. Short speculative positions are negatively related to the expected margin changes.

- Speculative activity is more sensitive to margin change when negative margins are present than when positive margins are being offered by the futures. In contrast, hedgers are more sensitive to positive margins than to negative margins.

- Based on the analysis over disaggregated data sets, changes in long speculative positions have a positive correlation with margin changes while changes in short speculative positions have a negative correlation with margin changes. These results imply that speculative activity will contribute to correcting the market imbalances rather than prolong the imbalances.

- Considering the analysis over selected intervals segmented by $1 and $2 per cwt., long speculative activity is negatively related to expected margin changes over the segments ranging from $3 per cwt. to maximum and from -$6 per cwt. to -$7 per cwt. If margins are increasing within the former range, the negative coefficient sign implies that the reduced long speculative activity leads to decreased futures prices and decreases in the margin offered by the futures. Then, this kind of action will help the market correct the imbalances. The same is true for the -$6 to -$7 range if the margins are decreasing. As negative margins become more extreme, long speculative activity increases and this helps to "*turn*" the markets back toward an equilibrium level.

- Considering only long speculative activity, the possible "*feeding margin range*" may be defined as the range from -$3 per cwt. to $3 per cwt., but the range is not explicitly and clearly isolated.

Analysis of EXPM Behavior in Response to Trader Activity:

- Long (short) speculative position changes exert a positive (negative) influence on the magnitude of expected margin changes. These results confirm the notion that since long (short) positions represent buying (selling) pressure, the increase in long (short) positions is expected to increase (constrain) futures price and increase the margins offered by the price. Therefore, these kinds of buying and/or selling pressure could keep the futures prices and the margins offered by the prices within a normal range around the underlying equilibrium price. The results are consistent with those of the correlation analysis.

- With expected margins being both positive and negative, the changes in long (short) positions held by speculators are positively (negatively) related to the changes in the expected margins. These results are consistent over the complete data set. With the reasons analogous to those above, these kinds of speculative activities would be exerting a restraining influence on futures prices and on the available margins offered by the prices, reducing the magnitude and/or duration of the market imbalances.

- Considering margin <u>changes</u> being both positive and negative in a state of relative imbalance, the results provide consistency in terms of coefficients signs. That is, the variables of changes in long and short speculative positions have positive and negative signs, respectively. Therefore, the above arguments do hold in general.

- Within the upper range (from $2 per cwt. to maximum EXPM), short speculative position change has a significant negative influence on the change in expected margin. This implies that if margins become more positive (excessive margins) an increase in short speculative positions will constrain the price increases and the margins offered by the prices.

- Within the lower range (from -$3 per cwt. to minimum EXPM), long speculative position change have a significant positive influence on the margin moves. If negative margins become more extreme, an increase in long speculative positions will move the futures prices and the available margins up, helping to turn the markets back up. The results confirm those of the correlation analysis.

Analysis of Trader Behavior Depending on the level of EXPM:

- Considering the complete data set, long speculators generally follow similar trading patterns as long hedgers in response to the change in expected margin. This result is not true for the case of negative/increasing margins. Overall, the trading pattern of large short speculators is different from that of large short hedgers. While speculators are more sensitive to negative margins than to positive margins, hedgers are more sensitive when positive margins are present than when negative margins are offered by the futures.

- Long speculative positions have a positive and statistically significant association with margin changes when negative margins are present. For negative margins being offered by the futures prices, speculators tend to increase long positions, which helps to move the prices back up. This implies that long speculators react to the margin changes in such a way that they help restore the market equilibrium.

- Short speculative positions have a negative and statistically significant relation with margin changes when negative margins are present. This implies that short speculators' reaction to the margin changes has a constraining influence on futures prices with respect to negative margins being present. This short speculative activity will thus help to correct the market imbalances.

In the alternative specification of trading behavior depending on margin level, long speculators' reaction to margin levels is difficult to interpret. The coefficients are statistically insignificant and have mixed signs, often contrary to *a priori* expectations. In addition, the evidence of short speculators' reacting to margin level is less conclusive. The lack of consistency with the other analyses when the margins are disaggregated may be partly due to the inappropriate definition of dummy variables. Along with this problem, the inconsistent results may result from the insufficient numbers of observations in some of the ranges represented by the dummy variables.

However, based on the correlation analysis and expected margin behavior in response to trading activities, the following evidences are clear: speculative activity "*turns*" the market at the extreme level of negative margin, and at the excessive level of positive margin with a less significance level. These evidences are consistent with those of the trader's behavior analysis over the disaggregated subsets of margins.

CHAPTER SIX: CONCLUSIONS

6.1 Summary

This research focused on the examination of the relationship between the expected margins offered by the distant live cattle futures prices and trading activity, especially speculation. This examination involves two aspects. One is to identify how activity by different trading groups affects the expected margins, and the second is to examine how traders react to the changes in the expected margins. The objective was to ascertain if there is differential impact by type of trader on the process of restoring market equilibrium. Of special interest was the behavior of large speculators, a group that might best represent the impact of cattle feeders if cattle feeders were allowed to fully participate in the price discovery process.

This research began with a description of cattle feeders' economic environment and price discovery process via placement adjustments. Chapter 2 reviewed the literature on the issues related to the profitable hedging analysis, futures price behavior, and the function of traders in futures markets. In Chapter 3, a theoretical analysis of the relationships between traders' behavior, futures price, and the expected margins offered by the price was established in order to develop a conceptual framework. The variables of identifiable trading activities are discussed in Chapter 4 and developed into empirical models for explaining expected margin behavior. Also, alternative models were estimated to provide the understanding of trading behavior in response to the expected margin changes. An explanation of the estimation procedure (misspecification tests) was presented to specify the models appropriately. Chapter 5 showed the preliminary and final model results of the expected margin and trading behavior models, respectively. In Chapter 6, it will be identified what conclusions can be drawn from this investigation and what implications are apparent. A brief discussion of future research needs is also provided.

6.2 Conclusions

It was implicitly assumed that cattle feeders have access to superior information related to cattle feeding such as feeding costs. In addition, they are in a position to use that information without extended time delay. Cattle feeders would therefore be able to inject the influence of very current and specific information on costs of feeding numbers of cattle on feed, when cattle will be ready for market, etc. into trading levels for cattle futures. This is not to imply that they are controlling price, but that collectively their behavior may make price discovery process more efficient and more effective.

Well-informed producers can establish forward prices by hedging their slaughter cattle through the *Chicago Mercantile Exchange* (CME) live cattle futures contracts. Also, since they have a strong business-related interest in the markets, producers could act to minimize the duration and magnitude of the market imbalances when no profitable hedges are being offered or could be reasonably anticipated. They would thus help the markets restore equilibrium, with their trading activity moving the markets back toward equilibrium.

In spite of the immediate availability of the information and 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 negative margins are being offered and the feeders cannot enter the markets as hedgers. The obstacles to participation arise from the tax treatment of what would be seen as speculative trades by the IRS.

This research has shown that there exist relationships between trading activities and the expected margin behavior. However, the results of this research do not explicitly explain the causal flows. Given that prices and the expected margins offered by the prices are positively correlated, these results are consistent with past research. According to Rowsell, the activities of identifiable trading groups do provide significant explanatory power for price activity.

More specifically, long hedging activity is found to have a positive impact on expected margins. As for long speculative activity, the results are consistent with *a priori* expectations in that the estimated signs are found to be positive. Based on these findings, it may be argued that an increase in long hedging and/or long speculation brings an increase in the futures prices since increased long activity forms buying pressure. This, in turn, increases the expected margin offered by the futures prices, other things held fixed. On the other hand, short hedging activity is found to have a negative impact on the expected margin changes. In addition, consistent with prior expectations, short speculative activity is found to influence the expected margins negatively. Short activities represent selling pressure. An increase in the short hedging and short speculative activities leads to a decrease in the futures prices. Subsequently, the positive margin changes will be constrained by the increasing short hedge and short speculative positions.

These results suggest that large speculators tend to help constrain and correct developing market imbalances. This is especially true when the feeding margins are at what are apparently extreme negative levels. Short speculative positions are reduced and long speculative positions are increased in such circumstances, driving the market back toward balance and equilibrium.

Concerning trading activity models, developed to explain traders' reaction to the margin changes, the results accord well with prior expectations. For example, long speculative activity responds to the margin changes positively when negative expected margins are being offered by the distant live cattle futures prices. The net positive relationship implies that this type of trader plays a role in correcting the market imbalances. The analysis of long hedging activity results in similar conclusions though it is not always statistically significant.

Short speculative activity is found to respond to the expected margin changes in a negative fashion statistically speaking. The net negative relationship implies that speculators would tend to increase short positions as the positive margins become larger. The short speculative activity helps correct the positive market imbalances.

The conclusion drawn from these results is that arbitrage activity by current speculators will eventually correct any and all imbalances. This conclusion is supported by the findings of models to explain margins as a function of trader behavior and models to explain trading behavior as a function of the expected margin levels. When the feeding margins are expected to be abnormally positive or negative, long speculative and/or short speculative activities are found to be exerting a constraining influence on the futures prices and thereby on the expected margins offered by the futures prices.

One thing to note is that speculative activity is more sensitive to the margin changes when negative margins are present than when positive margins are being offered by the futures prices. As for hedging activity, the opposite results are apparent. When the markets cannot provide producers with profits through hedging, producers are being forced to speculate in the corresponding cash markets rather than taking what would be speculative positions in futures as suggested by IRS policy. Losses on speculative trades in futures are not deductible for tax purpose and cattle feeders are reluctant to be speculators in futures.

More importantly, the analysis of trader behavior in response to margin changes, confirmed by correlation analysis, has shown that short and/or long speculative activities "*turn*" the market back toward equilibrium. For instance, when the futures prices are low enough to merit a return toward a more nearly normal level given the fundamental supply-demand picture, speculators tend to increase long positions and/or decrease short positions. Speculators take the opposite positions as the prices become more positive and excessive margins are available. The conclusions drawn from these findings are that when the market is in a state of relative imbalance, especially at extreme negative margins, speculators are exerting a constraining influence on the margins. These kinds of speculators' actions will help to restore market balances rather than accentuate the market imbalances.

Therefore, if cattle feeders were able to participate using trading programs similar to those of large speculators, they would tend to establish positions that would push the market back toward the equilibrium position. They will, it could be argued, be able to recognize the departure from equilibrium even more quickly as the feeding margins become more negative or more positive. Cattle feeders are involved in the market related activities daily, have access to timely and proprietary information, and are in, perhaps, a superior position to correct a market imbalance. When extreme negative margins are being offered and cash cattle programs do not appear economically viable, cattle feeders would tend to sell nearby feeder cattle futures and buy the distant live cattle futures if they were fully involved in the price discovery process. These actions would tend to block continued moves to negative margins and decrease the duration and/or magnitude of any string of negative margins.

As discussed in Chapter 1, prolonged market imbalances tend to prompt highly variable placements of cattle and resultant variability in fed cattle prices. Such variability implies a possible social loss associated with any policy position, such as the IRS position, which could impose costs on every economic agent in the markets, from producer to consumer. Also, the economic viability of producers' business investments is influenced in a significant and negative way by those market imbalances. Therefore, more active participation by cattle feeders could be important to the overall effectiveness and efficiency of trade in cattle futures.

6.3 Policy Implications

Prolonged imbalances between feeder cattle costs and the pricing opportunities offered by live cattle futures would be seen as evidence of inefficient markets. But that view is too narrow and too 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 efficiency of the cattle futures markets. What appears to be an inefficient market may result from any policy position, such as the IRS position, that blocks participation of well-informed participants such as feedlot owners/managers in correcting market imbalances. As a result, the policy could constrain the effectiveness of the price discovery process in the cattle futures markets. It also generates pricing patterns and market behavior that seem to be evidence of market inefficiency.

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. More research is needed to confirm that the markets are more volatile and less efficient in the price discovery process than they could be. But it is logical to expect that cattle feeders are concerned about the tax treatments over losses on speculative trades constrained by the IRS policy and this concern was verified by a 1991 survey conducted by Purcell. IRS policy thus appears to have at least a marginal effect on constraining and/or reducing the efficiency of the price discovery process for cattle. That is, the IRS position has a "*chilling impact*[38]" on cattle feeders participation as speculators under current IRS position and interpretations. If this is the case, legislative or administrative action to correct the current policies of the IRS should be considered.

6.4 Suggestions for Future Research

To fully examine the issues analyzed in this research, the following aspects should be more thoroughly investigated. In this research, it is implicitly assumed that cattle feeders have access to better information on costs of cattle feeding and the related opportunities offered by the futures markets. That assumption should be tested. Surveys of producers' reaction to the changes in market conditions may provide some evidence of the appropriateness of this assumption. It would also be possible to compare and contrast the information at the disposal of cattle feeders with that at the disposal of large speculators who have no position and no

[38] Although cattle feeders are concerned about the tax treatment over the losses from speculative trades, they, in practice, would be and should be forced to participate as speculators when the futures markets provide no profitable opportunities from cattle feeding (Purcell, February 1992). In other words, cattle feeders are reluctant to take "*reverse*" positions (long live cattle futures and/or short feeder cattle futures) which are treated as speculative trades under the current IRS interpretations.

investment in the cash markets.

It is apparent that cattle feeders potentially have more specificity in available information and that the information is available without time lags. The lack of access to such information has limited this study. Therefore, research is needed to measure the differential impact on price discovery processes of broad versus specific measures of feeding costs, conversion rates, days on feed, current feedlot inventories, etc. Related to this issue, future research should compare and contrast the information that is widely used in discovering prices for cattle futures with that accessible to cattle feeders. For this purpose, measures like the average feeding costs in more widely available series, such as the USDA reports, could be compared to a specific distribution of costs in different feedlot conditions.

More importantly, the lagged response by cattle feeders to information, if any, should be examined. That is, the direction, timing, and magnitude of changes in cattle futures prices in response to basic information streams should be analyzed in a temporal context. Conceptually, the information on feeding costs and the forward pricing opportunities is immediately available to cattle feeders and futures prices could reflect such information intraday or with a time lag of one day at most. A Granger causality analysis of the information flows and their temporal relationships to futures prices or the available margins offered by the prices could enhance understanding of market behavior and guide future policy.

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APPENDIX A: Correlation between Speculative Trading Groups and Margin Change and Direction of Movement

Every Wednesday/All Contract

	Positive/ Increasing	Positive/ Decreasing	Negative/ Increasing	Negative/ Decreasing
Long Speculation:				
CH1EXPM	-0.46207 (S)** *0.0027	-0.21230 (D)*** 0.3829	-0.08093 (D) 0.4670	0.26134 (D) 0.0090
CH2EXPM	-0.33635 (S) 0.0338	0.29177 (S) 0.2255	0.17729 (S) 0.1088	0.14584 (D) 0.1540
CH3EXPM	-0.18090 (S) 0.2640	0.16251 (S) 0.5062	0.08364 (S) 0.4550	0.16958 (D) 0.0968
CH4EXPM	-0.22271 (S) 0.1672	-0.07421 (D) 0.5062	0.11905 (S) 0.2898	0.17500 (D) 0.0864
CH5EXPM	-0.02878 (S) 0.8601	-0.13786 (D) 0.5736	0.07266 (S) 0.5218	0.15403 (D) 0.1320
Short Speculation:				
CH1EXPM	-0.20238 (D) 0.2104	-0.04919 (S) 0.8415	-0.18154 (S) 0.1005	-0.11473 (D) 0.2582
CH2EXPM	0.04737 (S) 0.7716	-0.19626 (S) 0.4207	-0.43251 (S) 0.0001	-0.37850 (D) 0.0001
CH3EXPM	-0.14442 (D) 0.3739	-0.16312 (S) 0.5046	-0.36568 (S) 0.0007	-0.27029 (D) 0.0293
CH4EXPM	-0.11350 (D) 0.4856	-0.01348 (S) 0.9563	-0.34267 (S) 0.0017	-0.22141 (D) 0.0293
CH5EXPM	0.00187 (S) 0.9909	-0.24555 (S) 0.3109	-0.21055 (S) 0.0608	-0.12851 (D) 0.2097

Weekly Average/All Contract

	Positive/ Increasing	Positive/ Decreasing	Negative/ Increasing	Negative/ Decreasing
Long Speculation:				
CH1EXPM	-0.26437 (S)** *0.0993	0.18822 (S) 0.4403	-0.08672 (D)*** 0.4328	0.21122 (D) 0.0322
CH2EXPM	-0.12571 (S) 0.4396	0.25273 (S) 0.2965	0.22391 (S) 0.0406	0.19719 (D) 0.0481
CH3EXPM	-0.03843 (S) 0.8139	0.69933 (S) 0.0009	0.07466 (S) 0.5023	0.23458 (D) 0.0182
CH4EXPM	-0.02515 (S) 0.8776	0.55777 (S) 0.0131	0.11357 (S) 0.3097	0.19825 (D) 0.0469
CH5EXPM	-0.00588 (S) 0.9713	0.42046 (S) 0.0731	0.03808 (S) 0.7357	0.16348 (D) 0.1024

Continued.

Short Speculation:				
CH1EXPM	-0.32612 (D) 0.0400	-0.08179 (S) 0.7392	0.23398 (D) 0.0322	-0.15234 (D) 0.1245
CH2EXPM	-0.23366 (D) 0.1467	-0.31284 (S) 0.1922	-0.00021 (S) 0.9985	-0.37517 (D) 0.0001
CH3EXPM	-0.12503 (D) 0.4421	-0.44151 (S) 0.0584	-0.12004 (S) 0.2797	-0.23987 (D) 0.0157
CH4EXPM	-0.09997 (D) 0.5394	-0.15824 (S) 0.5176	0.08053 (D) 0.4720	-0.20253 (D) 0.0422
CH5EXPM	0.03269 (S) 0.8413	-0.10587 (S) 0.6662	0.12573 (D) 0.2634	-0.14053 (D) 0.1610

Weekly Average/Specific Contract

	Positive/ Increasing	**Positive/ Decreasing**	**Negative/ Increasing**	**Negative/ Decreasing**
Long Speculation:				
CH1EXPM	-0.53672 (S)** *0.0004	-0.18573 (D)*** 0.4465	0.08078 (S) 0.4651	0.12972 (D) 0.1916
CH2EXPM	-0.30959 (S) 0.0519	0.26510 (S) 0.2727	0.06412 (S) 0.5623	0.10670 (D) 0.2882
CH3EXPM	-0.13946 (S) 0.3907	0.11211 (S) 0.6477	0.03014 (S) 0.7868	0.26881 (D) 0.0066
CH4EXPM	-0.23228 (S) 0.1492	-0.10276 (D) 0.6755	-0.03655 (D) 0.7444	0.29197 (D) 0.0031
CH5EXPM	-0.02015 (S) 0.9018	-0.10796 (D) 0.6600	-0.06996 (D) 0.5349	0.21281 (D) 0.0326
Short Speculation:				
CH1EXPM	-0.15817 (D) 0.3297	0.04279 (D) 0.8619	0.26360 (D) 0.0154	-0.00107 (D) 0.9915
CH2EXPM	0.03485 (S) 0.8309	-0.35618 (S) 0.1345	0.05041 (D) 0.6488	0.03679 (S) 0.7149
CH3EXPM	-0.16983 (D) 0.2948	-0.16638 (S) 0.4960	-0.07740 (S) 0.4867	0.11777 (S) 0.2408
CH4EXPM	-0.13216 (D) 0.4163	-0.02875 (S) 0.9070	0.12323 (D) 0.2700	0.09730 (S) 0.3331
CH5EXPM	-0.00960 (D) 0.9531	-0.22628 (S) 0.3516	0.15726 (D) 0.1609	0.13666 (S) 0.1730

* P-Value = Prob > |R| under Ho: Rho=0

** "S" means the corresponding traders' reaction to change in EXPM over 1 to 5 weeks would be expected to Stabilize the market.

*** "D" means the corresponding traders' reaction to change in EXPM over 1 to 5 weeks would be expected to Destabilize the market.

APPENDIX B: Misspecification Test Results for Preliminary Model

Every Wednesday/All

Variable	Estimate	St. Error	t-value
CONST	0.031794	0.098223	0.323697
CHLONGC	0.000172	0.000075	2.281163
CHSHORTC	-0.000243	0.000063	-3.841800
CHLONGN	0.000289	0.000054	5.399279
CHSHORTN	-0.000318	0.000082	-3.885391

Normality test: 19.892846 P-value: 0.000048
Skewness = 0.292134 Kurtosis = 4.290206

Linearity RESET test of order 3
F-test: 0.462776 P-value : 0.630116

RESET test for Heteroskedasticity of order 3
F-test: 0.253897 P-value: 0.858515

Autocorrelation tests
F-statistic: 6.074484 P-value: 0.000539

Parameter structural change tests.
coefficient equality: 1.69388 P-value: 0.13697
variance equality: 1.63804 p-value: 0.00890

Every Wednesday/Specific

Variable	Estimate	St.Error	t-value
CONST	0.008839	0.103871	0.085100
CHWDLC	0.000533	0.000175	3.044848
CHWDSC	-0.000113	0.000112	-1.010046
CHWDLN	0.000387	0.000174	2.219952
CHWDSN	-0.000191	0.000175	-1.091561

Normality test: 13.534941 P-value: 0.001151
Skewness = 0.194744 Kurtosis = 4.101439

Linearity RESET test of order 3
F-test: 2.084434 P-value : 0.126711

RESET test for Heteroskedasticity of order 3
F-test: 0.442956 P-value: 0.722510

Autocorrelation tests
F-statistic is: 7.933642 P-value: 0.000045

Parameter structural change tests.
coefficient equality: 1.36721 P-value: 0.23755
variance equality: 1.61580 p-value: 0.01056

Weekly Average/All Contract

Variable	Estimate	St.Error	t-value
CONST	-0.005558	0.103667	-0.053613
CHWATLC	0.000166	0.000097	1.723509
CHWATSC	-0.000188	0.000077	-2.455052
CHWATLN	0.000289	0.000067	4.328958
CHWATSN	0.000028	0.000026	1.102443

Normality test:14.533059 P-value: 0.000699
Skewness = 0.296334 Kurtosis = 4.055587

Linearity RESET test of order 3
F-test: 2.248365 P-value : 0.107877

RESET test for Heteroskedasticity of order 3
F-test: 0.280199 P-value: 0.839666

Autocorrelation tests
F-statistic: 5.029921 P-value: 0.002149

Parameter structural change tests.
coefficient equality: 3.85654 P-value: 0.00225
variance equality: 1.69714 p-value: 0.00562

Weekly Average/Specific

Variable	Estimate	St.Error	t-value
CONST	-0.003441	0.104348	-0.032972
CHWASLC	0.000452	0.000197	2.294648
CHWASSC	-0.000033	0.000129	-0.256786
CHWASLN	0.000193	0.000201	0.960429
CHWASSN	0.000050	0.000027	1.871083

Normality test: 12.612207 P-value: 0.001825
Skewness = 0.144177 Kurtosis = 4.090262

Linearity RESET test of order 3
F-test: 1.493936 P-value : 0.226648

RESET test for Heteroskedasticity of order 3
F-test: 0.118574 P-value: 0.949132

Autocorrelation tests
F-statistic: 9.203093 P-value: 0.000008

Parameter structural change tests.
coefficient equality: 2.32048 P-value: 0.04416
variance equality: 1.67742 p-value: 0.00656

APPENDIX C: Misspecification Test Results for Modified Models of Various Specifications

Every Wednesday/All

Variable	Estimate	St..Error	t-value
CONST	0.033936	0.094649	0.358545
LGCHEXPM	-0.262060	0.060229	-4.351078
CHLONGC	0.000167	0.000072	2.297207
CHSHORTC	-0.000193	0.000062	-3.105481
CHLONGN	0.000275	0.000052	5.312346
CHSHORTN	-0.000394	0.000081	-4.878191

Normality test: 9.202249 P-value: 0.010041
Skewness = 0.235961 Kurtosis = 3.839790

Linearity RESET test of order 3
F-test: 0.776614 P-value : 0.461163

RESET test for Heteroskedasticity of order 3
F-test: 0.085187 P-value: 0.968085

Autocorrelation tests
F-statistic: 3.066182 P-value: 0.028813

Parameter structural change tests.
coefficient equality: 1.34904 P-value: 0.23645
variance equality: 0.66314 p-value: 0.00763

Every Wednesday/Specific

Variable	Estimate	St. Error	t-value
CONST	0.006683	0.101169	0.066062
LGCHEXPM	-0.228225	0.061842	-3.690432
CHWDLC	0.000531	0.000170	3.116852
CHWDSC	-0.000106	0.000109	-0.970263
CHWDLN	0.000392	0.000170	2.309534
CHWDSN	-0.000200	0.000170	-1.172431

Normality test: 6.872210 P-value: 0.032190
Skewness = 0.164289 Kurtosis = 3.764874

Linearity RESET test of order 3
F-test: 2.205572 P-value : 0.112513

RESET test for Heteroskedasticity of order 3
F-test: 0.189491 P-value: 0.903492

Autocorrelation tests
F-statistic: 4.552333 P-value: 0.004049

Parameter structural change tests.
coefficient equality: 1.35531 P-value: 0.23379
variance equality: 1.52795 p-value: 0.02117

Weekly Average/All Contract

Variable	Estimate	St.Error	t-value
CONST	-0.004617	0.101133	-0.045649
LGCHEXPM	-0.226478	0.063250	-3.580711
CHWATLC	0.000142	0.000094	1.501371
CHWATSC	-0.000152	0.000076	-2.006871
CHWATLN	0.000296	0.000065	4.542159
CHWATSN	0.000017	0.000025	0.673571

Normality test: 8.005281 P-value: 0.018267
Skewness = 0.252899 Kurtosis = 3.742578

Linearity RESET test of order 3
F-test: 1.408802 P-value : 0.246537

RESET test for Heteroskedasticity of order 3
F-test: 0.113949 P-value: 0.951881

Autocorrelation tests
F-statistic: 3.924290 P-value: 0.009299

Parameter structural change tests.
coefficient equality: 3.76494 P-value: 0.00136
variance equality: 1.81250 p-value: 0.00238

Weekly Average/Specific

Variable	Estimate	St.Error	t-value
CONST	-0.003759	0.101760	-0.036943
LGCHEXPM	-0.224654	0.062312	-3.605280
CHWASLC	0.000473	0.000192	2.462990
CHWASSC	-0.000041	0.000126	-0.321851
CHWASLN	0.000217	0.000196	1.110227
CHWASSN	0.000042	0.000026	1.611071

Normality test: 6.694050 P-value: 0.035189
Skewness = 0.139378 Kurtosis = 3.772868

Linearity RESET test of order 3
F-test: 0.888366 P-value : 0.412734

RESET test for Heteroskedasticity of order 3
F-test: 0.118969 P-value: 0.948896

Autocorrelation tests
F-statistic: 5.759391 P-value: 0.000819

Parameter structural change tests.
coefficient equality: 2.35227 P-value: 0.03182
variance equality: 1.61801 p-value: 0.01077

APPENDIX D: Trading Position Regressed on Different Subsets of Expected Margins for Every Wednesday/Specific Contract Model

(1) All (2) Positive/ (3) Positive/Increasing (4) Positive/Decreasing (5) Negative/ (6) Negative/Increasing (7) Negative/Decreasing

Dependent	Reporting Long Hedgers' Position (WDLC)						
	Subsets						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Constant:	494.860	-127.939	-265.477	274.661	589.439	293.750	753.510
	(4.118)*	(-.286)	(-.548)	(.274)	(4.806)	(2.081)	(3.795)
Lagged WDLC:	.692	.902	1.030	.635	.614	.875	.446
	(14.557)	(8.419)	(9.393)	(2.389)	(11.724)	(14.613)	(5.897)
Change in EXPM (CHEXPM):	73.404	85.323	57.356	-233.845	46.037	34.888	35.387
	(2.634)	(1.492)	(.723)	(-.975)	(1.426)	(.629)	(.487)
TREND:	1.385	3.909	3.591	3.172	1.206	-.556	2.611
	(2.082)	(1.771)	(1.598)	(.551)	(1.763)	(-.772)	(2.439)
Regression Statistics:							
F Value:	88.379	25.794	30.706	2.795	59.422	80.769	19.089
R^2:	.523	.584	.719	.358	.494	.751	.368
Adjusted R^2:	.517	.561	.695	.230	.486	.742	.349
Degrees of Freedom:	244.000	58.000	39.000	18.000	185.000	83.000	101.000

Dependent	Reporting Short Hedgers' Position (WDSC)						
	Subsets						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Constant:	594.553	488 926	819.672	2602.125	622.811	443.909	992.093
	(2.760)*	(.678)	(1.552)	(1.142)	(2.682)	(1.889)	(2.305)
Lagged WDSC:	.756	.597	.856	.025	.780	.924	.660
	(17.659)	(5.650)	(11.104)	(.080)	(16.142)	(19.416)	(8.641)
Change in EXPM (CHEXPM):	106.375	-78.237	-344.648	-205.182	199.176	10.769	232.586
	(1.868)	(-.751)	(-3.207)	(-.353)	(2.887)	(.100)	(1.424)
TREND:	4.427	9.446	3.900	9.716	3.870	1.753	5.741
	(2.881)	(2.090)	(1.181)	(.756)	(2.263)	(1.038)	(2.083)
Regression Statistics:							
F Value:	176.045	15.589	53.501	.324	159.394	230.974	47.042
R^2:	.686	.459	.816	.060	.724	.896	.590
Adjusted R^2:	.682	.430	.801	-.126	.719	.892	.577
Degrees of Freedom:	244.000	58.000	39.000	18.000	185.000	83.000	101.000

* Numbers in ( )'s are t-ratios.

Continued.

Dependent	Reporting Long Speculators' Position (WDLN)						
	Subsets						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Constant:	21.921	-432.802	-44.623	-16.232	71.517	19.804	153.226
	(.202)*	(-1.206)	(-.109)	(-.021)	(.615)	(.118)	(.781)
Lagged WDLN:	.844	.887	.943	.810	.846	.868	.812
	(23.753)	(9.192)	(8.561)	(4.834)	(21.059)	(16.474)	(13.545)
Change in EXPM (CHEXPM):	70.980	-64.142	-247.408	-207.913	120.559	32.135	70.798
	(2.181)	(-1.142)	(-2.992)	(-.901)	(3.040)	(.363)	(.847)
TREND:	2.424	5.799	5.296	.982	2.045	3.277	1.211
	(2.673)	(2.223)	(1.885)	(.175)	(2.006)	(2.354)	(.819)
Regression Statistics:							
F Value:	327.329	47.511	49.977	9.374	277.452	187.695	106.721
R^2:	.802	.721	.806	.652	.820	.875	.765
Adjusted R^2:	.800	.706	.790	.582	.817	.870	.758
Degrees of Freedom:	244.000	58.000	39.000	18.000	185.000	83.000	101.000

Dependent	Reporting Short Speculators' Position (WDSN)						
	Subsets						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Constant:	170.021	-405.130	-463.474	383.849	220.602	27.464	335.889
	(2.020)*	(-1.655)	(-1.634)	(.670)	(2.436)	(.251)	(2.154)
Lagged WDSN:	.711	1.064	1.108	.640	.656	.850	.500
	(15.677)	(11.859)	(12.520)	(2.311)	(12.881)	(14.199)	(6.609)
Change in EXPM (CHEXPM):	5.927	-3.289	-47.417	-63.243	-1.679	-12.278	-54.527
	(.249)	(-.087)	(-.833)	(-.381)	(-.058)	(-.226)	(-.837)
TREND:	2.105	3.378	3.973	.923	2.078	1.437	2.399
	(3.301)	(1.998)	(2.244)	(.229)	(2.966)	(1.786)	(2.248)
Regression Statistics:							
F Value:	142.237	62.623	73.362	2.373	104.347	118.886	291.743
R^2:	.639	.773	.859	.321	.632	.816	.902
Adjusted R^2:	.634	.761	.847	.186	.626	.809	.899
Degrees of Freedom:	244.000	58.000	39.000	18.000	185.000	83.000	98.000

* Numbers in ( )'s are t-ratios.

Weekly Average/All Contract Model

Dependent	Reporting Long Hedgers' Position (WATLC)						
				Subsets			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Constant:	988.629	-116.906	586.069	-875.807	1010.246	328.677	1512.454
	(3.648)*	(-.142)	(.610)	(-.535)	(3.397)	(.817)	(3.485)
Lagged WATLC:	.910	.923	.928	.957	.912	.969	.862
	(38.658)	(18.843)	(16.347)	(9.781)	(33.765)	(26.937)	(21.399)
Change in EXPM (CHEXPM):	29.958	185.370	-62.666	381.396	-20.815	27.231	-63.011
	(.698)	(2.061)	(-.435)	(1.027)	(-.412)	(.249)	(-.568)
TREND:	.977	6.692	4.944	8.509	.496	-.029	.766
	(.926)	(1.771)	(1.174)	(1.006)	(.448)	(-.020)	(.462)
Regression Statistics:							
F Value:	590.387	122.383	91.649	34.080	462.070	297.034	195.707
R^2:	.879	.869	.884	.872	.883	.917	.855
Adjusted R^2:	.878	.862	.876	.846	.881	.914	.851
Degrees of Freedom:	245.000	58.000	39.000	18.000	186.000	83.000	102.000

Dependent	Reporting Short Hedgers' Position (WATSC)						
				Subsets			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Constant:	940.310	2455.704	2469.120	5966.706	699.669	488.869	696.972
	(2.717)*	(1.838)	(1.387)	(3.766)	(1.862)	(1.089)	(1.073)
Lagged WATSC:	.953	.918	.949	.791	.965	.990	.950
	(51.482)	(14.377)	(11.396)	(10.947)	(47.242)	(42.749)	(29.057)
Change in EXPM (CHEXPM):	-61.661	-310.662	-658.951	-755.459	-22.020	134.067	22.023
	(-.870)	(-2.214)	(-2.612)	(-2.225)	(-.259)	(.838)	(.113)
TREND:	1.927	.471	.787	-10.940	.627	-4.751	4.345
	(.868)	(.072)	(.093)	(-1.402)	(.253)	(-1.607)	(1.125)
Regression Statistics:							
F Value:	1706.762	94.915	65.188	57.326	1608.543	1376.037	594.176
R^2:	.955	.838	.844	.919	.963	.981	.947
Adjusted R^2:	.954	.829	.831	.903	.962	.980	.945
Degrees of Freedom:	245.000	58.000	39.000	18.000	186.000	83.000	102.000

* Numbers in ( )'s are t-ratios.

Continued.

Dependent	Reporting Long Speculators' Position (WATLN)						
				Subsets			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Constant:	251.157	-472.207	-912.722	1998.862	258.767	291.527	667.791
	(1.020)*	(-.595)	(-.907)	(1.394)	(.982)	(.825)	(1.482)
Lagged WATLN:	.959	1.114	1.188	.910	.961	1.006	.921
	(49.838)	(19.569)	(16.460)	(9.823)	(44.374)	(36.418)	(29.147)
Change in EXPM (CHEXPM):	187.013	7.321	-83.420	159.853	223.202	-126.357	372.269
	(2.636)	(.059)	(-.388)	(.365)	(2.628)	(-.722)	(2.018)
TREND:	2.301	.691	.003	-3.146	.957	-.731	3.140
	(1.108)	(.113)	(.001)	(-.290)	(.411)	(-.245)	(.912)
Regression Statistics:							
F Value:	1427.338	188.445	167.276	38.444	1250.612	883.547	523.488
R^2:	.946	.911	.933	.884	.953	.970	.940
Adjusted R^2:	.945	.906	.927	.861	.952	.969	.938
Degrees of Freedom:	245.000	58.000	39.000	18.000	186.000	83.000	102.000

Dependent	Reporting Short Speculators' Position (WATSN)						
				Subsets			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Constant:	-1274.190	-388.521	363.888	-1372.184	-1299.601	-4076.748	465.036
	(-1.967)*	(-.696)	(.485)	(-1.453)	(-1.565)	(-2.311)	(1.750)
Lagged WATSN:	1.222	.899	.906	.920	1.237	1.454	.953
	(12.733)	(10.032)	(12.520)	(7.150)	(9.044)	(4.986)	(22.765)
Change in EXPM (CHEXPM):	113.473	-99.301	-278.738	12.931	217.648	1025.350	-146.842
	(.739)	(-1.172)	(-1.859)	(.046)	(1.020)	(1.340)	(-1.614)
TREND:	-.670	8.012	5.079	13.516	-.760	-2.019	.279
	(-.143)	(1.715)	(.829)	(1.857)	(-.126)	(-.161)	(.153)
Regression Statistics:							
F Value:	83.498	74.844	45.377	32.160	59.135	21.576	363.017
R^2:	.508	.803	.790	.865	.492	.447	.916
Adjusted R^2:	.502	.792	.773	.838	.483	.426	.914
Degrees of Freedom:	245.000	58.000	39.000	18.000	186.000	83.000	102.000

* Numbers in ( )'s are t-ratios.

Weekly Average/Specific Contract Model

Dependent	Reporting Long Hedgers' Position (WASLC)						
	Subsets						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Constant:	435.714	18.597	-180.018	466.954	517.216	243.395	711.064
	(3.930)*	(.050)	(-.558)	(.473)	(4.382)	(2.007)	(3.614)
Lagged WASLC:	.731	.897	1.022	.595	.661	.906	.486
	(16.236)	(9.919)	(13.762)	(2.228)	(12.778)	(17.527)	(6.194)
Change in EXPM (CHEXPM):	68.082	73.802	73.610	-198.650	46.683	22.480	41.062
	(2.695)	(1.577)	(1.396)	(-.839)	(1.538)	(.477)	(.584)
TREND:	1.173	2.728	2.430	3.028	1.078	-.457	2.391
	(1.941)	(1.495)	(1.629)	(.531)	(1.671)	(-.747)	(2.309)
Regression Statistics:							
F Value:	108.362	35.673	64.884	2.451	69.742	116.729	20.411
R^2:	.573	.660	.843	.329	.533	.814	.382
Adjusted R^2:	.568	.642	.830	.194	.525	.807	.363
Degrees of Freedom:	245.000	58.000	39.000	18.000	186.000	83.000	102.000

Dependent	Reporting Short Hedgers' Position (WASSC)						
	Subsets						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Constant:	573.536	574.369	904.679	2721.365	601.618	452.109	939.368
	(2.745)*	(.806)	(1.875)	(1.178)	(2.674)	(1.954)	(2.266)
Lagged WASSC:	.764	.623	.915	.029	.781	.931	.656
	(18.039)	(5.791)	(12.457)	(.091)	(16.426)	(19.684)	(8.760)
Change in EXPM (CHEXPM):	112.115	-68.794	-308.090	-207.249	198.308	15.568	227.646
	(2.020)	(-.664)	(-3.153)	(-.349)	(2.958)	(.146)	(1.444)
TREND:	4.275	8.086	1.430	8.829	3.906	1.343	6.152
	(2.844)	(1.783)	(.464)	(.684)	(2.340)	(.802)	(2.312)
Regression Statistics:							
F Value:	185.443	15.989	66.194	.279	167.911	237.114	50.471
R^2:	.696	.465	.846	.052	.733	.898	.604
Adjusted R^2:	.693	.436	.833	-.136	.729	.895	.592
Degrees of Freedom:	245.000	58.000	39.000	18.000	186.000	83.000	102.000

* Numbers in ( )'s are t-ratios.

Continued.

Dependent	Reporting Long Speculators' Position (WASLN)						
				Subsets			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Constant:							
	24.008	-457.984	-96.408	55.983	75.661	18.126	939.368
	(.235)*	(-1.325)	(-.285)	(.065)	(.698)	(.117)	(2.266)
Lagged WASLN:							
	.857	.915	.997	.768	.856	.875	.656
	(25.206)	(9.865)	(11.110)	(4.004)	(22.387)	(17.763)	(8.760)
Change in EXPM (CHEXPM):							
	54.963	-75.205	-253.466	-198.401	102.838	30.613	227.646
	(1.797)	(-1.390)	(-3.699)	(-.765)	(2.780)	(.374)	(1.444)
TREND:							
	2.208	5.575	4.890	1.110	1.845	2.923	6.152
	(2.584)	(2.248)	(2.145)	(.177)	(1.928)	(2.253)	(2.312)
Regression Statistics:							
F Value:	366.683	52.220	78.102	6.298	314.220	218.519	50.471
R^2:	.819	.740	.866	.557	.837	.891	.604
Adjusted R^2:	.817	.726	.855	.468	.834	.887	.592
Degrees of Freedom:	245.000	58.000	39.000	18.000	186.000	83.000	102.000

Dependent	Reporting Short Speculators' Position (WASSN)						
				Subsets			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Constant:							
	-368.417	-398.411	-487.524	170.884	-207.725	-2206.818	277.884
	(-1.967)*	(-1.955)	(-2.013)	(.355)	(-.331)	(-1.523)	(1.902)
Lagged WASSN:							
	.818	1.143	1.180	.859	.709	.847	.538
	(2.805)	(14.741)	(14.968)	(3.533)	(1.937)	(1.043)	(7.304)
Change in EXPM (CHEXPM):							
	313.925	.144	-20.720	9.038	476.308	1569.962	-52.929
	(2.124)	(.005)	(-.427)	(.063)	(2.360)	(2.192)	(-.870)
TREND:							
	6.979	2.429	2.927	.988	8.492	11.897	2.400
	(1.759)	(1.720)	(1.941)	(.289)	(1.744)	(1.117)	(2.404)
Regression Statistics:							
F Value:	8.872	93.152	99.617	5.258	6.869	4.152	37.954
R^2:	.099	.835	.892	.512	.101	.134	.534
Adjusted R^2:	.087	.826	.883	.415	.086	.102	.520
Degrees of Freedom:	245.000	58.000	39.000	18.000	186.000	83.000	102.000

* Numbers in ( )'s are t-ratios.

Table D.2 Traders' Positions over Expected Margin Level Segmented by $1 & $2 per cwt. for Every Wednesday/Specific Contract

Dependent	Long Hed	Short Hed	Long Spec	Short Spec
Constant	1226.447	310.632	333.843	1107.853
	(1.023)*	(.121)	(.225)	(1.028)
Lagged	.680	.804	.891	.779
Dep. Var.	(15.331)	(21.335)	(29.460)	(19.612)
EXPM	181.478	288.975	171.015	97.449
	(1.222)	(.909)	(.932)	(.730)
D1	-295.538	-220.585	-804.385	-1127.450
	(-.169)	(-.095)	(-.371)	(-.717)
D2	-903.112	-319.722	-378.131	-978.747
	(-.586)	(-.097)	(-.198)	(-.708)
D3	-443.892	162.858	-303.644	-962.546
	(-.313)	(.054)	(-.173)	(-.757)
D4	-193.020	635.848	79.112	-371.881
	(-.153)	(.235)	(.051)	(-.329)
D5	-412.009	1040.083	128.311	-742.187
	(-.368)	(.434)	(.093)	(-.741)
D6	-450.714	1371.855	271.679	-594.129
	(-.455)	(.648)	(.223)	(-.671)
D7	-176.571	1211.619	189.301	-650.089
	(-.207)	(.663)	(.180)	(-.850)
D8	-63.872	1383.281	316.702	-736.420
	(-.088)	(.895)	(.356)	(-1.142)
D9	465.126	2306.631	601.692	-73.564
	(.768)	(1.784)	(.809)	(-.136)
D10	107.653	1763.573	775.347	-304.316
	(.207)	(1.586)	(1.213)	(-.658)
D11	530.401	2399.688	965.448	-173.127
	(1.185)	(2.500)	(1.757)	(-.436)
Regression Statistics:				
F Value	24.376	42.107	74.382	34.812
R^2	.576	.701	.805	.660
Adjusted R^2	.552	.684	.795	.641
Degrees of Freedom	246.000	246.000	246.000	246.000

Dependent	Long Hed	Short Hed	Long Spec	Short Spec
Constant	1877.629	1932.852	328.985	379.337
	(3.455)*	(1.663)	(.496)	(.782)
Lagged	.677	.803	.890	.787
Dep. Var.	(15.336)	(21.597)	(29.999)	(20.089)
EXPM	220.832	275.354	68.727	9.719
	(2.951)	(1.713)	(.751)	(.145)
D1'	-1484.835	-1876.487	-213.027	-63.229
	(-1.965)	(-1.159)	(-.231)	(-.094)
D2'	-990.143	-1191.684	4.006	153.024
	(-1.598)	(-.897)	(.005)	(.278)
D3'	-1035.719	-428.797	102.572	-43.025
	(-2.163)	(-.416)	(.176)	(-.101)
D4'	-660.855	-378.153	-47.983	-223.130
	(-1.851)	(-.492)	(-.110)	(-.703)
D5'	-109.535	438.665	171.614	142.568
	(-.410)	(.760)	(.524)	(.597)
Regression Statistics:				
F Value	43.774	75.095	136.726	61.918
R^2	.561	.687	.800	.644
Adjusted R^2	.549	.678	.794	.634
Degrees of Freedom	246.000	246.000	246.000	246.000

* Numbers in ( )'s are t-ratios.

Weekly Average/All Contract

Dependent	Long Hed	Short Hed	Long Spec	Short Spec
Constant	4789.131	139.022	808.189	-11025.000
	(2.379)*	(.042)	(.259)	(-1.563)
Lagged	.910	.965	.970	1.225
Dep. Var.	(40.339)	(68.202)	(64.660)	(15.134)
EXPM	407.916	-21.341	393.069	-1397.768
	(1.681)	(-.053)	(1.020)	(-1.612)
D1	-4658.848	503.452	-2040.012	13927.000
	(-1.630)	(.106)	(-.448)	(1.362)
D2	-4433.332	1852.046	-276.707	13237.000
	(-1.762)	(.445)	(-.069)	(1.471)
D3	-4177.284	901.120	-894.269	11606.000
	(-1.800)	(.235)	(-.243)	(1.400)
D4	-4087.126	1136.610	486.742	10141.000
	(-1.977)	(.333)	(.148)	(1.375)
D5	-3478.458	355.398	-230.919	8327.423
	(-1.896)	(.118)	(-.080)	(1.282)
D6	-3097.934	989.179	727.146	8461.078
	(-1.911)	(.371)	(.284)	(1.468)
D7	-2634.242	614.976	304.120	6140.098
	(-1.881)	(.267)	(.137)	(1.233)
D8	-2319.626	712.871	370.456	4398.481
	(-1.958)	(.367)	(.198)	(1.046)
D9	-1923.272	583.744	854.575	2821.628
	(-1.945)	(.359)	(.548)	(.804)
D10	-2000.882	-128.159	1526.015	1978.406
	(-2.363)	(-.092)	(1.136)	(.657)
D11	-508.049	695.016	1478.106	1406.224
	(-.698)	(.580)	(1.283)	(.543)
Regression Statistics:				
F Value	138.223	396.760	354.258	19.697
R^2	.884	.956	.951	.522
Adjusted R^2	.878	.954	.949	.496
Degrees of Freedom	247.000	247.000	247.000	247.000

Dependent	Long Hed	Short Hed	Long Spec	Short Spec
Constant	3139.509	-601.321	-1479.092	-5306.610
	(3.455)*	(-.408)	(-1.045)	(-1.696)
Lagged	.914	.968	.974	1.214
Dep. Var.	(41.457)	(69.841)	(65.537)	(15.508)
EXPM	225.486	-195.086	-92.715	-716.202
	(1.887)	(-.980)	(-.478)	(-1.670)
D1'	-2405.858	2629.391	2809.720	5931.479
	(-2.002)	(1.312)	(1.437)	(1.375)
D2'	-2356.843	1864.671	2549.000	4537.889
	(-2.393)	(1.136)	(1.592)	(1.284)
D3'	-1870.692	1158.861	1988.800	3481.506
	(-2.458)	(.913)	(1.608)	(1.273)
D4'	-1428.341	822.760	1161.120	1763.078
	(-2.518)	(.870)	(1.260)	(.866)
D5'	-1225.164	190.655	963.885	215.723
	(-2.880)	(.268)	(1.391)	(.140)
Regression Statistics:				
F Value	260.615	738.985	640.199	36.667
R^2	.883	.955	.949	.516
Adjusted R^2	.880	.954	.947	.502
Degrees of Freedom	247.000	247.000	247.000	247.000

* Numbers in ( )'s are t-ratios.

Weekly Average/Specific Contract

Dependent	Long Hed	Short Hed	Long Spec	Short Spec
Constant	1592.076	145.041	78.721	-8164.956
	(1.456)*	(.058)	(.056)	(-1.186)
Lagged	.718	.810	.902	1.041
Dep. Var.	(16.987)	(21.927)	(31.216)	(3.975)
EXPM	239.394	259.456	123.054	-1072.732
	(1.766)	(.836)	(.711)	(-1.259)
D1	-1023.909	43.789	-445.322	12159.000
	(-.640)	(.012)	(-.218)	(1.211)
D2	-1504.922	-156.647	-16.100	10720.000
	(-1.070)	(-.049)	(-.009)	(1.213)
D3	-1004.216	388.890	61.358	9701.556
	(-.776)	(.131)	(.037)	(1.194)
D4	-782.458	793.807	239.704	8955.059
	(-.678)	(.301)	(.163)	(1.238)
D5	-840.569	1158.930	344.248	7473.603
	(-.822)	(.495)	(.264)	(1.167)
D6	-742.335	1450.319	390.603	8013.684
	(-.821)	(.702)	(.340)	(1.417)
D7	-463.205	1256.512	298.989	5406.612
	(-.594)	(.705)	(.301)	(1.106)
D8	-304.600	1401.361	406.545	4051.149
	(-.461)	(.929)	(.485)	(.982)
D9	208.886	2244.315	654.055	3534.111
	(.378)	(1.780)	(.934)	(1.024)
D10	23.780	1686.538	734.837	2143.762
	(.050)	(1.555)	(1.220)	(.725)
D11	485.718	2358.046	908.178	1326.822
	(1.187)	(2.519)	(1.754)	(.522)
Regression Statistics:				
F Value	29.073	44.237	83.420	1.907
R^2	.617	.710	.822	.095
Adjusted R^2	.596	.694	.812	.045
Degrees of Freedom	247.000	247.000	247.000	247.000

Dependent	Long Hed	Short Hed	Long Spec	Short Spec
Constant	1828.674	1933.464	411.058	-3758.744
	(3.688)*	(1.707)	(.659)	(-1.233)
Lagged	.713	.810	.901	1.014
Dep. Var.	(16.987)	(22.195)	(31.862)	(3.977)
EXPM	222.144	274.529	76.251	-568.212
	(3.259)	(1.754)	(.886)	(-1.351)
D1′	-1549.197	-1928.382	-338.910	5375.710
	(-2.251)	(-1.223)	(-.391)	(1.269)
D2′	-1094.248	-1194.145	-128.715	4461.908
	(-1.940)	(-.923)	(-.182)	(1.285)
D3′	-1035.032	-465.717	-9.076	3897.488
	(-2.374)	(-.464)	(-.017)	(1.450)
D4′	-674.295	-426.013	-121.334	1942.802
	(-2.074)	(-.569)	(-.297)	(.971)
D5′	-162.284	351.038	125.565	1148.936
	(-.667)	(.625)	(.408)	(.765)
Regression Statistics:				
F Value	52.707	79.076	154.484	3.155
R^2	.605	.697	.818	.084
Adjusted R^2	.594	.688	.813	.057
Degrees of Freedom	247.000	247.000	247.000	247.000

* Numbers in ( )'s are t-ratios.

APPENDIX E: Misspecification Results of Trading Activity Models Regressed on Change in Expected Margin

Every Wednesday/All Contract

Dependent: LONGC	Dependent: SHORTC	Dependent: LONGN	Dependent: SHORTN
Normality test: 1.323538 (.515938)	Normality tests: 24.297536 (.000005)	Normality test: 17.456351 (.000162)	Normality test: 0.706822 (.702288)
Linearity test: 1.573005 (.209570)	Linearity test: 1.773862 (.171912)	Linearity test: 1.066164 (.345965)	Linearity test: 3.024113 (.050473)
Heteroskedasticity: 2.024406 (.111119)	Heteroskedasticity: 4.651731 (.003514)	Heteroskedasticity: 12.620290 (.000000)	Heteroskedasticity: 2.830873 (.039073)
Autocorrelation: 0.511546 (.674701)	Autocorrelation: 5.061711 (.002048)	Autocorrelation: 3.543616 (.015322)	Autocorrelation: 3.216291 (.023594)
Coefficient equality: 2.13739 (.07692)	Coefficient equality: 1.83768 (.12233)	Coefficient equality: 0.75749 (.55392)	Coefficient equality: 2.15285 (.07508)
Variance equality: 1.13566 (.26899)	Variance equality: 0.95358 (.00065)	Variance equality: 1.60117 (.01109)	Variance equality: 0.90384 (.70485)

Wednesday/Specific Contract

Dependent: WDLC	Dependent: WDSC	Dependent: WDLN	Dependent: WDSN
Normality tests: 357.256301 (.000000)	Normality test: 297.079258 (.000000)	Normality test: 370.620877 (.000000)	Normality test: 1419.30628 (.000000)
Linearity test: 10.653206 (.000037)	Linearity test: 1.678720 (.188815)	Linearity test: 2.525368 (.082172)	Linearity test: 3.812810 (.023447)
Heteroskedasticity: 20.831087 (.000000)	Heteroskedasticity: 18.335119 (.000000)	Heteroskedasticity: 9.734503 (.000003)	Heteroskedasticity: 31.923525 (.000000)
Autocorrelation: 1.905357 (.129409)	Autocorrelation: 0.223590 (.879947)	Autocorrelation: 0.385521 (.763533)	Autocorrelation: 1.815697 (.144984)
Coefficient equality: 0.89430 (.46801)	Coefficient equality: 1.51068 (.19976)	Coefficient equality: 2.60045 (.03685)	Coefficient equality: 1.22633 (.30031)
Variance equality: 1.55685 (.01562)	Variance equality: 1.67559 (.00618)	Variance equality: 1.94770 (.00068)	Variance equality: 2.17689 (.00010)

Average/All Contract

Dependent: WATLC	Dependent: WATSC	Dependent: WATLN	Dependent: WATSN
Normality test:	Normality test:	Normality test:	Normality test:
149.628324 (.000000)	249.769223 (.000000)	204.137113 (.000000)	631.242678 (.000000)
Linearity test:	Linearity test:	Linearity test:	Linearity test:
12.728956 (.000006)	1.530085 (.218639)	3.073992 (.048077)	4.195445 (.016193)
Heteroskedasticity:	Heteroskedasticity:	Heteroskedasticity:	Heteroskedasticity:
17.520698 (.000000)	18.046148 (.000000)	10.393300 (.000000)	39.569292 (.000000)
Autocorrelation:	Autocorrelation:	Autocorrelation:	Autocorrelation:
0.900371 (.441696)	0.143817 (.933561)	0.133419 (.940084)	0.688649 (.559788)
Coefficient equality:	Coefficient equality:	Coefficient equality:	Coefficient equality:
0.97162 (.42373)	1.62753 (.16803)	2.75939 (.02851)	1.49614 (.20407)
Variance equality:	Variance equality:	Variance equality:	Variance equality:
1.68528 (.00572)	1.52391 (.02009)	1.91942 (.00086)	2.34405 (.00003)

Average/Specific Contract

Dependent: WASLC	Dependent: WASSC	Dependent: WASLN	Dependent: WASSN
Normality test:	Normality test:	Normality test:	Normality test:
1.474566 (.478412)	3.774190 (.001021)	8.596284 (.013594)	356558.821 (.00000)
Linearity test:	Linearity:	Linearity:	Linearity:
0.765045 (.466454)	1.560521 (.212168)	0.820828 (.441309)	74.108478 (.000000)
Heteroskedasticity:	Heteroskedasticity:	Heteroskedasticity:	Heteroskedasticity:
1.653697 (.177695)	4.744332 (.003107)	14.862204 (.000000)	35.429362 (.000000)
Autocorrelation:	Autocorrelation:	Autocorrelation:	Autocorrelation:
5.492435 (.001156)	15.203473 (.000000)	13.361504 (.000000)	6.162455 (.000475)
Coefficient equality:	Coefficient equality:	Coefficient equality:	Coefficient equality:
2.33985 (.05588)	2.31445 (.05819)	0.50687 (.73073)	1.15645 (.33081)
Variance equality:	Variance equality:	Variance equality:	Variance equality:
1.05499 (.40252)	1.67462 (.00622)	1.79822 (.00231)	22.21173 (.00000)

VITA

Won-Cheol Yun, son of Mr. Sung-Hwan Yun and Mrs. Kyung-Hee Bang of Seoul, Korea, was born June 11, 1967, in Pusan, Korea.

In March, 1986, Won-Cheol entered the Department of Agricultural Economics at Seoul National University in Seoul, Korea. After completing four years of full time course work, he graduated in February, 1990 with a Bachelor of Art Degree in Economics from the Agricultural College, Seoul National University.

In September, 1990, Won-Cheol entered the MBA program of Virginia Polytechnic Institute and State University (VPI & SU) and transferred to the Master's program of Agricultural Economics of the same university in May, 1991. In May, 1992, the requirements for a Master of Science Degree in Agricultural Economics were completed.

Upon completion of his Master's program, Won-Cheol entered the Doctor of Philosophy program in Agricultural Economics at VPI & SU. During his Doctoral Program, Won-Cheol was working as a Research Assistant for Dr. Wayne D. Purcell, Professor and Director of the Research Institute on Livestock Pricing.