To the Graduate Council:

I am submitting herewith a thesis written by Cregg Dale Miyat entitled "Analysis of Alternative Hedging Strategies for Backgrounding Feeder Calves in Tennessee." I have examined the final copy of this thesis for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Master of Science, with a major in Agricultural Economics.

Dan L. McLemore, Major Professor

We have read this thesis
and recommend its acceptance:

Accepted for the Council

Vice Chancellor
Graduate Studies and Research

C

ANALYSIS OF ALTERNATIVE HEDGING STRATEGIES FOR BACKGROUNDING FEEDER CALVES IN TENNESSEE

A Thesis

Presented for the

Master of Science

Degree

The University of Tennessee, Knoxville

Cregg Dale Miyat

December 1981

3055538

ACKNOWLEDGEMENTS

I appreciated the help and friendship of the many people who assisted in making this thesis a reality. Dr. Dan McLemore was most helpful in conceptualizing and initiating this research, which quickly led me to Morgan Gray for assistance in programming the computer. Although Morgan avoided me as best he could, a great amount of appreciation is extended to him for the time and effort he did share with me throughout this stimulating experience, which ultimately led to the results herein.

Gratitude is extended to Dr. Dan McLemore for his criticism, guidance and direction, and dedication to quality throughout the course of this research, especially during the writing process. Appreciation is also due to Dr. Emmit Rawls and Dr. Irving Dubov for their helpful suggestions, insights and encouragement.

Special thanks is extended to the Head of the Department, Dr. Joe Martin, for granting me a research assistantship which truly made this educational opportunity and research work possible.

I am also indebted to Anna Norwood and Shelia Reed who typed the final draft of this manuscript. Also appreciation is deserved to my fellow graduate students, who made my experiences throughout the past two years very rewarding and memorable.

Finally, I would like to express my love and appreciation to my wife, Dana, for her support, encouragement and continual love she has expressed to me throughout our marriage.

ABSTRACT

This research evaluated various futures market hedging strategies for feeder cattle backgrounding operations to determine their impact on level and variability of net returns. Improving overall net returns and avoiding risk associated with adverse cash price movements were assumed objectives for the cattle producer backgrounding feeder steers. The hedging strategies were simulated with the use of models representing the typical Tennessee producer's summer and winter feeder cattle backgrounding operations during the 1972-79 period. The strategies simulated included variations of basic, moving average, and point-and-figure analysis hedging strategies and the typical cash sale. The mean and variance of net returns were used as criteria for comparing the effectiveness of the strategies simulated.

The primary results of the simulations showed that selective hedging could give larger mean net return and lower variance of net return than the cash market. The basic hedging strategies appeared to perform well when the producer began backgrounding steers in the spring and marketed them in the fall. In almost every observation, the moving average and point-and-figure hedging strategies were superior to the cash market by yielding higher mean net returns with lower variances. Assuming similar production and market conditions to those of the simulation period, the results of this study indicate that a producer can effectively increase his mean net returns with smaller risk compared to the cash market when utilizing the superior selective hedging strategies discussed in this study.

TABLE OF CONTENTS

CHAPTER		PAGE
I.	INTRODUCTION	1
	The Cattle Industry in the Southeastern Region	2
	The Cattle Industry in Tennessee	3
	Backgrounding Feeder Steers in Tennessee	3
	Futures Market Hedging	4
	Futures Market	5
	Problem	7
	Literature Review	9
	Objectives	13
II.	HEDGING PROCEDURE	15
	Cash Market Strategy	17
	Basic Hedging Strategies	17
	Moving Average Hedging Strategies	22
	Point-and-Figure Analysis Hedging Strategies	27
III.	METHODOLOGY	37
	Development of the Price Data	38
	Development of the 240-Day Winter Backgrounding Operation Budgets	39
	Development of the 165-Day Summer Backgrounding Operation Budgets	41
	Calculation of Basis Estimates	42
	Cost of Trading Futures	44
	Method of Analysis	45
IV.	RESULTS	46
	Analysis of the Winter Backgrounding Operation Beginning September 1 and Ending May 1	46
	Analysis of the Winter Backgrounding Operation Beginning October 1 and Ending June 1	56
	Analysis of the Winter Backgrounding Operation Beginning November 1 and Ending July 1	65
	Summary Analysis of the Winter Backgrounding Operations Combined	73
	Analysis of the Summer Backgrounding Operation Beginning March 15 and Ending September 1	82
	Analysis of the Summer Backgrounding Operation Beginning April 15 and Ending October 1	90
	Analysis of the Summer Backgrounding Operation Beginning May 15 and Ending November 1	100
	Summary Analysis of the Summer Backgrounding Operations Combined	107

CHAPTER PAGE

V. SUMMARY, CONCLUSIONS, AND IMPLICATIONS 116
Summary 116
Conclusions and Implications 121
Future Research Implications 123

LIST OF REFERENCES 124

APPENDICES 128
Appendix A 129
Appendix B 138

VITA 174

LIST OF TABLES

TABLE		PAGE
1.	Index of Prices Paid by Farmers (1972 = 100) and Inflated Dollar Increments used in the Basic Hedging Strategies for the Simulation Period, 1972-1979	20
2.	Moving Average Hedging Strategies Evaluated in the Study	28
3.	Daily High and Low Prices for the May 1979 Feeder Cattle Futures Contract, April 10, 1979 to April 24, 1979	30
4.	Point-and-Figure Hedging Strategies Evaluated in the Study	36
5.	Mean and Variance of Net Returns, Maximum and Minimum Net Return Levels, and Number of Hedges Executed for the Winter Operation, Beginning September 1 and Ending May 1, Using Specified Basic Hedging Strategies, Tennessee, 1972-1979	47
6.	Mean and Variance of Net Returns, Maximum and Minimum Net Return Levels, Total, Average, and Maximum and Minimum Number of Hedges Executed for the Winter Operation, Beginning September 1 and Ending May 1, Using Specified Moving Average Hedging Strategies, Tennessee, 1972-1979	50
7.	Mean and Variance of Net Returns, Maximum and Minimum Net Return Levels, Total, Average, and Maximum and Minimum Number of Hedges Executed for the Winter Operation Beginning September 1 and Ending May 1, Using Specified Point-and-Figure Hedging Strategies, Tennessee, 1972-1979	51
8.	Mean and Variance of Net Returns, Maximum and Minimum Net Return Levels, and Number of Hedges Executed for the Winter Operation, Beginning October 1 and Ending June 1, Using Specified Basic Hedging Strategies, Tennessee, 1972-1979	57
9.	Mean and Variance of Net Returns, Maximum and Minimum Net Return Levels, Total, Average, and Maximum and Minimum Number of Hedges Executed for the Winter Operation Beginning October 1 and Ending June 1, Using Specified Moving Average Hedging Strategies, Tennessee, 1972-1979	60

TABLE PAGE

10. Mean and Variance of Net Returns, Maximum and Minimum Net Return Levels, Total, Average, and Maximum and Minimum Number of Hedges Executed for the Winter Operation Beginning October 1 and Ending June 1, Using Specified Point-and-Figure Hedging Strategies, Tennessee, 1972-1979 61

11. Mean and Variance of Net Returns, Maximum and Minimum Net Return Levels, and Number of Hedges Executed for the Winter Operation, Beginning November 1 and Ending July 1, Using Specified Basic Hedging Strategies, Tennessee, 1972-1979 66

12. Mean and Variance of Net Returns, Maximum and Minimum Net Return Levels, Total, Average, and Maximum and Minimum Number of Hedges Executed for the Winter Operation Beginning November 1 and Ending July 1, Using Specified Moving Average Hedging Strategies, Tennessee, 1972-1979 69

13. Mean and Variance of Net Returns, Maximum and Minimum Net Return Levels, Total, Average, and Maximum and Minimum Number of Hedges Executed for the Winter Operation Beginning November 1 and Ending July 1, Using Specified Point-and-Figure Hedging Strategies, Tennessee, 1972-1979 70

14. Summary Analysis of Mean and Variance of Net Returns, Maximum and Minimum Net Return Levels, and Number of Hedges Executed for the Winter Operations Combined, Using Specified Basic Hedging Strategies, Tennessee, 1972-1979 74

15. Summary Analysis of Mean and Variance of Net Returns, Maximum and Minimum Net Return Levels, Total, Average, and Maximum and Minimum Number of Hedges Executed for the Winter Operations Combined, Using Specified Moving Average Hedging Strategies, Tennessee, 1972-1979 77

16. Summary Analysis of Mean and Variance of Net Returns, Maximum and Minimum Net Return Levels, Total, Average, and Maximum and Minimum Number of Hedges Executed for the Winter Operations Combined, Using Specified Point-and-Figure Hedging Strategies, Tennessee, 1972-1979. . . 78

17. Mean and Variance of Net Returns, Maximum and Minimum Net Return Levels, and Number of Hedges Executed for the Summer Operation Beginning March 15 and Ending September 1, Using Specified Basic Hedging Strategies, Tennessee, 1973-1979 83

TABLE PAGE

18. Mean and Variance of Net Returns, Maximum and Minimum Net Return Levels, Total, Average, and Maximum and Minimum Number of Hedges Executed for the Summer Operation Beginning March 15 and Ending September 1, Using Specified Moving Average Hedging Strategies, Tennessee, 1973-1979 85

19. Mean and Variance of Net Returns, Maximum and Minimum Net Return Levels, Total, Average, and Maximum and Minimum Number of Hedges Executed for the Summer Operation Beginning March 15 and Ending September 1, Using Specified Point-and-Figure Hedging Strategies, Tennessee, 1973-1979 86

20. Mean and Variance of Net Returns, Maximum and Minimum Net Return Levels and Number of Hedges Executed for the Summer Operation Beginning April 15 and Ending October 1, Using Specified Basic Hedging Strategies, Tennessee, 1973-1979 92

21. Mean and Variance of Net Returns, Maximum and Minimum Net Return Levels, Total, Average, and Maximum and Minimum Number of Hedges Executed for the Summer Operation Beginning April 15 and Ending October 1, Using Specified Moving Average Hedging Strategies, Tennessee, 1973-1979 94

22. Mean and Variance of Net Returns, Maximum and Minimum Net Return Levels, Total, Average, and Maximum and Minimum Number of Hedges Executed for the Summer Operation Beginning April 15 and Ending October 1, Using Specified Point-and-Figure Hedging Strategies, Tennessee, 1973-1979 95

23. Mean and Variance of Net Returns, Maximum and Minimum Net Return Levels and Number of Hedges Executed for the Summer Operation Beginning May 15 and Ending November 1, Using Specified Basic Hedging Strategies, Tennessee, 1973-1979 101

24. Mean and Variance of Net Returns, Maximum and Minimum Net Return Levels, Total, Average, and Maximum and Minimum Number of Hedges Executed for the Summer Operation Beginning May 15 and Ending November 1, Using Specified Moving Average Hedging Strategies, Tennessee, 1973-1979 103

TABLE PAGE

25. Mean and Variance of Net Returns, Maximum and Minimum Net Return Levels, Total, Average, and Maximum and Minimum Number of Hedges Executed for the Summer Operation Beginning May 15 and Ending November 1, Using Specified Point-and-Figure Hedging Strategies, Tennessee, 1973-1979 104

26. Summary Analysis of Mean and Variance of Net Returns, Maximum and Minimum Net Return Levels, and Number of Hedges Executed for the Summer Operations Combined, Using Specified Basic Hedging Strategies, Tennessee, 1973-1979 108

27. Summary Analysis of Mean and Variance of Net Returns, Maximum and Minimum Net Return Levels, Total, Average, and Maximum and Minimum Number of Hedges Executed for the Summer Operations Combined, Using Specified Moving Average Hedging Strategies, Tennessee, 1973-1979 110

28. Summary Analysis of Mean and Variance of Net Returns, Maximum and Minimum Net Return Levels, Total, Average, and Maximum and Minimum Number of Hedges Executed for the Summer Operations Combined, Using Point-and-Figure Hedging Strategies, Tennessee, 1973-1979 111

A-1. Initial and Maintenance Margin Data Obtained from Chicago Mercantile Exchange Officials for the Period 1972-1979 130

A-2. Monthly Breakeven Prices for the 240-Day Winter and 165-Day Summer Feeder Cattle Backgrounding Operations, Tennessee, 1972-1979 131

A-3. Basis Estimates Computed Using Tennessee Auctions Cash Price Data and a Two-Year Moving Average for the First Ten-Day Period of Each Marketing Month, 1973-1979 . . . 133

A-4. Yearly Interest Rates Used in Calculating Budgets and Trading Costs, 1972-1979 135

A-5. Monthly Cash Price Index by Year, for 500-600 Pound Feeder Steers, Tennessee, 1972-1979 136

A-6. Monthly Cash Price Index for 500-600 Pound Feeder Steers, for the Eight Years of the Simulation Time Period, Beginning 1972 and Ending 1979, Tennessee . . . 137

TABLE PAGE

B-1. Annual Net Returns for the Winter Operation, Beginning September 1 and Ending May 1, Using Specified Basic Hedging Strategies, Moving Average Hedging Strategies, and Point-and-Figure Hedging Strategies, Tennessee, 1972-1979 139

B-2. Annual Net Returns for the Winter Operation, Beginning October 1 and Ending June 1, Using Specified Basic Hedging Strategies, Moving Average Hedging Strategies and Point-and-Figure Hedging Strategies, Tennessee, 1972-1979 145

B-3. Annual Net Returns for the Winter Operation, Beginning November 1 and Ending July 1, Using Specified Basic Hedging Strategies, Moving Average Hedging Strategies, and Point-and-Figure Hedging Strategies, Tennessee, 1972-1979 151

B-4. Annual Net Returns for the Summer Operation, Beginning March 15 and Ending September 1, Using Specified Basic Hedging Strategies, Moving Average Hedging Strategies, and Point-and-Figure Hedging Strategies, Tennessee, 1973-1979 157

B-5. Annual Net Returns for the Summer Operation Beginning April 15 and Ending October 1, Using Specified Basic Hedging Strategies, Moving Average Hedging Strategies, and Point-and-Figure Hedging Strategies, Tennessee, 1973-1979 162

B-6. Annual Net Returns for the Summer Operation Beginning May 15 and Ending November 1, Using Specified Basic Hedging Strategies, Moving Average Hedging Strategies, and Point-and-Figure Hedging Strategies, Tennessee, 1973-1979 168

LIST OF FIGURES

FIGURE		PAGE
1.	Illustration of Crossing Action of Two Moving Averages	24
2.	Illustration of Sell and Buy Signals from Three Moving Averages	26
3.	Point-and-Figure Chart for Feeder Cattle Futures, April 10, 1979 to April 24, 1979, Box Size = 20¢, Reversal Number = 2	31
4.	The Simple Sell and Buy Signals on Point-and-Figure Charts	33
5.	Example of $1.40 Trailing Stop, Box Size = 20¢	35
6.	Mean and Variance for the Winter Operation Beginning September 1 and Ending May 1, Using Specified Hedging Strategies, Tennessee, 1972-1979	53
7.	Mean and Variance for the Winter Operation Beginning October 1 and Ending June 1, Using Specified Hedging Strategies, Tennessee, 1972-1979	62
8.	Mean and Variance for the Winter Operation Beginning November 1 and Ending July 1, Using Specified Hedging Strategies, Tennessee, 1972-1979	71
9.	Overall Mean and Variance for the Combined Winter Operations	79
10.	Mean and Variance for the Summer Operation Beginning March 15 and Ending September 1, Using Specified Hedging Strategies, Tennessee, 1973-1979	87
11.	Mean and Variance for the Summer Operation Beginning April 15 and Ending October 1, Using Specified Hedging Strategies, Tennessee, 1973-1979	96
12.	Mean and Variance for the Summer Operation Beginning May 15 and Ending November 1, Using Specified Hedging Strategies, Tennessee, 1973-1979	105
13.	Overall Mean and Variance for the Combined Summer Operations	113

CHAPTER I

INTRODUCTION

A substantial part of unexpected gains and losses in the cattle industry are the direct result of the cattle numbers cycle [13, p. 9]. Historically, the high cattle inventories in the U.S. have occurred every 10 years since 1945 [22, p. 3]. In general, the overall profitability of the cattle industry appears to be a mirror image of the cattle cycle. Typically beef prices seem to decline one to two years after cattle numbers peak. This narrows the cattleman's margins causing profitability to decrease. However, it should be noted that the profitability and structure of the cattle industry is a function of many factors. The shortfalls in grain production in 1972 and 1974 and the large grain exports to the Soviet Union and developing countries in 1972-74, resulted in sharp increases in the domestic grain prices causing the cost of production to rise. With these economic pressures and growing inflation in the past decade, livestock producers experienced not only increased production costs but highly variable livestock prices as well. For instance, in Tennessee livestock auctions, the weekly average cash price for 500 pound feeder steers in the second week of August 1973 was $69.00/cwt., by the fourth week in August 1974 the average cash price had fallen to $29.25/cwt. [7]. On the other hand, the weekly average cash price doubled from the first week of April 1978 from $51.75/cwt. to $103.50/cwt. by the third week of April 1979. This type of price fluctuation had an adverse affect on many cattle producers in the 1970's. Depressed prices for beef and rising production costs caused apparently severe financial losses during 1974-77 [22, p. 1].

This led to heavy liquidation of the cattle inventory in the U.S. and especially in the Southern Region during this period [23].

Currently the cattle industry is rebuilding and growing again with the rise in beef prices experienced in recent years. However, producers are still faced with increasing production cost and price variability along with narrow profit margins. This further emphasizes the desirability of a management tool which can help protect producers from adverse price fluctuations.

Futures market hedging is a risk management tool which, when properly used, may offer producers the assistance they need in protecting themselves from adverse price fluctuations, allowing them to better maintain a financially sound operation.

I. The Cattle Industry in the Southeastern Region

The Southeast[1] led all other regions in growth of cattle raising from 1950-1978 [18, pp. 94-96]. Throughout this time period the traditional sources of feeder cattle in the Great Plains of the Midwest and the High Plains of the South had been retaining more of their feeders to supply their own expanding feeding enterprises. This placed more emphasis on other regions to supply feeders to the Corn Belt area. The Southeastern States were able to capitalize on this opportunity by expanding their calf production industry. This new growth and development was further encouraged indirectly by crop diversion and conservation practices of the 1950's and 1960's which saw acreage formerly devoted

---

[1]Includes Virginia, West Virginia, Kentucky, North and South Carolina, Tennessee, Arkansas, Louisiana, Mississippi, Alabama, Georgia and Florida.

to cotton and grain production shift into forages which were necessary for the feeder cattle industry. The Southeastern States became more important as a source of feeders for the Corn Belt in the mid 1970's [3, p. 6]. Despite the changes in the economic conditions of the past decade, which resulted in many farmers shifting acreage from forage to more grain production, especially to soybean production, the Southeast has maintained its role in the feeder cattle industry.

II. The Cattle Industry in Tennessee

The livestock industry is a very important element of Tennessee's agricultural economy. It has accounted for over 53 percent of cash receipts from the State's farm marketing in the last half of the 1970's [30]. Cattle were the State's leading farm commodity, comprising 24 percent of cash receipts from farm marketings in 1978. The cattle industry in Tennessee ranked fifteenth nationwide in total beef cattle numbers, as of January 1, 1979. Clearly, the livestock industry and notably the cattle industry play a major role in Tennessee's agricultural economy.

III. Backgrounding Feeder Steers in Tennessee

This study concentrated on one segment of the cattle industry in Tennessee, backgrounding feeder steers. Backgrounding or stockering is a system which carries light feeder calves to heavier weights, allowing the calves to develop and increase in size and scale. It usually requires a large amount of forage and typically consists of grazing calves on some combination(s) of silage, cornstalks, pasture and hay for a period of 5-10 months. Although backgrounding is only one aspect

of the cattle industry, it is one of the major phases of the beef production process for Tennessee, since many calves produced in this state are considered too small to enter feedlots at first sale. Most of these calves weigh less than 500 pounds. Backgrounding allows them to gain 200-300 pounds before entering the feedlot weighing around 600-700 pounds. Many production and economic factors are considered in determining the optimal time periods for backgrounding calves. The two typical time periods for backgrounding are: (1) start calves in the fall and background through the winter to the spring or summer months or (2) start in the early spring and pasture until late summer or fall.

IV. Futures Market Hedging

By utilizing the futures market, hedging can be used as a management tool which may allow the producer to increase net returns and reduce risk of price changes. Hedging, as defined by Hieronymus, is to insulate one's business activities from price level speculation while retaining the opportunity to speculate in basis variation [12, p. 150]. Essentially, when a producer hedges he is taking a position in the futures market that is opposite his present cash position. Therefore, by hedging his cattle the producer is able to establish a buying or selling price for his livestock in the futures market before they are ready for purchase or sale in the cash market. This allows the producer to protect himself from an adverse price movement in the cash market. Thus, any losses experienced in the cash market should be offset by a favorable situation in the futures market and vise versa. This is based on the observation that typically cash and future prices move together [1, p. 13; 31, p. 8].

Hedging may not only remove the risk of price level variation, but may also improve the producer's ability to obtain production credit. This is significant since costs of production have continually trended upward. Many loan officers consider an operator's ability to minimize risk as well as maximize profits as important factors when contemplating farm loans. Hedging can help both the producer and the loan officer eliminate some of this risk.

It must be noted that while hedging appears to offer potential for increasing a producer's profits and decreasing his financial problems, there are no assurances of this; in actuality the exact opposite may occur [6, 8, 14, 15, 20, 26]. Therefore, the ability to increase profits or minimize losses through hedging, depends to a large extent on the management ability of the producer and his ability to place hedge(s) at appropriate time(s).

V. Futures Market

The Chicago Mercantile Exchange provides the producer with the opportunity to utilize hedging by offering futures contracts in several commodities. Over the years, the Exchange has developed into one of the world's largest commodity futures markets with more than 12.2 million contracts traded in 1979 [4, 1979, p. 332]. It was organized in 1898 as the Butter and Egg Board, becoming known as the Chicago Mercantile Exchange in 1919. Since its beginning, many new contracts have been added for storable commodities. In November of 1964, the Exchange broke from tradition and offered futures contracts for a nonstorable commodity, live cattle.

During the first full year of cattle trading, more than 59,000 contracts were exchanged [4, 1979, p. 333]. The cattle futures were so successful from the outset that live hogs were listed in February, 1966. By 1970, hog trading volume had exceeded 115,000 contracts and cattle trading had continued to expand rapidly, surpassing the million-contract barrier the previous year. In view of the growing success of the live cattle and hog contracts, feeder cattle futures were offered in November, 1971. Like the cattle and hog contracts, the feeder cattle futures have been successful from the beginning. Trading volume has grown each year and in 1979 over 980,000 contracts changed hands.

Live feeder cattle futures contracts are offered for the months of January, March, April, May, August, September, October and November. These contracts are usually offered for trading about a year in advance of their maturity date, with all trading being terminated on the twentieth calendar day of the respective contract month.[2] Each contract is for 42,000 pounds of feeder steers averaging between 550 and 650 pounds which is approximately 76 to 65 head, respectively. The contract specifies that feeder steers must grade not less than 80% USDA Choice and not more than 20% USDA Good quality grade. Penalties are assessed for feeder cattle not meeting the contract specifications, as well as for any other deviations from the contract agreements. The Commodity exchange has further rules and regulations which govern the delivery of a contract. However, it is rare for a producer to actually make or take delivery on a futures contract, since most producers liquidate

---

[2]If the 20th calendar day is not a business day, trading will be terminated on the business day immediately preceding the 20th calendar day of the contract month.

their position in the commodity market before "delivery time". Nevertheless, if a situation exists requiring the producer to deliver on the contract, the services of a livestock order buyer are usually employed to fulfill the futures contract at the designated delivery point.

VI. Problem

Although the futures market seems to be gaining in importance and use by producers, very few are directly taking advantage of this opportunity. A 1977 survey conducted for the Commodity Futures Trading Commission by Helmuth [11] indicated that less than 10 percent of U.S. farmers with annual gross commodity sales greater than $10,000 had used the futures market during 1972-76. Only 5.3 percent of the Southeastern[3] farmers made this same claim. Surprisingly, among those farmers not using the futures market, 30.4 percent kept track of futures prices during 1976, but only 18.2 percent of the Southeastern farmers did so. It is interesting to note that of those Southeastern farmers who did not trade futures during 1976, 41.8 percent said their main reason for not trading was their lack of acquaintance with how the futures market operated. Some 22.9 percent felt their farms were too small to justify trade in the futures market. These two reasons were typical of those given by other farmers across the country. This indicates a possible need for more farmer education on the mechanics of the futures market and on the tools available for increasing farm marketing opportunities.

The Tennessee cattleman must continually strive to improve his management strategy if he is to survive in the long run. With growing

---

[3]Includes Alabama, Florida, Georgia, Kentucky, Mississippi, North and South Carolina, and Tennessee.

With growing research and literature indicating hedging as a successful pricing alternative [2, 9, 10, 24, 25], the cattleman must determine whether he can afford to assume all the risk of production and price variation in the cash market, or if hedging can improve his position. In making this determination the producer should consider available literature and professional consultation to familiarize himself with the futures market and with the process of hedging.

If hedging does indeed appear appropriate, the cattle producer should understand its limitations and vulnerabilities. It is critical for him to be prudent when utilizing hedging in his operation, because failing to do so could lead to undesirable results. Some producers who have failed to comprehend this point have been unsuccessful with hedging and are now critical of utilizing it in their operation. It is commonly recognized that determining when and when not to hedge is the key to a successful hedging program. This ultimately may be a major factor in determining the success and profitability of the production operation itself.

Many hedging strategies are available for the producer to utilize. However, some strategies seem to be more reliable and profitable than others [9, 10, 14, 15, 26]. It is thus necessary for the producer to analyze past data, allowing him to choose the most appropriate hedging strategy for his particular commodity and situation. Without appropriate and reliable research analyzing and comparing the different hedging strategies and techniques, it is difficult for the producer to make a sound decision about the available strategies. Ideally, he should base his final decision on studies which best simulate his actual production process and marketing opportunities.

Unfortunately, there has been little research which specifically addresses the questions posed by the Tennessee cattle industry pertaining to the profitability and reliability of alternative hedging strategies as applied to their operations and local markets. Such information could be of substantial benefit and use to the cattle industry in Tennessee.

VII. Literature Review

Several studies have examined different hedging strategies as they relate to the futures market to determine the overall viability of hedging as a risk management tool [16]. Typically the cash market (no hedge) provides a benchmark for comparison of hedging strategies. A superior hedge is one which yields a higher profit (greater mean return) with less risk involved (lower return variance) when compared to the cash market. Hedging strategies which yield a lower mean and higher variance than the cash market are inferior. Those hedges that yield either lower means and lower variances or higher means and higher variances than cash sales are in an "indeterminate" category. In these cases, whether the hedge is preferred depends upon the trade-off between risk and return in the individual's utility function. Individuals with a strong aversion to risk might choose a strategy with lower returns as long as it also provided smaller risk. Conversely, individuals willing to assume more risk as long as higher returns could be achieved would choose a different strategy.

Studies by Purcell, Hague and Holland [26], Farris [6], Menzie and Archer [21], McCoy and Price [20], and Leuthold [14] simulated cattle feeding operations using actual cash data to estimate the costs and

revenues of such operations. They had a common objective of analyzing fat cattle hedging strategies by selling a contract in the live-cattle futures market. These studies generally concluded: (1) that routine hedging reduces risks considerably, but also reduces the mean returns to a level which makes this practice undesirable except for those who are highly risk averse; (2) that selective hedging strategies were usually superior to a no-hedge strategy, especially when the futures prices were at a substantial premium relative to the estimated breakeven price and/or the current cash price level; and (3) that many of the strategies which required hedging when marketing in certain latter months of the year or which required seasonal hedging, regardless of economic conditions, yielded inferior results or fell into the "indeterminate" category.

Brown and Purcell [2] estimated predictive equations for feeder steer prices and combined their use with hedging strategies for feeder cattle. Each of the strategies tested did reduce risk compared to the cash market and all except one strategy increased returns. Thus, any one of the hedging strategies was better than not hedging at all, but the correct strategy to follow depended on the individual producer's financial ability to carry risk and his aversion toward risk.

Three studies, Farris [6], McCoy, Price and Soloman [19] and Leuthold and Peterson [15], examined hog hedging programs using methodology similar to that used in the previous cattle studies. In general the results were similar, concluding that routine hedging appears to be inadvisable. Although in most cases hedging significantly reduced risk, McCoy et al. could find no strategy with returns significantly greater than the no-hedge strategy. Contrary to the previous cattle studies,

the results from selective hedging strategies based on various relationships between futures prices, cash prices and breakeven prices were not necessarily superior to not hedging, since most of the results fell into the "indeterminate" category. An interesting variation used by Leuthold and Peterson allowed the liquidation of the hedge when the producer received his first or second margin call. This resulted in substantially increased returns above those of holding the short futures position until the hogs were marketed, regardless of the initial selective hedging plan. When this approach was followed, practically all of the selective hedging strategies became superior to the no-hedge strategy.

A considerable body of popular literature, exemplified by Purcell [24, 25] and Franzmann and Lehenbauer [9] analyzed the use of a trend-following method of technical price analysis known as moving averages. This method concentrates on signals arising from the relationship between two or three moving averages of futures prices in triggering decisions to place and lift hedges. It requires daily computation by the trader and usually results in "in and out" trading in the futures market. Part of the research relates to optimal length of time on which to compute the moving average. Franzmann and Lehenbauer added a new dimension to this charting technique by applying various weighting schemes to the moving averages. They also applied a minimum penetration rule which required that the averages cross by a prescribed minimum amount before a trade signal would be generated. This penetration rule improved profits considerably. Overall, the moving average scheme appeared to yield impressive results for feeder cattle in both studies by increasing profits and reducing risk as compared to the no-hedge strategy. Purcell noted that the results were mixed for fat cattle.

All three studies noted that the hedger must be willing to stick with his strategy and recognize that he will not always increase his profits, but in the long run the net return should be higher and less variable.

Recently Russell and Franzmann [29] tested the use of "oscillators" in analyzing price relationships for hedging feeder cattle. This concept depends on price differences rather than price levels to indicate futures market buy and sell signals. The study showed that use of oscillators could increase profits for the hedger while usually decreasing the variance of profit.

Finally, there has been a growing interest in point-and-figure analysis, as depicted by Franzmann and Lehenbauer [10], which is a trend-following graphic tool of market analysis. This technique also usually results in "in and out" trading in the futures market as does the moving average technique. Basically, point-and-figure analysis is concerned only with the daily high, the daily low and the extent of the price change in the event a new high or new low fails to materialize. The system has no reference to time. Essentially, the graphic structure of this technique is composed only of a price scale parameter, based on a predetermined box size, along the vertical axis, without any reference to a horizontal axis. A graphic illustration of this technique shows the price movement in a series of unique, often irregular, alternating vertical columns of X's and O's, which represent successive daily high and daily low prices, respectively. Sell and buy signals are consequently generated based on the trend-configuration of the graph, which these irregular columns forms. In order to determine if losses could be cut sooner in the event of an adverse price movement, various sizes of "stop" and "trailing-stop" rules were tested by Franzmann and

Lehenbauer. The stop rule liquidated the hedge automatically whenever the price moved a specific amount against the entry price of the hedge. The incorporation of this rule increased net profits for each strategy parameter except one. Most of the increase in total net profits was the result of increased profits from long trades[4], whereas net profits from some of the short trades[5] were actually decreased. The trailing stop rule liquidates a short (long) hedge automatically whenever the high (low) price moved a specified amount above (below) the preceding low (high) price that was plotted. The use of this rule increased the total net profit for all the strategy parameters, when compared to the same strategies without the use of stops, with most of the increase in total net profit attributed to the increase in net profit from short trades. Franzmann and Lehenbauer again noted that it was imparative for the hedger to stick with his selective hedging strategy if he was going to realize increased returns and lower variance in the long run.

VIII. Objectives

The general objective of this study was to determine whether futures market hedging was a viable management tool to help Tennessee feeder cattle backgrounding operations increase net returns and/or reduce price risk.

The specific objectives were:

1) To evaluate several variations of basic futures market hedging strategies, moving average hedging strategies, and point-and-figure

---

[4]Long trades refer to a position in the futures market established by purchasing a futures contract without having previously sold.

[5]Short trades refer to a position in the futures market established by selling a futures contract without having previously purchased.

analysis hedging strategies to determine the mean and variance of net returns for each strategy for Tennessee feeder cattle backgrounding operations using historical data.

2) To identify the optimal pricing strategies for Tennessee feeder cattle backgrounding operators over the recent past using level and variability of net returns as the criteria for evaluation.

The analysis was based upon the assumption that a study of past performance of the various strategies will give a strong indication of their future performance. The variety of strategies evaluated was limited to a group selected from those strategies which were found to be superior in similar studies for other geographic areas, other time periods, or other production systems.

CRANES CREST

CHAPTER II

HEDGING PROCEDURE

There have been a substantial number of studies, which have collectively analyzed numerous concepts, variations and combinations of proposed hedging strategies to determine their potential as a risk management tool [6, 9, 10, 14, 15, 19, 26]. Since it would be impractical and uneconomical to analyze all possible hedging strategies based on Tennessee conditions, this study selected and analyzed those strategies which appeared to offer the producer the greatest potential to maximize his returns and minimize his risk based upon similar studies conducted in other geographic areas. Some new variations of the selected hedging strategies were also tested to determine their effect on the level and variability of net returns.

The May, August, September, October and November futures contracts were used, beginning with the 1973 contract year and ending with the 1979 contract year. A computer simulated summer backgrounding operation which began on March 15, April 15, and May 15 and ended on September 1, October 1, and November 1, respectively, utilized the September, October and November contracts, respectively, for hedging purposes. A computer simulated winter backgrounding operation which began on September 1, and ended on May 1 used the May contract, while the operations which began on October 1, and November 1, and ended on June 1 and July 1, respectively, used the August contract for hedging purposes.

In order to correctly evaluate the success of each hedging strategy, it was necessary to compute the net returns for each computer simulated backgrounding operation. Therefore, a breakeven price for each operation

was required which would reflect the price required for a marketed feeder steer, which allowed the producer to cover all his major variable expenses. Consequently, breakeven prices were calculated on a per hundredweight basis, in monthly intervals, based on the budgets and procedures described in Chapter III. It was assumed that costs included in the budgets remained constant throughout the entire production period; therefore, each production operation used the breakeven price for the month in which the actual production period began. This assumption was necessary because a breakeven price was required at the beginning of the production period in order to test some of the hedging strategies.

All positions taken in the futures market were directly dictated by the particular hedging strategy being followed which eliminated all subjectivity from marketing decisions. Even though new futures contracts are usually offered a year in advance of their expiration date, the producer was not allowed to take a position in the futures market until the day he actually began backgrounding the steers. Also, the producer was not allowed to place a hedge after the 23rd day of the month immediately preceding the month in which the feeder steers were to be sold. In a "real world" situation if the cash price started moving downward at this point in time, the producer would probably sell his feeder steers early, since this would be only a week prior to the planned marketing date. If the producer was holding an open position in the futures market on the day he sold his feeder steers in the cash market, he was required also to close out his futures position the same day. Finally, no futures trading was allowed on days when the closing price was up or down the daily limit. Trades which could not be made

on the appropriate day because of limit moves were deferred until the next trading day.

I. Cash Market Strategy

The fundamental cash market sale of feeder cattle served as the benchmark strategy against which the other strategies were compared. This "no-hedge" strategy made no use of the futures market. Net returns for this strategy were computed simply by subtracting the calculated breakeven price per cwt. from the cash price per cwt. received for the feeder steers at the completion of each backgrounding operation.

II. Basic Hedging Strategies

Cash prices on local markets typically are not identical to price quotations on the futures markets. This difference between the futures price and the local cash price is known as the basis. Basis is defined as the number of cents per cwt. that, on a given day, the local cash price for feeder steers is above or below the current price for a particular futures contract. Therefore, a producer with knowledge of the basis for his local market could translate a given futures price into a price he could expect to receive from his local market. This process is known as "localizing" the futures price.

The specific basic strategies evaluated in this study were based upon the selected from research by Leuthold and Peterson [15] and Leuthold [14]. The basic hedging strategies require that the producer have knowledge about his local basis so he can translate a given futures quotation into a localized futures price. Although these strategies are selective, they do not allow the producer to be "in and out" of the

futures market. Once a hedge has been placed the producer does not lift the hedge until the end of the production period except as noted later. A hedge was placed when specific criteria were met. If the criteria were never met, no hedge occurred.

Localized Futures Exceeds Breakeven Price

This strategy triggered hedging only if the calculated localized futures was greater than the computed breakeven price. The results of this hedging strategy rely on the ability of the producer to accurately predict the basis. If the basis is accurately predicted this strategy will insure the producer that at least all of the variable costs will be covered, provided the difference between the localized futures and breakeven is sufficient to cover the cost of trading futures. However if the basis is underestimated, this strategy could result in losses.

Localized Futures Exceeds Breakeven Price Plus an Increment

This strategy is the same as the previous strategy, except that it assures the producer of a return of a specific dollar increment above variable costs of production. The increment consisted of $.50, $1.00, $2.00, $3.00 and $5.00 per cwt. Adjustments were made in the size of the increment to account for inflation over the simulation period (1972-1979) as noted later.

Localized Futures Exceeds Cash Price

This strategy allowed a hedge to be placed only when the localized futures was above the current local cash price. This should permit a producer to take advantage of cyclical and seasonal cash price patterns, and allow him to lock in higher current futures prices when subsequent

CRANES CREST

futures prices are low. As in the previous strategies involving the computation of the localized futures price, the results of this strategy also rely on the ability of the producer to accurately predict the basis.

Localized Futures Exceeds Cash Price Plus an Increment

This strategy is the same as the previous strategy, except that it assures the producer of at least a certain increment above the cash price. Increments of $1.00 and $2.00 per cwt. were evaluated.

Increments Adjusted to Account for Inflation

In order to maintain a constant real value for the dollar increments used in the strategies discussed above, it was necessary to account for the devaluation of the dollar caused by inflation over the time period of this study, 1972-1979. This was accomplished by converting the index numbers of prices paid by farmers for commodities, interest, taxes and wage rates found in USDA Agricultural Statistics [32, p. 483] from a 1967 dollar base to a 1972 dollar base. The dollar increments were then multiplied by this new index, which converted the increments into equivalent 1972 dollar values. The actual dollar increments used in the localized hedging strategies evaluated in this study are shown in Table 1. For example, a $5.00 increment in 1972 was equivalent to a $7.20 increment in 1975 and a $10.00 increment in 1979. This procedure was necessary to simulate equivalent comparisons of the strategies over time.

Variations in Lifting the Hedge

Three variations in lifting each hedge were evaluated. The first variation required that once a hedge had been placed, it was not lifted

Table 1. Index of Prices Paid by Farmers (1972 = 100) and Inflated Dollar Increments Used in the Basic Hedging Strategies for the Simulation Period, 1972-1979

Year	Index	$ .50	$1.00	$2.00	$3.00	$5.00
		Dollars/cwt.				
1972	1.000	0.500	1.000	2.000	3.000	5.000
1973	1.152	0.576	1.152	2.304	3.456	5.760
1974	1.312	0.656	1.312	2.624	3.936	6.560
1975	1.440	0.720	1.440	2.880	4.320	7.200
1976	1.536	0.768	1.536	3.072	4.608	7.680
1977	1.616	0.808	1.616	3.232	4.848	8.080
1978	1.752	0.876	1.752	3.504	5.256	8.760
1979	2.000	1.000	2.000	4.000	6.000	10.000

until the feeder steers were marketed regardless of what happened to price levels in the meantime. Some economists refer to this type of hedge as a "pure" hedge.

The last two variations in lifting the hedge involved margin requirements for futures trading. When a hedger or speculator initiates a futures contract through a brokerage firm, he is required to post a predetermined amount of cash, commonly referred to as the initial margin deposit, which serves as a guarantee of fulfillment of the contract. Once the initial margin has been deposited and a trade established, the individual trader must maintain a certain margin equity throughout the course of his trading or his position in the futures market will be closed out automatically by the brokerage firm. This required maintenance level is set below the initial margin level. If the futures market moves against the individual's position to the extent that the individual's margin equity is below the maintenance level required, the individual will receive a margin call from the brokerage firm demanding additional funds to bring the account back up to the initial level. On the other hand, if the futures market moves in a favorable direction to the individual's position, the trader can withdraw the excess above the required margin level. Margin calls are usually cause for concern on the part of the hedger, but they should not cause the hedger to overreact by lifting his hedge at an inopportune time. The last two variations in the basic strategies simulate lifting the hedge after receiving the first or second margin call in order to determine what effect this would have on profitability and profit variability.

The second variation lifted the hedge when the producer received his first margin call. Therefore, the producer did not meet the margin

call and liquidated his position in the futures market. Once the hedge had been lifted, the producer did no further futures trading under this strategy. The dollar difference between the initial and maintenance margin requirement for the particular futures contract (Table A-1, Appendix) determined the amount of adverse price movement needed before the market triggered the margin call.

The third variation lifted the hedge when the producer received a second margin call. This meant the producer met his first margin call but liquidates his position upon receiving the next margin call. The second margin call was triggered based upon the price level at which the first margin call occurred, plus the dollar amount of adverse price movement needed to reach the maintenance margin level. Again, once the hedge had been lifted, the producer did not re-enter the futures market.

III. Moving Average Hedging Strategies

The moving average hedging strategies are a trend-following method of technical price analysis based on the principle of "selling weakness and buying strength" [9]. It utilizes the concept of progressive averages by adding the current price to the end of the averaged series daily, while simultaneously dropping the oldest price from the beginning of the series. Shorter length moving averages would be more sensitive to price changes than longer length moving averages. Thus, the shorter length moving average will indicate a directional change in the trend of future prices sooner than a longer length moving average. Therefore, when different length moving averages are used, sell and buy signals are generated by the "crossing action" of the moving averages. The

success of this concept is based on the notion that, since progressive moving averages consist of a number of daily price observations, they are a better indicator of the "true" direction of price trends as compared to observing the price fluctuations strictly on a day-to-day basis.

The objective of a trend-following method, is to prevent the producer from placing a hedge on an upward trending market, but allowing him to place a hedge on a downward trending market. A strategy consisting of two different length moving averages generates a sell signal when the shorter length moving average crosses the longer length moving average from above. This indicates a downward trend in price movement. An upward trend in price movement or a buy signal is indicated when the shorter length moving average crosses the longer length moving average from below. The crossing action becomes more frequent and reflects a greater degree of sensitivity in revealing price trend changes as the time length of the moving averages becomes shorter. Figure 1 illustrates the sell and buy signals generated by the crossing action of two moving averages.

Some of the false signals generated by the strategies consisting of two moving averages can be eliminated when a third moving average is added to the strategy. This third moving average serves as a check and balance system, by either confirming or rejecting the sell and buy signals being generated by the other two moving averages. The sell and buy signals are generated in the same manner as before; however, a sell signal is generated only when the shortest length moving average has preceded the medium length moving average in crossing the longest length moving

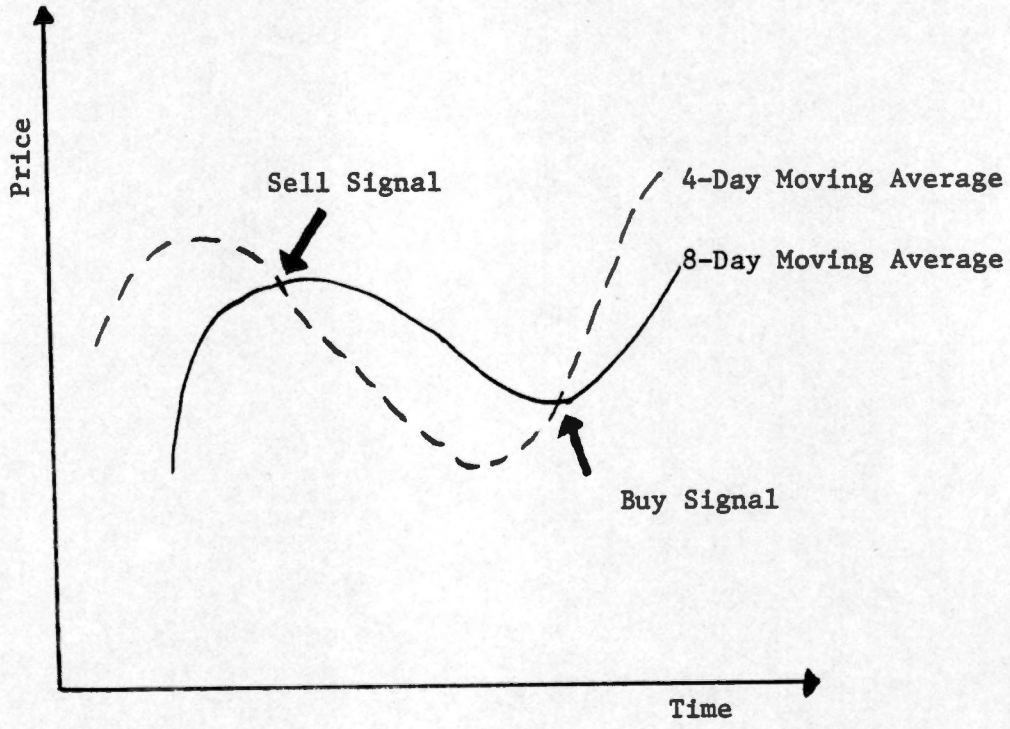


Figure 1. Illustration of Crossing Action of Two Moving Averages.

average from above. Conversely, a buy signal is indicated only when the shortest length moving average has preceded the medium length moving average in crossing the longest length moving average from below. Figure 2 illustrates the sell and buy signals generated by the crossing action of three moving averages.

Franzmann and Lehenbauer [9], added a new dimension to the moving average technique with the application of a linear weighted average scheme. This scheme consisted of giving the most recent price in the moving average series the largest weighted value, with the successively older prices in the series receiving a weighted value which was proportionally less and less. This new dimension maintained the concept of moving averages, but placed emphasis on the most recent prices. The weight factor used in this study directly corresponded to the number of prices in the series being weighted. The weighted value for the next oldest price in the series was decreased by a value of one. This process continued until the oldest price in the series was weighted by one. Due to this weighting scheme the divisor for the weighted moving average series equals the sum of the weights instead of the number of prices in the series[6].

---

[6]To illustrate how a 4-day linear weighted moving average was calculated, let t be the most recent day. The 4-day weighted moving average was then calculated as follows:

Day	Closing Price	Weight	Product
t	$59.25	4	237.00
t-1	$58.50	3	175.50
t-2	$58.00	2	116.00
t-3	$57.00	1	57.00
		10	585.50

The 4-day weighted average is 585.50/10 = $58.55.

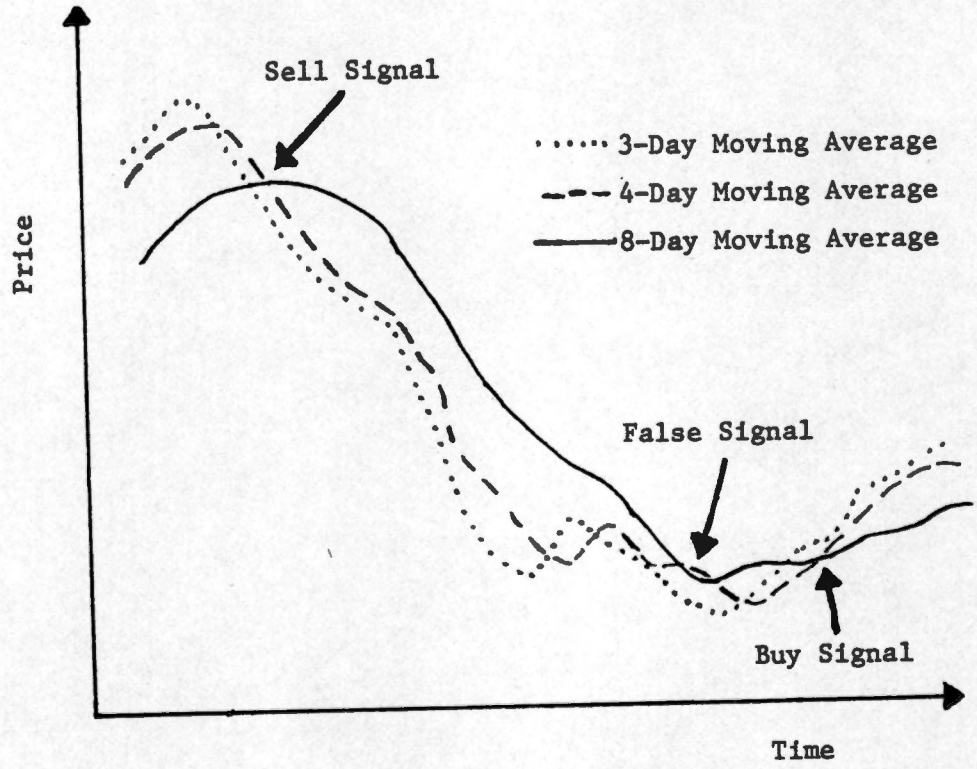


Figure 2. Illustration of Sell and Buy Signals from Three Moving Averages.

A penetration rule was also tested to determine its effect on the moving average strategies [9]. It simply required that the shortest moving average length in the strategies consisting of two moving averages and the short and medium moving average lengths in the strategies consisting of three moving averages, cross the longest moving average length by a prescribed minimum amount before a buy or sell signal was generated. This rule attempts to eliminate some of the false signals generated when the market is in a "side-ways" trend; that is, when small day-to-day movements in prices generate buy or sell signals when there is actually no price trend.

The moving average hedging strategies allowed the producer to selectively place and lift hedges throughout the production period. The sell and buy signals generated indicated when hedges should be initiated and lifted, respectively. The specific strategies evaluated in this study are shown in Table 2. They were based upon and selected from strategies which proved most effective in research by Franzmann and Lehenbauer [9].

IV. Point-and-Figure Analysis Hedging Strategies

Point-and-figure analysis is a trend-following graphic tool of market analysis which is commonly used by traders in the futures market [10]. This technique also usually results in "in and out" trading in the futures market as does the moving average technique. However, unlike the moving average technique, it has no reference to time, but rather is concerned only with the daily high, the daily low, and the extent of the price change in the event a new high or new low fails to materialize. Thus, when graphing this technique, a price scale based on a predetermined box

Table 2. Moving Average Hedging Strategies Evaluated in the Study

Length of Moving Averages[a]	Minimum Penetration Required
- - Days - - -	- - Dollars/cwt. - -
4-8	None
5-10	
3-4-8	
4-8W	
3-4-8W	
4W-4-8W	
4-8	.05
5-10	.04
3-4-8	.02
4-8W	.05
3-4-8W	.02
4W-4-8W	.02

[a] W denotes weighted average.

size[7] is placed on the vertical axis and the horizontal axis has no reference. The actual graph produced by this technique shows price movement in a series of alternating vertical columns of X's and O's which represent successive daily high and daily low prices, respectively. Consequently, the irregular columns of X's and O's form a trend configuration which ultimately generates the sell and buy signals.

For example, the data in Table 3 is plotted in Figure 3. The market for the May 1979 feeder cattle futures contract was in an upward trend on April 9, 1979. Therefore, starting with the high price of $90.30/cwt. on April 10, an X was plotted in the $90.20/cwt. box. A new high of $90.90/cwt. was reached the following day, April 11, and three additional X's were plotted vertically. Both April 12 and April 16 produced further highs and X's were plotted through the $93.20/cwt. box. However, April 17 failed to produce a new high. Therefore, the low price for that day is checked. If the difference between that low and the previous high is equal to or greater than the product of the box size and a predetermined reversal number[8], then a reverse trend has been established. To determine whether a reversal had occurred the low on April 17, $92.40/cwt., was subtracted from the most recent high, $93.35/cwt. The difference is $.95 which is greater than $.40 ($.20 box size multiplied by the 2 box reversal number) needed for a reversal to occur.

---

[7]The box size is an arbitrary dollar value, which reflects the increments of the price scale on the vertical axis of the point-and-figure graph.

[8]The reversal number is a given arbitrary number which is multiplied by the relevant box size to establish the price level difference required for the reversal criteria to be met.

Table 3. Daily High and Low Prices for the May 1979 Feeder Cattle Futures Contract, April 10, 1979 to April 24, 1979

Date	High	Low
	- - - - $/cwt. - - - -	
4-10	90.30	89.00
4-11	90.90	89.35
4-12	92.30	91.45
4-16	93.35	92.40
4-17	93.30	92.40
4-18	94.00	91.45
4-19	92.35	91.55
4-20	92.65	90.80
4-23	92.50	91.50
4-24	92.00	90.45

Source: Chicago Mercantile Exchange 1979 Yearbook.

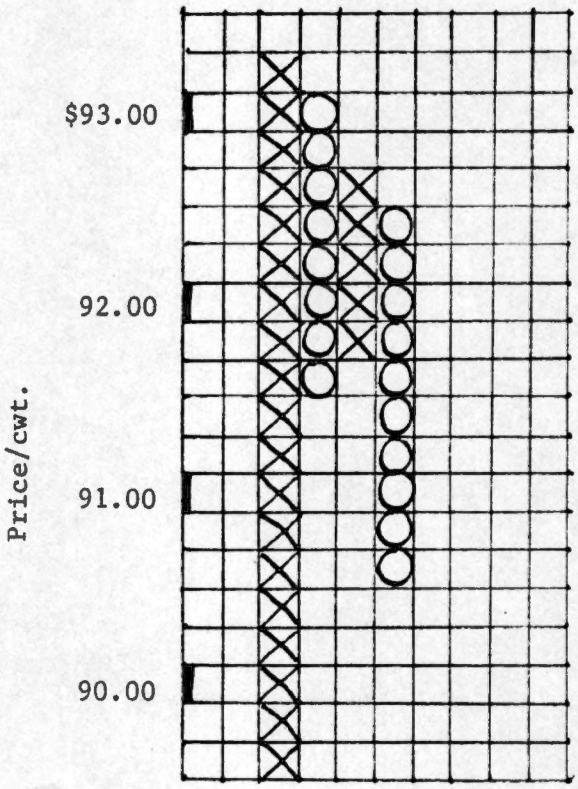


Figure 3. Point-and-Figure Chart for Feeder Cattle Futures, April 10, 1979 to April 24, 1979, Box Size = 20¢, Reversal Number = 2.

To graph this reversal, O's are plotted in the vertical column immediately to the right of the X column beginning one box below the highest X box plotted in the preceding column. The market is now in a downward trend and the new lows become the focus of attention. Consequently, O's were plotted one column to the right, down to $92.40/cwt. April 18 produced a new low and O's were plotted down to $91.40/cwt. However, on the following day, April 19, a new low was not produced and when the high of $92.35/cwt. on April 19 was subtracted from the recent low of $91.45/cwt. of April 18, the difference of $.90 signaled a reversal. This reversal indicates an upward market again. Now X's are plotted in the next vertical column immediately to the right of the O column beginning one box above the lowest O box plotted in the preceding column. Thus, X's were plotted one column over, up to $92.20/cwt. The same procedure was followed in plotting the remaining data.

Basic sell and buy signals are generated by market actions when two reversals result in a Double Top or Double Bottom as illustrated in Figure 4. Penetration of a Double Top results in a buy signal and penetration of a Double Bottom results in a sell signal. More complex procedures have been defined and employed by point-and-figure analysts, but they were not utilized in this research.

In addition to the simple buy and sell signals, various sizes of stops and trailing stops were included to test their effect on profitability of the various selected parameter combinations [10]. The stop rule liquidated the hedge automatically whenever the price moved a specified amount against the entry price of the hedge. For example, if a 30¢ stop was specified and a hedge had been placed at $70.00, the hedge

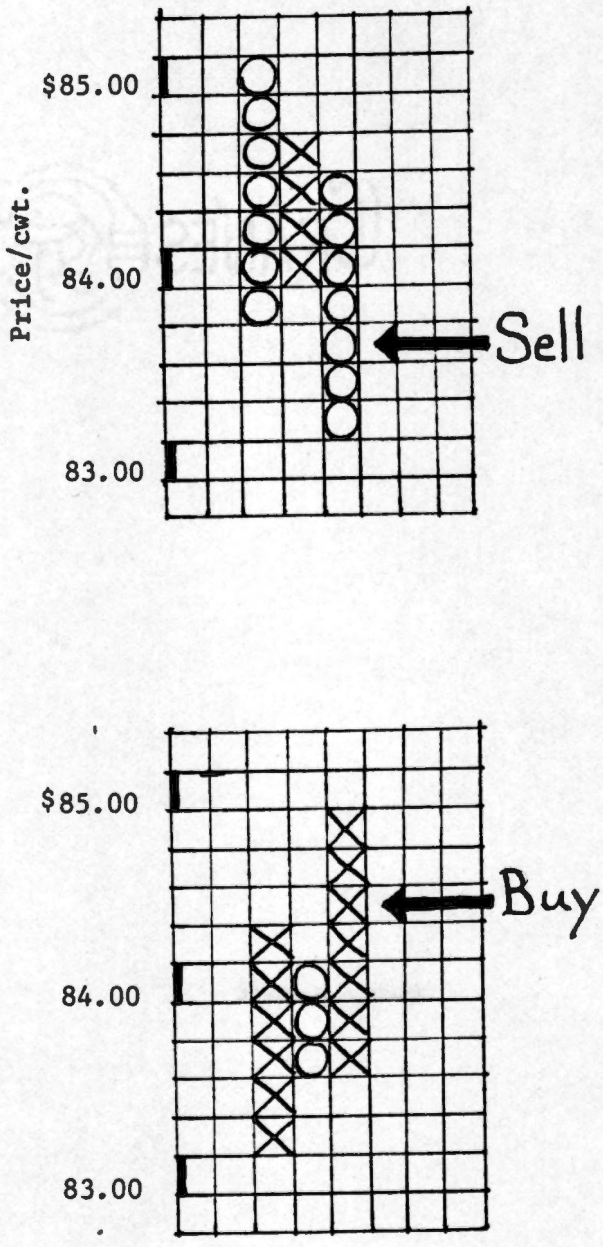
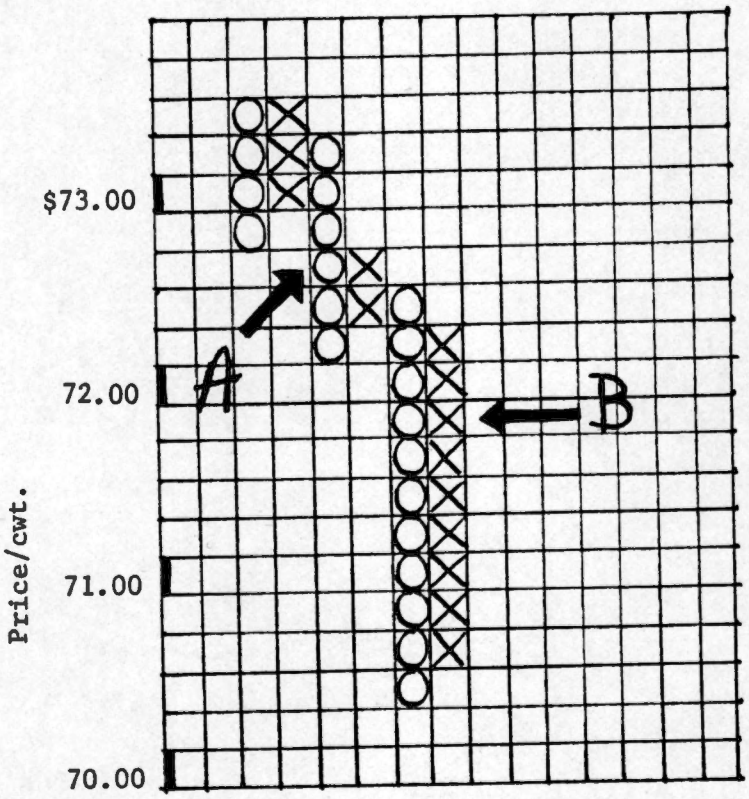


Figure 4. The Simple Sell and Buy Signals on Point-and-Figure Charts.

would automatically be "stopped out" if the closing price ever rose to $70.30 or higher.

The trailing stop rule disregarded the entry price of the hedge. It liquidated the hedge automatically whenever the high price moved a specified amount above the preceding low price that was plotted. An example of a $1.40 trailing stop is illustrated in Figure 5.

The specific point-and-figure analysis strategies evaluated in this study are shown in Table 4. They were selected from strategies which proved most effective in research by Franzmann and Lehenbauer [10]. As in the moving average strategies, the producer was allowed to selectively place and lift hedges throughout the production period.



A. Sell signal at $72.60 triggered by penetration of the double bottom.

B. Buy signal at $71.80 triggered by the trailing stop.

Figure 5. Example of $1.40 Trailing Stop, Box Size = 20¢.

Table 4. Point-and-Figure Hedging Strategies Evaluated in the Study

Box Size	Reversal Distance	Size of Stop
- $/cwt. -	- - - Boxes - - -	- $/cwt. -
.05	5	None
.15	1	
.20	1	
		With STOPS
.05	5	.65
.15	1	.30
.20	1	.75
		With TRAILING STOPS
.05	5	1.50
.15	1	1.35
.20	1	1.35

CHAPTER III

METHODOLOGY

In order to analyze the effectiveness of hedging strategies, models were developed which mathematically represented two realistic types of feeder cattle backgrounding operations in Tennessee. These models were incorporated into computer simulation routines with mathematical representations of the alternative hedging strategies. These simulation routines were "operated" based on data from the 1972-79 period. The assumption was made that this simulation procedure was sufficiently representative of the "real world" so that results obtained would be valid for the time period simulated.

This study simulated two of the most widely used backgrounding systems in Tennessee. One simulated operation began backgrounding feeder steers on forage in the fall and finished approximately 240 days later in early to mid summer. The other simulated operation started backgrounding feeder steers on pasture in the spring and ended 165 days later in the fall. Variable factors included within the simulation models were cash and futures prices for feeder cattle, basis estimates, and input cost data used in the budgets.

The budgets developed reflected only variable costs. Therefore, the results of this study yielded only the net returns above or below variable costs of production rather than net profit of the operation. However, the variable production costs in each operation were adjusted either monthly or annually depending on available information to

represent realistic breakeven costs of production from year to year. It should be noted that the results of this study would not have differed if fixed costs had been included in the budgets, since they remain constant from year to year in the short-run.

I. Development of the Price Data

Live feeder cattle futures price data and Tennessee auctions cash price data constituted the major portion of data collected for this study. Data were collected from the time that feeder cattle futures contracts were first available in the fall of 1971 through 1979.

Daily high, low, and closing futures contract prices were taken from the Chicago Mercantile Exchange Yearbooks [4]. The closing prices were assumed to represent the most realistic approximation of the price for each day's futures trading and, thus, were used as the transaction prices in trading futures contracts.

The local Tennessee cash prices were based upon the weekly average of approximately 15 livestock auction markets throughout the State and were furnished by the Federal-State Market News Service in Nashville, Tennessee [7]. The markets included in the data varied somewhat over the simulation time period, but a reasonable geographic cross section of the entire State was maintained. Therefore, this data gave a reasonably accurate representation of the cash price of feeder steers in Tennessee. The market price quotations were for feeder steers weighing 500-600 pounds. This weight range did not perfectly match the futures contract specification (550-650 pounds), but it was used rather than the prices for the 600-700 pound weight range because the lower weight range better represented the typical feeder steers being marketed by Tennessee producers.

II. Development of the 240-Day Winter Backgrounding Operation Budgets

The winter backgrounding operations basically consisted of backgrounding feeder steers on pasture and hay in the fall, with hay becoming the main source of nutriment during the winter months. As the pasture began to grow in the spring, the hay ration was reduced accordingly. Three replications of the winter backgrounding operation were simulated each year, beginning September 1, October 1, and November 1, and ending 240 days later on May 1, June 1, and July 1, respectively. Only variable costs were included in the budgets. Fixed costs and management were assumed to receive the residual of returns above variable costs. The variables in the budgets were based upon backgrounding budgets in the Tennessee Farm Planning Manual [28, p. 108] and consisted of feeder steer prices, hay prices, pasture costs, interest costs, veterinary and medicine costs, trucking costs, tractor costs, marketing costs and labor costs.

A starting weight of 400 pounds for feeder steers was used in the winter budgets. Monthly average prices for Good quality steers weighing 400-500 pounds were used for calculating the initial feeder steer costs. These prices were obtained from Tennessee Agricultural Statistics annual bulletins [30]. A 1 1/2 percent death loss was also taken into consideration based on the value of a 400-pound feeder steer. At the completion of the 240-day operation the steers were assumed to have gained a net weight of 250 pounds, which is an average daily gain of 1.04 pounds.

Inputs needed for the 250 pounds of net gain were 640 pounds of hay, .75 pounds of salt and mineral, 4.06 hours of labor, 1.5 hours of tractor use, and 1 acre of pasture in addition to the cost of marketing, trucking, veterinary and medicine, and interest on operating capital. All costs used for these variables, except hay prices and interest rates, were obtained from the 1968, 1973, 1975, 1978 and 1980 Tennessee Farm Planning Manuals. Straight line interpolation was used to yield estimates of costs for the years between Planning Manual publications. The prices used for hay were obtained from the Tennessee Agricultural Statistics annual bulletins. Interest rates were obtained from USDA Agricultural Statistics [32, p. 483].

Interest costs were calculated for the operating capital invested in hay, salt and mineral, veterinary and medicine, labor, tractor, pasture, trucking, and marketing costs for only half of the production period, since these costs occur continuously throughout the period. However, the cost of purchasing the initial feeder steer occurred at the beginning of the production period and, therefore, the interest cost for this variable was computed for the entire production period and added to the previously calculated interest cost to give a total interest expense for the operation.

The breakeven prices were calculated on a per cwt. basis by dividing total variable costs by 6.5 (Table A-2, Appendix). This assumed that the feeder steer was marketed at 650 pounds. As previously noted, breakeven costs were computed on a monthly basis and each production period used the breakeven cost for the month in which the production period began. This assumed that cost for variable factors remained

constant throughout the entire production period. This procedure was necessary since a breakeven price was required at the beginning of the production period in order to test the basic hedging strategies.

III. Development of the 165-Day Summer Backgrounding Operation Budgets

The summer backgrounding operations consisted of backgrounding feeder steers on pastures from spring to fall. Three replications of the summer backgrounding operation were simulated per year, beginning March 15, April 15, and May 15, and ending 165 days later on September 1, October 1, and November 1, respectively. As in the winter backgrounding operations, only variable costs were included in these budgets. Therefore, fixed costs and management were, again, assumed to receive the residual of returns above variable costs.

This operation was based upon the backgrounding budget in Tennessee Beef Systems Management and Marketing Options [27, p. 12]. This operation began backgrounding feeder steers weighing 430 pounds. At the completion of the 165-day operation and after accounting for shrinkage, the steers were assumed to have gained a net weight of 220 pounds. This is an average net daily gain of 1.33 pounds. As was the case with the winter budget, a 650-pound feeder steer was the final product.

Since this is primarily a summer operation, the total hay requirement, the tractor cost, and 3.06 hours of labor associated with feeding the hay in the winter operation were eliminated. Therefore, inputs needed for the 220 pounds of net gain in this operation were .75 pounds of salt

and mineral, 1 hour of labor, and 1 acre of pasture. In addition, marketing, trucking, veterinary and medicine, and interest on operating capital were charged as in the 240-day winter backgrounding operation.

All variable costs and prices came from the same sources cited in the winter operation. The only other difference was the assumption of a 1 percent death loss based on the value of a 430-pound feeder steer in the summer operation rather than the 1 1/2 percent death loss based on a 400-pound feeder steer in the winter operation.

The same procedures were followed in calculating the final monthly breakeven costs (Table A-2, Appendix) for this operation as were previously described for the winter operation. Each production operation used the breakeven costs for the month in which the production period began. Again, this procedure was necessary since a breakeven price was required at the beginning of the production period in order to test the basic hedging strategies. Therefore, the same assumption that costs for variable factors remained constant throughout the entire production period applied to this operation as in the winter operation.

IV. Calculation of Basis Estimates

As noted earlier, basis is the difference between the local current cash price and the price for a particular futures contract. Knowledge of the basis is required for the producer to translate a futures price into a localized futures price, or a price he probably could receive from his local market. The basis for a future time period cannot be predicted exactly because many factors influence its level. This uncertainty as to what basis will be at a given time in the future is commonly referred to as basis risk.

Despite the fact that the basis for nonstoreable commodities, e.g., livestock, is more variable than for storeable commodities, e.g., grains, [17, 5], typically, the basis can be predicted with far greater accuracy than the level of prices [3, p. 17]. Thus, hedgers are willing to accept a relatively small basis risk in preference to the usually much greater risk of an unfavorable price level change. Hedgers are, in effect substituting basis risk for price level risk.

The traditional method for calculating the basis was used for this study. This method consisted of subtracting the cash price from the futures price. Basis estimates were made for ten-day intervals. This procedure consisted of dividing each month into three ten-day periods and averaging the actual basis within each ten-day period. The mean was then used as an estimate of the basis for each day in that ten-day period. Since all feeder cattle were marketed on the first day of the month, the simulations used the first ten-day period of the month as the basis estimate.

These ten-day basis estimates were incorporated into a two-year moving average of corresponding ten-day periods. Thus, the estimate of the basis for each approaching ten-day period was the average for the corresponding ten-day period in the preceding two years. This procedure was used in estimating the basis for all the simulated periods except for the observations in 1973. Since the futures contract for feeder steers was not initiated until late 1971, it was impossible to obtain a two-year basis average for the operations ending in 1973. Therefore, in order to maximize the number of observations from the data

available, the basis estimates for the simulation in 1973 were estimated from only one year, 1972. The estimated bases used for this study and the actual bases are shown in Table A-3, Appendix.

V. Costs of Trading Futures

As stated earlier, when a hedger or speculator initiates a futures contract through a brokerage firm, he is required to post a predetermined amount of cash, commonly referred to as the initial margin deposit, which serves as a guarantee of fulfillment of the contract. In addition, he must also pay a commission charge for services rendered by the brokerage firm. The commission charge is a fixed sum billed to the individual trader by the brokerage firm when each futures transaction is closed. Therefore, the commission charge represents a direct cost of hedging and must be included in the producer's variable cost. However, once the individual has liquidated his position in the futures market, the margin deposit will be refunded. Consequently, only the interest cost associated with the necessary margin money need be included in the producer's variable cost.

The actual initial minimum and maintenance margin requirements are established by the commodity exchange. However, brokerage firms may require an initial margin larger than the exchange's minimum. Initial and maintenance margin data were obtained from the Chicago Mercantile Exchange for the period of this study (Table A-1, Appendix). Since the probability of the market moving in a favorable direction as opposed to receiving a margin call were assumed to be equal, the cost of additional capital to meet margin calls was ignored. However, the interest

charge for the initial margin money was considered a cost when a hedge occurred. This cost was determined by multiplying the amount of the initial margin deposit by the number of days the margin was on deposit multiplied by the relevant daily interest rate. The annual interest rates were the same as used in the production budgets previously described (Table A-4, Appendix).

Also based upon communication with Chicago Mercantile Exchange officials, a charge of $50 per contract was assumed to be representative of the actual brokerage commission charge for the production periods simulated. Thus, 12¢/cwt. was added to the cost of operation each time a group of feeder cattle were hedged.

VI. Method of Analysis

All analysis was conducted using mean and variance of profitability as the measures of the level of profitability and price risk, respectively, which ultimately were the measures of each alternative hedging strategy's success or failure. Returns above variable costs were computed for each type of operation on a yearly basis. In turn, these returns were combined to give a seven-year mean and variance over the entire simulation period for each type of operation. Finally, separate overall mean and variance were calculated for the entire simulation period for all the summer operations combined and for all the winter operations combined.

CHAPTER IV

RESULTS

Producers utilize hedging as a management tool to accomplish one of three goals: (1) to obtain a higher mean return compared to the cash market; (2) to obtain a lower variance of return compared to the cash market; (3) to obtain a higher mean return and lower variance compared to the cash market.

Hedging strategies which yield a lower mean return and a higher variance than the cash market are clearly inferior. However, those hedges which yield both higher means and variances than the cash market or lower means and variances fall into an "indeterminate" category, for it depends upon the individual's utility function (his aversion toward risk) whether they are preferred relative to the cash market. For the analysis of this study, a clearly superior hedge was one which yielded a higher mean return (greater profit) with a lower variance (less risk) when compared to the cash market.

I. Analysis of the Winter Backgrounding Operation Beginning September 1 and Ending May 1

The net returns from all the selected hedging strategies for this operation are presented on a yearly basis in Table B-1 (Appendix) to reveal the actual fluctuation in the level of returns the producer experienced from one year to the next. The mean and variance of net returns were further analyzed in Tables 5, 6, and 7 for the entire

Table 5. Mean and Variance of Net Returns, Maximum and Minimum Net Return Levels, and Number of Hedges Executed for the Winter Operation, Beginning September 1 and Ending May 1, Using Specified Basic Hedging Strategies, Tennessee, 1972-1979

No.	Strategy	Mean	Variance	Maximum	Minimum	Number of Hedges Executed
		Dollars per cwt.				
0)	Cash	13.15	208.30	38.29	-5.98	
1)[a]	Localized Futures Exceeds Breakeven Price	5.47	24.94	15.35	1.05	7
2)[a]	Same as 1, First Margin Call	12.23	204.50	36.94	-6.90	7
3)[a]	Same as 1, Second Margin Call	11.47	200.00	35.78	-7.85	7
7)	Localized Futures Exceeds Breakeven Price + $1.00	5.49	24.84	15.35	1.05	7
8)	Same as 7, First Margin Call	12.25	204.74	36.94	-6.90	7
9)	Same as 7, Second Margin Call	11.50	200.50	35.78	-7.85	7
10)	Localized Futures Exceeds Breakeven Price + $2.00	5.84	23.94	15.35	1.05	7
11)	Same as 10, First Margin Call	12.15	204.58	36.94	-6.90	7
12)	Same as 10, Second Margin Call	11.46	200.13	35.78	-7.85	7

Table 5 (Continued)

No.	Strategy	Mean	Variance	Maximum	Minimum	Number of Hedges Executed
		- - - - - - - - Dollars per cwt. - - - - - - - -				
13)	Localized Futures Exceeds Breakeven Price + $3.00	6.23	23.38	15.35	1.05	7
14)	Same as 13, First Margin Call	12.18	204.05	36.94	-6.90	7
15)	Same as 13, Second Margin Call	11.43	199.19	35.78	-7.85	7
16)	Localized Futures Exceeds Breakeven Price + $5.00	7.78	26.94	16.59	1.86	7
17)	Same as 16, First Margin Call	12.50	197.08	37.02	-6.90	7
18)	Same as 16, Second Margin Call	11.92	193.54	36.07	-7.85	7
19)	Localized Futures Exceeds Cash Price	5.49	24.84	15.35	1.05	7
20)	Same as 19, First Margin Call	12.25	204.74	36.94	-6.90	7
21)	Same as 19, Second Margin Call	11.50	200.50	35.78	-7.85	7
22)	Localized Futures Exceeds Cash Price + $1.00	5.54	24.71	15.35	1.05	7
23)	Same as 22, First Margin Call	12.23	204.44	36.94	-6.90	7
24)	Same as 22, Second Margin Call	11.48	200.12	35.78	-7.85	7

Table 5 (Continued)

No.	Strategy	Mean	Variance	Maximum	Minimum	Number of Hedges Executed
		- - - - - - - - Dollars per cwt. - - - - - - - -				
25)	Localized Futures Exceeds Cash Price + $2.00	6.61	38.26	19.49	1.05	7
26)	Same as 25, First Margin Call	12.26	207.28	37.29	-6.90	7
27)	Same as 25, Second Margin Call	11.56	201.91	36.03	-7.85	7

[a]Same results apply to localized futures exceeds breakeven price + $.50.

Table 6. Mean and Variance of Net Returns, Maximum and Minimum Net Return Levels, Total, Average, and Maximum and Minimum Number of Hedges Executed for the Winter Operation, Beginning September 1 and Ending May 1, Using Specified Moving Average Hedging Strategies, Tennessee, 1972-1979

No.	Strategy	Mean	Variance	Maximum	Minimum	Number of Hedges Executed	Average Number of Hedges	Maximum/ Minimum Number of Hedges
		- - - - - Dollars per cwt. - - - - -					- - Executed per year - -	
0)	Cash	13.15	208.30	38.29	-5.98			
28)	4-8	11.98	66.30	24.16	3.00	58	8.3	11 / 6
29)	5-10	11.25	64.93	21.68	1.71	47	6.7	8 / 5
30)	3-4-8	11.72	77.20	25.51	2.85	52	7.4	9 / 5
31)	4-8W	11.27	73.65	25.83	2.17	79	11.3	14 / 10
32)	3-4-8W	11.96	81.94	26.00	1.95	55	7.8	10 / 5
33)	4W-4-8W	12.00	63.40	23.74	3.52	53	7.6	9 / 5
34)	4-8 with 5¢ Penetration	12.13	64.60	22.79	3.65	49	7.0	9 / 5
35)	5-10 with 4¢ Penetration	11.69	71.86	22.09	2.72	43	6.1	8 / 5
36)	3-4-8 with 2¢ Penetration	11.73	73.28	24.09	3.65	48	6.8	9 / 5
37)	4-8W with 5¢ Penetration	12.30	80.86	26.31	2.17	57	8.1	11 / 6
38)	3-4-8W with 2¢ Penetration	12.45	93.59	26.63	2.77	51	7.3	10 / 4
39)	4W-4-8W with 2¢ Penetration	12.22	68.54	24.37	3.72	50	7.1	9 / 5

Table 7. Mean and Variance of Net Returns, Maximum and Minimum Net Return Levels, Total, Average, and Maximum and Minimum Number of Hedges Executed for the Winter Operation Beginning September 1 and Ending May 1, Using Specified Point-and-Figure Hedging Strategies, Tennessee, 1972-1979

No.	Strategy	Mean	Variance	Maximum	Minimum	Number of Hedges Executed	Average Number of Hedges	Maximum/ Minimum Number of Hedges
		----- Dollars per cwt. ------					-- Executed per year --	
0)	Cash	13.15	208.30	38.29	-5.98			
40)	5¢ Box, 5 Reversal	13.89	107.69	33.06	2.57	36	5.1	8 / 2
41)	5¢ Box, 5 Reversal w/ 65¢ Stop	14.46	123.04	35.46	2.62	37	5.3	9 / 2
42)	5¢ Box, 5 Reversal w/ $1.50 Trailing Stop	14.86	130.73	37.33	2.57	43	6.1	9 / 3
43)	15¢ Box, 1 Reversal	13.69	109.62	33.06	2.37	37	5.3	9 / 2
44)	15¢ Box, 1 Reversal w/ 30¢ Stop	12.91	116.12	33.41	2.82	46	6.6	10 /3
45)	15¢ Box, 1 Reversal w/ $1.35 Trailing Stop	14.86	130.89	37.33	2.57	44	6.3	9 /3
46)	20¢ Box, 1 Reversal	13.23	101.54	31.37	2.74	37	5.3	9 / 2
47)	20¢ Box, 1 Reversal w/ 75¢ Stop	13.97	113.43	33.78	2.79	37	5.3	9 / 2
48)	20¢ Box, 1 Reversal w/ $1.35 Trailing Stop	15.04	171.72	41.13	2.94	42	6.0	10 / 2

seven years of the simualtion period to reveal the long-term results of all the selected hedging strategies. Figure 6, illustrates graphically the results expressed in Tables 5, 6, and 7.

Basic Hedging Strategies

Inspection of Table 5 and Figure 6 shows that despite the lower variances of the basic hedging strategies, the mean return was higher in the cash market (number 0) than for any of the basic hedging strategies tested (numbers 1-27). Therefore, all the basic hedging strategies fall into the "indeterminate" category. These results appear to be obtained because cash price moved upward during the winter production period every year except in 1974 and 1975 (Table A-5, Appendix). Therefore, the producer was locking in a price which met the hedging criteria, but due to the rise in the price level he was buying back the futures contract at a higher price.

Lifting the hedge after the first margin call (numbers 2, 5, 8, 11, 14, 17, 20, 23, 26) significantly improved the mean net return of the hedging strategies because it got the producer out of the futures market thereby allowing him to benefit from the rising price. Lifting the hedge after the second margin call also improved the mean net return of the hedging strategies by limiting the producer's losses in the futures market, but it forced him to absorb slightly more loss than lifting the hedge after the first margin call. Both of these options also yielded variances significantly higher than the hedge and hold option.

During the production periods ending in 1974 and 1975 the level of cash price movement was generally in a downward direction (Table A-5, Appendix). Thus, all the strategies which placed a hedge and held to the end of the 1974 production period proved to be superior to the cash

Figure 6. Mean and Variance for the Winter Operation Beginning September 1 and Ending May 1, Using Specified Hedging Strategies, Tennessee, 1972-1979

0) Cash

1) Localized Futures Greater Than Breakeven
2) Same as 1, First Margin Call
3) Same as 1, Second Margin Call
4) Localized Futures Greater Than Breakeven + $ .50
5) Same as 4, First Margin Call
6) Same as 4, Second Margin Call
7) Localized Futures Greater Than Breakeven + $1.00
8) Same as 7, First Margin Call
9) Same as 7, Second Margin Call
10) Localized Futures Greater Than Breakeven + $2.00
11) Same as 10, First Margin Call
12) Same as 10, Second Margin Call
13) Localized Futures Greater Than Breakeven + $3.00
14) Same as 13, First Margin Call
15) Same as 13, Second Margin Call
16) Localized Futures Greater Than Breakeven + $5.00
17) Same as 16, First Margin Call
18) Same as 16, Second Margin Call

19) Localized Futures Greater Than Cash
20) Same as 19, First Margin Call
21) Same as 19, Second Margin Call
22) Localized Futures Greater Than Cash + $1.00
23) Same as 22, First Margin Call
24) Same as 22, Second Margin Call
25) Localized Futures Greater Than Cash + $2.00
26) Same as 25, First Margin Call
27) Same as 25, Second Margin Call

28) 4-8
29) 5-10
30) 3-4-8
31) 4-8W
32) 3-4-8W
33) 4W-4-8W
34) 4-8 with 5¢ Penetration
35) 5-10 with 4¢ Penetration
36) 3-4-8 with 2¢ Penetration
37) 4-8W with 5¢ Penetration
38) 3-4-8W with 2¢ Penetration
39) 4W-4-8W with 2¢ Penetration

40) 5¢ Box, 5 Reversal
41) 5¢ Box, 5 Reversal w/ 65¢ Stop
42) 5¢ Box, 5 Reversal w/ $1.50 Trailing Stop
43) 15¢ Box, 1 Reversal
44) 15¢ Box, 1 Reversal w/ 30¢ Stop
45) 15¢ Box, 1 Reversal w/ $1.35 Trailing Stop
46) 20¢ Box, 1 Reversal
47) 20¢ Box, 1 Reversal w/ 75¢ Stop
48) 20¢ Box, 1 Reversal w/ $1.35 Trailing Stop

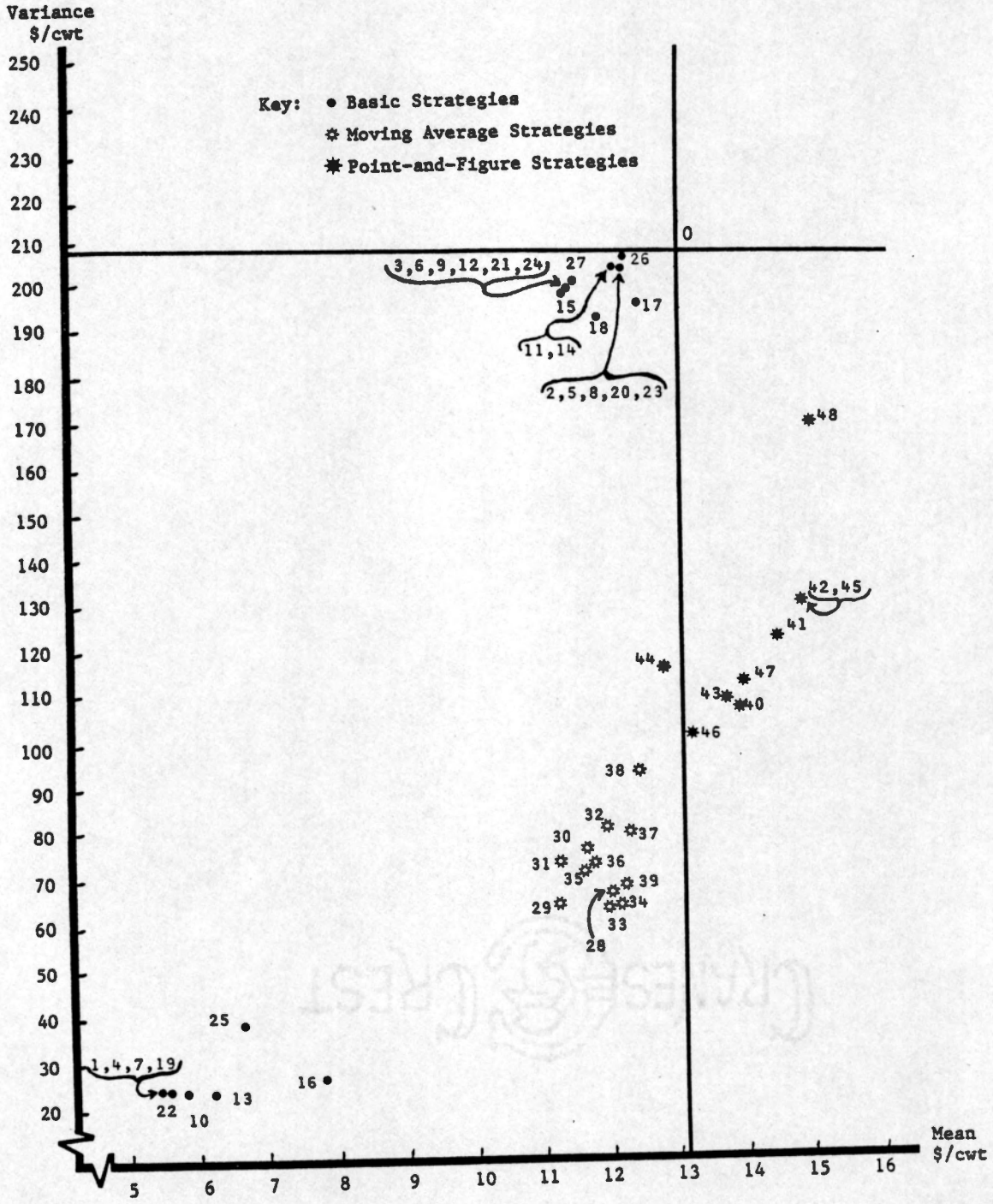

Variance
$/cwt
Key: • Basic Strategies
✡ Moving Average Strategies
✸ Point-and-Figure Strategies
0
3,6,9,12,21,24
27
26
15
17
18
11,14
2,5,8,20,23
48
42,45
41
44
47
43
40
46
38
32
37
30
31
36
35
39
29
34
33
28
25
1,4,7,19
16
22
13
10
Mean
$/cwt

Figure 6

market. However, short term price fluctuations were sufficient to trigger both first and second margin calls. Therefore, strategies following these two options lifted hedges early and were inferior to the cash market net return as a result. Apparently, the upward price movement toward the end of the 1975 production period was sufficient to yield a positive return in the cash market and cause a slight loss in all the basic hedging strategies, except for the three strategies which had added five dollars to the breakeven price (numbers 16, 17, 18). These strategies were superior to the cash market in this particular situation.

As seen in Table 5, the result of adding additional dollar increments was to improve the basic hedging strategy's mean return. This pattern would have continued until no hedging occurred thus obtaining the cash mean return. By increasing the dollar increment, the necessary criteria required to initiate a hedge became more difficult to meet, which meant the producer would be relying more on the cash market. As the hedging strategy became more and more selective, a point would be reached where no hedges occurred and the producer would be operating only in the cash market.

Moving Average Hedging Strategies

The results in Table 6 and Figure 6 show that all the moving averages (numbers 28-39) yielded slightly lower means and considerably lower variances than cash. This lower variance of returns or consistency of returns can also be observed in Table B-1, Appendix. None of the strategies yielded negative returns in any year during the simulation period, however the cash market did in 1974. The penetration rules (numbers 34-39)

were successful in increasing the overall net mean returns of all the moving averages and in decreasing the variance in the 4-8 and 3-4-8 strategies. This was accomplished by eliminating some of the minute side-ways fluctuations in the market, as apparent from the decrease in the number of hedges executed with the application of the penetration rule.

Point-and-Figure Hedging Strategies

As seen in Table 7 and Figure 6, all the point-and-figure hedging strategies, with the exception of strategy number 44, were superior to the cash market. The addition of the stop (numbers 41, 44, 47) and trailing stop (numbers 42, 45, 48) increased the mean net return in every strategy except strategy number 44. The trailing stop rules yielded the highest overall mean returns of all strategies. The mean returns and variances were higher and the average number of hedges executed per year were slighlty lower for the point-and-figure hedging strategies than for the moving average strategies.

II. Analysis of the Winter Backgrounding Operation Beginning October 1 and Ending June 1

To reveal the actual fluctuation in the level of returns the producer experienced from one year to the next the net returns of all the selected hedging strategies in this operation were analyzed on a yearly basis in Table B-2, Appendix. The mean and variance of net returns were further analyzed in Tables 8, 9, and 10 for the entire seven years of the simulation period, to reveal the long-term results of all the hedging strategies. Figure 7 illustrates graphically the results expressed in Tables 8, 9, and 10.

Table 8. Mean and Variance of Net Returns, Maximum and Minimum Net Return Levels, and Number of Hedges Executed for the Winter Operation, Beginning October 1 and Ending June 1, Using Specified Basic Hedging Strategies, Tennessee, 1972-1979

No.	Strategy	Mean	Variance	Maximum	Minimum	Number of Hedges Executed
		- - - - - - - - Dollars per cwt. - - - - - - - -				
0)	Cash	11.39	230.61	32.52	-13.18	
1)	Localized Futures Exceeds Breakeven Price	5.95	97.71	27.82	-0.78	7
2)	Same as 1, First Margin Call	10.39	233.84	31.66	-14.30	7
3)	Same as 1, Second Margin Call	9.60	237.66	30.91	-15.30	7
4)[a]	Localized Futures Exceed Breakeven Price + $.50	6.09	95.60	27.82	0.22	7
5)[a]	Same as 4, First Margin Call	10.39	233.84	31.66	-14.30	7
6)[a]	Same as 4, Second Margin Call	9.59	238.57	30.91	-15.41	7
10)	Localized Futures Exceeds Breakeven Price + $2.00	6.46	92.41	27.82	0.52	7
11)	Same as 10, First Margin Call	10.44	234.76	31.66	-14.26	7
12)	Same as 10, Second Margin Call	12.03	140.40	30.91	1.37	7

Table 8 (Continued)

No.	Strategy	Mean	Variance	Maximum	Minimum	Number of Hedges Executed
		- - - - - - - - Dollars per cwt. - - - - - - - -				
13)	Localized Futures Exceeds Breakeven Price + $3.00	5.11	145.48	27.82	-13.80	6
14)	Same as 13, First Margin Call	10.68	224.40	31.66	-13.18	6
15)	Same as 13, Second Margin Call	9.91	211.75	30.91	-13.18	6
16)	Localized Futures Exceeds Breakeven Price + $5.00	6.54	146.12	27.82	-13.18	6
17)	Same as 16, First Margin Call	11.24	214.41	31.66	-13.18	6
18)	Same as 16, Second Margin Call	10.99	204.53	30.90	-13.18	6
19)	Localized Futures Exceeds Cash Price	5.57	103.87	27.82	-3.03	7
20)	Same as 19, First Margin Call	10.40	237.41	31.66	-14.55	7
21)	Same as 19, Second Margin Call	9.58	240.36	30.91	-15.55	7
22)	Localized Futures Exceeds Cash Price + $1.00	5.90	102.69	28.90	-1.78	7
23)	Same as 22, First Margin Call	10.40	233.57	31.44	-14.30	7
24)	Same as 22, Second Margin Call	9.59	236.36	30.54	-15.30	7

Table 8 (Continued)

No.	Strategy	Mean	Variance	Maximum	Minimum	Number of Hedges Executed
		- - - - - - - - Dollars per cwt. - - - - - - - -				
25)	Localized Futures Exceeds Cash Price + $2.00	8.42	142.54	28.02	-0.78	5
26)	Same as 25, First Margin Call	9.59	199.41	28.02	-14.30	5
27)	Same as 25, Second Margin Call	8.98	210.24	28.02	-15.30	5

[a]Same results apply to localized futures exceeds breakeven price + $1.00.

Table 9. Mean and Variance of Net Returns, Maximum and Minimum Net Return Levels, Total, Average, and Maximum and Minimum Number of Hedges Executed for the Winter Operation Beginning October 1, and Ending June 1, Using Specified Moving Average Hedging Strategies, Tennessee, 1972-1979

No.	Strategy	Mean	Variance	Maximum	Minimum	Number of Hedges Executed	Average Number of Hedges	Maximum/ Minimum Number of Hedges
		- - - - - Dollars per cwt. - - - - -					- - Executed per year - -	
0)	Cash	11.39	230.61	32.52	-13.18			
28)	4-8	11.80	115.91	30.73	-1.46	43	6.1	9 / 4
29)	5-10	10.37	104.24	25.99	-3.63	42	6.0	8 / 4
30)	3-4-8	11.70	117.96	30.73	-1.96	43	6.1	9 / 4
31)	4-8W	10.88	132.30	31.22	-4.07	66	9.4	13 / 7
32)	3-4-8W	11.38	113.22	29.04	-3.10	48	6.8	10 / 4
33)	4W-4-8W	12.22	105.69	30.27	-0.06	44	6/3	9 / 4
34)	4-8 with 5¢ Penetration	11.60	110.25	29.43	-1.46	41	5.8	9 / 4
35)	5-10 with 4¢ Penetration	10.28	109.53	25.99	-4.51	37	5.3	8 / 3
36)	3-4-8 with 2¢ Penetration	11.80	117.56	30.73	-1.96	41	5.8	9 / 4
37)	4-8W with 5¢ Penetration	10.57	126.65	28.72	-5.15	44	6.3	9 / 5
38)	3-4-8W with 2¢ Penetration	11.09	114.75	28.14	-3.83	44	6.3	10 / 4
39)	4W-4-8W with 2¢ Penetration	11.91	107.44	29.36	-2.01	38	5.4	9 / 3

Table 10. Mean and Variance of Net Returns, Maximum and Minimum Net Return Levels, Total, Average, and Maximum and Minimum Number of Hedges Executed for the Winter Operation Beginning October 1, and Ending June 1, Using Specified Point-and-Figure Hedging Strategies, Tennessee, 1972-1979

No.	Strategy	Mean	Variance	Maximum	Minimum	Number of Hedges Executed	Average Number of Hedges	Maximum/ Minimum Number of Hedges
		- - - - - Dollars per cwt. - - - - -					- - Executed per year - -	
0)	Cash	11.39	230.61	32.52	-13.18			
40)	5¢ Box, 5 Reversal	13.05	179.85	35.71	-2.73	29	4.1	7 / 2
41)	5¢ Box, 5 Reversal w / 65¢ Stop	12.29	196.99	35.63	-4.05	35	5.0	10 /2
42)	5¢ Box, 5 Reversal w/ $1.50 Trailing Stop	12.20	146.09	29.15	-2.73	35	5.0	9 / 2
43)	15¢ Box, 1 Reversal	12.80	181.78	35.31	-2.73	32	4.6	8 / 2
44)	15¢ Box, 1 Reversal w/ 30¢ Stop	12.54	202.05	35.71	-4.05	39	5.6	11 / 3
45)	15¢ Box, 1 Reversal w/ $1.35 Trailing Stop	12.25	148.84	29.15	-2.73	38	5.4	9 / 2
46)	20¢ Box, 1 Reversal	12.95	180.52	35.31	-2.73	28	4.0	6 / 2
47)	20¢ Box, 1 Reversal w/ 75¢ Stop	12.67	189.48	35.63	-4.15	31	4.4	6 / 3
48)	20¢ Box, 1 Reversal w/ $1.35 Trailing Stop	12.18	149.98	29.15	-2.73	35	5.0	9 / 2

Figure 7. Mean and Variance for the Winter Operation Beginning October 1 and Ending June 1, Using Specified Hedging Strategies, Tennessee, 1972-1979

0) Cash

1) Localized Futures Greater Than Breakeven
2) Same as 1, First Margin Call
3) Same as 1, Second Margin Call
4) Localized Futures Greater Than Breakeven + $ .50
5) Same as 4, First Margin Call
6) Same as 4, Second Margin Call
7) Localized Futures Greater Than Breakeven + $1.00
8) Same as 7, First Margin Call
9) Same as 7, Second Margin Call
10) Localized Futures Greater Than Breakeven + $2.00
11) Same as 10, First Margin Call
12) Same as 10, Second Margin Call
13) Localized Futures Greater Than Breakeven + $3.00
14) Same as 13, First Margin Call
15) Same as 13, Second Margin Call
16) Localized Futures Greater Than Breakeven + $5.00
17) Same as 16, First Margin Call
18) Same as 16, Second Margin Call

19) Localized Futures Greater Than Cash
20) Same as 19, First Margin Call
21) Same as 19, Second Margin Call

22) Localized Futures Greater Than Cash + $1.00
23) Same as 22, First Margin Call
24) Same as 22, Second Margin Call
25) Localized Futures Greater Than Cash + $2.00
26) Same as 25, First Margin Call
27) Same as 25, Second Margin Call

28) 4-8
29) 5-10
30) 3-4-8
31) 4-8W
32) 3-4-8W
33) 4W-4-8W
34) 4-8 with 5¢ Penetration
35) 5-10 with 4¢ Penetration
36) 3-4-8 with 2¢ Penetration
37) 4-8W with 5¢ Penetration
38) 3-4-8W with 2¢ Penetration
39) 4W-4-8W with 2¢ Penetration

40) 5¢ Box, 5 Reversal
41) 5¢ Box, 5 Reversal w/ 65¢ Stop
42) 5¢ Box, 5 Reversal w/ $1.50 Trailing Stop
43) 15¢ Box, 1 Reversal
44) 15¢ Box, 1 Reversal w/ 30¢ Stop
45) 15¢ Box, 1 Reversal w/ $1.35 Trailing Stop
46) 20¢ Box, 1 Reversal
47) 20¢ Box, 1 Reversal w/ 75¢ Stop
48) 20¢ Box, 1 Reversal w/ $1.35 Trailing Stop

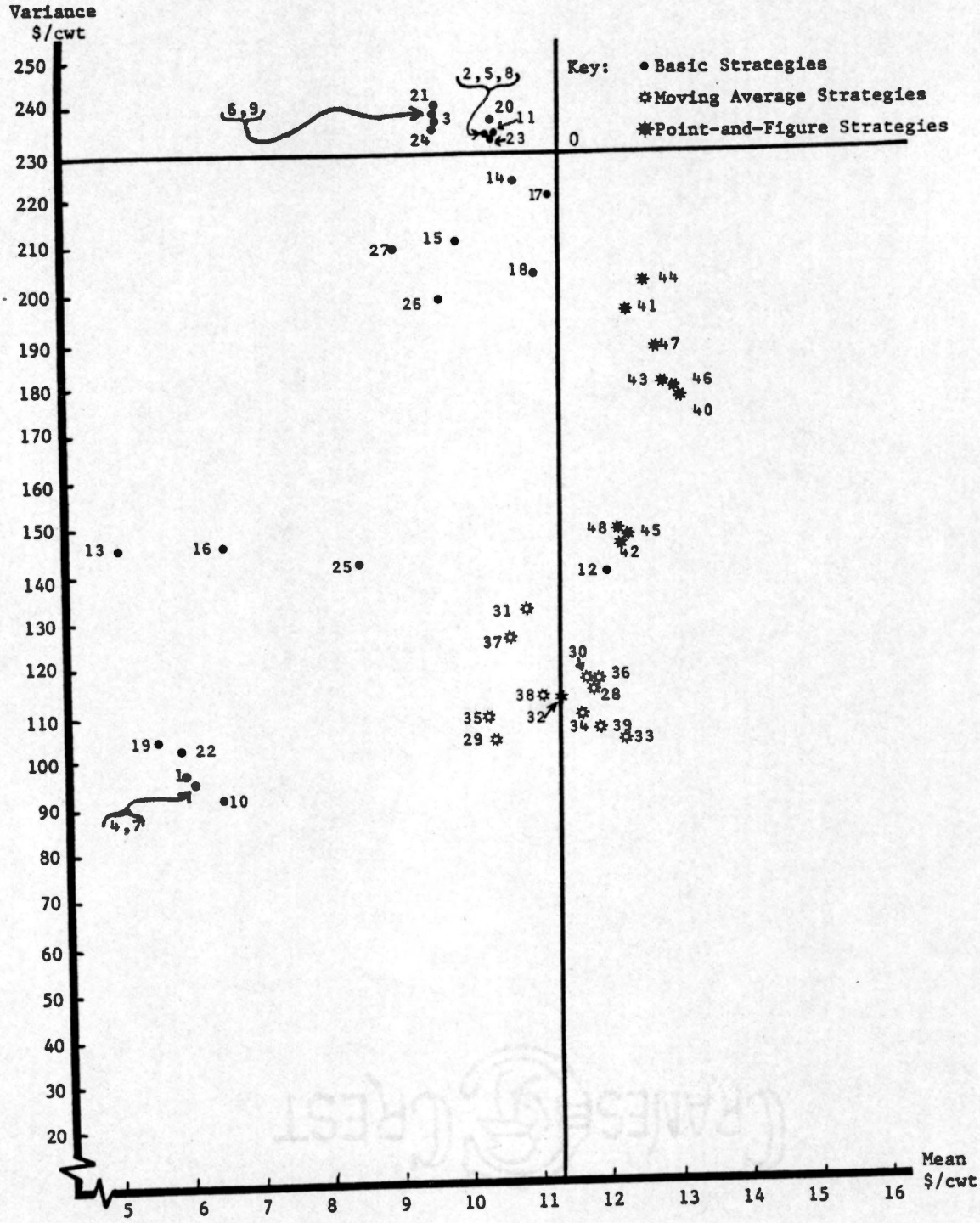

Variance
$/cwt
Key: • Basic Strategies
✲ Moving Average Strategies
✱ Point-and-Figure Strategies
0
Mean
$/cwt
250
240
230
220
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
5
6
7
8
9
10
11
12
13
14
15
16
2,5,8
6,9
4,7

Figure 7

Basic Hedging Strategies

Inspection of Table 8 and Figure 7 shows that the results are very similar to the results obtained in the previous operation (September 1 to May 1), with the mean of returns being higher in the cash market (number 0) than for any of the basic hedging strategies tested (numbers 1-27). However, nine of the total 27 basic hedging strategies were actually inferior to the cash market since they showed a larger variance and a smaller mean. The direction of price movement in this operation was, for the most part, in an upward direction (Table A-5, Appendix) as for the previous operation. Therefore, the same reasoning used to explain the results in the previous operation can be applied in explaining the results in this case.

Moving Average Hedging Strategies

Examination of Table 9 and Figure 7 reveals that six of the moving average strategies produced higher means and lower variances than the cash market. The strategies which were superior to the cash market were numbers 28, 30, 33, 34, 36, and 39. The other six strategies fell into the "indeterminate" category. The penetration rule, despite reducing the total number of hedges executed in all strategies, only improved the overall net mean return and decreased the variance in the 3-4-8 strategy.

Point-and-Figure Hedging Strategies

As seen in Table 10 and Figure 7 all the point-and-figure hedging strategies (numbers 40-48) were superior to the cash market. Unlike the previous operation, the addition of stop and trailing stop rules to

the hedging strategies did not yield higher means. The stop rule not only produced lower means but also yielded higher variances, whereas the trailing stop rule yielded both lower means and lower variances. With the exception of strategy numbers 42 and 48, all the point-and-figure hedging strategies yielded higher means than the moving average strategies and all yielded higher variances than the moving average hedging strategies.

III. Analysis of the Winter Backgrounding Operation Beginning November 1 and Ending July 1

The net returns from all the selected hedging strategies in this operation were analyzed on a yearly basis in Table B-3 (Appendix) to reveal the actual fluctuation in the level of returns the producer experienced from one year to the next. To reveal the long-term results of all the selected hedging strategies the mean and variance of net returns were further analyzed in Tables 11, 12, and 13 for the entire seven years of simulation time period. The results expressed in Tables 11, 12, and 13 are illustrated in Figure 8.

Basic Hedging Strategies

Inspection of Table 11 and Figure 8 shows that the results were very similar to the results obtained in the previous two operations. Again, none of the basic hedging strategies (numbers 1-27) were superior to the cash market. However, 14 of the total 27 basic hedging strategies tested were actually inferior to the cash market. In general, the level of price movement was in an upward direction (Table A-5, Appendix) as in the previous two operations which explains the similar pattern of results.

Table 11. Mean and Variance of Net Returns, Maximum and Minimum Net Return Levels, and Number of Hedges Executed for the Winter Operation, Beginning November 1 and Ending July 1, Using Specified Basic Hedging Strategies, Tennessee, 1972-1979

No.	Strategy	Mean	Variance	Maximum	Minimum	Number of Hedges Executed
		- - - - - - - - Dollars per cwt. - - - - - - - -				
0)	Cash	9.66	112.75	22.75	-7.71	
1)[a]	Localized Futures Exceeds Breakeven Price	4.92	83.01	24.61	-3.63	7
2)[a]	Same as 1, First Margin Call	8.57	117.11	21.89	-9.08	7
3)[a]	Same as 1, Second Margin Call	7.76	119.83	21.14	-10.08	7
7)	Localized Futures Exceeds Breakeven Price + $1.00	5.10	79.67	24.61	-2.37	7
8)	Same as 7, First Margin Call	8.61	115.64	21.89	-8.83	7
9)	Same as 7, Second Margin Call	7.80	118.35	21.14	-9.83	7
10)	Localized Futures Exceeds Breakeven Price + $2.00	5.44	76.38	24.61	-1.37	7
11)	Same as 10, First Margin Call	8.61	115.66	21.89	-8.83	7
12)	Same as 10, Second Margin Call	7.83	118.04	21.14	-9.83	7

Table 11 (Continued)

No.	Strategy	Mean	Variance	Maximum	Minimum	Number of Hedges Executed
		- - - - - - - - Dollars per cwt. - - - - - - - -				
13)	Localized Futures Exceeds Breakeven Price + $3.00	6.26	71.43	24.61	-0.37	7
14)	Same as 13, First Margin Call	8.64	115.52	21.89	-8.83	7
15)	Same as 13, Second Margin Call	7.85	117.90	21.14	-9.94	7
16)	Localized Futures Exceeds Breakeven Price + $5.00	7.10	97.11	24.61	-7.71	6
17)	Same as 16, First Margin Call	8.91	107.27	21.89	-7.71	6
18)	Same as 16, Second Margin Call	8.32	102.57	21.13	-7.71	6
19)	Localized Futures Exceeds Cash Price	4.96	83.00	24.61	-3.62	7
20)	Same as 19, First Margin Call	8.57	117.11	21.89	-9.08	7
21)	Same as 19, Second Margin Call	7.80	119.59	21.14	-10.08	7
22)	Localized Futures Exceeds Cash Price + $1.00	5.18	80.09	24.61	-2.37	7
23)	Same as 22, First Margin Call	8.69	116.22	21.89	-8.83	7
24)	Same as 22, Second Margin Call	7.81	117.57	21.14	-9.83	7

Table 11 (Continued)

No.	Strategy	Mean	Variance	Maximum	Minimum	Number of Hedges Executed
		- - - - - - - - Dollars per cwt. - - - - - - - -				
25)	Localized Futures Exceeds Cash Price + $2.00	5.34	65.96	22.75	-1.37	5
26)	Same as 25, First Margin Call	8.88	119.42	22.75	-8.83	5
27)	Same as 25, Second Margin Call	8.24	124.74	22.75	-9.83	5

[a]Same results apply to localized futures exceeds breakeven price + $.50.

Table 12. Mean and Variance of Net Returns, Maximum and Minimum Net Return Levels, Total, Average, and Maximum and Minimum Number of Hedges Executed for the Winter Operation Beginning November 1, and Ending July 1, Using Specified Moving Average Hedging Strategies, Tennessee, 1972-1979

No.	Strategy	Mean	Variance	Maximum	Minimum	Number of Hedges Executed	Average Number of Hedges	Maximum/ Minimum Number of Hedges
		- - - - - Dollars per cwt. - - - - - -					- - Executed per year - -	
0)	Cash	9.66	112.75	22.75	-7.71			
28)	4-8	12.60	105.32	31.35	3.70	48	6.8	9 / 4
29)	5-10	10.75	82.72	26.09	1.29	46	6.6	8 / 4
30)	3-4-8	12.56	108.39	31.57	3.20	47	6.7	9 / 4
31)	4-8W	11.55	116.50	31.84	0.52	69	9.8	12 / 8
32)	3-4-8W	11.95	99.12	29.87	1.49	51	7.3	9 / 6
33)	4W-4-8W	12.66	96.50	31.10	4.09	47	6.7	9 / 4
34)	4-8 with 5¢ Penetration	12.31	94.12	30.26	3.19	46	6.6	9 / 4
35)	5-10 with 4¢ Penetration	10.28	65.71	22.65	1.46	44	6.3	8 / 3
36)	3-4-8 with 2¢ Penetration	12.55	107.01	31.57	3.20	46	6.6	9 / 4
37)	4-8W with 5¢ Penetration	11.37	100.38	29.34	1.01	49	7.0	8 / 5
38)	3-4-8W with 2¢ Penetration	12.04	97.36	28.97	1.33	48	6.8	9 / 5
39)	4W-4-8W with 2¢ Penetration	12.67	94.42	30.20	3.15	43	6.1	9 / 4

Table 13. Mean and Variance of Net Returns, Maximum and Minimum Net Return Levels, Total, Average, and Maximum and Minimum Number of Hedges Executed for the Winter Operation Beginning November 1, and Ending July 1, Using Specified Point-and-Figure Hedging Strategies, Tennessee, 1972-1979

No.	Strategy	Mean	Variance	Maximum	Minimum	Number of Hedges Executed	Average Number of Hedges	Maximum/ Minimum Number of Hedges
		- - - - - Dollars per cwt. - - - - -					- - Executed per year - -	
0)	Cash	9.66	112.75	22.75	-7.71			
1)	5¢ Box, 5 Reversal	11.24	73.88	25.45	2.43	34	4.8	8 / 2
2)	5¢ Box, 5 Reversal w/ 65¢ Stop	10.61	83.20	25.37	1.11	40	5.7	11 / 3
3)	5¢ Box, 5 Reversal w/ $1.35 Trailing Stop	10.73	73.32	22.74	1.56	45	6.4	12 / 3
4)	15¢ Box, 1 Reversal	11.00	76.35	25.05	1.91	37	5.3	9 / 2
5)	15¢ Box, 1 Reversal w/ 30¢ Stop	10.18	79.88	23.58	1.11	47	6.7	12 / 3
6)	15¢ Box, 1 Reversal w/ $1.35 Trailing Stop	10.77	76.31	22.74	1.56	48	6.8	12 / 3
7)	20¢ Box, 1 Reversal	11.09	74.61	25.05	1.84	33	4.7	7 / 2
8)	20¢ Box, 1 Reversal w/ 75¢ Stop	10.80	79.73	25.37	1.01	36	5.1	7 / 3
9)	20¢ Box, 1 Reversal w/ $1.35 Trailing Stop	10.64	75.82	22.74	1.07	45	6.4	12 / 3

Figure 8. Mean and Variance for the Winter Operation Beginning November 1 and Ending July 1, Using Specified Hedging Strategies, Tennessee 1972-1979

0) Cash

1) Localized Futures Greater Than Breakeven
2) Same as 1, First Margin Call
3) Same as 1, Second Margin Call
4) Localized Futures Greater Than Breakeven + $ .50
5) Same as 4, First Margin Call
6) Same as 4, Second Margin Call
7) Localized Futures Greater Than Breakeven + $1.00
8) Same as 7, First Margin Call
9) Same as 7, Second Margin Call
10) Localized Futures Greater Than Breakeven + $2.00
11) Same as 10, First Margin Call
12) Same as 10, Second Margin Call
13) Localized Futures Greater Than Breakeven + $3.00
14) Same as 13, First Margin Call
15) Same as 13, Second Margin Call
16) Localized Futures Greater Than Breakeven + $5.00
17) Same as 16, First Margin Call
18) Same as 16, Second Margin Call

19) Localized Futures Greater Than Cash
20) Same as 19, First Margin Call
21) Same as 19, Second Margin Call
22) Localized Futures Greater Than Cash + $1.00
23) Same as 22, First Margin Call
24) Same as 22, Second Margin Call
25) Localized Futures Greater Than Cash + $2.00
26) Same as 25, First Margin Call
27) Same as 25, Second Margin Call

28) 4-8
29) 5-10
30) 3-4-8
31) 4-8W
32) 3-4-8W
33) 4W-4-8W
34) 4-8 with 5¢ Penetration
35) 5-10 with 4¢ Penetration
36) 3-4-9 with 2¢ Penetration
37) 4-8W with 5¢ Penetration
38) 3-4-8W with 2¢ Penetration
39) 4W-4-8W with 2¢ Penetration

40) 5¢ Box, 5 Reversal
41) 5¢ Box, 5 Reversal w/ 65¢ Stop
42) 5¢ Box, 5 Reversal w/ $1.50 Trailing Stop
43) 15¢ Box, 1 Reversal
44) 15¢ Box, 1 Reversal w/ 30¢ Stop
45) 15¢ Box, 1 Reversal w/ $1.35 Trailing Stop
46) 20¢ Box, 1 Reversal
47) 20¢ Box, 1 Reversal w/ 75¢ Stop
48) 20¢ Box, 1 Reversal w/ $1.35 Trailing Stop

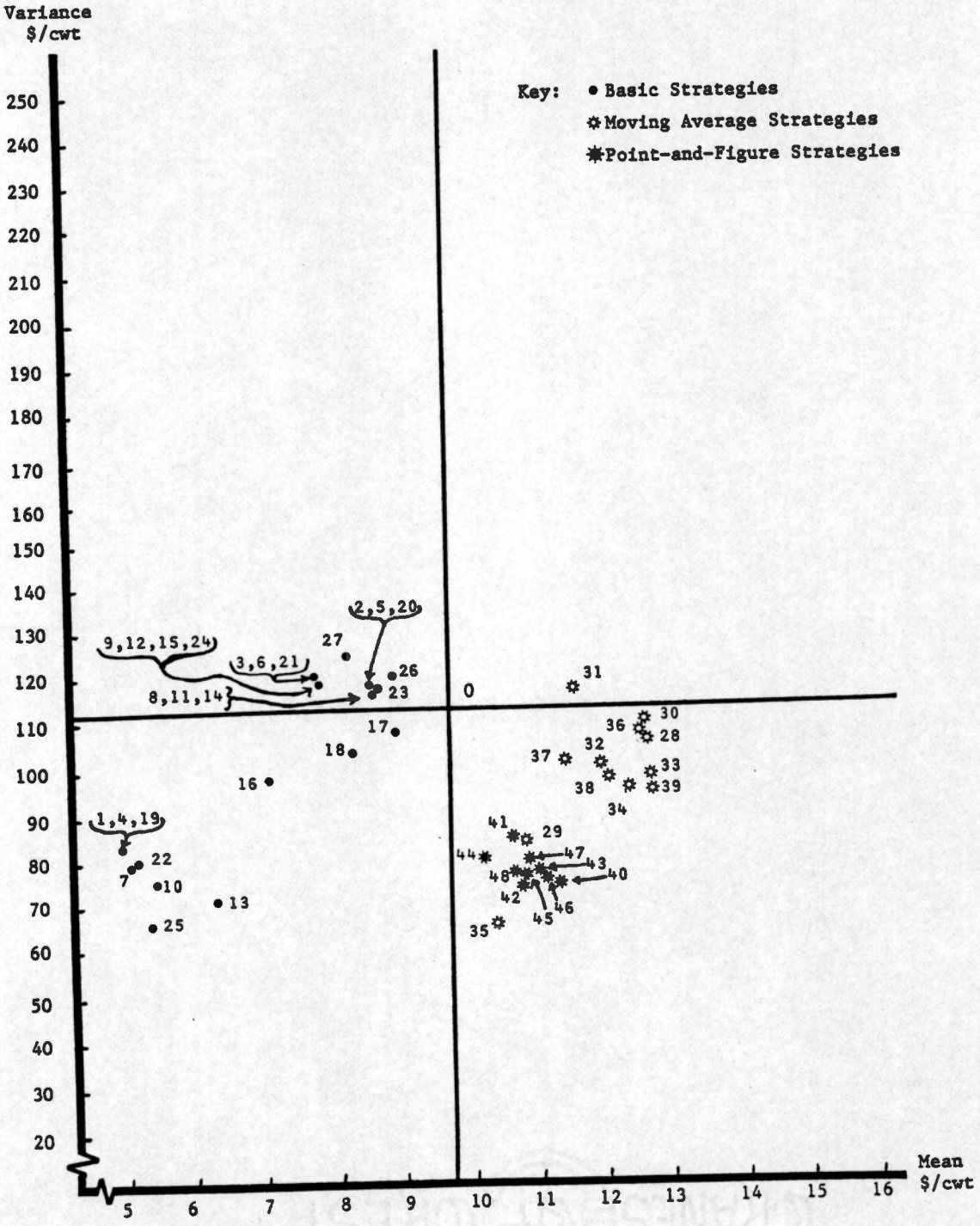

Variance
$/cwt
Key: • Basic Strategies
✡ Moving Average Strategies
✱ Point-and-Figure Strategies
250
240
230
220
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
0
2,5,20
9,12,15,24
27
3,6,21
26
23
8,11,14
31
17
18
16
30
36
28
32
37
33
38
39
34
1,4,19
41
29
44
47
43
48
40
42
46
45
35
22
7
10
13
25
5
6
7
8
9
10
11
12
13
14
15
16
Mean
$/cwt

Figure 8

Moving Average Hedging Strategies

Examination of Table 12 and Figure 8 shows that all of the moving average strategies (numbers 28-39) with the exception of strategy number 31, were superior to the cash market. Strategy 31, despite producing a higher mean, also yielded a higher variance than the cash market and, thus, falls into the "indeterminate" category. The addition of the penetration rule produced better results (higher means and lower variance) in only the 3-4-8W and 4W-4-8W moving average strategies.

Point-and-Figure Hedging Strategies

As seen in Table 13 and Figure 8 all the point-and-figure hedging strategies (numbers 40-48) were superior to the cash market. The addition of the stop and trailing stop rules to the hedging strategies failed to produce higher means. The stop rule actually yielded lower means with higher variances than the initial strategies. With the exception of moving average strategy numbers 29 and 35, all the point-and-figure hedging strategies yielded lower means and variances than the moving average strategies.

IV. Summary Analysis of the Winter Backgrounding Operations Combined

The mean and variance of net returns for all three winter operations were combined in Tables 14, 15, and 16 to yield overall means and variances of net returns for the entire simulation period. Figure 9 graphically illustrates the results expressed in these tables.

Table 14. Summary Analysis of Mean and Variance of Net Returns, Maximum and Minimum Net Return Levels, and Number of Hedges Executed for the Winter Operations Combined, Using Specified Basic Hedging Strategies, Tennessee, 1972-1979

No.	Strategy	Mean	Variance	Maximum	Minimum	Number of Hedges Executed
		- - - - - - - - Dollars per cwt. - - - - - - - -				
0)	Cash	11.40	167.63	38.29	-13.18	21
1)	Localized Futures Exceeds Breakeven Price	5.45	61.88	27.82	-3.62	21
2)	Same as 1, First Margin Call	10.40	168.98	36.94	-14.30	21
3)	Same as 1, Second Margin Call	9.61	169.66	35.78	-15.30	21
4)	Localized Futures Exceeds Breakeven Price + $ .50	5.49	61.31	27.82	-3.62	21
5)	Same as 4, First Margin Call	10.40	168.98	36.94	-14.30	21
6)	Same as 4, Second Margin Call	9.61	169.93	35.78	-15.41	21
7)	Localized Futures Exceeds Breakeven Price + $1.00	5.56	60.21	27.82	-2.37	21
8)	Same as 7, First Margin Call	10.42	168.58	36.94	-14.30	21
9)	Same as 7, Second Margin Call	9.63	169.63	35.78	-15.41	21

Table 14 (Continued)

No.	Strategy	Mean	Variance	Maximum	Minimum	Number of Hedges Executed
		- - - - - - - - Dollars per cwt. - - - - - - - -				
10)	Localized Futures Exceeds Breakeven Price + $2.00	5.91	58.00	27.82	-1.37	21
11)	Same as 10, First Margin Call	10.40	168.69	36.94	-14.26	21
12)	Same as 10, Second Margin Call	10.44	141.20	35.78	-9.83	21
13)	Localized Futures Exceeds Breakeven Price + $3.00	5.87	72.39	27.82	-13.18	20
14)	Same as 13, First Margin Call	10.50	165.40	36.94	-13.18	20
15)	Same as 13, Second Margin Call	9.73	160.91	35.78	-13.18	20
16)	Localized Futures Exceeds Breakeven Price + $5.00	7.14	81.32	27.82	-13.18	19
17)	Same as 16, First Margin Call	10.88	157.96	37.02	-13.18	19
18)	Same as 16, Second Margin Call	10.41	152.63	36.07	-13.18	19
19)	Localized Futures Exceeds Cash Price	5.34	63.59	27.82	-3.62	21
20)	Same as 19, First Margin Call	10.41	170.14	36.94	-14.55	21
21)	Same as 19, Second Margin Call	9.63	170.54	35.78	-15.55	21

Table 14 (Continued)

No.	Strategy	Mean	Variance	Maximum	Minimum	Number of Hedges Executed
		- - - - - - - - Dollars per cwt. - - - - - - - -				
22)	Localized Futures Exceeds Cash Price + $1.00	5.54	62.34	28.20	-2.37	21
23)	Same as 22, First Margin Call	10.44	168.45	36.94	=14.30	21
24)	Same as 22, Second Margin Call	9.63	168.45	35.78	-15.30	21
25)	Localized Futures Exceeds Cash Price + $2.00	6.97	75.70	28.02	-1.37	17
26)	Same as 25, First Margin Call	10.24	160.04	37.29	-14.30	17
27)	Same as 25, Second Margin Call	9.59	163.20	36.03	-15.30	17

Table 15. Summary Analysis of Mean and Variance of Net Returns, Maximum and Minimum Net Return Levels, Total, Average, and Maximum and Minimum Number of Hedges Executed for the Winter Operations Combined, Using Specific Moving Average Hedging Strategies, Tennessee, 1972-1979

No.	Strategy	Mean	Variance	Maximum	Minimum	Number of Hedges Executed	Average Number of Hedges	Maximum/ Minimum Number of Hedges
		- - - - - Dollars per cwt. - - - - -					- - Executed per year - -	
0)	Cash	11.40	167.63	38.29	-13.18			
28)	4-8	12.13	86.38	31.35	-1.46	149	7.1	11 / 4
29)	5-10	10.79	75.70	26.09	-3.63	135	6.4	8 / 4
30)	3-4-8	11.99	91.24	31.57	-1.96	142	6.8	9 / 4
31)	4-8W	11.23	96.81	31.84	-4.07	214	10.2	14 / 4
32)	3-4-8W	11.76	88.36	29.87	-3.10	154	7.3	10 / 4
33)	4W-4-8W	12.29	79.76	31.10	-0.06	144	6.8	9 / 4
34)	4-8 with 5¢ Penetration	12.02	80.79	30.26	-1.46	136	6.5	9 / 4
35)	5-10 with 4¢ Penetration	10.75	74.60	25.99	-4.51	124	5.9	8 / 3
36)	3-4-8 with 2¢ Penetration	12.03	89.50	31.57	-1.96	135	6.4	9 / 4
37)	4-8W with 5¢ Penetration	11.41	92.89	29.34	-5.15	150	7.1	11 / 5
38)	3-4-8W with 2¢ Penetration	11.86	92.05	28.97	-3.83	143	6.8	10 / 4
39)	4W-4-8W with 2¢ Penetration	12.27	81.22	30.20	-2.01	131	6.2	9 / 3

Table 16. Summary Analysis of Mean and Variance of Net Returns, Maximum and Minimum Net Return Levels, Total, Average, and Maximum and Minimum Number of Hedges Executed for the Winter Operations Combined, Using Specified Point-and-Figure Hedging Strategies, Tennessee, 1972-1979

No.	Strategy	Mean	Variance	Maximum	Minimum	Number of Hedges Executed	Average Number of Hedges	Maximum/ Minimum Number of Hedges
		- - - - - Dollars per cwt. - - - - -					- - Executed per year - -	
0)	Cash	11.40	167.63	38.29	-13.18			
40)	5¢ Box, 5 Reversal	12.73	109.70	35.71	-2.73	99	4.77	8 / 2
41)	5¢ Box, 5 Reversal w/ 65¢ Stop	12.45	123.56	35.63	-4.05	112	5.3	11 / 2
42)	5¢ Box, 5 Reversal w/ $1.50 Trailing Stop	12,60	108.12	37.33	-2.73	123	5.8	12 / 2
43)	15¢ Box, 1 Reversal	12.50	111.64	35.31	-2.73	106	5.0	9 / 2
44)	15¢ Box, 1 Reversal w/ 30¢ Stop	11.88	120.95	35.71	-4.05	132	6.3	12 / 3
45)	15¢ Box, 1 Reversal w/ $1.35 Trailing Stop	12.63	109.82	37.33	-2.73	130	6.2	12 / 2
46)	20¢ Box, 1 Reversal	12.42	107.95	35.31	-2.73	98	4.7	9 / 2
47)	20¢ Box, 1 Reversal w/ 75¢ Stop	12.48	116.57	35.63	-4.15	104	4.9	9 / 2
48)	20¢ Box, 1 Reversal w/ $1.35 Trailing Stop	12.62	122.74	41.13	-2.73	122	5.8	12 / 2

Figure 9. Overall Mean and Variance for the Combined Winter Operations

0) Cash

1) Localized Futures Greater Than Breakeven
2) Same as 1, First Margin Call
3) Same as 1, Second Margin Call
4) Localized Futures Greater Than Breakeven + $ .50
5) Same as 4, First Margin Call
6) Same as 4, Second Margin Call
7) Localized Futures Greater Than Breakeven + $1.00
8) Same as 7, First Margin Call
9) Same as 7, Second Margin Call
10) Localized Futures Greater Than Breakeven + $2.00
11) Same as 10, First Margin Call
12) Same as 10, Second Margin Call
13) Localized Futures Greater Than Breakeven + $3.00
14) Same as 13, First Margin Call
15) Same as 13, Second Margin Call
16) Localized Futures Greater Than Breakeven + $5.00
17) Same as 16, First Margin Call
18) Same as 16, Second Margin Call

19) Localized Futures Greater Than Cash
20) Same as 19, First Margin Call
21) Same as 19, Second Margin Call
22) Localized Futures Greater Than Cash + $1.00
23) Same as 4, First Margin Call
24) Same as 4, Second Margin Call
25) Localized Futures Greater Than Cash + $2.00
26) Same as 7, First Margin Call
27) Same as 7, Second Margin Call

28) 4-8
29) 5-10
30) 3-4-8
31) 4-8W
32) 3-4-8W
33) 4W-4-8W
34) 4-8 with 5¢ Penetration
35) 5-10 with 4¢ Penetration
36) 3-4-8 with 2¢ Penetration
37) 4-8W with 5¢ Penetration
38) 3-4-8W with 2¢ Penetration
39) 4W-4-8W with 2¢ Penetration

40) 5¢ Box, 5 Reversal
41) 5¢ Box, 5 Reversal w/ 65¢ Stop
42) 5¢ Box, 5 Reversal w/ $1.50 Trailing Stop
43) 15¢ Box, 1 Reversal
44) 15¢ Box, 1 Reversal w/ 30¢ Stop
45) 15¢ Box, 1 Reversal w/ $1.35 Trailing Stop
46) 20¢ Box, 1 Reversal
47) 20¢ Box, 1 Reversal w/ 75¢ Stop
48) 20¢ Box, 1 Reversal w/ $1.35 Trailing Stop

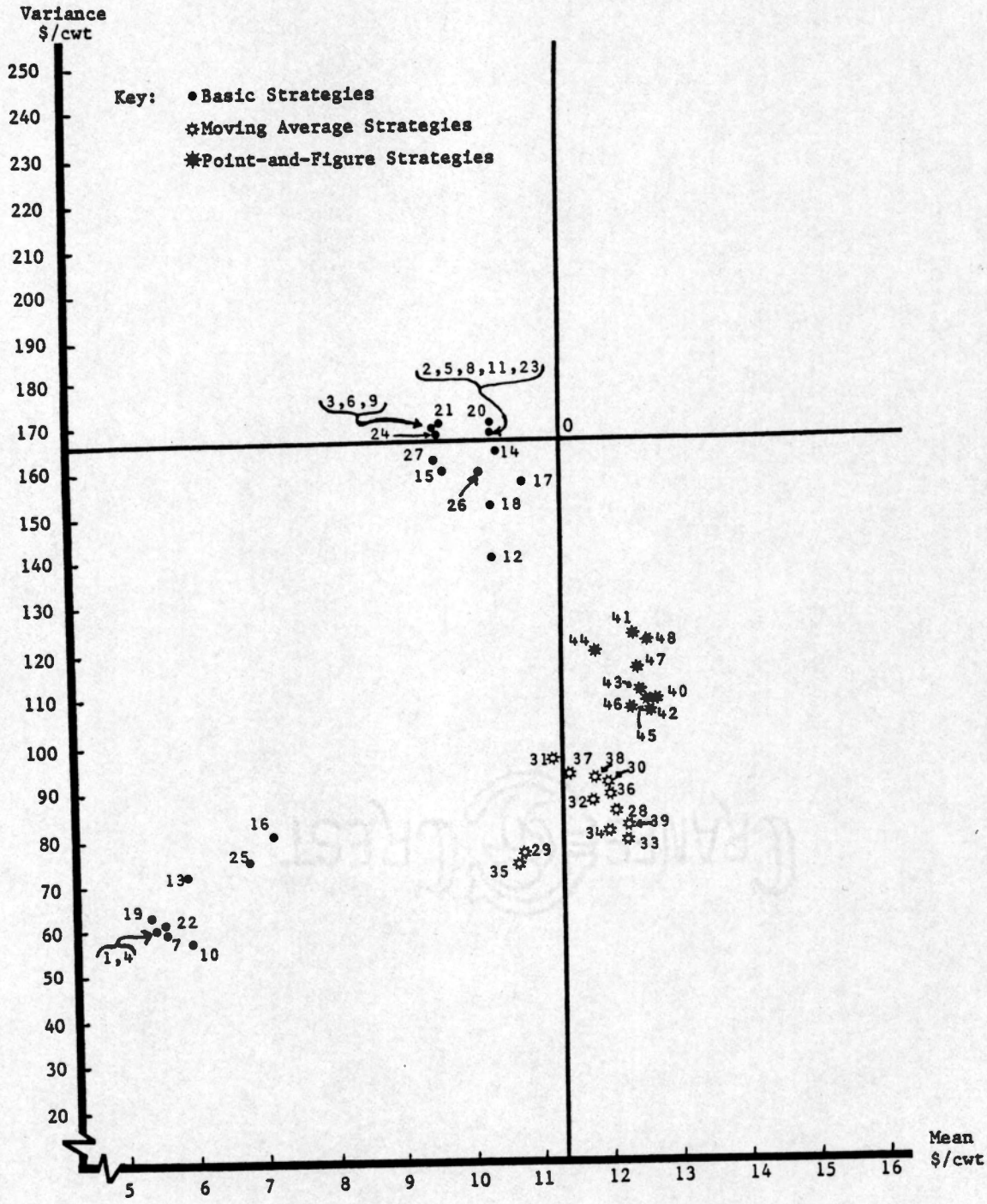

Variance
$/cwt
Key: •Basic Strategies
☼Moving Average Strategies
✱Point-and-Figure Strategies
250
240
230
220
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
0
2,5,8,11,23
3,6,9
21
20
24
27
14
15
17
26
18
12
41
44
48
47
43
40
46
42
45
31
37
38
30
36
32
28
39
34
33
29
35
16
25
13
19
22
7
10
1,4
5
6
7
8
9
10
11
12
13
14
15
16
Mean
$/cwt

Figure 9

Basic Hedging Strategies

None of the basic hedging strategies (numbers 1-27) proved to be superior to the cash market as seen in Table 14 and Figure 9. Eleven of the basic strategies proved to be inferior to the cash market, with the remaining 16 strategies falling into the "indeterminate" category. In general, this type of operation experienced a rising level of prices during the production period (Table A-6, Appendix) which meant the producer was executing a hedge only to buy back the contract at a higher price at the completion of the operation. The option of lifting the hedge after the first margin call did improve the hedging strategies but only to the extent that it got the producer out of the rising market sooner, which limited his losses. The option of lifting the hedge after the second margin call did improve the overall net mean return but to a lesser extent than lifting the hedge after the first margin call. This is understandable since, by the second margin call, the market had risen further. Both of these options yielded variances significantly higher than the option of holding the hedge once it had been placed.

Moving Average Hedging Strategies

Inspection of Table 15 and Figure 9 shows that all but three of the moving average strategies were superior to the cash market. The other three strategies (numbers 29, 31, 35) fell into the "indeterminate" category. The addition of the penetration rule improved the overall net mean return and variance for the 3-4-8 and 4-8W moving average strategies, and also improved the mean return in the 3-4-8W strategy.

Point-and-Figure Hedging Strategies

As seen in Table 16 and Figure 9 all of the point-and-figure hedging strategies proved to be superior to the cash market. The addition of a stop rule improved the overall mean return with the 20¢ box size strategy only, while decreasing the overall mean and increasing the variance in the 5¢ and 15¢ box size strategies. The addition of a trailing stop rule improved the mean net return and variance of the 15¢ box size and improved the mean in the 20¢ box size. With the exception of strategy number 44, all the point-and-figure hedging strategies yielded higher means and variances than the moving average strategies.

V. Analysis of the Summer Backgrounding Operation Beginning March 15 and Ending September 1

To reveal the actual fluctuation in the levels of returns the producer experienced from one year to the next the net returns of all the selected hedging strategies in this operation were analyzed on a yearly basis in Table B-4, Appendix. The mean and variance of net returns were further analyzed in Tables 17, 18, and 19 for the entire seven years of the simulation period to reveal the long-term results of following each selected hedging strategy. The results expressed in Tables 17, 18, and 19 are illustrated in Figure 10.

Basic Hedging Strategies

Inspection of Table 17 and Figure 10 reveal that all but eight of the 27 basic hedging strategies were superior to the cash market. Of the eight strategies which were not superior, six were actually inferior

Table 17. Mean and Variance of Net Returns, Maximum and Minimum Net Return Levels, and Number of Hedges Executed for the Summer Operation Beginning March 15 and Ending September 1, Using Specified Basic Hedging Strategies, Tennessee, 1973-1979

No.	Strategy	Mean	Variance	Maximum	Minimum	Number of Hedges Executed
		- - - - - - - - Dollars per cwt. - - - - - - - -				
0)	Cash	5.64	67.41	16.32	-9.97	
1)[a]	Localized Futures Excceeds Breakeven Price	6.24	4.43	8.62	2.36	7
2)[a]	Same as 1, First Margin Call	4.67	67.73	15.40	-10.85	7
3)[a]	Same as 1, Second Margin Call	6.43	22.76	14.94	0.62	7
16)	Localized Futures Exceeds Breakeven Price + $5.00	7.48	11.21	13.57	3.31	6
17)	Same as 16, First Margin Call	6.07	75.91	14.63	-10.85	6
18)	Same as 16, Second Margin Call	9.05	13.29	13.58	5.34	6
19)	Localized Futures Exceeds Cash Price	5.02	8.47	8.39	-0.09	7
20)	Same as 19, First Margin Call	4.44	68.22	15.40	-10.85	7
21)	Same as 19, Second Margin Call	6.34	23.48	14.94	0.62	7
22)	Localized Futures Exceeds Cash Price + $1.00	6.07	4.41	8.65	2.36	6
23)	Same as 22, First Margin Call	5.77	66.57	15.14	-10.85	6
24)	Same as 22, Second Margin Call	8.00	9.27	13.59	5.53	6

Table 17 (Continued)

No.	Strategy	Mean	Variance	Maximum	Minimum	Number of Hedges Executed
		- - - - - - - - Dollars per cwt. - - - - - - - -				
25)	Localized Futures Exceeds Cash Price + $2.00	6.00	9.67	11.42	2.36	5
26)	Same as 25, First Margin Call	4.96	66.30	15.30	-10.85	5
27)	Same as 25, Second Margin Call	7.15	13.37	13.83	2.95	5

[a]Same results apply to localized futures exceeds breakeven price + $.50, $1.00, $2.00 and $3.00.

Table 18. Mean and Variance of Net Returns, Maximum and Minimum Net Return Levels, Total, Average, and Maximum and Minimum Number of Hedges Executed for the Summer Operation Beginning March 15 and Ending September 1, Using Specified Moving Average Hedging Strategies, Tennessee, 1973-1979

No.	Strategy	Mean	Variance	Maximum	Minimum	Number of Hedges Executed	Average Number of Hedges	Maximum/ Minimum Number of Hedges
		- - - - - - Dollars per cwt. - - - - - -					- - Executed per year - -	
0)	Cash	5.64	67.41	16.32	-9.97			
28)	4-8	11.62	41.45	22.37	5.02	45	6.4	9 / 4
29)	5-10	9.71	37.67	19.65	3.61	36	5.1	6 / 4
30)	3-4-8	11.16	44.59	22.15	5.02	39	5.6	9 / 4
31)	4-8W	10.82	42.61	22.05	5.05	66	9.4	11 / 8
32)	3-4-8W	11.17	43.33	22.96	5.62	47	6.7	9 / 5
33)	4W-4-8W	11.43	44.34	22.96	5.62	43	6.1	9 / 4
34)	4-8 with 5¢ Penetration	11.31	38.07	22.15	3.99	41	5.8	9 / 4
35)	5-10 with 4¢ Penetration	9.83	37.02	19.85	4.24	34	4.8	6 / 4
36)	3-4-8 with 2¢ Penetration	11.56	43.40	22.15	5.02	38	5.4	8 / 4
37)	4-8W with 5¢ Penetration	11.14	44.65	22.19	5.10	49	7.0	10 / 4
38)	3-4-8W with 2¢ Penetration	11.15	43.92	22.35	5.42	42	6.0	9 / 4
39)	4W-4-8W with 2¢ Penetration	11.08	44.63	22.35	5.42	41	5.8	8 / 4

Table 19. Mean and Variance of Net Returns, Maximum and Minimum Net Return Levels, Total, Average, and Maximum and Minimum Number of Hedges Executed for the Summer Operation Beginning March 15 and Ending September 1, Using Specified Point-and-Figure Hedging Strategies, Tennessee, 1973-1979

No.	Strategy	Mean	Variance	Maximum	Minimum	Number of Hedges Executed	Average Number of Hedges	Maximum/ Minimum Number of Hedges
		- - - - - Dollars per cwt. - - - - -					- - Executed per year - -	
0)	Cash	5.64	67.41	16.32	-9.97			
1)	5¢ Box, 5 Reversal	9.42	48.48	16.95	0.47	34	4.8	6 / 3
2)	5¢ Box, 5 Reversal w/ 65¢ Stop	7.71	31.52	14.81	0.91	39	5.6	7 / 4
3)	5¢ Box, 5 Reversal w/ $1.50 Trailing Stop	7.33	37.23	17.22	-1.61	44	6.3	10 / 3
4)	15¢ Box, 1 Reversal	7.84	28.92	16.95	0.47	35	5.0	6 / 3
5)	15¢ Box, 1 Reversal w/ 30¢ Stop	6.66	27.11	14.79	0.62	46	6.6	9 / 5
6)	15¢ Box, 1 Reversal w/ $1.35 Trailing Stop	7.07	22.95	11.98	-1.61	44	6.3	11 / 3
7)	20¢ Box, 1 Reversal	8.37	28.30	16.95	1.60	32	4.6	6 / 3
8)	20¢ Box, 1 Reversal w/ 75¢ Stop	7.44	26.27	14.79	0.91	37	5.3	6 / 4
9)	20¢ Box, 1 Reversal w/ $1.35 Trailing Stop	7.24	23.49	12.55	-0.48	41	5.8	9 / 3

Figure 10. Mean and Variance for the Summer Operation Beginning March 15 and Ending September 1, Using Specified Hedging Strategies, Tennessee, 1973-1979

0) Cash

1) Localized Futures Greater Than Breakeven
2) Same as 1, First Margin Call
3) Same as 1, Second Margin Call
4) Localized Futures Greater Than Breakeven + $ .50
5) Same as 4, First Margin Call
6) Same as 4, Second Margin Call
7) Localized Futures Greater Than Breakeven + $1.00
8) Same as 7, First Margin Call
9) Same as 7, Second Margin Call
10) Localized Futures Greater Than Breakeven + $2.00
11) Same as 10, First Margin Call
12) Same as 10, Second Margin Call
13) Localized Futures Greater Than Breakeven + $3.00
14) Same as 13, First Margin Call
15) Same as 13, Second Margin Call
16) Localized Futures Greater Than Breakeven + $5.00
17) Same as 16, First Margin Call
18) Same as 16, Second Margin Call

19) Localized Futures Greater Than Cash
20) Same as 19, First Margin Call
21) Same as 19, Second Margin Call
22) Localized Futures Greater Than Cash + $1.00
23) Same as 22, First Margin Call
24) Same as 22, Second Margin Call
25) Localized Futures Greater Than Cash + $2.00
26) Same as 25, First Margin Call
27) Same as 25, Second Margin Call

28) 4-8
29) 5-10
30) 3-4-8
31) 4-8W
32) 3-4-8W
33) 4W-4-8W
34) 4-8 with 5¢ Penetration
35) 5-10 with 4¢ Penetration
36) 3-4-8 with 2¢ Penetration
37) 4-8W with 5¢ Penetration
38) 3-4-8W with 2¢ Penetration
39) 4W-4-8W with 2¢ Penetration

40) 5¢ Box, 5 Reversal
41) 5¢ Box, 5 Reversal w/ 65¢ Stop
42) 5¢ Box, 5 Reversal w/ $1.50 Trailing Stop
43) 15¢ Box, 1 Reversal
44) 15¢ Box, 1 Reversal w/ 30¢ Stop
45) 15¢ Box, 1 Reversal w/ $1.35 Trailing Stop
46) 20¢ Box, 1 Reversal
47) 20¢ Box, 1 Reversal w/ 75¢ Stop
48) 20¢ Box, 1 Reversal w/ $1.35 Trailing Stop

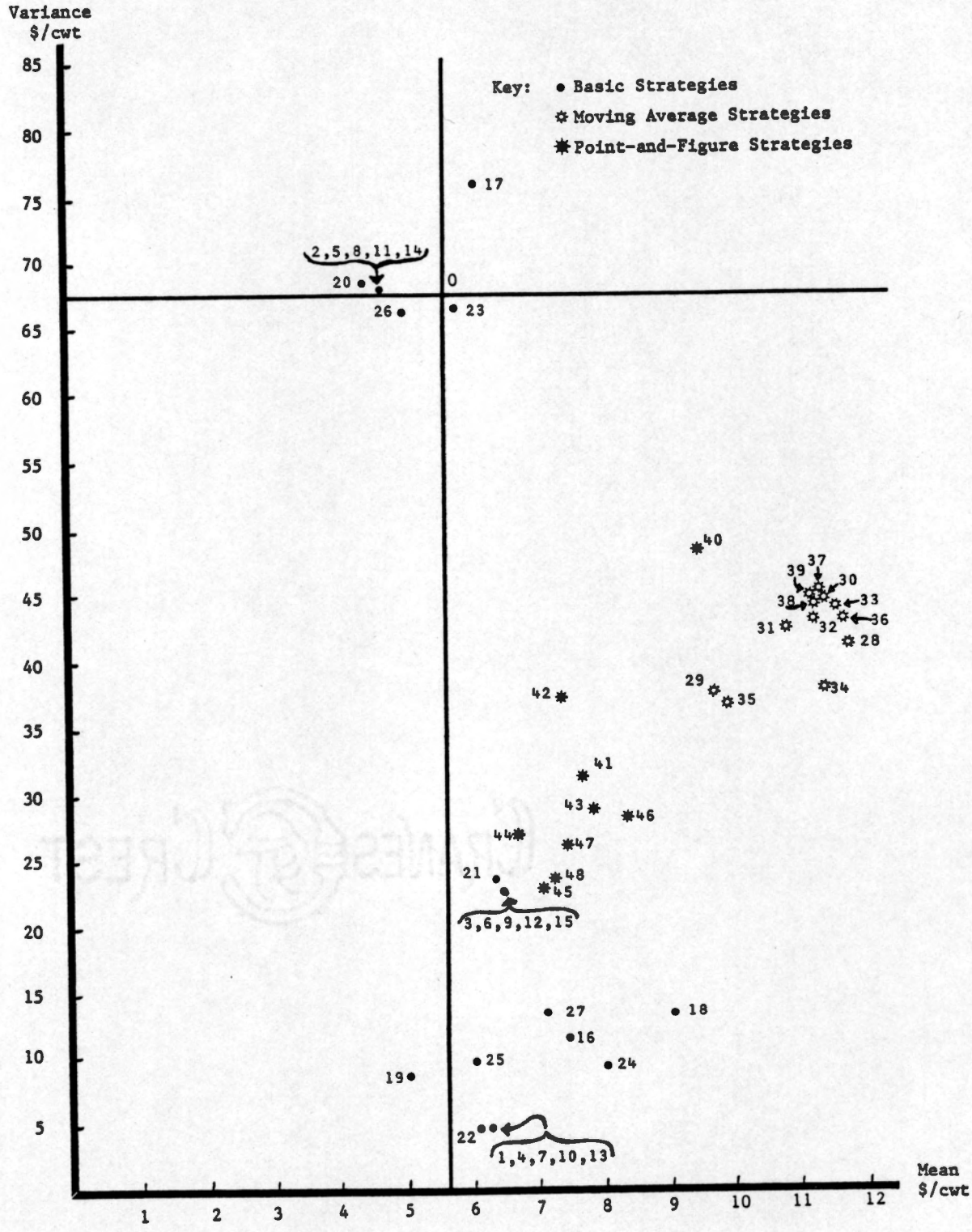

Variance
$/cwt
85
80
75
70
65
60
55
50
45
40
35
30
25
20
15
10
5
Key: • Basic Strategies
✡ Moving Average Strategies
✱ Point-and-Figure Strategies
2,5,8,11,14
20
0
17
26
23
40
37
39
30
38
33
31
32
36
28
29
35
34
42
41
43
46
44
47
21
48
45
3,6,9,12,15
27
18
16
25
24
19
22
1,4,7,10,13
1
2
3
4
5
6
7
8
9
10
11
12
Mean
$/cwt

Figure 10

to the cash market and two fell into the "indeterminate" category. By comparing the net returns in Table B-4 (Appendix) with the cash price indices (Table A-5, Appendix), it can be seen that the basic hedging strategies out-performed the cash market whenever the index fell from the beginning of the production period to the end. However, in some cases the market apparently fluctuated enough to trigger a margin call, thus making the option of lifting the hedge after the first margin call inferior to the cash market. Evidently, the market in these cases did not fluctuate enough to trigger a second margin call before it started trending downward. This option therefore yielded returns equal to or greater than the hedge and hold strategies in those cases. However, the option of lifting the hedge after the second margin call did allow the producer to liquidate his position in the futures market when the price trend was truly rising. Results show that over the entire simulation period, the option of holding the hedge until the end of the production period proved to be the most advantageous strategy, however, the option of lifting the hedge after the second margin call did yield higher net mean returns, but did so with higher variances.

In general, adding dollar increments to the strategies, allowed the producer to place his hedge at a higher level in a rising market before the market began to fall toward the end of the production period. The mean net return for the strategies utilizing breakeven prices are assumed to "top-out" with the addition of a $5.00 increment, whereas the strategies utilizing cash prices "topped-out" with the addition of $1.00. Further dollar increments beyond these two levels would make hedging less likely. Therefore, the producer would be hedging less and relying

on the cash market more, which means the net returns would eventually be equal to the cash market returns.

Moving Average Hedging Strategies

By referring to Table 18 and Figure 10 it can be seen that all of the moving average hedging strategies (numbers 28-39) were superior to the cash market and yielded higher means than the basic and point-and-figure hedging strategies. The addition of a penetration rule improved both the mean return and variance for the 5-10 and 3-4-8 moving average strategies. All of the strategies prevented the producer from experiencing negative returns in 1974, except the cash market.

Point-and-Figure Hedging Strategies

Table 19 and Figure 10 reveal that all of the point-and-figure hedging strategies (numbers 40-48) yielded superior results to the cash market. The addition of both the stop and trailing stop rules failed to increase the mean return of the initial strategies. The use of the stop rule was superior to the trailing stop in the case of the 5¢ box size, with the reverse being true with the 15¢ box size. The stop rule also yielded a higher mean in the 20¢ box size than the trailing stop rule. All the point-and-figure hedging strategies yielded lower means and, with the exception of strategy numbers 40 and 42, yielded lower variances than the moving average strategies.

VI. Analysis of the Summer Backgrounding Operation Beginning April 15 and Ending October 1

The net returns of all the selected hedging strategies in this operation were analyzed on a yearly basis in Table B-5 (Appendix)

to reveal the actual fluctuation in the levels of returns the producer experienced from one year to the next. To reveal the long-term results of following all the selected hedging strategies the mean and variance of net returns were further analyzed in Tables 20, 21, and 22 for the entire seven years of the simulation time period. Figure 11 illustrates graphically the results expressed in Tables 20, 21, and 22.

Basic Hedging Strategies

Inspection of Table 20 and Figure 11 shows that all of the basic hedging strategies were superior to the cash market for the seven year period as a whole. The option of lifting the hedge after the second margin call yielded higher means for all the strategies utilizing breakeven prices with the exception of the strategy adding a $5.00 increment. However, the strategies utilizing cash prices produced higher means when the hedge was lifted after the first margin call.

By comparing the annual returns (Table B-5, Appendix) from the initial strategies (numbers 1 and 19) and from the cash market (number 0) to the price index, (Table A-5, Appendix), it can be seen that when the price index rose from the start of the production period to the end of the production period (years 1973, 1975, 1978) the cash market yielded higher returns than the hedging strategies. However, when the annual price index fell from the start of the production period to the end of the production period (years 1974, 1976, 1977, 1979) the hedging strategies out-performed the cash market, and prevented the producer from experiencing negative returns resulting from the cash market trends in 1974, 1976, and 1979.

Table 20. Mean and Variance of Net Returns, Maximum and Minimum Net Return Levels and Number of Hedges Executed for the Summer Operation Beginning April 15 and Ending October 1, Using Specified Basic Hedging Strategies, Tennessee, 1973-1979

No.	Strategy	Mean	Variance	Maximum	Minimum	Number of Hedges Executed
		- - - - - - - - Dollars per cwt. - - - - - - - -				
0)	Cash	3.30	84.90	16.70	-11.16	
1)[a]	Localized Futures Exceeds Breakeven Price	6.07	4.31	8.20	3.04	7
2)[a]	Same as 1, First Margin Call	7.03	34.48	15.23	-4.63	7
3)[a]	Same as 1, Second Margin Call	8.34	5.70	13.67	6.86	7
10)	Localized Futures Exceeds Breakeven Price + $2.00	5.07	9.43	8.20	-0.12	7
11)	Same as 10, First Margin Call	6.04	41.84	15.23	-4.63	7
12)	Same as 10, Second Margin Call	7.34	16.09	13.67	-0.12	7
13)	Localized Futures Exceeds Breakeven + $3.00	5.27	8.77	8.20	-0.12	6
14)	Same as 13, First Margin Call	6.01	41.23	15.03	-4.63	6
15)	Same as 13, Second Margin Call	7.35	16.20	13.72	-0.12	6

Table 20 (Continued)

No.	Strategy	Mean	Variance	Maximum	Minimum	Number of Hedges Executed
		- - - - - - - - Dollars per cwt. - - - - - - - -				
16)	Localized Futures Exceeds Breakeven Price + $5.00	3.95	19.14	7.94	-3.86	4
17)	Same as 16, First Margin Call	5.52	39.22	15.58	-3.86	4
18)	Same as 16, Second Margin Call	5.16	35.76	14.82	-3.86	4
19)	Localized Futures Exceeds Cash Price	5.32	26.30	9.31	-5.49	7
20)	Same as 19, First Margin Call	5.73	48.18	15.58	-4.53	7
21)	Same as 19, Second Margin Call	5.36	47.07	14.83	-5.15	7
22)	Localized Futures Exceeds Cash Price + $1.00	6.10	10.76	9.31	0.80	7
23)	Same as 22, First Margin Call	7.42	19.19	15.23	0.80	7
24)	Same as 22, Second Margin Call	6.95	14.12	13.13	0.80	7
25)	Localized Futures Exceeds Cash Price + $2.00	4.50	25.50	9.70	-3.86	5
26)	Same as 25, First Margin Call	5.53	40.70	15.78	-3.86	5
27)	Same as 25, Second Margin Call	5.35	32.76	13.68	-3.86	5

[a]Same results apply to localized futures exceeds breakeven price + $.50 and $1.00.

Table 21. Mean and Variance of Net Returns, Maximum and Minimum Net Return Levels, Total, Average, and Maximum and Minimum Number of Hedges Executed for the Summer Operation Beginning April 15 and Ending October 1, Using Specified Moving Average Hedging Strategies, Tennessee, 1973-1979

No.	Strategy	Mean	Variance	Maximum	Minimum	Number of Hedges Executed	Average Number of Hedges	Maximum/ Minimum Number of Hedges
		- - - - - Dollars per cwt. - - - - -					- - Executed per year - -	
0)	Cash	3.30	84.90	16.70	-11.16			
28)	4-8	9.46	30.51	19.14	4.93	41	5.8	8 / 4
29)	5-10	8.07	45.84	17.89	-2.05	36	5.1	7 / 4
30)	3-4-8	9.10	28.30	18.01	4.16	37	5.3	7 / 3
31)	4-8W	8.55	27.07	17.31	4.39	61	8.7	9 / 8
32)	3-4-8W	8.70	20.98	16.02	4.97	40	5.7	7 / 4
33)	4W-4-8W	9.51	27.48	18.01	4.97	37	5.3	7 / 3
34)	4-8 with 5¢ Penetration	9.35	28.67	18.01	4.20	36	5.1	7 / 3
35)	5-10 with 4¢ Penetration	8.31	47.67	17.66	-2.05	29	4.1	6 / 3
36)	3-4-8 with 2¢ Penetration	8.90	30.59	18.01	3.74	37	5.3	7 / 3
37)	4-8W with 5¢ Penetration	10.15	28.98	17.70	4.10	42	6.0	7 / 5
38)	3-4-8W with 2¢ Penetration	8.67	31.02	18.53	3.41	38	5.4	7 / 3
39)	4W-4-8W with 2¢ Penetration	9.18	30.05	18.01	3.41	35	5.0	6 / 3

Table 22. Mean and Variance of Net Returns, Maximum and Minimum Net Return Levels, Total, Average, and Maximum and Minimum Number of Hedges Executed for the Summer Operation Beginning April 15 and Ending October 1, Using Specified Point-and-Figure Hedging Strategies, Tennessee, 1973-1979

No.	Strategy	Mean	Variance	Maximum	Minimum	Number of Hedges Executed	Average Number of Hedges	Maximum/ Minimum Number of Hedges
		- - - - - Dollars per cwt. - - - - -					- - Executed per year - -	
0)	Cash	3.30	84.90	16.70	-11.16			
40)	5¢ Box, 5 Reversal	8.73	48.98	20.12	2.11	41	5.8	8 / 4
41)	5¢ Box, 5 Reversal w/ 65¢ Stop	8.87	43.22	19.25	2.30	43	6.1	8 / 5
42)	5¢ Box, 5 Reversal w/ $1.50 Trailing Stop	8.20	55.66	23.48	2.71	48	6.8	9 / 5
43)	15¢ Box, 1 Reversal	9.06	41.08	19.44	2.95	40	5.7	9 / 4
44)	15¢ Box, 1 Reversal w/ 30¢ Stop	8.73	43.16	19.15	2.07	47	6.7	10 / 5
45)	15¢ Box, 1 Reversal w / $1.35 Trailing Stop	8.53	48.48	22.80	2.71	47	6.7	9 / 5
46)	20¢ Box, 1 Reversal	9.17	35.01	18.39	2.74	39	5.6	8 / 4
47)	20¢ Box, 1 Reversal w/ 75¢ Stop	9.38	40.88	19.04	2.05	39	5.6	8 / 4
48)	20¢ Box, 1 Reversal w/ $1.35 Trailing Stop	8.69	41.13	21.75	2.50	47	6.7	9 / 5

Figure 11. Mean and Variance for the Summer Operation Beginning April 15 and Ending October 1, Using Specified Hedging Strategies, Tennessee, 1973-1979

0) Cash

1) Localized Futures Greater Than Breakeven
2) Same as 1, First Margin Call
3) Same as 1, Second Margin Call
4) Localized Futures Greater Than Breakeven + $ .50
5) Same as 4, First Margin Call
6) Same as 4, Second Margin Call
7) Localized Futures Greater Than Breakeven + $1.00
8) Same as 7, First Margin Call
9) Same as 7, Second Margin Call
10) Localized Futures Greater Than Breakeven + $2.00
11) Same as 10, First Margin Call
12) Same as 10, Second Margin Call
13) Localized Futures Greater Than Breakeven + $3.00
14) Same as 13, First Margin Call
15) Same as 13, Second Margin Call
16) Localized Futures Greater Than Breakeven + $5.00
17) Same as 16, First Margin Call
18) Same as 16, Second Margin Call

19) Localized Futures Greater Than Cash
20) Same as 19, First Margin Call
21) Same as 19, Second Margin Call
22) Localized Futures Greater Than Cash + $1.00
23) Same as 22, First Margin Call
24) Same as 22, Second Margin Call
25) Localized Futures Greater Than Cash + $2.00
26) Same as 25, First Margin Call
27) Same as 25, Second Margin Call

28) 4-8
29) 5-10
30) 3-4-8
31) 4-8W
32) 3-4-8W
33) 4W-4-8W
34) 4-8 with 5¢ Penetration
35) 5-10 with 4¢ Penetration
36) 3-4-8 with 2¢ Penetration
37) 4-8W with 5¢ Penetration
38) 3-4-8W with 2¢ Penetration
39) 4W-4-8W with 2¢ Penetration

40) 5¢ Box, 5 Reversal
41) 5¢ Box, 5 Reversal w/ 65¢ Stop
42) 5¢ Box, 5 Reversal w/ $1.50 Trailing Stop
43) 15¢ Box, 1 Reversal
44) 15¢ Box, 1 Reversal w/ 30¢ Stop
45) 15¢ Box, 1 Reversal w/ $1.35 Trailing Stop
46) 20¢ Box, 1 Reversal
47) 20¢ Box, 1 Reversal w/ 75¢ Stop
48) 20¢ Box, 1 Reversal w/ $1.35 Trailing Stop

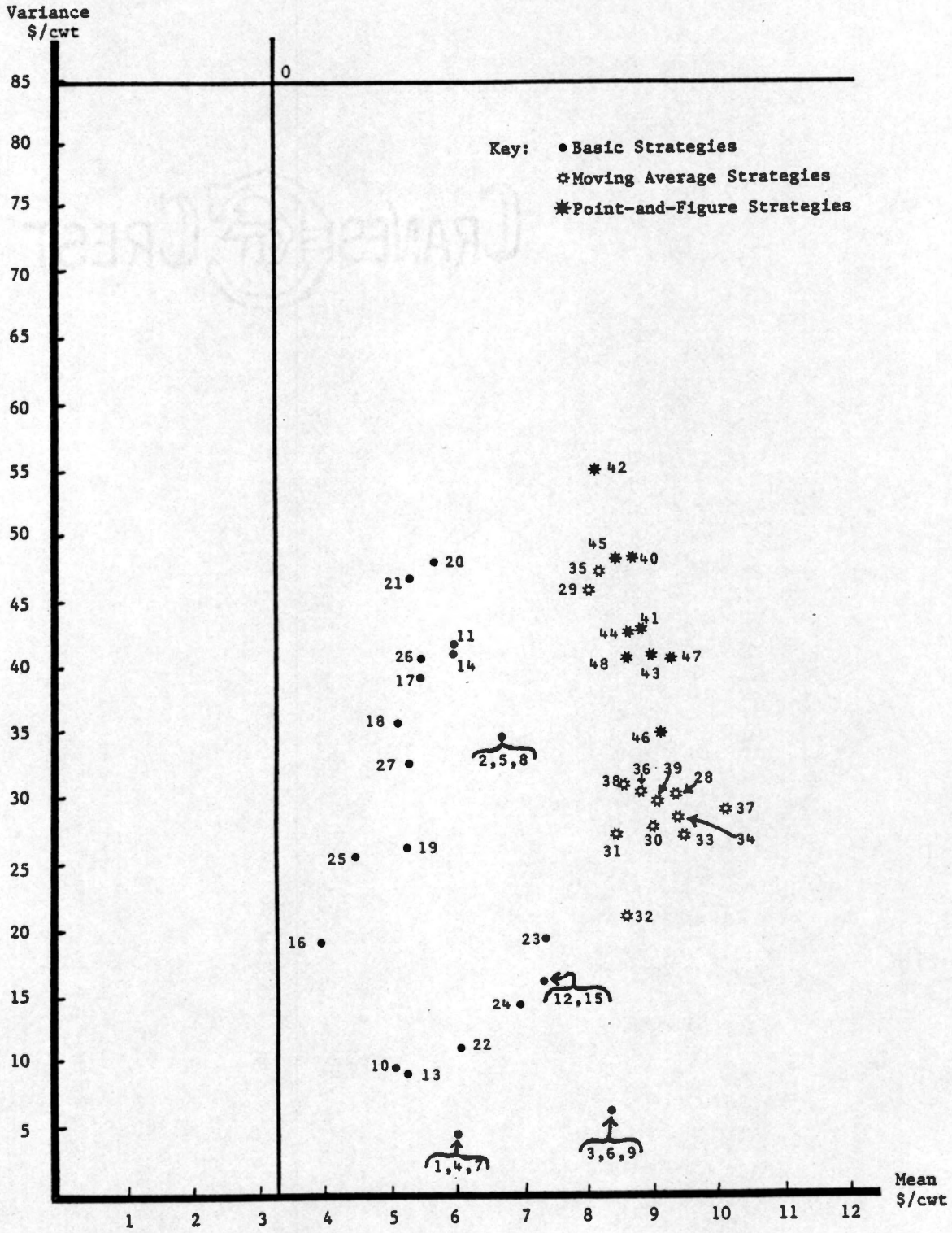

Variance
$/cwt
0
85
80
75
70
65
60
55
50
45
40
35
30
25
20
15
10
5
Key: • Basic Strategies
✡ Moving Average Strategies
✱ Point-and-Figure Strategies
✱42
45
✱40
20
35✡
21•
29✡
41
✱
44✱
11
26•
14
48✱
✱47
17•
43
18•
46✱
2,5,8
27•
36
39
28
38✡
✡37
30
✡33
34
31
25•
19•
✡32
16•
23•
12,15
24•
22•
10•
13•
1,4,7
3,6,9
1
2
3
4
5
6
7
8
9
10
11
12
Mean
$/cwt

Figure 11

When the market was experiencing an upward trend in prices the option of lifting the hedge after the first margin call improved the net returns by limiting the losses in the futures market. When the market was experiencing a downward trend in prices this option produced results equal to or better than the other two options of lifting the hedge, with the exception of 1976 for the strategies utilizing breakeven prices. During this production period, the market experienced a downward trend in prices but evidently fluctuated enough to trigger a margin call, which resulted in a negative return for the hedge. However, the market did not fluctuate enough to trigger a second margin call for the strategies utilizing breakeven prices, therefore the hedge was not lifted until the end of the production period. Consequently, the hedge yielded a positive return which more than compensated for the loss in the cash market. Despite the fact that the strategies utilizing breakeven prices with the option of lifting the hedge after the second margin call did not produce results superior to the option of lifting the hedge after the first margin call in any of the production periods, with the exception of 1976, this option did yield results which were large enough in 1976 to result in the highest mean return for the entire seven year production period, 1973-1979. This explains why the option of lifting the hedge after the second margin call appeared to be superior to the option of lifting the hedge after the first margin call for the strategies utilizing breakeven prices.

The addition of dollar increments to the strategies utilizing breakeven prices failed to yield higher returns with additional

increments. Conversely, the addition of a dollar increment to the hedging strategies utilizing cash prices initially increased mean returns. Additional increments beyond $1.00 proved to have an adverse affect on mean returns in both the strategies utilizing breakeven and cash prices. These additional increments made the hedging criteria more difficult to meet, thereby reducing the number of hedges executed, which made the producer rely more on the cash market. Thus, the results began to move toward the cash market results.

Moving Average Hedging Strategies

Table 21 and Figure 11 reveal that all of the moving average hedging strategies (numbers 28-39) were superior to the cash market. The penetration rule increased mean returns only in the 5-10 and 4-8W moving average strategies. In spite of the fact that the cash market yielded negative returns in three of the seven years, all the moving average strategies except the 5-10 strategies prevented the producer from receiving negative returns. The 5-10 strategies did, however, shield the producer from negative returns in two of the three bad years and reduced losses in the third year.

Point-and-Figure Hedging Strategies

The results in Table 22 and Figure 11 show that the point-and-figure hedging strategies were all superior to the cash market. The strategies actually yielded over twice the mean return of the cash market. The use of the stop rule increased the mean return and decreased the variance for the 5¢ box size and increased the mean return for the 20¢ box size. The use of the trailing stop rule did not improve

any of the strategies in the long-run. However, it did improve the strategies in given years as can be seen in Table B-5, Appendix. In general, the point-and-figure strategies yielded about the same mean returns as did the moving average strategies, but with higher variances.

VII. Analysis of the Summer Backgrounding Operation Beginning May 15 and Ending November 1

The net returns from all the selected hedging strategies in this operation were analyzed on a yearly basis in Table B-6 (Appendix) to reveal the actual fluctuation in the levels of returns the producer experienced from year to year. The mean and variance of net returns were further analyzed in Tables 23, 24, and 25 for the entire seven years of the simulation time period to reveal the long-term results of following each of the selected hedging strategies. Figure 12 illustrates graphically the results expressed in Tables 23, 24, and 25.

Basic Hedging Strategies

Inspection of Table 23 and Figure 12 shows that of the 27 basic hedging strategies tested, four strategies were inferior, three strategies fell into the "indeterminate" category and 20 were superior to the cash market. The options of lifting the hedge after the first or second margin call failed to improve the mean returns for any of the strategies.

The addition of dollar increments yielded beneficial results up to a point. The strategies utilizing breakeven costs were improved by adding dollar increments up to $3.00. The strategies utilizing cash

Table 23. Mean and Variance of Net Returns, Maximum and Minimum Net Return Levels and Number of Hedges Executed for the Summer Operation Beginning May 15 and Ending November 1, Using Specified Basic Hedging Strategies, Tennessee, 1973-1979

No.	Strategy	Mean	Variance	Maximum	Minimum	Number of Hedges Executed
		- - - - - - - - Dollars per cwt. - - - - - - - -				
0)	Cash	3.26	35.54	13.59	-4.21	
1)[a]	Localized Futures Exceeds Breakeven Price	5.47	16.21	13.73	1.87	7
2)[a]	Same as 1, First Margin Call	2.74	39.03	12.47	-5.30	7
3)[a]	Same as 1, Second Margin Call	3.27	27.62	11.27	-4.87	7
10)	Localized Futures Exceeds Breakeven Price + $2.00	5.67	15.99	13.73	1.87	7
11)	Same as 10, First Margin Call	2.70	39.28	12.47	-5.30	7
12)	Same as 10, Second Margin Call	4.31	23.63	11.27	-4.87	7
13)	Localized Futures Exceeds Breakeven Price + $3.00	6.36	13.22	13.73	3.13	7
14)	Same as 13, First Margin Call	5.19	24.16	12.47	-3.92	7
15)	Same as 13, Second Margin Call	5.85	8.23	11.27	3.28	7

Table 23 (Continued)

No.	Strategy	Mean	Variance	Maximum	Minimum	Number of Hedges Executed
		- - - - - - - - Dollars per cwt. - - - - - - - -				
16)	Localized Futures Exceeds Breakeven Price + $5.00	3.33	36.21	13.73	-4.21	3
17)	Same as 16, First Margin Call	2.83	30.64	12.47	-4.21	3
18)	Same as 16, Second Margin Call	2.74	27.51	11.27	-4.21	3
19)	Localized Futures Exceeds Cash Price	5.01	26.66	14.73	-0.97	7
20)	Same as 19, First Margin Call	3.69	31.07	12.27	-5.33	7
21)	Same as 19, Second Margin Call	2.99	26.22	9.56	-6.13	7
22)	Localized Futures Exceeds Cash Price + $1.00	6.18	25.10	16.43	1.43	7
23)	Same as 22, First Margin Call	4.10	26.22	11.26	-5.33	7
24)	Same as 22, Second Margin Call	5.16	10.03	11.26	1.34	7
25)	Localized Futures Exceeds Cash Price + $2.00	4.31	26.11	13.59	-2.95	3
26)	Same as 25, First Margin Call	4.17	24.39	13.59	-2.95	3
27)	Same as 25, Second Margin Call	3.96	24.35	13.59	-2.95	3

[a]Same results apply to localized futures exceeds breakeven price + $.50 and $1.00.

Table 24. Mean and Variance of Net Returns, Maximum and Minimum Net Return Levels, Total, Average, and Maximum and Minimum Number of Hedges Executed for the Summer Operation Beginning May 15 and Ending November 1, Using Specified Moving Average Hedging Strategies, Tennessee, 1973-1979

No.	Strategy	Mean	Variance	Maximum	Minimum	Number of Hedges Executed	Average Number of Hedges	Maximum/ Minimum Number of Hedges
		- - - - - Dollars per cwt. - - - - -					- - Executed per year - -	
0)	Cash	3.26	35.54	13.59	-4.21			
28)	4-8	8.01	37.62	16.85	1.26	49	7.0	10 / 5
29)	5-10	6.65	56.74	17.73	-4.04	41	5.8	8 / 4
30)	3-4-8	7.63	40.50	16.52	1.26	42	6.0	9 / 4
31)	4-8W	7.78	43.18	17.47	0.80	63	9.0	14 / 4
32)	3-4-8W	7.91	36.36	16.03	0.89	46	6.6	9 / 4
33)	4W-4-8W	8.37	41.16	17.92	0.82	43	6.1	9 / 4
34)	4-8 with 5¢ Penetration	8.15	43.87	18.22	0.19	41	5.8	7 / 4
35)	5-10 with 4¢ Penetration	6.78	57.62	17.73	-4.04	35	5.0	6 / 4
36)	3-4-8 with 2¢ Penetration	8.06	43.51	18.22	1.26	40	5.7	9 / 4
37)	4-8W with 5¢ Penetration	7.78	51.91	18.56	0.87	49	7.0	10 / 4
38)	3-4-8W with 2¢ Penetration	7.79	39.62	15.70	0.12	44	6.3	9 / 4
39)	4W-4-8W with 2¢ Penetration	7.95	47.54	17.92	0.12	43	6.1	9 / 4

Table 25. Mean and Variance of Net Returns, Maximum and Minimum Net Return Levels, Total, Average and Maximum and Minimum Number of Hedges Executed for the Summer Operation Beginning May 15 and Ending November 1, Using Specified Point-and-Figure Hedging Strategies, Tennessee, 1973-1979

No.	Strategy	Mean	Variance	Maximum	Minimum	Number of Hedges Executed	Average Number of Hedges	Maximum/ Minimum Number of Hedges
		- - - - - Dollars per cwt. - - - - -					- - Executed per year - -	
0)	Cash	3.26	35.54	13.59	-4.21			
40)	5¢ Box, 5 Reversal	9.29	28.00	15.27	4.18	33	4.7	6 / 3
41)	5¢ Box, 5 Reversal w/ 65¢ Stop	7.13	26.43	15.27	2.26	39	5.6	7 / 3
42)	5¢ Box, 5 Reversal w/ $1.50 Trailing Stop	8.08	31.17	19.06	3.85	46	6.6	10 / 4
43)	15¢ Box, 1 Reversal	8.88	22.42	15.27	4.18	33	4.7	6 / 3
44)	15¢ Box, 1 Reversal w/ 30¢ Stop	6.37	18.93	15.27	2.26	42	6.0	9 / 3
45)	15¢ Box, 1 Reversal w/ $1.35 Trailing Stop	7.73	31.90	18.18	3.31	47	6.7	10 / 3
46)	20¢ Box, 1 Reversal	9.07	29.75	15.27	3.68	33	4.7	6 / 3
47)	20¢ Box, 1 Reversal w/ 75¢ Stop	7.14	28.88	15.27	2.09	38	5.4	7 / 3
48)	20¢ Box, 1 Reversal w/ $1.35 Trailing Stop	7.89	35.69	19.06	3.31	48	6.8	10 / 4

Figure 12. Mean and Variance for the Summer Operation Beginning May 15 and Ending November 1, Using Specified Hedging Strategies, Tennessee, 1973-1979

0) Cash

1) Localized Futures Greater Than Breakeven
2) Same as 1, First Margin Call
3) Same as 1, Second Margin Call
4) Localized Futures Greater Than Breakeven + $ .50
5) Same as 4, First Margin Call
6) Same as 4, Second Margin Call
7) Localized Futures Greater Than Breakeven + $1.00
8) Same as 7, First Margin Call
9) Same as 7, Second Margin Call
10) Localized Futures Greater Than Breakeven + $2.00
11) Same as 10, First Margin Call
12) Same as 10, Second Margin Call
13) Localized Futures Greater Than Breakeven + $3.00
14) Same as 13, First Margin Call
15) Same as 13, Second Margin Call
16) Localized Futures Greater Than Breakeven + $5.00
17) Same as 16, First Margin Call
18) Same as 16, Second Margin Call

19) Localized Futures Greater Than Cash
20) Same as 18, First Margin Call
21) Same as 19, Second Margin Call
22) Localized Futures Greater Than Cash + $1.00
23) Same as 22, First Margin Call
24) Same as 22, Second Margin Call
25) Localized Futures Greater Than Cash + $2.00
26) Same as 25, First Margin Call
27) Same as 25, Second Margin Call

28) 4-8
29) 5-10
30) 3-4-8
31) 4-8W
32) 3-4-8W
33) 4W-4-8W
34) 4-8 with 5¢ Penetration
35) 5-10 with 2¢ Penetration
36) 3-4-8 with 2¢ Penetration
37) 4-8W with 5¢ Penetration
38) 3-4-8W with 2¢ Penetration
39) 4W-4-8W with 2¢ Penetration

40) 5¢ Box, 5 Reversal
41) 5¢ Box, 5 Reversal w/ 65¢ Stop
42) 5¢ Box, 5 Reversal w/ $1.50 Trailing Stop
43) 15¢ Box, 1 Reversal
44) 15¢ Box, 1 Reversal w/ 30¢ Stop
45) 15¢ Box, 1 Reversal w/ $1.35 Trailing Stop
46) 20¢ Box, 1 Reversal
47) 20¢ Box, 1 Reversal w/ 75¢ Stop
48) 20¢ Box, 1 Reversal w/ $1.35 Trailing Stop

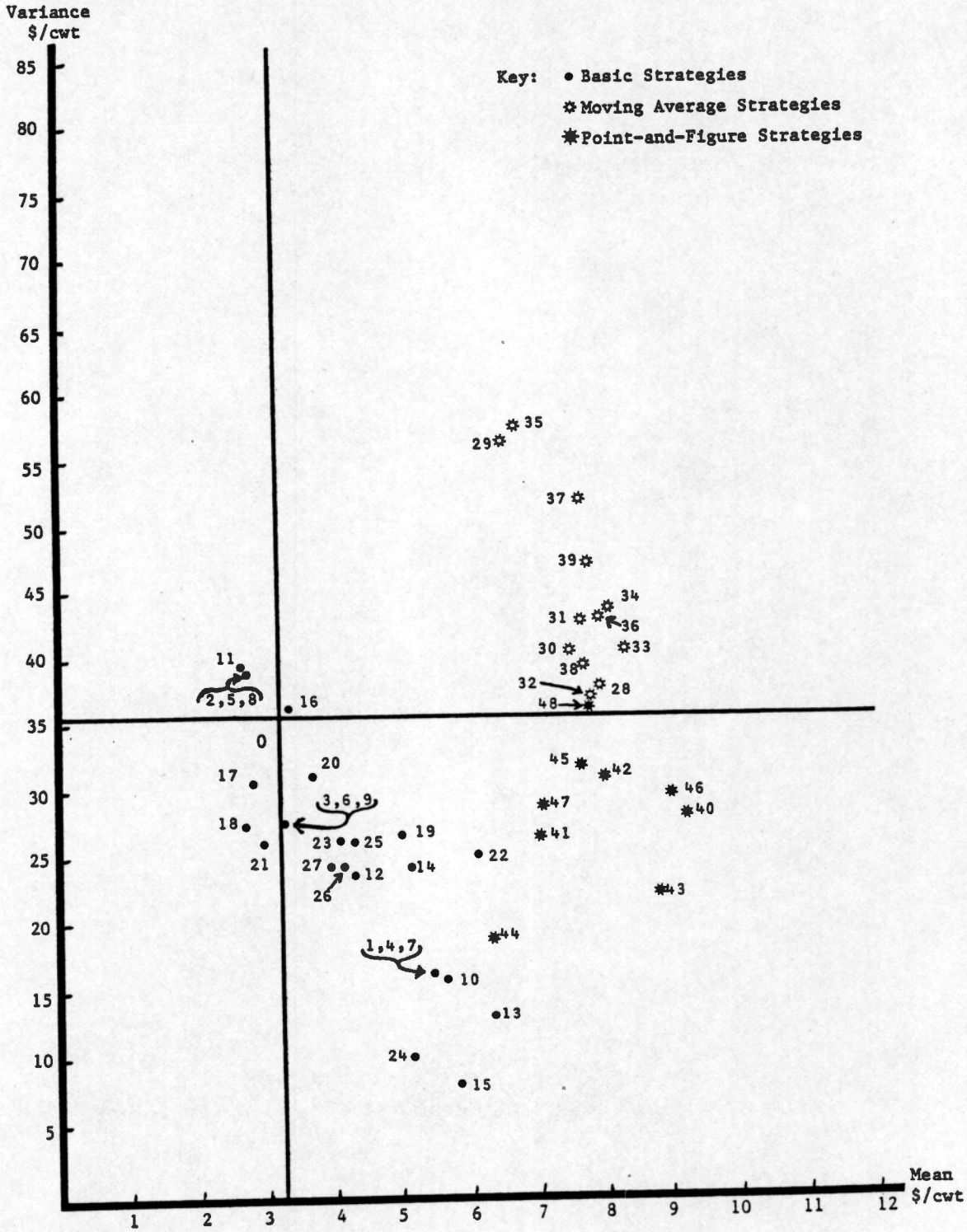

Variance
$/cwt
Key: • Basic Strategies
✡ Moving Average Strategies
✱ Point-and-Figure Strategies
85
80
75
70
65
60
55
50
45
40
35
30
25
20
15
10
5
1
2
3
4
5
6
7
8
9
10
11
12
Mean
$/cwt
0
2,5,8
3,6,9
1,4,7

Figure 12

prices were improved by adding up to $1.00. Additional increments beyond these two levels decreased mean returns for all the strategies.

Moving Average Hedging Strategies

The results in Table 24 and Figure 12 show that all of the moving average hedging strategies fell into the "indeterminate" category. All the strategies yielded higher mean returns, but they also yielded higher variances. The penetration rule improved the mean returns for the 4-8, 5-10, and the 3-4-8 moving average strategies.

Point-and-Figure Hedging Strategies

Inspection of Table 25 and Figure 12 reveals that all of the point-and-figure hedging strategies, except strategy number 48, were superior to the cash market. Strategy 48 fell into the "indeterminate" category, since, despite yielding a higher mean, it also produced a higher variance. The addition of both the stop and trailing stop rules failed to increase the overall mean return in any of the strategies. In general, the point-and-figure strategies again produced about the same mean returns as did the moving average strategies, but they did so with a lower variance.

VII. Summary Analysis of the Summer Backgrounding Operations Combined

The mean and variance of net returns for the hedging strategies tested in all three summer operations were combined in Tables 26, 27, and 28 to yield overall mean and variance of net returns for the

Table 26. Summary Analysis of Mean and Variance of Net Returns, Maximum and Minimum Net Return Levels, and Number of Hedges Executed for the Summer Operations Combined, Using Specified Basic Hedging Strategies, Tennessee, 1973-1979

No.	Strategy	Mean	Variance	Maximum	Minimum	Number of Hedges Executed
		- - - - - - - - Dollars per cwt. - - - - - - - -				
0)	Cash	4.07	57.65	16.70	-11.16	
1)[a]	Localized Futures Exceeds Breakeven Price	5.93	7.60	13.73	1.87	21
2)[a]	Same as 1, First Margin Call	4.81	45.61	15.40	-10.85	21
3)[a]	Same as 1, Second Margin Call	6.01	21.40	14.94	-4.87	21
10)	Localized Futures Exceeds Breakeven Price + $2.00	5.66	9.19	13.73	-0.12	21
11)	Same as 10, First Margin Call	4.47	46.62	15.40	-10.85	21
12)	Same as 10, Second Margin Call	6.03	20.44	14.94	-4.87	21
13)	Localized Futures Exceeds Breakeven Price + $3.00	5.95	8.18	13.73	-0.12	20
14)	Same as 13, First Margin Call	5.29	40.25	15.40	-10.85	20
15)	Same as 13, Second Margin Call	6.54	14.56	14.94	-0.12	20

Table 26 (Continued)

No.	Strategy	Mean	Variance	Maximum	Minimum	Number of Hedges Executed
		- - - - - - - - Dollars per cwt. - - - - - - - -				
16)	Localized Futures Exceeds Breakeven Price + $5.00	4.92	23.47	13.73	-4.21	13
17)	Same as 16, First Margin Call	4.81	45.84	15.58	-10.85	13
18)	Same as 16, Second Margin Call	5.65	30.07	14.82	-4.21	13
19)	Localized Futures Exceeds Cash Price	5.11	18.45	14.73	-5.49	21
20)	Same as 19, First Margin Call	4.62	44.98	15.58	-10.85	21
21)	Same as 19, Second Margin Call	4.90	31.10	14.94	-6.13	21
22)	Localized Futures Exceeds Cash Price + $1.00	6.12	12.08	16.43	0.80	20
23)	Same as 22, First Margin Call	5.76	35.53	15.23	-10.85	20
24)	Same as 22, Second Margin Call	6.70	11.47	13.59	0.80	20
25)	Localized Futures Exceeds Cash Price + $2.00	4.93	18.99	13.59	-3.86	13
26)	Same as 25, First Margin Call	4.89	39.74	15.78	-10.85	13
27)	Same as 25, Second Margin Call	5.49	22.94	13.83	-3.86	13

[a]Same results apply to localized futures exceeds breakeven price + $.50 and $1.00.

Table 27. Summary Analysis of Mean and Variance of Net Returns, Maximum and Minimum Net Return Levels, Total, Average, and Maximum and Minimum Number of Hedges Executed for the Summer Operations Combined, Using Specified Moving Average Hedging Strategies, Tennessee, 1973-1979

No.	Strategy	Mean	Variance	Maximum	Minimum	Number of Hedges Executed	Average Number of Hedges	Maximum/ Minimum Number of Hedges
		- - - - - Dollars per cwt.					- - Executed per year - -	
0)	Cash	4.07	57.65	16.70	-11.16			
28)	4-8	9.70	35.18	22.37	1.26	135	6.4	10 / 4
29)	5-10	8.15	43.72	19.65	-4.04	113	5.4	8 / 4
30)	3-4-8	9.30	36.22	22.15	1.26	118	5.6	9 / 3
31)	4-8W	9.05	35.61	22.05	0.80	190	9.0	14 / 4
32)	3-4-8W	9.26	32.23	22.96	0.89	133	6.3	9 / 4
33)	4W-4-8W	9.77	35.57	22.96	0.82	123	5.8	9 / 3
34)	4-8 with 5¢ Penetration	9.60	34.97	22.15	0.19	118	5.6	9 / 3
35)	5-10 with 4¢ Penetration	8.31	44.32	19.85	-4.04	98	4.7	6 / 3
36)	3-4-8 with 2¢ Penetration	9.50	37.58	22.15	1.26	115	5.5	9 / 3
37)	4-8W with 5¢ Penetration	9.69	39.76	22.19	0.87	140	6.7	10 / 4
38)	3-4-8W with 2¢ Penetration	9.20	36.49	22.35	0.12	124	5.9	9 / 3
39)	4W-4-8W with 2¢ Penetration	9.40	38.40	22.35	0.12	119	5.7	9 / 3

Table 28. Summary Analysis of Mean and Variance of Net Returns, Maximum and Minimum Net Return Levels, Total, Average, and Maximum and Minimum Number of Hedges Executed for the Summer Operations Combined, Using Point-and-Figure Hedging Strategies, Tennessee, 1973-1979

No.	Strategy	Mean	Variance	Maximum	Minimum	Number of Hedges Executed	Average Number of Hedges	Maximum/ Minimum Number of Hedges
		- - - - - Dollars per cwt. - - - - -					- - Executed per year - -	
0)	Cash	4.07	57.65	16.70	-11.16			
40)	5¢ Box, 5 Reversal	9.15	37.73	20.12	0.47	108	5.1	8 / 3
41)	5¢ Box, 5 Reversal w/ 65¢ Stop	7.90	30.89	19.25	0.91	121	5.8	8 / 3
42)	5¢ Box, 5 Reversal w/ $1.50 Trailing Stop	7.87	37.38	23.48	-1.61	138	6.6	10 / 3
43)	15¢ Box, 1 Reversal	8.59	28.03	19.44	0.47	108	5.1	9 / 3
44)	15¢ Box, 1 Reversal w/ 30¢ Stop	7.25	27.92	19.15	0.62	135	6.4	10 / 3
45)	15¢ Box, 1 Reversal w/ $1.35 Trailing Stop	7.78	31.38	22.80	-1.61	138	6.6	11 / 3
46)	20¢ Box, 1 Reversal	8.87	28.05	18.39	1.60	104	4.9	8 / 3
47)	20¢ Box, 1 Reversal w/ 75¢ Stop	7.98	29.85	19.04	0.91	114	5.4	8 / 3
48)	20¢ Box, 1 Reversal w/ $1.35 Trailing Stop	7.94	30.46	19.06	-0.48	136	6.5	10 / 3

entire simulation period. Figure 13 graphically illustrates the results expressed in these tables.

Basic Hedging Strategies

Table 26 and Figure 13 reveals that all of the basic hedging strategies were superior to the cash market. In general, this type of operation experienced a falling level of prices during each production year (Table A-6, Appendix), which meant the producer was able to execute a hedge at a higher price than that at which he was required to liquidate the same hedge. The option of lifting the hedge after the first margin call failed to yield higher overall means in any of the initial hedging strategies. However, the option of lifting the hedge after the second margin call did improve the overall mean returns in every hedging strategy except one, (localized futures exceeds cash price). Adding additional dollar increments appeared to improve the overall mean return in all strategies up to a certain level. Strategies utilizing breakeven prices appeared to yield optimal overall mean returns when a $3.00 increment was added, whereas strategies utilizing cash prices yielded optimal overall mean returns when a $1.00 increment was added. Additional dollar increments beyond these two levels had an adverse affect on the mean returns of the basic hedging strategies. This result occurred because the hedging criteria became harder to meet, thus eliminating some hedging activity, which forced the producer to rely more on the cash market. Eventually, a point would be reached where the hedging criteria would never be met, thus putting the producer completely in the cash market.

Figure 13. Overall Mean and Variance for the Combined Summer Operations

0) Cash

1) Localized Futures Greater Than Breakeven
2) Same as 1, First Margin Call
3) Same as 1, Second Margin Call
4) Localized Futures Greater Than Breakeven + $ .50
5) Same as 4, First Margin Call
6) Same as 4, Second Margin Call
7) Localized Futures Greater Than Breakeven + $1.00
8) Same as 7, First Margin Call
9) Same as 7, Second Margin Call
10) Localized Futures Greater Than Breakeven + $2.00
11) Same as 10, First Margin Call
12) Same as 10, Second Margin Call
13) Localized Futures Greater Than Breakeven + $3.00
14) Same as 13, First Margin Call
15) Same as 13, Second Margin Call
16) Localized Futures Greater Than Breakeven + $5.00
17) Same as 16, First Margin Call
18) Same as 16, Second Margin Call

19) Localized Futures Greater Than Cash
20) Same as 19, First Margin Call
21) Same as 19, Second Margin Call
22) Localized Futures Greater Than Cash + $1.00
23) Same as 22, First Margin Call
24) Same as 22, Second Margin Call
25) Localized Futures Greater Than Cash + $2.00
26) Same as 25, First Margin Call
27) Same as 25, Second Margin Call

28) 4-8
29) 5-10
30) 3-4-8
31) 4-8W
32) 3-4-8W
33) 4W-4-8W
34) 4-8 with 5¢ Penetration
35) 5-10 with 4¢ Penetration
36) 3-4-8 with 2¢ Penetration
37) 4-8W with 5¢ Penetration
38) 3-4-8W with 2¢ Penetration
39) 4W-4-8W with 2¢ Penetration

40) 5¢ Box, 5 Reversal
41) 5¢ Box, 5 Reversal w/ 65¢ Stop
42) 5¢ Box, 5 Reversal w/ $1.50 Trailing Stop
43) 15¢ Box, 1 Reversal
44) 15¢ Box, 1 Reversal w/ 30¢ Stop
45) 15¢ Box, 1 Reversal w/ $1.35 Trailing Stop
46) 20¢ Box, 1 Reversal
47) 20¢ Box, 1 Reversal w/ 75¢ Stop
48) 20¢ Box, 1 Reversal w/ $1.35 Trailing Stop

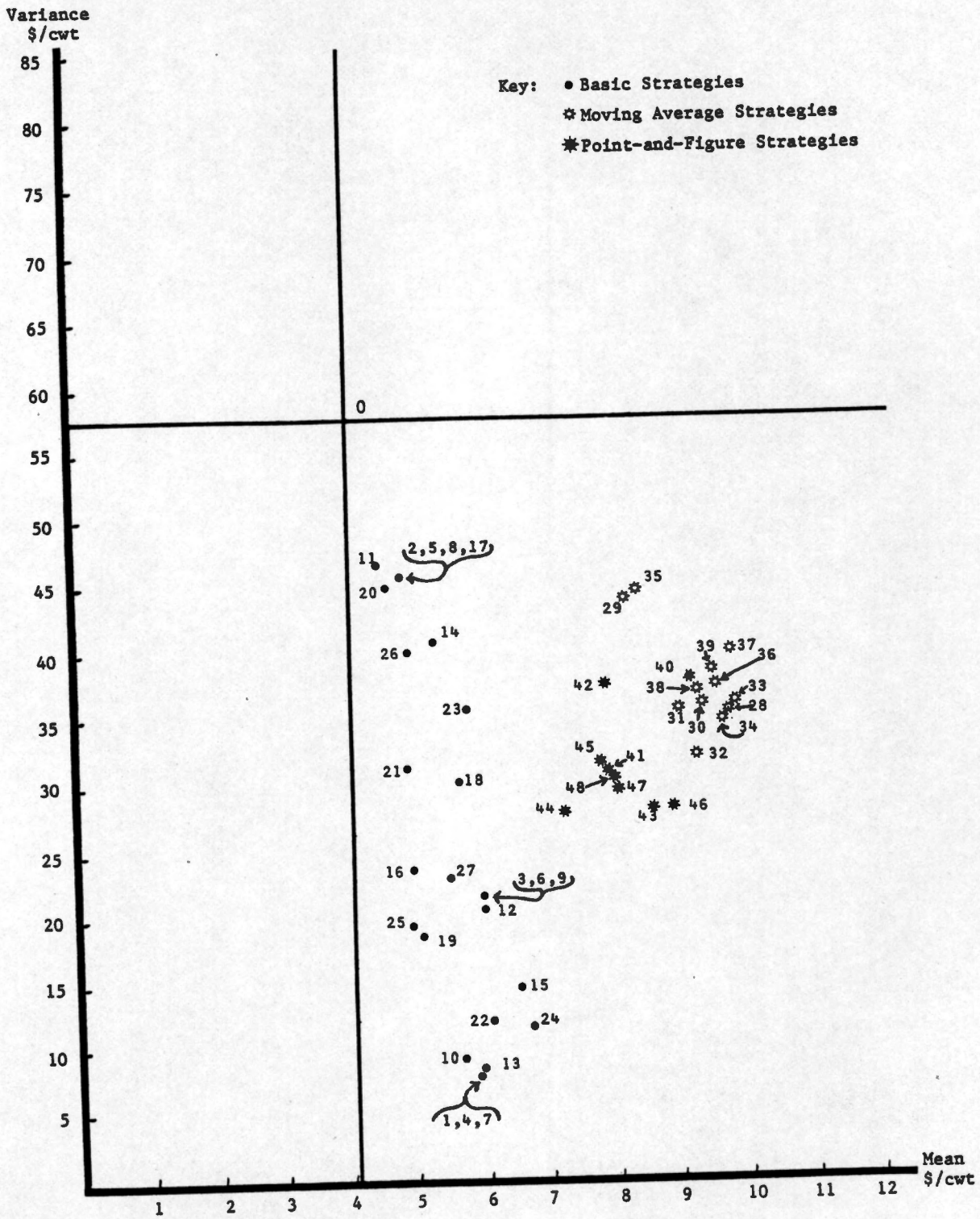

Variance
$/cwt
85
80
75
70
65
60
55
50
45
40
35
30
25
20
15
10
5
0
Key: • Basic Strategies
✡ Moving Average Strategies
✱ Point-and-Figure Strategies
11
2,5,8,17
20
35
29
14
26
39
37
36
40
42
38
33
23
28
31
30
34
45
41
32
21
18
48
47
44
43
46
16
27
3,6,9
12
25
19
15
22
24
10
13
1,4,7
1
2
3
4
5
6
7
8
9
10
11
12
Mean
$/cwt

Figure 13

Moving Average Hedging Strategies

Inspection of Table 27 and Figure 13 shows that all of the moving average strategies were superior to the cash market. Actually, all the strategies yielded mean returns which were more than twice that of the cash market. The penetration rule yielded higher mean returns in the 5-10, 3-4-8 and 4-8W moving average strategies. It yielded lower means with higher variances in the 3-4-8W and 4W-4-8W moving average strategies.

Point-and-Figure Hedging Strategies

Examination of Table 28 and Figure 13 revealed that all of the point-and-figure hedging strategies were superior to the cash market. The use of stop and trailing stop rules did not increase the overall mean return of any of the strategies and in some cases it actually yielded higher variances. The overall results for the point-and-figure hedging strategies generally showed slightly lower means and variances compared to the overall results for the moving average strategies.

CHAPTER V

SUMMARY, CONCLUSIONS, AND IMPLICATIONS

I. Summary

During the past decade livestock producers have experienced not only increased production costs but highly variable livestock prices as well. This situation creates the need for a management tool which can help protect producers from adverse price fluctuations, especially producers of feeder cattle who typically operate on narrow profit margins.

Hedging is a risk management tool which, when properly used, may offer producers the assistance they need in protecting themselves from adverse price fluctuations, allowing them to better maintain a financially sound and profitable operation. Despite growing research and literature indicating hedging as a successful marketing alternative, less than 10 percent of U.S. farmers with annual gross commodity sales greater than $10,000 had used the futures market during 1972-1976 [11]. Only 5.3 percent of the Southeastern farmers could make this same claim.

In an effort to better inform feeder cattle backgrounders in Tennessee about the use of the futures market, this research specifically addressed questions pertaining to the profitability and reliability of alternative hedging strategies as applied to their operations and local markets. The general objective of this study was to determine whether hedging was a viable management tool to help the producer increase net returns and/or reduce price risk. The specific objectives were: (1) to evaluate several variations of basic futures market hedging strategies, moving average hedging strategies, and point-and-figure analysis hedging strategies to determine the mean and variance of net returns for each

strategy for Tennessee feeder cattle backgrounding operations using historical data, and (2) to identify the optimal pricing strategies for Tennessee feeder cattle backgrounding operators over the recent past using net returns and variability of net returns criteria.

Two feeder cattle backgrounding operations were simulated. One operation began backgrounding feeder steers on forage in the fall and finished approximately 240 days later in the spring or early summer. The other operation started backgrounding feeder steers on pasture in the spring and ended 165 days later in the fall. Variable factors included in the models were cash and futures prices, basis estimates, and production budgets to represent the winter and summer backgrounding operations. The budgets developed reflected only variable costs rather than total cost of production. Therefore, the results of this study yielded only the net returns above or below the variable costs of production and not net profit of the operation.

The hedging strategies analyzed were selected based upon results of similar studies conducted in other localities. The actual strategies tested included basic, moving average, and point-and-figure hedging strategies. Variations of these selected strategies were also tested to determine their effect on net returns.

All analysis was conducted using mean and variance of net returns as the measures of the level of profitability and risk, respectively, which ultimately were the measures of each alternative hedging strategy's success or failure. The cash market represented an unhedged operation's strategy and thus served as a benchmark for comparison with the other strategies tested. For the analysis of this study, a superior hedge

was one which yielded a higher mean net return (greater profit) with a lower variance (less risk) when compared to the cash market.

In general, the price level for feeder cattle appeared to show a reasonably consistent seasonal pattern which reached a low in January and then continually increased until it reached annual highs in May. June usually showed a decline in price level with the market recovering in July and peaking again in August. After August the price level appeared to decrease continually through the fall months (Table A-6, Appendix). In retrospect, this seasonal price pattern had a predictable affect on the performance of the hedging strategies.

The mean-variance analysis showed that the basic hedging strategies failed to yield results superior to the cash market in the winter backgrounding operations. Typically the producer was placing a hedge in a rising market and having to lift the hedge at a higher price. This created negative returns for futures market trading activity, which limited net returns to the hedged backgrounding operation. As the marketing date moved from May to July, the number of basic hedging strategies which become inferior to the cash strategy increased. The analysis for the combined winter operations suggests that there was no substantial difference between the use of breakeven as opposed to cash prices in the basic hedging strategies. The results showed that these strategies yielded either significantly lower means and variances or means and variances slightly less than the cash market. However, some strategies actually yielded lower means and higher variances than the cash market.

The mean-variance analysis for the moving average hedging strategies for the winter backgrounding operation finishing in May, showed that all the strategies yielded slightly lower means with considerably lower variance than the cash market. As the marketing date moved from May toward July, these strategies began yielding higher means and lower variances than the cash market. For the July marketing date all the moving average strategies were superior to the cash market except strategy number 31 which yielded both a higher mean and variance than the cash market. The overall analysis for the combined winter operations suggested that all but three strategies (numbers 29, 31, 35) were superior to the cash market. The use of the penetration rules appeared to improve the overall mean return and variance of the 3-4-8 and 4-8W moving average strategies and increased the overall mean, but with a slightly higher variance, in the 3-4-8W strategy.

The mean-variance analysis for the point-and-figure hedging strategies showed that all the strategies were superior to the cash market in all three winter backgrounding operations, with the exception of strategy number 44 in the operation which marketed feeder steers on May 1. In this case, strategy 44 yielded a mean slightly less than the cash market but with 44 percent less variance. For the most part, the point-and-figure hedging strategies yielded higher means and variances than the moving average strategies, with the reverse holding true for the operation beginning in November and ending in July. The overall analysis for the combined winter operations showed that all of the point-and-figure strategies were superior to the cash market, with the majority of the strategies yielding a higher mean and variance than the moving average

strategies. The addition of the stop rule improved the overall combined mean return only with the 20¢ box size strategy, while decreasing the mean and increasing the variance in the 5¢ and 15¢ box size strategies. The addition of the trailing stop rule improved the overall mean and variance of the 15¢ box size and yielded a higher mean than the stop rule produced in the 20¢ box size.

The summer backgrounding operations for the most part were in operation during a general decline in the overall price level (Table A-7, Appendix). This situation appeared to be beneficial for the general results of the basic hedging strategies. It allowed the producer to place hedges at higher prices and lift them at lower prices. Thus, the analysis for the combined summer operations showed that all the basic hedging strategies were superior to the cash market. The strategies which held the hedge until the actual marketing date, appeared to be the best option to follow. The option of lifting the hedge after the second margin call produced slightly higher means, but it also produced considerably more variance. The option of lifting the hedge after the first margin call appeared to be the least desirable of the three summer operations simulated. However, overall it yielded results superior to the cash market.

The mean-variance analysis showed that all the moving average strategies were superior to the cash market in two of the three summer backgrounding operations. The results in the third operation, which began May 15, and ended November 1, showed that while all the moving averages yielded higher mean returns than the cash market, they also yielded higher variances. This placed all the strategies in the "indeterminate" category. The analysis for the combined summer operations

showed that all the moving average strategies yielded superior results compared to the cash market. The penetration rule increased the mean return for the 5-10, 3-4-8, and 4-8W moving averages, while it decreased the mean and increased the variance for the 3-4-8W and 4W-4-8W moving average strategies.

The mean-variance analysis for the point-and-figure hedging strategies in the summer backgrounding operations showed that all the strategies were superior to the cash market with the exception of strategy number 48 in the May to November operation. In this case, strategy 48, while producing a higher mean, also yielded a slightly higher variance than the cash market, which forced the strategy into the "indeterminate" category. As the marketing date progressed from September to November, the point-and-figure hedging strategies in general, when compared to the moving average strategies, went from yielding lower means and variances to yielding about the same level of means with a lower variance. The analysis for the combined summer operations showed that, in general, the point-and-figure strategies produced a slightly lower mean and variance than the moving average strategies. The addition of both the stop and trailing stop rules failed to increase the overall mean in all the strategies.

II. Conclusions and Implications

The results of the winter and summer backgrounding operation simulations showed that certain selective hedging strategies can be viable management tools in helping producers increase net returns and/or reduce price risk.

The basic hedging strategies appeared to be undesirable for backgrounding feeder steers from the fall to the spring or summer months. However, these strategies performed well when the producer began backgrounding steers in the spring and marketed them in the fall. The option of holding the hedge until the end of the production period appeared to be the optimal choice where the producer was marketing in the fall months.

The moving average and point-and-figure hedging strategies were superior to the cash market in almost every observation of both the summer and winter operations, and appeared to show the most promise. In general, these strategies offered the most potential to increase net returns of all strategies tested. Ignoring variance, neither the moving average or point-and-figure hedging strategies were consistent or clearly superior to one another. Therefore, the optimal strategy would ultimately be determined by the individual producer, based upon his desire for high returns and his aversion toward risk.

Thus, assuming that the market conditions during the simulation period are fairly representative of what will occur in the future and that the simulation procedures are sufficiently representative of actual Tennessee producers' operations, a producer following the conclusions from this study should be able to effectively increase his net returns with a smaller risk compared to the cash market. However, the producer should recognize that selective hedging will not increase his net returns every year, but that in the long run, average net returns should be higher with less variability.

III. Future Research Implications

Producers who utilize localized futures prices as part of their hedging criteria must rely strongly on their ability to accurately predict the basis. The 10-day, two-year moving average technique used in this study to estimate the basis was choosen as a realistic and reasonable technique. However, examination of (Table A-2, Appendix) reveals that the predicted basis did not accurately reflect the actual basis. Therefore, further research in the areas of basis analysis and prediction techniques appears to be needed in order to provide more accurate and reliable techniques for utilization by the producer.

It is common knowledge that trend-following methods of technical price analysis generate different results when applied to different commodities. Sometimes the results differ for each contract month of the same commodity. This study evaluated only a limited number of the countless possible combinations of technical price analysis hedging strategies. Therefore, further research in this area to determine the optimal combinations and variations of technical price analysis hedging strategies which will yield the greatest profitability with the least amount of risk should be pursued. In addition, new techniques and concepts which are certain to be developed in the future should be evaluated for use by producers as they become available.

LIST OF REFERENCES

LIST OF REFERENCES

1. Blau, Gerda. "Some Aspects of the Theory of Futures Trading," Selected Writings on Futures Markets, ed. by A. E. Peck, Board of Trade of the City of Chicago, Vol. II, 1977, pp. 5-40.

2. Brown, R. and W. Purcell. Price Prediction Models and Related Hedging Programs for Feeder Cattle, Oklahoma Agricultural Experiment Station Bulletin B-734, 1978.

3. Chicago Mercantile Exchange. Feeder Cattle & Beef Cattle Futures, Chicago: Chicago Mercantile Exchange, 1973.

4. Chicago Mercantile Exchange. Yearbook, Chicago: Statistical Department Chicago Mercantile Exchange, 1971-1979.

5. Ehrich, R. "Cash-Futures Price Relationship for Live Beef Cattle." American Journal Agricultural Economics, Vol. 51, Feb. 1969, pp. 26-40.

6. Farris, D. Livestock Futures and Price Management-Results of Hedging Six Consecutive Lots of Cattle and Hogs, Texas Agricultural Experiment Station Information Report 72-1, Feb. 1972.

7. Federal-State Market News Service. Nashville, Tennessee. Unpublished Weekly Price Quotations, 1971-1979.

8. Franzmann, J. "A Tool for the Hedger. Part I Technical Analysis of Futures Markets:" Oklahoma Current Farm Economics, Agricultural Experiment Station, Vol. 48, No. 4, Dec. 1975.

9. Franzmann, J. and J. Lehenbauer. Hedging Feeder Cattle With the Aid of Moving Averages. Oklahoma: Agriculture Experiment Station/ Oklahoma State University Bulletin 746, July 1979.

10. Franzmann, J. and J. Lehenbauer. Timing Feeder Cattle Hedges Through Point-and-Figure Analysis. Oklahoma: Agricultural Experiment Station/Oklahoma State University Bulletin 747, July 1979.

11. Helmuth, John. Grain Pricing, Washington, D.C.: Commodity Futures Trading Commission, 1977.

12. Hieronymus, Thomas. Economics of Futures Trading, New York, N.Y.: Commodity Research Bureau, Inc., 1977.

13. Jacobs, V. and G. Grimes. "The Cattle Cycle: What's Next?", Beef, Dec. 1979, pp. 8-14.

14. Leuthold, Raymond. Actual and Potential Use of the Livestock Futures Market by Illinois Producers, Urbana, Champaign: Department of Agricultural Economics, Agricultural Experiment Station of the University of Illinois, Dec. 1975.

15. Leuthold, Raymond and Paul Peterson. "Using the Hog Futures Market Effectively While Hedging," Journal of American Society of Farm Managers and Rural Appraisers, Vol. 44, No. 1, April 1980, pp. 6-12.

16. Leuthold, R. and W. Tomek. "Developments in the Livestock Futures Literature," Livestock Futures Research Symposium, Chicago: Chicago Mercantile Exchange, 1980, pp. 39-67.

17. Leuthold, Raymond. "The Price Performance on the Futures Market of a Nonstorable Commodity: Live Beef Cattle," Selected Writings on Futures Market, ed. by A. E. Peck. Board of Trade of the City Chicago, Vol. II, 1977, pp. 375-384.

18. Martin, J. Rod. "Beef," Another Revolution in U.S. Farming, Washington, D.C.: U.S. Department of Agriculture, 1979, pp. 85-118.

19. McCoy, J., R. Price and R. Solomon. Hog Hedging Strategies, Kansas State University Agricultural Experiment Station Bulletin 604, Sept. 1976.

20. McCoy, J. and R. Price. Cattle Hedging Strategies, Kansas State University Agricultural Experiment Station Bulletin 591, Aug. 1975.

21. Menzie, E. and T. Archer. "Hedging as a Marketing Tool for Western Cattle Feeders," Western Ag. Econ. Assoc, Proceedings, 1972, pp. 86-90.

22. Purcell, J. Southern Cattle Inventory 1945-1975 and Projected 1980-1985, Athens, Georgia: The University of Georgia College of Agriculture Experiment Stations, Research Report 326, Aug. 1979.

23. Purcell, J. "Up and Down Cattle Cycles," Livestock Breeder Journal, Vol. 27, No. 7, 1978, pp. 291-295, 308-309.

24. Purcell, W. "A Closer Look at the Long Feeder Cattle Hedge," Commodities, Aug. 1978, pp. 34-35.

25. Purcell, W. "Effective Hedging of Live Cattle," Commodities, July 1977, pp. 26-30.

26. Purcell, W., T. Hague and D. Holland. Economic Evaluation of Alternative Hedging Strategies for the Cattle Feeder, Oklahoma Agricultural Experiment Station Bulletin 13-702, Sept. 1972.

27. Rawls, Emmit. Tennessee Beef Systems Management and Marketing Options, No. 4, Spring 1977 for Summer/Fall 1977.

28. Ray, Robert and Herb Walch. Farm Planning Manual, Tennessee: Agricultural Extension Service/The University of Tennessee, Dec. 1975.

29. Russel, J. and J. Franzmann. "Oscillators As Decision Guides in Hedging Feeder Cattle: An Economic Evaluation," Southern Journal of Agricultural Economics, Vol. 11, No. 1, July 1979, p. 83.

30. Tennessee Crop Reporting Service, Tennessee Agricultural Statistics, Annual Bulletin, 1970-1979.

31. The Board of Trade Clearing Corporation, Basis-The Economics of Where & When, Chicago: Board of Trade Clearing Corporation, Undated.

32. U.S. Department of Agriculture, Agricultural Statistics 1979, Washington, D.C.: Government Printing Office, 1979.

APPENDICES

APPENDIX A

Table A-1. Initial and Maintenance Margin Data Obtained from Chicago Mercantile Exchange Officials for the Period 1972-1979

Year	Month	Day	Initial Margin		Maintenance Margin	Difference Between Initial and Maintenance Margin
			$ per contract	$ per cwt.	$ per contract	$ per cwt.
1971	November	30	400	.95	250	0.36
1973	August	6	600	1.43	400	0.48
1974	October	31	700	1.67	500	0.48
1976	March	22	600	1.43	400	0.48
1978	March	27	1000	2.30	700	0.71
1979	March	26	1500	3.57	1200	0.71

Table A-2. Monthly Breakeven Prices for the 240-Day Winter and 165-Day Summer Feeder Cattle Backgrounding Operations, Tennessee, 1972-1979

Year	Beginning Month	165 Days Summer	240 Days Winter
		- - - -Dollars per cwt. - - - -	
1972	September		37.80
	October		38.40
	November		39.81
1973	March	46.95	
	April	45.74	
	May	46.30	
	September		46.48
	October		44.68
	November		42.21
1974	March	38.59	
	April	37.16	
	May	32.71	
	September		27.38
	October		26.42
	November		24.98
1975	March	22.75	
	April	22.25	
	May	26.44	
	September		29.57
	October		29.32
	November		30.50
1976	March	33.55	
	April	36.61	
	May	35.70	
	September		34.01
	October		34.27
	November		32.44
1977	March	34.66	
	April	36.18	
	May	34.54	
	September		37.90
	October		37.08
	November		36.96

Table A-2 (Continued)

Year	Beginning Month	165 Days Summer	240 Days Winter
		- - - -Dollars per cwt. - - - -	
1978	March	46.18	
	April	48.68	
	May	51.91	
	September		58.21
	October		56.48
	November		60.00
1979	March	78.97	
	April	85.62	
	May	78.12	

Table A-3. Basis Estimates Computed Using Tennessee Auctions Cash Price Data and a Two-Year Moving Average for the First Ten-Day Period of Each Marketing Month, 1973-1979

Year	Month	Basis Estimate	Actual Basis
1973	May	-5.1563	-2.7763
	June	-2.7800	1.2360
	July	-2.3833	0.8733
	September	-4.4500	-0.9667
	October	-0.6917	-0.4875
	November	-0.7429	1.9357
1974	May	-3.9663	2.0875
	June	-0.7720	0.6417
	July	-0.7550	3.9642
	September	-2.7084	1.1283
	October	-0.5896	3.0875
	November	0.5964	2.4340
1975	May	-0.3440	3.4450
	June	0.9389	4.1900
	July	2.4188	5.3071
	September	0.0808	4.7943
	October	1.3000	3.0863
	November	2.1849	4.3083
1976	May	2.7663	1.6833
	June	2.4159	2.6188
	July	4.6357	2.5717
	September	2.9613	0.5429
	October	3.0869	0.7700
	November	3.3712	4.1457
1977	May	2.5642	2.8671
	June	3.4044	4.8800
	July	3.9394	2.9400
	September	2.6686	1.2433
	October	1.9282	0.9000
	November	4.2270	2.4688
1978	May	2.2752	1.9000
	June	3.7494	0.8300
	July	2.7559	2.4000
	September	0.8931	0.8140
	October	0.8350	1.5743
	November	3.3073	0.5486

Table A-3 (Continued)

Year	Month	Basis Estimate	Actual Basis
1979	May	2.3836	-6.4263
	June	2.8550	-6.1100
	July	2.6700	-4.7017
	September	1.0287	-0.7780
	October	1.2372	-2.7937
	November	1.5087	4.8628

Table A-4. Yearly Interest Rates Used in Calculating Budgets and Trading Costs, 1972-1979

Year	Interest Rate
1972	0.0702
1973	0.0809
1974	0.0943
1975	0.0891
1976	0.0824
1977	0.0788
1978	0.0883
1979	0.1050*

*Estimated.

Source: USDA Ag. Statistics 1979, Washington, D.C., Government Printing Office, 1979, p. 483.

Table A-5. Monthly Cash Price Index by Year, for 500-600 pound feeder steers, Tennessee, 1972-1979[a]
[Average Price = 1.000]

Month	1972	1973	1974	1975	1976	1977	1978	1979
January	0.871	1.010	1.041	0.487	0.703	0.719	0.892	1.635
February	0.848	1.117	0.986	0.426	0.777	0.779	1.006	1.806
March	0.924	1.197	0.927	0.447	0.809	0.830	1.112	1.940
April	0.840	1.145	0.892	0.586	0.904	0.871	1.165	2.038
May	0.921	1.173	0.771	0.646	0.887	0.826	1.262	1.924
June	0.890	1.111	0.689	0.680	0.850	0.771	1.226	1.764
July	0.913	1.221	0.673	0.618	0.778	0.811	1.292	1.754
August	0.930	1.335	0.667	0.606	0.786	0.852	1.324	1.746
September	0.943	1.169	0.593	0.665	0.741	0.857	1.401	1.766
October	0.960	1.097	0.476	0.689	0.741	0.833	1.388	1.706
November	0.918	1.034	0.538	0.692	0.705	0.808	1.420	1.660
December	0.915	0.968	0.497	0.717	0.731	0.838	1.531	1.619

[a]A local monthly average cash price was computed for the entire period of 1972-1979, and then divided into each yearly, monthly average cash price to yield a cash index on a month basis for 8 years.

Table A-6. Monthly Cash Price Index for 500-600 Pound Feeder Steers, for the Eight Years of the Simulation Time Period, Beginning 1972 and Ending 1979, Tennessee[a]
[Average Price = 1.000]

Month	Index
January	0.921
February	0.965
March	1.025
April	1.046
May	1.053
June	0.998
July	1.001
August	1.041
September	1.003
October	1.001
November	0.972
December	0.974

[a]A local monthly average cash price was computed for the entire period of 1972-1979, and then divided into each month's average cash price for the 1972-1979 period to yield a monthly cash index for the entire 8 years.

APPENDIX B

Table B-1. Annual Net Returns for the Winter Operation, Beginning September 1 and Ending May 1, Using Specified Basic Hedging Strategies, Moving Average Hedging Strategies, and Point-and-Figure Hedging Strategies, Tennessee, 1972-1979[a]

No.	Strategy	1973	1974	1975	1976	1977	1978	1979
		Dollars						
0)	Cash	18.20 7644.00	-5.98 -2511.60	1.74 730.80	13.43 5620.60	6.24 2620.80	20.10 8442.00	38.29 16081.80
1)[b]	Localized Futures Exceeds Breakeven Price	8.40 3565.48	1.90 799.16	1.05 441.92	2.66 1117.36	4.84 2033.27	3.95 1661.05	15.35 6448.93
2)[b]	Same as 1, First Margin Call	17.14 7201.29	-6.90 -2898.40	.81 342.56	12.71 5337.68	5.53 2323.99	19.37 8137.76	36.94 15513.61
3)[b]	Same as 1, Second Margin Call	16.54 6948.66	-7.85 -3297.81	1.05 411.92	11.46 4811.98	4.55 1911.21	18.77 7884.05	35.78 15029.43
7)	Localized Futures Exceeds Breakeven Price + $1.00	8.49 3565.48	1.90 799.16	1.05 411.92	2.66 1117.36	4.84 2033.27	4.16 1745.70	15.35 6448.93
8)	Same as 7, First Margin Call	17.14 7201.29	-6.90 -2898.40	.81 342.56	12.71 5337.68	5.53 2323.99	19.47 8179.89	36.78 15513.61
9)	Same as 7, Second Margin Call	16.54 6948.66	-7.85 -3297.81	1.05 441.92	11.46 4811.98	4.55 1911.21	18.97 7968.71	35.78 15029.43

Table B-1 (Continued)

No.	Strategy	1973	1974	1975	1976	1977	1978	1979
					Dollars			
10)	Localized Futures Exceeds Breakeven Price + $2.00	8.49 3565.48	1.90 799.16	1.05 441.92	3.26 1369.88	4.84 2033.27	5.98 2512.09	15.35 6448.93
11)	Same as 10, First Margin Call	17.14 7201.29	-6.90 -2898.40	.81 342.56	12.06 5064.50	5.53 2323.99	19.43 8159.28	36.94 15513.61
12)	Same as 10, Second Margin Call	16.54 6948.66	-7.85 -3297.81	1.05 441.92	11.28 4738.85	4.55 1911.21	18.82 7905.44	35.78 15029.43
13)	Localized Futures Exceeds Breakeven Price + $3.00	8.49 3565.48	1.90 799.16	1.05 441.92	4.51 1895.58	4.84 2033.27	7.46 3133.17	15.35 6448.93
14)	Same as 13, First Margin Call	17.14 7201.29	-6.90 -2898.40	.81 342.56	12.53 5264.54	5.53 2323.99	19.19 8061.63	36.94 15513.61
15)	Same as 13, Second Margin Call	16.54 6948.66	-7.85 -3297.81	1.05 441.92	11.48 4822.92	4.55 1911.21	18.43 7741.18	35.78 15029.43
16)	Localized Futures Exceeds Breakeven Price + $5.00	8.49 3565.48	1.90 799.16	1.86 779.76	7.24 3041.56	7.01 2946.16	11.40 4787.34	16.59 6966.72
17)	Same as 16, First Margin Call	17.14 7201.29	-6.90 -2898.40	1.86 779.76	12.53 5264.54	7.01 2946.16	18.83 7907.27	37.02 15547.21
18)	Same as 16, Second Margin Call	16.54 6948.66	-7.85 -3297.81	1.86 779.76	11.53 4844.20	7.01 2946.16	18.27 7675.83	36.07 15147.74

Table B-1 (Continued)

No.	Strategy	1973	1974	1975	1976	1977	1978	1979
					Dollars			
19)	Localized Futures Exceeds Cash Price	8.48 3565.48	1.90 799.16	1.05 441.92	2.66 1117.36	4.84 2033.27	4.16 1745.70	15.35 6448.93
20)	Same as 19, First Margin Call	17.14 7201.29	-6.90 -2898.40	.81 342.56	12.71 5337.68	5.53 2323.99	19.47 8179.89	36.94 15513.61
21)	Same as 19, Second Margin Call	16.54 6948.66	-7.85 -3297.81	1.05 441.92	11.46 4811.98	4.55 1911.21	18.97 7968.70	35.78 15029.43
22)	Localized Futures Exceeds Cash Price + $1.00	8.49 3565.48	1.90 799.16	1.05 441.92	2.66 1117.36	4.84 2033.27	4.49 1885.49	15.35 6448.93
23)	Same as 22, First Margin Call	17.14 7201.29	-6.90 -2898.40	.81 342.56	12.71 5337.68	5.53 2323.99	19.35 8126.08	36.94 15513.61
24)	Same as 22, Second Margin Call	16.54 6948.66	-7.85 -3297.81	1.05 441.92	11.46 4811.98	4.55 1911.21	18.82 7904.13	35.78 15029.43
25)	Localized Futures Exceeds Cash Price + $2.00	8.49 3565.48	1.90 799.16	1.05 441.92	4.91 2063.75	4.84 2033.27	5.58 2343.17	19.49 8186.61
26)	Same as 25, First Margin Call	17.14 7201.29	-6.90 -2898.40	.81 342.56	12.58 5285.26	5.53 2323.99	19.33 8117.02	37.29 15661.02
27)	Same as 25, Second Margin Call	16.54 6948.66	-7.85 -3297.81	1.05 441.92	11.88 4991.09	4.55 1911.21	18.72 7862.92	36.03 15133.52

Table B-1 (Continued)

No.	Strategy	1973	1974	1975	1976	1977	1978	1979
		Dollars						
28)	4-8	21.00	3.87	3.00	8.87	9.06	13.90	24.16
		8818.82	1627.32	1261.28	3724.81	3805.09	5837.96	10147.03
29)	5-10	19.78	1.71	3.45	9.83	5.95	16.96	21.68
		8309.69	720.26	1450.61	4128.71	2499.03	6870.66	9106.77
30)	3-4-8	20.79	2.85	3.00	9.45	6.59	13.85	25.51
		8731.60	1195.33	1261.28	3968.77	2767.41	5816.67	10715.11
31)	4-8W	18.74	2.34	2.17	9.43	8.46	11.89	25.83
		7869.28	983.76	912.28	3959.81	3552.96	4996.08	10848.82
32)	3-4-8W	21.56	1.95	3.95	9.76	6.56	13.92	26.00
		9057.68	817.49	1659.88	4098.43	2754.82	5844.89	10920.45
33)	4W-4-8W	21.04	3.84	3.52	9.21	8.70	13.92	23.74
		8838.73	1614.86	1480.20	3867.27	3653.63	5844.89	9971.91
34)	4-8 with 5¢ Penetration	22.29	3.69	3.65	9.15	8.63	14.72	22.79
		9360.15	1551.86	1535.16	3842.43	3624.62	6181.81	9572.30
35)	5-10 with 4¢ Penetration	21.97	2.72	3.54	8.70	5.89	16.96	22.09
		9229.42	1140.73	1487.79	3653.31	2473.97	7123.06	9276.71
36)	3-4-8 with 2¢ Penetration	21.85	3.67	3.65	8.83	5.56	14.49	24.09
		9178.28	1539.89	1534.98	3708.04	2334.42	6085.49	10119.14

Table B-1 (Continued)

No.	Strategy	1973	1974	1975	1976	1977	1978	1979
		Dollars						
37)	4-8W with 2¢	21.19	2.17	4.27	8.93	7.71	15.52	26.31
	Penetration	8899.54	912.83	1794.16	3749.87	3237.82	6517.78	11050.90
38)	3-4-8W with 2¢	23.67	2.77	4.15	8.25	5.89	15.79	26.63
	Penetration	9943.66	1162.04	1743.89	3467.43	2473.28	6630.80	11185.34
39)	4W-4-8W with 2¢	21.34	4.66	3.72	7.65	8.03	15.79	24.37
	Penetration	8962.80	1959.42	1564.21	3215.44	3372.09	6630.80	10236.79
40)	5¢ Box, 5 Reversal	21.07	10.43	2.57	10.81	5.09	14.19	33.06
		8848.65	4379.67	1079.95	4540.37	2139.16	5961.43	13886.59
41)	5¢ Box, 5 Reversal	21.37	10.43	2.62	12.21	5.09	14.03	35.46
	w/ 65¢ Stop	9874.80	4379.67	1101.65	5129.86	2139.16	5891.42	14895.62
42)	5¢ Box, 5 Reversal	20.70	7.99	2.57	13.07	8.27	14.13	37.33
	w/ $1.50 Trailing Stop	8694.21	3354.49	1079.95	5489.66	3471.93	5932.98	15679.87
43)	15¢ Box, 1 Reversal	21.07	10.43	2.37	8.39	5.92	14.60	33.06
		8851.61	4379.68	994.90	3523.38	2487.08	6131.71	13886.59
44)	15¢ Box, 1 Reversal	19.25	3.67	2.82	10.18	6.64	14.43	33.41
	w/ 30¢ Stop	8084.76	1542.99	1183.74	4277.35	2790.43	6062.01	14032.76
45)	15¢ Box, 1 Reversal	20.70	9.07	2.57	10.65	8.25	15.48	37.33
	w/ $1.35 Trailing Stop	8694.21	3808.05	1079.96	4472.66	3463.66	6502.71	15679.87

Table B-1 (Continued)

No.	Strategy	1973	1974	1975	1976	1977	1978	1979
					Dollars			
46)	20¢ Box, 1 Reversal	21.07 8851.16	10.43 4379.68	2.74 1150.80	7.51 3155.00	5.07 2130.90	14.46 6072.02	31.37 13176.68
47)	20¢ Box, 1 Reversal w/ 75¢ Stop	21.37 8974.80	10.43 4379.67	2.79 1172.53	9.92 4167.71	5.07 2130.90	14.46 6072.01	33.78 14186.43
48)	20¢ Box, 1 Reversal w/ $1.35 Trailing Stop	21.65 9093.48	8.17 3430.20	2.94 1235.88	9.77 4104.30	5.87 2467.16	15.74 6610.76	41.13 17273.49

[a]The net returns per cwt. are given as the top numbers with the bottom numbers representing the net returns for 42,000 pounds of feeder steers marketed.

[b]Same results apply to localized futures exceeds breakeven price + $ .50.

Table B-2. Annual Net Returns for the Winter Operation, Beginning October 1 and Ending June 1, Using Specified Basic Hedging Strategies, Moving Average Hedging Strategies and Point-and-Figure Hedging Strategies, Tennessee, 1972-1979[a]

No.	Strategy	1973	1974	1975	1976	1977	1978	1979
					Dollars			
0)	Cash	13.60	-13.18	4.20	13.18	3.48	25.92	32.52
		5712.00	-5535.60	1764.00	5535.60	1461.60	10886.40	13658.40
1)	Localized Futures Exceeds Breakeven Price	2.44	-.78	.52	6.15	2.28	3.22	27.82
		1023.31	-328.37	219.64	2585.24	959.03	1354.58	11683.57
2)	Same as 1, First Margin Call	12.50	-14.30	2.70	12.56	2.66	24.99	31.66
		5249.14	-6006.47	1134.45	5273.24	1117.06	10494.74	13296.05
3)	Same as 1, Second Margin Call	11.85	-15.30	1.79	11.80	1.76	24.41	30.90
		4977.72	-6426.79	750.37	4956.99	738.65	10254.55	12980.20
4)[b]	Localized Futures Exceeds Breakeven Price + 50¢	2.44	.22	.52	6.15	2.28	3.22	27.82
		1023.31	92.10	219.64	2585.24	959.03	1354.58	11683.57
5)[b]	Same as 4, First Margin Call	12.50	-14.30	2.70	12.56	2.66	24.99	31.66
		5249.14	-6006.47	1134.45	5274.24	1117.06	10494.74	13296.05
6)[b]	Same as 4, Second Margin Call	11.85	-15.41	1.79	11.80	1.76	24.41	30.90
		4977.72	-6472.56	750.37	4956.99	738.65	10254.55	12980.20

Table B-2 (Continued)

No.	Strategy	1973	1974	1975	1976	1977	1978	1979
					Dollars			
10)	Localized Futures Exceeds Breakeven Price + $2.00	2.44 1023.31	1.37 576.51	.52 219.64	6.15 2585.24	2.28 959.03	4.61 1936.03	27.82 11683.57
11)	Same as 10, First Margin Call	12.50 5294.14	-14.26 -5988.15	2.70 1134.45	12.56 5274.24	2.66 1117.06	25.25 10604.08	31.66 13296.05
12)	Same as 10, Second Margin Call	11.85 4977.72	1.37 576.51	1.79 750.37	11.80 4956.99	1.76 738.65	24.76 10399.46	30.90 12980.20
13)	Localized Futures Exceeds Breakeven Price + $3.00	2.44 1023.31	-13.18 -5535.60	1.90 798.79	6.15 2585.24	3.88 1631.58	6.75 2833.61	27.82 11683.57
14)	Same as 13, First Margin Call	12.50 5249.14	-13.18 -5535.60	3.16 1329.52	12.56 5274.24	2.82 1186.61	25.24 10601.91	31.66 13296.05
15)	Same as 13, Second Margin Call	11.85 4977.72	-13.18 -5535.60	2.54 1068.78	11.80 4956.99	2.25 947.06	23.19 9740.02	30.90 12980.00
16)	Localized Futures Exceeds Breakeven Price + $5.00	2.44 1023.31	-13.18 -5535.60	4.32 1813.39	7.66 3219.09	6.75 2834.47	10.01 4203.76	27.82 11683.57
17)	Same as 16, First Margin Call	12.50 5249.14	-13.18 -5535.60	3.53 1482.08	12.41 5211.88	6.75 2834.47	25.05 10520.85	31.66 13296.05
18)	Same as 16, Second Margin Call	11.85 4977.72	-13.18 -5535.60	4.32 1813.39	11.81 4959.56	6.75 2834.47	24.50 10289.41	30.90 12980.20

Table B-2 (Continued)

No.	Strategy	1973	1974	1975	1976	1977	1978	1979
					Dollars			
19)	Localized Futures Exceeds	2.44	-3.03	.52	6.15	2.28	2.78	27.82
	Cash Price	1023.31	-1273.84	219.64	2585.24	959.03	1166.89	11683.57
20)	Same as 19, First	12.50	-14.55	2.70	12.56	2.66	25.29	31.66
	Margin Call	5249.14	-6111.31	1134.45	5274.24	1117.06	10622.84	13296.05
21)	Same as 19, Second	11.85	-15.55	1.79	11.80	1.76	24.54	30.90
	Margin Call	4977.72	-6531.47	750.37	4956.99	738.65	10307.06	12980.20
22)	Localized Futures Exceeds	2.44	-1.78	.52	6.15	2.28	3.49	28.20
	Cash Price + $1.00	1023.31	-748.53	219.64	2585.24	959.03	1464.44	11843.74
23)	Same as 22, First	12.50	-14.30	2.70	12.56	2.66	25.25	31.44
	Margin Call	5249.14	-6006.16	1134.45	5274.24	1117.06	10604.60	13203.65
24)	Same as 22, Second	11.85	-15.30	1.79	11.80	1.76	24.68	30.53
	Margin Call	4977.72	-6426.63	750.37	4956.99	738.65	10364.42	12825.08
25)	Localized Futures Exceeds	-.55	-.78	-.52	6.76	2.28	22.67	28.02
	Cash Price + $2.00	-233.10	-328.37	219.64	2839.33	959.03	9521.40	11768.40
26)	Same as 25, First	12.98	-14.30	2.70	12.41	2.66	22.67	28.02
	Margin Call	5451.21	-6006.47	1134.45	5211.08	1117.06	9521.40	11768.40
27)	Same as 25, Second	12.23	-15.30	1.79	11.70	1.76	22.67	28.02
	Margin Call	5135.98	-6426.79	750.37	4916.27	738.65	9521.40	11768.40

Table B-2 (Continued)

No.	Strategy	1973	1974	1975	1976	1977	1978	1979
		- - - - - - - - - - - - - - - - - - Dollars - - - - - - - - - - - - - - - - - -						
28)	4-8	13.63	-1.46	3.54	11.83	5.49	18.85	30.73
		5725.60	-613.14	1487.56	4969.59	2306.27	7918.67	12908.39
29)	5-10	14.67	-3.63	.79	12.63	5.18	16.95	25.99
		6161.74	-1523.59	332.56	5205.43	2175.82	7119.78	10914.39
30)	3-4-8	13.63	-1.96	3.54	12.03	5.13	18.60	30.73
		5725.60	-822.67	1487.56	5053.73	2230.80	7813.80	12908.39
31)	4-8W	12.72	-4.07	2.23	12.15	4.78	17.14	31.22
		5343.13	-1710.28	936.15	5102.66	2006.98	7199.79	13114.66
32)	3-4-8W	15.38	-3.10	3.14	12.28	5.41	17.48	29.04
		6459.88	-1303.04	1319.04	5157.75	2272.10	7342.73	12198.06
33)	4W-4-8W	15.38	-.06	3.02	12.28	6.73	17.95	30.27
		6459.88	-25.77	1268.47	5157.75	2872.05	7540.95	12711.86
34)	4-8 with 5¢ Penetration	13.83	-1.46	2.49	12.08	5.96	18.87	29.43
		5809.42	-163.14	1045.69	5074.43	2503.80	7926.41	12361.98
35)	5-10 with 4¢ Penetration	14.90	-4.51	1.23	12.23	4.60	17.52	25.99
		6258.34	1893.67	516.49	5137.57	1931.93	7359.55	10914.39
36)	3-4-8 with 2¢ Penetration	13.88	-1.96	3.34	11.53	6.18	18.87	30.37
		5830.51	-822.67	1403.39	4843.41	2596.07	7926.41	12908.39

Table B-2 (Continued)

No.	Strategy	1973	1974	1975	1976	1977	1978	1979
		Dollars						
37)	4-8W with 5¢	14.05	-5.15	1.81	11.69	4.67	18.20	28.72
	Penetration	5901.19	-2163.25	759.05	4910.75	1961.71	7643.53	12064.78
38)	3-4-8W with 2¢	14.50	-3.83	2.86	12.83	4.77	18.35	28.14
	Pentration	6091.53	-1609.61	1201.61	5390.01	2004.11	7706.98	11819.77
39)	4W-4-8W with 2¢	13.88	-2.01	3.43	13.15	6.96	18.57	29.36
	Penetration	5830.90	-843.67	1441.01	5524.89	2924.20	7800.32	12333.58
40)	5¢ Box, 5 Reversal	15.70	-2.73	1.43	14.05	4.30	22.90	35.71
		6952.76	-1148.38	601.36	5901.21	1805.43	9617.69	14997.86
41)	5¢ Box, 5 Reversal	14.88	-4.05	.62	14.30	1.77	22.90	35.63
	w/ 65¢ Stop	6249.52	-1701.68	259.22	6007.02	742.25	9617.69	14963.32
42)	5¢ Box, 5 Reversal	15.71	-2.73	1.43	12.01	4.35	25.48	29.15
	w/ $1.50 Trailing Stop	6598.08	-1148.38	601.36	5045.10	1827.74	10702.68	12243.76
43)	5¢ Box, 1 Reversal	15.70	-2.73	.84	14.68	3.22	22.60	35.13
		6592.74	-1148.40	353.90	6163.71	1351.56	9492.38	14829.58
44)	15¢ Box, 1 Reversal	14.11	-4.05	.97	14.93	1.70	24.40	35.71
	w/ 30¢ Stop	5926.39	-1701.99	407.09	6269.50	715.61	10249.42	15000.08
45)	15¢ Box, 1 Reversal	16.58	-2.73	.84	12.64	4.08	25.18	29.15
	w/ $1.35 Trailing Stop	6963.74	-1148.40	353.90	5307.59	1712.30	10577.60	12243.76

Table B-2 (Continued)

No.	Strategy	1973	1974	1975	1976	1977	1978	1979
					Dollars			
46)	20¢ Box, 1 Reversal	15.70 6592.74	-2.73 -1148.38	.77 382.82	14.68 6163.71	4.04 1695.41	22.90 9617.45	35.31 14829.58
47)	20¢ Box, 1 Reversal	14.63 6144.61	-4.15 -1743.83	.86 360.71	14.76 6197.94	4.04 1695.41	22.90 9617.69	35.63 14963.32
48)	20¢ Box, 1 Reversal w/ $1.35 Trailing Stop	15.71 6598.08	-2.73 -1148.38	.00 1.46	12.64 5307.59	4.99 2095.80	25.48 10702.68	29.15 12243.76

[a]The net returns per cwt. are given as the top numbers with the bottom numbers representing the net returns for 42,000 pounds of feeder steers marketed.

[b]Same results apply to localized futures exceeds breakeven price + $1.00.

Table B-3. Annual Net Returns for the Winter Operation, Beginning November 1 and Ending July 1, Using Specified Basic Hedging Strategies, Moving Average Hedging Strategies and Point-and-Figure Hedging Strategies, Tennessee, 1972-1979[a]

No.	Strategy	1973	1974	1975	1976	1977	1978	1978
		- - - - - - - - - - - - - - - - - - Dollars - - - - - - - - - - - - - - - - - -						
0)	Cash	13.19	-7.71	5.71	6.25	6.06	21.79	22.75
		5539.80	-3238.20	2213.40	2625.00	2545.20	9151.80	9555.00
1)[b]	Localized Futures Exceeds	.77	-3.62	1.28	4.66	4.41	2.34	24.61
	Breakeven Price	325.65	-1521.85	536.83	1958.83	1852.81	984.72	10336.17
2)[b]	Same as 1, First	12.50	-14.30	2.70	12.56	2.66	24.99	31.66
	Margin Call	5249.14	-6006.47	1134.45	5274.24	1117.06	10494.74	13296.05
3)[b]	Same as 1, Second	11.85	-15.30	1.79	11.89	1.76	24.41	30.90
	Margin Call	4977.72	-6426.79	750.37	4956.99	738.65	10254.55	12980.20
7)	Localized Futures Exceeds	.77	-2.37	1.28	4.66	4.41	2.34	24.61
	Breakeven Price + $1.00	325.65	-996.53	536.83	1958.83	1852.81	984.72	10336.17
8)	Same as 7, First	12.50	-8.83	2.70	12.56	2.66	24.99	31.66
	Margin Call	5249.14	-3708.76	1134.45	5274.24	1117.06	10494.74	13296.05
9)	Same as 7, Second	11.85	-9.83	1.79	11.80	1.76	24.41	31.90
	Margin Call	4977.72	-4129.23	750.37	4956.99	738.65	10254.55	12980.20

Table B-3 (Continued)

No.	Strategy	1973	1974	1975	1976	1977	1978	1979
					Dollars			
10)	Localized Futures Exceeds Breakeven Price + $2.00	.77 325.65	-1.37 -576.38	1.28 537.83	4.91 2063.99	4.41 1852.81	3.45 1448.29	24.61 10336.17
11)	Same as 10, First Margin Call	11.84 4974.12	-8.83 -3709.07	3.77 1583.85	5.63 2363.64	4.84 2032.52	21.12 8870.00	21.89 9192.65
12)	Same as 10, Second Margin Call	11.04 4637.89	-9.83 -4129.39	.286 1199.77	5.12 2151.55	3.94 1654.39	20.55 8629.82	21.13 8876.80
13)	Localized Futures Exceeds Breakeven Price + $3.00	.77 325.65	-.37 -155.90	2.66 1116.99	6.62 2781.84	4.41 1852.81	5.12 2151.80	24.61 10336.17
14)	Same as 13, First Margin Call	11.84 4974.12	-8.83 -3708.91	4.23 1778.92	5.33 2238.12	4.84 2032.52	21.18 8896.78	21.89 9192.65
15)	Same as 13, Second Margin Call	11.04 4647.89	-9.94 -4175.16	3.61 1518.18	4.63 1943.15	3.94 1654.39	20.52 8618.98	21.13 8876.80
16)	Localized Futures Exceeds Breakeven Price + $5.00	.77 325.65	-7.71 -3238.20	5.07 2131.58	9.75 4095.23	7.91 3324.54	9.32 3913.01	24.61 10336.17
17)	Same as 16, First Margin Call	11.84 4974.12	-7.71 -3238.20	.460 1931.48	5.33 2238.05	5.39 2263.14	21.02 8827.22	21.89 9192.65
18)	Same as 16, Second Margin Call	11.04 4637.89	-7.71 -3238.20	3.91 1644.18	4.78 2006.50	4.84 2031.62	20.27 8512.07	21.13 8876.80

Table B-3 (Continued)

No.	Strategy	1973	1974	1975	1976	1977	1978	1979
		Dollars						
19)	Localized Futures Exceeds Cash Price	.77 325.65	-3.62 -1521.85	1.28 537.83	4.91 2063.99	4.41 1852.81	2.34 984.72	24.61 10336.17
20)	Same as 19, First Margin Call	11.84 4974.12	-9.08 -3813.91	3.77 1583.85	5.63 2363.64	4.84 2032.52	21.12 8869.35	21.89 9192.65
21)	Same as 19, Second Margin Call	11.04 4637.89	-10.08 -4234.07	2.86 1199.77	5.12 2151.55	3.94 1654.39	20.57 8637.82	21.13 8876.80
22)	Localized Futures Exceeds Cash Price + $1.00	.33 137.58	-2.37 -996.53	1.28 537.83	5.37 2255.88	4.41 1852.81	2.62 1098.77	24.61 10336.17
23)	Same as 22, First Margin Call	12.56 5277.69	-8.83 -3708.76	3.77 1583.85	5.58 2343.44	4.84 2032.52	21.04 8836.27	21.89 9192.65
24)	Same as 22, Second Margin Call	11.39 4786.05	-9.83 -4129.23	2.86 1199.77	4.88 2048.64	3.94 1654.39	20.29 8520.48	21.13 8876.80
25)	Localized Futures Exceeds Cash Price + $2.00	.08 33.90	-1.37 -576.38	1.28 537.83	6.25 2625.00	4.41 1852.81	4.00 1679.69	22.75 9555.00
26)	Same as 25, First Margin Call	12.32 5174.01	-8.83 -3709.07	3.77 1583.85	6.25 2625.00	4.84 2032.52	21.10 8861.21	22.75 9555.00
27)	Same as 25, Second Margin Call	11.15 4682.38	-9.83 -4129.39	2.86 1199.77	6.25 2625.00	3.94 1654.39	20.54 8629.29	22.75 9555.00

Table B-3 (Continued)

No.	Strategy	1973	1974	1975	1976	1977	1978	1979
		Dollars						
28)	4-8	15.25	3.70	4.24	8.51	5.24	19.91	31.35
		6405.01	1555.90	1781.21	3572.58	2200.66	8363.83	13165.82
29)	5-10	15.08	1.54	1.29	9.16	5.36	16.76	26.09
		6333.44	645.13	542.04	3845.70	2250.27	7039.62	10959.63
30)	3-4-8	15.25	3.20	4.24	8.17	5.06	19.91	31.57
		6405.01	1346.37	1781.21	3656.72	2125.19	8363.83	13257.78
31)	4-8W	13.36	.52	3.30	7.92	5.60	18.32	31.84
		5611.35	219.67	1385.55	3327.51	2351.32	7695.08	13372.09
32)	3-4-8W	15.02	1.49	4.21	8.05	6.23	18.79	29.87
		6308.50	626.91	1768.44	3382.60	2616.44	7892.63	12547.45
33)	4W-4-8W	15.02	5.10	4.09	8.05	6.23	19.01	31.10
		6308.50	2143.27	1717.87	3382.60	2616.44	7985.98	13061.26
34)	4-8 with 5¢ Penetration	15.22	4.70	3.19	8.75	5.71	18.36	30.26
		6392.50	1975.74	1339.35	3677.42	2398.06	7712.12	12711.37
35)	5-10 with 4¢ Penetration	14.81	1.96	1.46	8.76	5.24	17.06	22.65
		6220.22	821.69	614.13	3677.83	2200.53	7166.41	9512.38
36)	3-4-8 with 2¢ Penetration	15.27	3.20	4.04	8.20	5.93	19.66	31.57
		6413.59	1346.37	1697.04	3446.40	2490.33	8258.70	13257.78

Table B-3 (Continued)

No.	Strategy	1973	1974	1975	1976	1977	1978	1979
		Dollars						
37)	4-8W with 5¢	14.97	1.01	2.51	8.37	5.74	17.69	29.34
	Penetration	6286.88	425.63	1052.70	3513.74	2410.92	7429.24	12322.21
38)	3-4-8W with 2¢	15.89	1.33	3.56	9.51	5.84	19.19	28.29
	Penetration	6674.61	559.24	1495.27	3993.00	2453.32	8060.39	12169.17
39)	4W-4-8W with 2¢	15.27	3.15	4.13	9.38	6.71	19.41	30.20
	Penetration	6413.98	1325.37	1734.67	4127.88	2818.46	8153.74	12682.97
40)	5¢ Box, 5 Reversal	13.42	2.43	2.50	12.39	4.89	17.64	25.45
		5634.70	1020.66	1050.76	5204.36	2052.21	7409.34	10689.63
41)	5¢ Box, 5 Reversal	12.60	1.11	1.69	12.64	3.26	17.64	25.37
	w/ 65¢ Stop	5291.47	467.05	708.62	5310.17	1367.17	7409.34	10655.08
42)	5¢ Box, 5 Reversal	13.43	1.56	2.50	9.16	4.94	20.76	22.74
	w/ $1.50 Trailing Stop	5640.02	656.84	1050.76	3845.21	2074.52	8719.54	9549.20
43)	15¢ Box, 1 Reversal	13.42	2.43	1.91	12.72	3.81	17.64	25.05
		5634.68	1020.64	803.30	5340.97	1598.23	7409.09	10521.35
44)	15¢ Box, 1 Reversal	11.01	1.11	2.04	11.77	2.29	19.44	23.58
	w/ 30¢ Stop	4624.92	467.05	856.49	4943.76	962.39	8166.15	9901.98
45)	15¢ Box, 1 Reversal	14.30	1.56	1.91	9.48	4.66	20.76	22.74
	w/ $1.35 Trailing Stop	6005.69	656.84	803.30	3891.84	1956.60	8719.54	9549.20

Table B-3 (Continued)

No.	Strategy	1973	1974	1975	1976	1977	1978	1979
		Dollars						
46)	20¢ Box, 1 Reversal	13.02	2.43	1.84	13.02	4.62	17.64	25.05
		5467.60	1020.66	773.22	5466.85	1942.08	7409.09	10521.35
47)	20¢ Box, 1 Reversal w/ 75¢ Stop	11.95	1.01	1.93	13.10	4.62	17.64	25.37
		5019.51	424.89	810.11	5501.10	1942.08	7409.34	10654.66
48)	20¢ Box, Reversal w/ $1.35 Trailing Stop	13.03	1.56	1.07	9.78	5.58	20.76	22.74
		5473.10	656.84	450.86	4107.70	2342.58	8719.54	9549.20

[a]The net returns per cwt. are given as the top numbers with the bottom numbers representing the net return for 42,000 pounds of feeder steers marketed.

[b]Same results apply to localized futures exceeds breakeven price + $ .50.

Table B-4. Annual Net Returns for the Summer Operation, Beginning March 15 and Ending September 1, Using Specified Basic Hedging Strategies, Moving Average Hedging Strategies, and Point-and-Figure Hedging Strategies, Tennessee, 1973-1979[a]

No.	Strategy	1973	1974	1975	1976	1977	1978	1979
		Dollars						
0)	Cash	11.55 4851.00	-9.97 -4187.40	7.75 3255.00	2.95 1239.00	5.34 2242.80	16.32 6854.40	5.53 2322.60
1)[b]	Localized Futures Exceeds Breakeven Price	8.39 3525.45	5.60 2351.24	2.36 991.96	5.72 2400.95	6.97 2926.48	6.02 2529.14	8.62 3618.98
2)[b]	Same as 1, First Margin Call	10.74 4509.52	-10.85 -4556.42	6.68 2805.43	1.57 661.19	4.71 1980.30	15.39 6466.23	4.43 1859.47
3)[b]	Same as 1, Second Margin Call	10.30 4328.38	5.60 2351.24	6.13 2573.90	.62 261.39	3.81 1601.51	14.93 6262.81	3.62 1522.91
16)	Localized Futures Exceeds Breakeven Price + $5.00	8.39 3525.45	5.60 2351.24	3.31 1391.13	9.33 3919.80	5.34 2242.80	6.79 2853.11	13.57 5697.85
17)	Same as 16, First Margin Call	10.74 4509.52	-10.85 -4556.42	7.08 3973.08	2.03 850.95	5.34 2242.80	14.63 6145.65	13.57 5697.85
18)	Same as 16, Second Margin Call	10.30 4328.38	5.60 2351.24	5.66 2376.16	9.33 3919.80	5.34 2242.80	13.58 5703.94	13.57 5697.85

Table B-4 (Continued)

No.	Strategy	1973	1974	1975	1976	1977	1978	1979
					Dollars			
19)	Localized Futures Exceeds Cash Price	8.39 3525.45	5.60 2351.24	2.36 991.96	5.72 2400.95	7.12 2989.71	6.02 2529.14	-0.09 -39.89
20)	Same as 19, First Margin Call	10.74 4509.52	-10.85 -4556.42	6.68 2805.43	1.57 661.19	4.71 1979.90	15.39 6466.23	2.82 1186.85
21)	Same as 19, Second Margin Call	10.30 4328.38	5.60 2351.24	6.13 2573.90	.62 261.39	3.96 1664.64	14.93 6272.81	2.82 1186.85
22)	Localized Futures Exceeds Cash Price + $1.00	8.39 3525.45	5.60 2351.24	2.36 991.96	8.65 3635.01	6.19 2599.52	5.75 2414.48	5.53 2322.60
23)	Same as 22, First Margin Call	10.74 4509.52	-10.85 -4556.42	6.68 2805.43	8.65 3635.01	4.52 1898.00	15.14 6358.50	5.53 2322.60
24)	Same as 22, Second Margin Call	10.30 4328.38	5.60 2351.24	6.13 2573.90	8.65 3635.01	6.19 2599.52	13.59 5707.02	5.53 2322.60
25)	Localized Futures Exceeds Cash Price + $2.00	8.39 3525.45	5.60 2351.24	2.36 991.96	2.95 1239.00	5.74 2412.22	11.42 4794.82	5.53 2322.60
26)	Same as 25, First Margin Call	10.74 4509.52	-10.85 -4556.42	6.68 2805.43	2.95 1239.00	4.41 1853.11	15.30 6425.05	5.53 2322.60
27)	Same as 25, Second Margin Call	10.30 4328.38	5.60 2351.24	6.13 2573.90	2.95 1239.00	5.74 2412.22	13.82 5806.94	5.53 2322.60

Table B-4 (Continued)

No.	Strategy	1973	1974	1975	1976	1977	1978	1979
					Dollars			
28)	4-8	22.37 9397.25	6.99 2934.87	7.51 3154.30	9.22 3873.98	5.02 2110.22	18.36 7710.59	11.85 4979.11
29)	5-10	19.65 8255.16	5.57 2340.78	10.22 4298.89	6.55 2752.03	3.61 1518.28	16.59 6966.54	5.79 2434.06
30)	3-4-8	22.15 9305.03	5.60 2352.17	7.81 3280.47	7.34 3084.63	5.02 2110.22	18.36 7710.59	11.85 4979.11
31)	4-8W	22.05 9262.85	7.48 3140.83	7.55 3171.97	5.05 2121.89	5.66 2379.68	17.71 7436.88	10.22 4292.49
32)	3-4-8W	22.96 9645.14	7.46 3133.21	8.19 3440.94	6.23 2617.60	5.62 2362.74	17.65 7412.16	10.09 4237.02
33)	4W-4-8W	22.96 9645.14	6.14 2577.87	6.89 2894.25	8.72 3663.02	5.62 2362.74	18.01 7463.83	11.68 4907.27
34)	4-8 with 5¢ Penetration	22.15 9305.03	7.10 2984.48	9.19 3860.77	8.42 3537.70	3.99 1677.22	16.46 6912.36	11.85 4979.11
35)	5-10 with 4¢ Penetration	19.85 8339.43	5.57 2340.78	9.49 3986.94	6.05 2542.44	4.24 1783.01	16.81 7059.50	6.79 2852.31
36)	3-4-8 with 2¢ Penetration	22.15 9305.03	5.60 2352.17	10.26 4310.69	7.34 3084.63	5.02 2110.22	18.66 7836.36	11.85 4979.11

Table B-4 (Continued)

No.	Strategy	1973	1974	1975	1976	1977	1978	1979
					Dollars			
37)	4-8W with 5¢	22.19	5.10	8.91	6.56	5.20	18.01	12.04
	Penetration	9321.83	2140.60	3742.99	2757.05	2182.54	7463.83	5055.14
38)	3-4-8W with 2¢	22.35	6.18	8.24	6.18	5.42	18.01	11.68
	Penetration	9389.38	2595.93	3461.07	2597.02	2277.96	7563.83	4907.27
39)	4W-4-8W with 2¢	22.35	5.64	7.86	6.57	5.42	18.01	11.68
	Penetration	9389.38	2367.55	3301.13	2760.98	2277.96	7563.83	4907.27
40)	5¢ Box, 5 Reversal	12.20	.47	8.74	5.32	3.28	18.98	16.95
		5123.10	198.63	3671.07	2232.76	1379.68	7972.18	7119.80
41)	5¢ Box, 5 Reversal	12.45	1.58	8.74	.91	3.79	11.71	14.81
	w/ 65¢ Stop	5228.18	662.36	3671.07	382.35	1590.47	4920.05	6220.74
42)	5¢ Box, 5 Reversal	12.29	-1.61	6.47	5.52	3.28	17.22	8.13
	w/ $1.50 Trailing Stop	5160.10	-674.77	2719.41	2317.86	1379.68	7234.26	3416.36
43)	15¢ Box, 1 Reversal	11.60	.47	7.62	6.01	3.59	8.54	16.95
		4870.83	198.45	3201.20	2525.80	1505.81	3628.93	7119.80
44)	15¢ Box, 1 Reversal	9.73	1.58	9.08	.62	2.59	8.22	14.79
	w/ 30¢ Stop	4085.78	662.36	3811.93	261.52	1086.22	3453.42	6212.34
45)	15¢ Box, 1 Reversal	11.98	-1.61	8.43	6.82	4.57	12.55	6.77
	w/ $1.35 Trailing Stop	5031.32	-674.77	3539.11	2863.04	1917.81	5272.33	2842.27

Table B-4 (Continued)

No.	Strategy	1973	1974	1975	1976	1977	1978	1979
		Dollars						
46)	20¢ Box, 1 Reversal	11.60	1.60	8.39	5.32	3.59	11.16	16.95
		4870.82	670.11	3523.88	2232.76	1505.83	4686.82	7118.49
47)	20¢ Box, 1 Reversal w/ 75¢ Stop	11.85	2.70	8.39	.91	3.79	9.64	14.79
		4975.91	1133.86	3523.90	382.35	1590.47	4048.91	6211.02
48)	20¢ Box, 1 Reversal w/ $1.35 Trailing Stop	11.98	-.48	6.53	5.52	3.59	12.55	10.97
		5031.32	-203.27	2741.63	2317.86	1505.81	5272.33	4607.14

[a]The net return per cwt. are given as the top number with the bottom numbers representing the net return for 42,000 pounds of feeder steers marketed.

[b]Same results apply to localized futures exceeds breakeven price + $.50, $1.00, $2.00, and $3.00.

Table B-5. Annual Net Returns for the Summer Operation Beginning April 15 and Ending October 1, Using Specified Basic Hedging Strategies, Moving Average Hedging Strategies, and Point-and-Figure Hedging Strategies, Tennessee, 1973-1979[a]

No.	Strategy	1973	1974	1975	1976	1977	1978	1979
0)	Cash	8.76 3679.20	-11.16 -4687.20	8.50 3570.00	-3.86 -1621.20	4.27 1793.40	16.70 7014.00	-0.12 -50.40
1)[b]	Localized Futures Exceeds Breakeven Price	6.00 2522.00	7.51 3153.28	3.36 1411.78	7.51 3156.58	8.20 3442.91	3.04 1275.50	6.86 2880.00
2)[b]	Same as 1, First Margin Call	8.19 3439.71	7.51 3153.28	7.87 3307.86	-4.63 -1945.15	8.20 3442.91	15.23 6395.65	6.86 2880.00
3)[b]	Same as 1, Second Margin Call	7.24 3040.62	7.51 3153.28	7.37 3096.82	7.51 3156.58	8.20 3442.91	13.67 5742.99	6.86 2880.00
10)	Localized Futures Exceeds Breakeven Price + $2.00	6.00 2522.00	7.51 3153.28	3.36 1411.78	7.51 3156.58	8.20 3442.91	3.04 1275.50	-0.12 -50.40
11)	Same as 10, First Margin Call	8.19 3439.71	7.51 3153.28	7.87 3307.86	-4.63 -1945.15	8.20 3442.91	15.23 6395.65	-0.12 -50.40
12)	Same as 10, Second Margin Call	7.24 3040.62	7.51 3153.28	7.37 3096.82	7.51 3156.58	8.20 3442.91	13.67 5742.99	-0.12 -50.40

Table B-5 (Continued)

No.	Strategy	1973	1974	1975	1976	1977	1978	1979
					Dollars			
13)	Localized Futures Exceeds Breakeven Price + $3.00	6.00 2522.00	7.51 3153.28	3.36 1411.78	7.51 3156.58	8.20 3442.91	4.39 1843.45	-0.12 -50.40
14)	Same as 13, First Margin Call	8.19 3439.71	7.51 3153.28	7.87 3307.86	-4.63 -1945.15	8.20 3442.91	15.03 6310.94	-0.12 -50.40
15)	Same as 13, Second Margin Call	7.24 3040.62	7.51 3153.28	7.37 3096.82	7.51 3156.58	8.20 3442.91	13.72 5764.23	-0.12 -50.40
16)	Localized Futures Exceeds Breakeven Price + $5.00	6.45 2711.09	7.51 3153.28	5.45 2289.51	-5.45 -1621.20	-3.86 1793.40	4.27 3337.30	-0.12 -50.40
17)	Same as 16, First Margin Call	7.69 3229.71	7.51 3153.28	7.55 3169.96	-3.86 -1621.20	4.27 1793.40	15.58 7543.13	-0.12 -50.40
18)	Same as 16, Second Margin Call	7.29 3060.99	7.51 3153.28	6.19 2601.74	-3.86 -1621.20	4.27 1793.40	14.82 6226.70	-0.12 -50.40
19)	Localized Futures Exceeds Cash Price	9.31 3911.86	7.51 3153.28	3.36 1411.78	6.38 2678.39	8.20 3442.91	7.94 3337.30	-5.49 -2307.54
20)	Same as 19, First Margin Call	7.96 3344.44	7.51 3153.28	7.87 3307.86	-4.53 -1902.74	8.20 3442.91	15.58 6543.13	-2.51 -1055.95
21)	Same as 19, Second Margin Call	7.26 3050.35	7.51 3153.28	7.37 3096.82	-5.15 -2163.82	8.20 3442.91	14.82 6226.70	-2.51 -1055.95

Table B-5 (Continued)

No.	Strategy	1973	1974	1975	1976	1977	1978	1979
					Dollars			
22)	Localized Futures Exceeds Cash Price + $1.00	9.31 3911.86	7.51 3153.28	3.36 1411.78	4.39 1843.61	8.20 3442.91	9.15 3842.48	0.79 334.08
23)	Same as 22, First Margin Call	7.96 3344.44	7.51 3153.28	7.87 3307.86	4.39 1843.61	8.20 3442.91	15.23 6395.65	0.79 334.08
24)	Same as 22, Second Margin Call	7.26 3050.35	7.51 3153.28	7.37 3096.82	4.39 1843.61	8.20 3442.91	13.12 5512.70	0.79 334.08
25)	Localized Futures Exceeds Cash Price + $2.00	9.31 3911.86	7.51 3153.28	3.36 1411.78	-3.86 -1621.20	5.61 2356.17	9.70 4074.19	-0.12 -50.40
26)	Same as 25, First Margin Call	7.96 3344.44	7.51 3153.28	7.87 3307.86	-3.86 -1621.20	3.60 1511.87	15.78 6627.36	-0.12 -50.40
27)	Same as 25, Second Margin Call	7.26 3050.35	7.51 3153.28	7.37 3096.82	-3.86 -1621.20	5.61 2356.17	13.68 5744.41	-0.12 -50.40
28)	4-8	14.49 6086.83	6.25 2624.97	10.45 4390.84	5.02 2110.35	4.93 2072.16	19.14 8040.03	5.92 2487.73
29)	5-10	13.86 5821.87	4.19 1759.29	11.76 4940.17	5.40 2269.95	5.47 2297.77	17.89 7514.55	-2.05 -862.56
30)	3-4-8	14.41 6053.32	6.25 2624.97	10.15 4275.01	4.16 1749.43	4.80 2017.69	18.01 7565.66	4.92 2487.73

Table B-5 (Continued)

No.	Strategy	1973	1974	1975	1976	1977	1978	1979
					Dollars			
31)	4-8W	14.18	5.59	8.69	4.66	4.99	17.31	4.39
		5956.49	2347.77	3641.81	1958.05	2097.36	7272.37	1843.82
32)	3-4-8W	13.69	4.97	9.91	5.52	5.05	16.02	5.75
		5750.60	2087.52	4160.53	2319.94	2123.08	6727.85	2414.58
33)	4W-4-8W	15.21	4.97	10.11	5.52	5.05	18.01	7.67
		6389.18	2087.52	4244.70	2319.94	2123.08	7565.43	3222.55
34)	4-8 with 5¢	14.96	6.25	10.70	5.37	4.20	18.01	5.92
	Penetration	6284.00	2624.97	4495.66	2257.35	1765.03	7565.66	2487.73
35)	5-10 with 4¢	15.09	4.09	11.78	4.64	6.94	17.66	-2.05
	Penetration	6336.16	1717.14	4948.39	1950.61	2914.65	7418.66	-862.56
36)	3-4-8 with 2¢	15.01	6.25	9.00	3.74	4.35	18.01	5.92
	Penetration	6304.92	2624.97	3781.14	1573.30	1828.42	7565.66	2487.73
37)	4-8W with 5¢	16.11	8.32	12.70	4.10	5.27	17.70	6.82
	Penetration	6767.63	3493.89	5336.01	1723.68	2213.90	7434.99	2866.87
38)	3-4-8W with 2¢	13.79	4.97	9.10	3.41	5.12	18.53	5.75
	Penetration	5792.87	2087.52	3823.49	1434.43	2152.75	7784.30	2414.58
39)	4W-4-8W with 2¢	15.31	4.97	9.40	3.41	6.44	18.01	6.69
	Penetration	6431.45	2087.52	3949.32	1434.43	2706.62	7565.43	2311.83

Table B-5 (Continued)

No.	Strategy	1973	1974	1975	1976	1977	1978	1979
		Dollars						
40)	5¢ Box, 5 Reversal	20.12 8450.35	3.32 1393.74	6.19 2599.21	2.11 885.05	2.55 1069.54	12.27 5153.68	14.55 6111.89
41)	5¢ Box, 5 Reversal w/ 65¢ Stop	19.25 8086.60	3.32 1393.74	8.54 3587.42	2.66 1116.19	2.30 965.20	11.45 4810.46	14.55 6111.89
42)	5¢ Box, 5 Reversal w/ $1.50 Trailing Stop	23.48 9862.36	6.11 2567.01	7.14 2998.73	2.94 1235.03	3.25 1363.93	11.76 4939.07	2.71 1140.22
43)	15¢ Box, 1 Reversal	19.44 8164.76	3.32 1392.80	6.49 2725.55	4.43 1858.75	2.95 1238.33	12.27 5153.69	14.55 6111.89
44)	15¢ Box, 1 Reversal w/ 30¢ Stop	19.15 8044.75	2.07 870.15	6.43 2699.45	4.06 1706.80	2.86 1202.50	11.99 5034.01	14.55 6111.89
45)	15¢ Box, 1 Reversal w/ $1.35 Trailing Stop	22.80 9576.76	5.71 2399.63	7.84 3293.25	5.26 2208.74	3.75 1532.72	11.76 4939.07	2.71 1140.22
46)	20¢ Box, 1 Reversal	18.39 7723.72	4.44 1863.82	6.79 2851.38	5.03 2110.63	2.74 1152.77	12.27 5153.69	14.55 6111.89
47)	20¢ Box, 1 Reversal w/ 75¢ Stop	19.04 7998.23	4.44 1863.82	7.44 3124.56	4.43 1858.77	2.05 859.80	13.72 5763.39	14.55 6111.89
48)	20¢ Box, 1 Reversal w/ $1.35 Trailing Stop	21.75 9135.72	6.11 2567.00	7.77 3264.89	5.86 2460.60	2.50 1049.07	11.76 4939.07	5.09 2137.37

Table B-5 (Continued)

---

[a]The net return per cwt. are given as the top number with the bottom numbers representing the net return for 42,000 pounds of feeder steers marketed.

[b]Same results apply to localized futures exceeds breakeven price + $.50 and $1.00.

Table B-6. Annual Net Returns for the Summer Operation Beginning May 15 and Ending November 1, Using Specified Basic Hedging Strategies, Moving Average Hedging Strategies, and Point-and-Figure Hedging Strategies, Tennessee, 1973-1979[a]

No.	Strategy	1973	1974	1975	1976	1977	1978	1979
		Dollars						
0)	Cash	5.70 2394.00	-4.21 -1768.20	5.06 2125.20	-2.95 -1239.00	3.96 1663.20	13.59 5707.80	1.68 705.60
1)[b]	Localized Futures Exceeds Breakeven Price	5.59 2349.89	3.61 1515.28	1.87 785.63	2.33 977.05	6.74 2830.10	13.73 4765.30	4.41 1851.00
2)[b]	Same as 1, First Margin Call	4.81 2019.75	-5.30 -2224.84	4.28 1799.20	-4.02 1688.81	6.74 2830.11	12.47 5236.69	.17 72.54
3)[b]	Same as 1, Second Margin Call	3.98 1670.52	3.61 1515.28	3.68 1546.85	-4.87 -2046.36	6.74 2830.11	1.27 4731.74	-1.49 -626.13
10)	Localized Futures Exceeds Breakeven Price + $2.00	5.59 2349.89	3.61 1515.28	1.87 785.63	2.33 977.05	6.74 2830.10	13.73 5765.30	5.79 2433.66
11)	Same as 10, First Margin Call	4.81 2019.75	-5.30 -2224.84	4.28 1799.20	-4.02 -1688.81	6.74 2830.11	12.47 5236.69	-.10 -43.47
12)	Same as 10, Second Margin Call	3.98 1670.52	3.61 1515.28	3.68 1546.85	-4.87 -2046.36	6.74 2830.11	11.27 4731.74	5.79 2433.66

Table B-6 (Continued)

No.	Strategy	1973	1974	1975	1976	1977	1978	1979
					Dollars			
13)	Localized Futures Exceeds Breakeven Price + $3.00	5.59 2349.89	4.57 1921.52	3.13 1313.59	3.28 1376.47	6.74 2830.11	13.73 4765.30	7.46 3132.33
14)	Same as 13, First Margin Call	4.81 2019.75	4.57 1921.52	4.24 1779.58	-3.92 -1646.95	6.74 2830.11	12.47 5236.69	7.46 3132.33
15)	Same as 13, Second Margin Call	3.98 1670.52	4.57 1921.52	3.64 1527.24	3.28 1376.47	6.74 2830.11	11.27 4731.74	7.46 3132.33
16)	Localized Futures Exceeds Breakeven Price + $5.00	5.59 2349.89	-4.21 -1768.20	5.48 2303.02	-2.95 -1239.00	3.96 1663.20	13.73 5765.30	1.68 705.60
17)	Same as 16, First Margin Call	4.81 2019.75	-4.21 -1768.20	4.04 1696.45	-2.95 -1239.00	3.96 1663.20	12.47 5236.69	1.68 705.60
18)	Same as 16, Second Margin Call	3.98 1670.52	-4.21 -1768.20	5.48 2303.02	-2.95 -1239.00	3.96 1663.20	11.27 4731.74	1.68 705.60
19)	Localized Futures Exceeds Cash Price	7.20 3022.97	1.77 744.73	1.87 787.72	3.73 1568.77	6.74 2830.11	14.73 6186.01	-.97 -409.22
20)	Same as 19, First Margin Call	4.92 2067.64	-4.33 -2238.76	4.29 1801.28	3.73 1568.77	6.74 2830.11	12.27 5152.45	-.81 -341.95
21)	Same as 19, Second Margin Call	4.17 1752.55	-6.13 -2574.91	3.69 1548.93	3.73 1568.77	6.74 2830.11	9.56 4014.81	-.81 -341.95

Table B-6 (Continued)

No.	Strategy	1973	1974	1975	1976	1977	1978	1979
					Dollars			
22)	Localized Futures Exceeds Cash Price + $1.00	7.20 3022.97	3.57 1501.05	2.53 1061.24	1.34 562.69	6.74 2831.03	16.43 6901.44	5.41 2274.39
23)	Same as 22, First Margin Call	4.92 2067.64	-5.33 -2239.07	4.34 1822.45	1.34 562.69	6.74 2831.03	11.26 4730.23	5.41 2274.39
24)	Same as 22, Second Margin Call	4.17 1752.55	3.57 1501.05	3.64 1527.24	1.34 562.69	6.74 2831.03	11.26 4730.23	5.41 2274.39
25)	Localized Futures Exceeds Cash Price + $2.00	7.20 3022.97	3.88 1628.62	2.79 1172.66	-2.95 -1239.00	3.96 1663.20	13.59 5707.80	1.68 705.60
26)	Same as 25, First Margin Call	4.92 2067.64	3.88 1628.62	4.12 1730.47	-2.95 -1239.00	3.96 1663.20	13.59 5707.80	1.68 705.60
27)	Same as 25, Second Margin Call	4.17 1752.55	3.88 1628.62	3.37 1415.12	-2.95 -1239.00	3.96 1663.20	13.59 5707.80	1.68 705.60
28)	4-8	15.31 6430.01	6.12 2570.26	9.60 4032.10	2.67 1120.53	4.25 1785.11	16.85 7076.74	1.26 530.97
29)	5-10	14.35 6026.99	5.30 2224.60	7.91 3321.61	.56 235.01	4.75 1994.72	17.73 7446.34	-4.04 -1697.05
30)	3-4-8	15.68 6585.50	4.03 1691.83	9.52 3998.15	2.04 856.06	4.34 1822.78	16.52 6938.85	1.26 530.97

Table B-6 (Continued)

No.	Strategy	1973	1974	1975	1976	1977	1978	1979
		Dollars						
31)	4-8W	15.38 6459.41	5.09 2136.55	9.83 4128.35	.80 338.23	3.38 1420.89	17.47 7338.32	2.49 1046.69
32)	3-4-8W	15.38 6459.41	5.40 2269.85	10.07 4229.67	.89 372.93	4.89 2053.91	16.03 6733.29	2.71 1138.65
33)	4W-4-8W	15.38 6459.41	6.78 2846.98	10.07 4229.67	.82 343.39	4.89 2053.91	17.92 7527.09	2.71 1138.65
34)	4-8 with 5¢ Penetration	15.03 6312.59	5.90 2480.17	10.42 4377.37	3.37 1414.25	3.91 1642.05	18.22 7642.05	.19 78.68
35)	5-10 with 4¢ Penetration	14.35 6027.08	5.48 2303.61	7.77 3275.44	-.19 -80.40	6.36 2670.78	17.73 7446.34	-4.04 -1697.05
36)	3-4-8 with 2¢ Penetration	15.33 6438.68	4.47 2341.88	9.64 4049.42	2.04 856.06	4.34 1822.78	18.22 7653.32	1.26 530.97
37)	4-8W with 5¢ Penetration	15.50 6509.86	2.82 1183.15	10.77 4524.72	.87 365.49	4.97 2087.12	18.56 7795.18	.97 405.84
38)	3-4-8W with 2¢ Penetration	15.38 6459.41	4.92 2068.88	11.22 4713.02	.12 49.80	4.94 2074.91	15.70 6595.40	2.26 950.09
39)	4W-4-8W with 2¢ Penetration	15.38 6459.41	3.81 1600.06	11.22 4713.02	.12 49.80	4.94 2074.91	17.92 7527.09	2.26 950.09

Table B-6 (Continued)

No.	Strategy	1973	1974	1975	1976	1977	1978	1979
		Dollars						
40)	5¢ Box, 5 Reversal	15.27 6414.56	4.18 1757.61	7.43 3118.79	4.69 1968.24	4.33 1817.13	15.27 6413.79	13.89 5834.95
41)	5¢ Box, 5 Reversal w/ 65¢ Stop	15.27 6416.56	2.26 948.43	5.21 2186.74	4.57 1918.80	4.43 1859.92	13.75 5775.62	4.44 1864.55
42)	5¢ Box, 5 Reversal w/ $1.50 Trailing Stop	19.06 8003.38	4.26 1788.48	7.63 3202.97	5.65 2372.95	4.33 1817.13	11.80 4954.62	3.85 1618.32
43)	15¢ Box, 1 Reversal	15.27 6414.58	4.18 1757.62	7.43 3118.79	4.69 1968.25	4.73 1985.53	11.98 5030.63	13.89 5834.95
44)	15¢ Box, 1 Reversal w/ 30¢ Stop	15.27 6414.58	2.26 948.43	7.06 2966.00	4.57 1918.80	3.22 1350.55	7.47 3139.04	4.74 1991.86
45)	15¢ Box, 1 Reversal w/ $1.35 Trailing Stop	18.18 7633.64	3.31 1389.95	8.08 3393.18	4.13 1735.93	4.16 1748.49	12.40 5208.39	3.85 1618.32
46)	20¢ Box, 1 Reversal	15.27 6416.58	4.23 1778.45	6.47 2718.92	4.69 1968.25	3.68 1544.93	15.27 6413.82	13.89 5834.95
47)	20¢ Box, 1 Reversal w/ 75¢ Stop	15.27 6414.56	2.09 877.24	4.91 2060.74	2.99 1255.62	3.21 1348.05	13.75 5775.62	7.74 3249.24
48)	20¢ Box, 1 Reversal w/ $1.35 Trailing Stop	19.06 8003.38	3.31 1389.95	6.98 2929.79	3.74 1569.44	5.23 2197.50	13.08 5493.41	3.85 1618.32

Table B-6 (Continued)

---

[a]The net return per cwt. are given as the top number with the bottom numbers representing the net return for 42,000 pounds of feeder steers marketed.

[b]Same results apply to localized futures exceeds breakeven price + $.50 and $1.00.

VITA

Cregg Dale Miyat, the son of James and Joan Miyat, was born in Jacksonville, Florida on February 4, 1955. He has a younger brother and two younger sisters. Mr. Miyat grew up in Greenfield, Indiana, and graduated from Greefield-Central High School in May 1973. The following August he entered Purdue University in West Lafayette, Indiana. Four years later, in May 1977, he received a Bachelor of Science degree in Agriculture, with a major in Animal Science from Purdue. The following month, he began work with Indiana Farm Bureau Co-op, as a trainee. He accepted a feed fieldman position with Union County Farm Bureau Co-op in Liberty, Indiana, in September 1977.

In September 1979, he began graduate work in the Department of Agricultural Economics at the University of Tennessee, Knoxville. During Christmas break in December 1979, he married Dana Crowell of Connersville, Indiana. He graduated with a Master of Science degree in Agriculture, with a major in Agricultural Economics in December 1981.

Mr. Miyat was a member of Gamma Sigma Delta, Agricultural honor society. He was also recognized as one of the Outstanding Young Men in America for 1981.