

FINANCIAL RATIOS IN THE EVALUATION
OF KANSAS AGRICULTURAL COOPERATIVES

by

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CHAPTER I

Introduction

The Setting

While United States agriculture is undergoing a self-proclaimed conversion to "agri-business" and the regional cooperatives point out how large they are, it nevertheless remains a fundamental tenet of cooperation to serve the owner-users. Thus, a majority of cooperative establishments are small, local operations.

Unfortunately, small businesses labor under many handicaps. Perhaps because of their history of socio-political involvement, cooperatives do not seem to have been included in the categorization of small business. Neither however have they been rigorously studied as their own entity. It is a sobering experience to search the literature on the economic theory or the management of cooperatives.

And, as we live in a "bigger is better" age, the timing seems to be bad for increased emphasis on the local cooperative. The hope for producer control seems to be placed in the regional cooperatives which may be large enough to compete with the large corporate enterprises. The idea seems to be that if, on a grand scale, inputs are purchased cheaply enough or products marketed, the owner-user of the local cooperative will benefit.

That idea would seem to be at least partially mistaken.

The local cooperative and its members must do a large amount of work to ensure that the product and service of the cooperative system are provided in a timely, efficient and competitive fashion. Should this be lacking, the entire exercise from the regional to the local cooperative to the individual member may be in vain.

Much potential information is available to the local cooperative for use in the management of its operation. The advent of the computer has allowed an abundance of business information to be almost instantaneously available. Here in Kansas, FarMarCo has a service available to local cooperatives whereby they may have rapid access to a computer facility which quickly processes financial information.

However, rapid processing of raw data and prompt availability of results are not guarantees that the local cooperative will benefit. It can be just another stumbling block and source of frustration if there is no organized framework within which to use the information, or no accepted standards by which to judge the flow of information as a guide to future action.

Perhaps one of the reasons local cooperatives have no generally accepted framework within which to use the available financial information is that they are too often viewed as a monolithic bloc. Most assuredly, however, local cooperatives are very different from each other. Rational examination of the thousands of

local coops would find them involved in many different activities and being of many different size groupings.

Objectives

This study is designed to provide a framework within which local cooperatives may make better use of the financial information they themselves routinely generate in their operations. Local Kansas cooperatives will be categorized on the basis of type of operations and volume of sales.

Financial ratios will be calculated for each of the observations. Benchmarks or standards will be derived for each of the categories by deriving mean values from the observations in each category. The standards will be studied to see if there are statistically significant differences among them.

Success, defined in terms of the rate of return on investment, will be studied in detail. Differences in return will be investigated with respect to differences in the other financial ratios, and those ratios most crucial to the success of local operations pointed out.

Review of Previous Studies

It has often been recognized that cooperatives are of different types. At least as long as twenty years ago, there were attempts to categorize Kansas agricultural cooperatives by

type.¹ Cooperatives were differentiated by commodity type, location and legal status. The Farmer Cooperative Service has presented data which differentiates among cooperatives according to type. In 1972, for example, the Farmer Cooperative Service (FCS) put out a profile of farmer cooperatives according to commodity and activity.² Much information was given, some of which could be used to calculate financial ratios. However, to make such calculations would leave one open to the charge of presenting the ratios in terms of broad general averages.

This exact lament is found in the cooperative literature. In a 1973 FCS publication, caution was advised in the use of financial ratios for analysis purposes. However, it was pointed out that a given cooperative may compare its values with standard values for similar cooperatives. However, no standards were presented nor was there indication of where these standards might be found.³

Phillips, in an earlier work, presented a more extensive treatment of financial ratios. While presenting a long list

¹Milton L. Manuel and French M. Hyre, Kansas Farmer Cooperatives: II. Organizational Aspects, Agricultural Experiment Station Circular 306, Kansas State University, April, 1954.

²Nelda Griffin, A Financial Profile of Farmer Cooperatives in the United States, Farmer Cooperative Service, U.S.D.A., FCS Research Report No. 23 (Washington: Farmer Cooperative Service, October, 1972)

³Milton L. Manuel, Improving Management of Farmer Cooperatives, Farmer Cooperative Service, U.S.D.A., General Report 120. (Washington: Farmer Cooperative Service, September, 1973), pp. 30-33.

of various types of ratios, he indicated that their use can be self-comparative, or judged against standards. However, he also gave no standards, nor indication of where they may be found.¹

Standards for cooperatives, while widely indicated as being useful, are not routinely included with cooperative statistics. A recent publication noted volume of sales, number of members as well as other data broken down by geographical location and commodity. However, no ratios were calculated even for the statistics given on an overall basis, much less by the breakdowns given.²

By contrast, in its annual report on the meat industry, the American Meat Institute breaks down the members of its industry responding to its survey by size and type.³ In addition to giving overall figures, it calculates comparative ratios for

¹Richard Phillips, Managing for Greater Returns in Grain, Feed and Other Retail Businesses Serving Agriculture (Manhattan: Agri-Research, Inc., 1962), pp. 174-85.

²Jane H. Click, Statistics of Farmer Cooperatives, 1969-70, Farmer Cooperative Service, U.S.D.A., FCS Research Report 22 (Washington: Farmer Cooperative Service, July, 1972)

³American Meat Institute, Financial Facts About the Meat Packing Industry - 1973 (Washington: American Meat Institute, November, 1974)

each of the categories in its breakdown. Thus standards, not generally found in the cooperative literature, are widely available in many industries.

Management of cooperatives gives much emphasis to matters of personnel, particularly to selection of management and boards of directors.¹ While this is certainly an important area of concern and perhaps needs more emphasis due to the cooperative form, the cooperative must compete in a very competitive world and survive as a viable economic entity if it is to be of use to its member-owners.

The value of study and research is not unrecognized in the cooperative field. According to the Farmer Cooperative Service, many of the regional cooperatives have research capabilities. However, only about thirty percent of the expenditures for research dealt with business aspects, with the much larger share going into the technical areas. Even more dismaying was the lack of emphasis given to the local cooperatives in their research.²

While local cooperatives have not been studied in detail nor are standards easily available, there have been attempts

¹Manuel, Improving Management; Kelsey B. Gardner, Managing Farmer Cooperatives, Farmer Cooperative Service, U.S.D.A., Educational Circular 17 (Washington: Farmer Cooperative Service, Nov. 1963)

²Martin A. Abrahamsen, Cooperative Research: Progress, Problems, Farmer Cooperative Service, U.S.D.A., FCS Research Report No. 26 (Washington: Farmer Cooperative Service, October, 1973), p. 14.

to provide the assistance necessary for good financial management. Dahl, in a 1975 study, looked at alternative financial management strategies for local cooperatives. The study dealt with the financial structure of Wisconsin farm supply cooperatives. Dahl pointed out that cooperatives have been relying on members as the major source of capital. However, as cooperatives have increased their need for capital, farmer-members have likewise faced increased demand for capital in their own operations. He investigated various alternatives, and generated some standards by which the local coops could test themselves.¹

Sharp and Lytle have used financial ratios to compare the operations of four model organizations chosen from 110 elevator operations in Ohio. Four models were chosen since the authors point out that there is great difficulty in obtaining comparable financial statements for a large number of firms. If dissimilar accounting procedures have been followed, the resulting analysis will have a source of variation not due to differences among cooperatives but rather only due to differences in reporting the data. They further point out that it is difficult to make intrafirm analyses since there will not be homogeneity through-

¹W.A. Dahl, "Alternative Financial Management Strategies for Local Farm Supply Cooperatives in Wisconsin" (unpublished Ph.D. dissertation, University of Wisconsin-Madison, 1975)

out the firms investigated. There will be differences due to varying capital structures, different services performed and differing volumes of business. They used stepwise regression analysis to point out financial ratios which were important in the prediction of the rate of return enjoyed by the cooperatives.¹

Gries and Torgerson studied the 1970 performance of 126 local cooperatives in Missouri. Noting that few studies about the financial structure and performance of cooperatives existed, they suggested 22 ratios for use in cooperative analysis. No attempt was made to separate cooperatives into categories on the basis of type of activity such as grain or farm supplies. However, size, in terms of sales volume, was considered and five categories used. A major finding of their study was that no statistically significant differences were found among the levels of profitability of the local cooperatives.² This was so even though the return on fixed assets varied from -.11 to +.16, return on net worth varied from .033 to .118, and return on total assets varied from .033 to .079. The smaller sales

¹John W. Sharp and P.W. Lytle, An Intrafirm Analysis of Financial Statements of Country Elevators, Ohio Agricultural Research and Development Center, Research Bulletin 1043, Ohio State University, Dec., 1970

²Gary E. Gries and Randall E. Torgerson, Financial Structure of Local Missouri Farm Supply Cooperatives, Agricultural Experiment Station Special Report 157, University of Missouri-Columbia, August, 1973.

categories consistently showed lower rates of return. They noted that the reason for the lack of statistical evidence of differences was the wide variability which existed in the sample data. Nevertheless, they concluded that profitability was independent of size and type of local cooperative.

CHAPTER II

The Data

Original Financial Statement Items

The original data were collected by C.R. Rock & Co., a Hutchinson, Kansas accounting firm which audits most Kansas agricultural cooperatives. Since the data came from a firm which has been doing audits for the cooperatives in the study over a period of time, the problem of dissimilar accounting practices noted by Sharp and Lytle was minimized. The Rock Company made these data available to the cooperatives for which it had done audits. Included was a cover letter indicating they might make comparisons with like organizations. A statistical summary also was provided which included some overall average financial ratios.

Balance Sheet and Income Statement data for the years 1969 through 1973 were presented for 246-256 local Kansas cooperatives. The cooperatives were listed by number only, which guaranteed anonymity. Table 2-1 presents a list of the original data.

The data were converted to computer useable form, and extensive checking of the data undertaken via computer. Since the data were the result of double-entry bookkeeping procedures, individual items summed to the totals given. Thus, it was a relatively simple albeit time-consuming matter to program the computer to sum the individual items and compare that sum with the given total.

Discrepancies were thus identified, checked for source of error and corrected. A small number of discrepancies were encountered in the original data, but as the differences were very minor, they were ignored. As the result of the extensive checking, it was felt that the data utilized in the study were a very accurate description of the results reported by the cooperatives.

TABLE 2-1
ORIGINAL FINANCIAL STATEMENT ITEMS

Income Statement	Balance Sheet
Grain Sales	Current Assets
Supply Sales	Investments
Grain Margins	Fixed Assets (Cost)
Supply Margins	Fixed Assets (Book Value)
CCC Storage & Handling	Total Assets
Other Operating Income	Current Liabilities
Salaries & Wages	Long-term Liabilities
Other Operating Expenses	Stock or Memberships
Depreciation	Deferred Patronage
Net Operating Savings	Retained Earnings
Patronage & Dividend Income	Total Members' Equity
Net Savings	Accounts Receivable
Allocated Patronage Dividends	Supply Inventory
Dividends on Stock	Liabilities to Outsiders

Generated Financial Statement Items

During the process of checking the data, several additional pieces of financial information were generated from the original data. There were derived by summing two or more of the original data items and are presented in Table 2-2.

TABLE 2-2
GENERATED FINANCIAL STATEMENT ITEMS

Generated Items	Components
Total Sales	Grain Sales + Supply Sales
Total Margin on Sales	Grain Margins + Supply Margins
Gross Margin on Operations	Total Margin on Sales + CCC Storage and Handling + Other Operating Income
Total Operating Expenses	Salaries & Wages + Other Operating Expenses + Depreciation
Total Liabilities	Current Liabilities + Long-term Liabilities
Total Other Income	CCC Storage & Handling + Other Operating Income

CHAPTER III

Categorization and Financial Ratios Used

Categorization

While no attempts were made to experiment with alternative categories to be used in this study, it was felt that two variables were especially important in determining cooperative success. Since the cooperatives included handled farm supplies, grain or some combination of both, one logical classification was what will here be called the "type" of cooperative. Was the particular observation a farm supply cooperative, or a grain cooperative or some combination? The second classification considered was "size", in terms of volume of total sales.

While the above were theoretical considerations, practical considerations influenced the actual boundaries of the categories chosen. The computer was used to sort the observations into an order based first on the percentage grain sales were of total sales. Categories were set up such that a reasonable number of observations were contained in each of the categories. Once these categories had been determined, a similar procedure was followed to set the boundaries for size.

It is not argued here that the classification system used is an optimal one. The determination of such a system was beyond the scope of this study. Rather, a workable system was needed, based

partially upon theoretical considerations but modified with practical constraints of the data.

Type of Cooperative

While the percent grain sales are of total sales in a cooperative may seem a rather simple concept to determine the type of cooperative, in practical application it was well justified. There are fundamental differences in investment, operation and margins for those handling farm supplies as contrasted with grain.

Four percentage categories were used in this study:

1) 0-20; 2) 20-60; 3) 60-80; and 4) 80-100. Cooperatives in the 0-20 percent category were considered to be essentially farm supply cooperatives as grain handling was minor. Indeed, most of the observations here handled no grain at all. At the other extreme, 80-100 percent, the observations were considered grain cooperatives with the farm supply operation being relatively unimportant. The two middle categories composed an interesting mix of operations.

Size of Cooperative

Size of operation is known to have a marked impact on the profitability of an organization. Economies of operation and increased return on assets are expected as the size increases. Cooperatives are no exceptions, though the literature often notes

that they are often too small to compete effectively.¹ At the same time, and perhaps partially because of this tendency toward smallness, diseconomies might be found in operations in cooperatives which have grown large and are not well-equipped to handle large operations.

Each of the percent grain categories was further subdivided by size of operation, as measured by the total volume of sales. Though it was originally planned to have but one size breakdown, two breakdowns were found to be necessary. The 0-20% category was significantly smaller in terms of total sales than were other categories. Table 3-1 presents the breakdowns used.

TABLE 3-1
SIZE CATEGORIES

Category	0-20%	20-60%, 60-80%, 80-100%
Small	\$ 1-500,000	\$ 1-1,000,000
Medium	500,000-1,000,000	1,000,000-2,000,000
Large	1,000,000-2,000,000	2,000,000-4,000,000
Very Large		4,000,000 and over

¹E.P. Roy, Cooperatives: Today and Tomorrow (Danville: The Interstate Printers & Publishers, Inc.), 1969., p. 587.

Table 4-2 shows the distribution of the observations in the categories.

Financial Ratios

The literature on cooperatives reveals little consensus on a group of generally accepted financial ratios to be used in the analysis of cooperatives. It frequently is pointed out that they may be used, but that their use is limited since they are averages. It is suggested that cooperatives calculate financial ratios which can then be used in yearly comparisons within the same organization. Further suggestions are that the ratios be compared with similar cooperatives, or with standards. However, these standard values largely are absent from cooperative literature.

This study hypothesizes that a major reason for the lack of widespread use of financial ratios in cooperative circles is that indeed financial ratios which are presented have been averaged over too wide a range. Differences in cooperatives due to commodity handled, size and many other factors often have not been taken into account. If ratios are calculated for a diverse group of cooperatives with little in common apart from a cooperative structure, it is easy to understand why the averaged result would not apply to many specific situations.

Since the cooperative literature did not offer a group of generally accepted financial ratios to be used in analysis, a

practical problem was to determine kinds of financial ratios to be used in this study. The approach used was to explore the analysis traditionally used in business circles.

Following this procedure, thirty-seven ratios were considered. In some cases, ratios very similar to each other were investigated. While some were essentially duplicates, they were included in the analysis with the intention of finding the most useful ratios for cooperative analysis. While one would not expect that all the ratios thus selected would be included in the final analysis, all rigorously were investigated. Table 3-2 presents the ratios considered.

TABLE 3-2

FINANCIAL RATIOS CONSIDERED IN THE STUDY

Liquidity Ratios

Current Assets/Current Liabilities
 Current Assets-Inventory/Current Liabilities
 Supply Inventory/Current Assets-Current Liabilities
 Current Liabilities/Supply Inventory

Activity and Operational Ratios

Accounts Receivable/Supply Sales
 Accounts Receivable/Total Sales
 Supply Inventory/Supply Sales
 Total Sales/Current Assets-Current Liabilities
 Total Sales/Total Assets
 Total Sales/Net Fixed Assets
 Total Expenses/ Total Sales
 Supply Margins/Supply Sales
 Grain Margins/Grain Sales
 Total Margins/Total Sales

TABLE 3-2 Continued

Leverage and Financial Structure Ratios

Total Liabilities/Total Assets
Member Equity/Total Assets
Long-term Liabilities/Current Assets - Current Liabilities
Member Equity/Net Fixed Assets + Inventory
Net Fixed Assets/Member Equity
Current Liabilities/Member Equity
Long-term Liabilities/Member Equity
Total Liabilities/Member Equity

Return on Investment and Profitability Ratios

Net Operating Savings/Total Sales
Net Operating Savings/Member Equity
Net Operating Savings/Total Assets
Net Operating Savings/Net Fixed Assets
Net Operating Savings/Current Assets - Current Liabilities
Net Operating Savings/Total Assets - Investments
Net Savings/Total Sales
Net Savings/Member Equity
Net Savings/Total Assets
Net Savings/Net Fixed Assets
Net Savings/Current Assets - Current Liabilities
Net Savings/Total Assets - Investments
Long-term Liabilities/Net Savings
Total Assets/Net Savings
Total Expenses/Net Operating Savings

CHAPTER IV

Analysis of Variance

Procedure & Assumptions

Having determined the categories of cooperatives and having generated a group of financial ratios, a statistical technique was needed to test the hypothesis that there were significant differences among cooperatives. For this purpose, the one-way analysis of variance technique was selected.

Analysis of variance allows testing of the hypothesis that there are differences among the means of the various categories at a particular level of significance. A finding of significant differences among the categories does not mean that each is different from all others, but rather that at least one category is different from at least one other category. In order to identify which categories are significantly different, other tests such as the Least Significant Differences (LSD) must be used. This manuscript does not present LSD results, although calculated, since the major hypothesis to be accepted or rejected is that there are important differences among various categories of cooperatives.

Use of the analysis of variance technique requires two vital assumptions. First, the data are normally distributed within the categories. For the purposes of this study, this assumption was considered to be met. The second assumption is that the

variances among categories are homogeneous, and can be tested with the Bartlett's Test of Homogeneity of Variance. If the second assumption is violated, the validity of a finding of significant differences among category means at a particular level of significance is suspect. The differences being found may be due to variation within categories rather than variation among categories.

The second assumption caused considerable problems for this study, as it was often violated. None of the dollar financial statement items met the assumption of homogeneity of variance. This was not particularly troubling or unexpected. However, many of the financial ratios also violated the assumption.

As a result, exhaustive attempts were undertaken to correct the situation by eliminating "outliers" from the analysis. From simple observation of the raw data, it could be seen that some of the cooperatives clearly had ratio values far different from the others. The presumption was made that those observations were being influenced by forces not experienced by an on-going cooperative. For example, the cooperative might be about to be merged or liquidated. Clearly, in such a situation, different managerial decisions would be made, different operating strategies undertaken and a wider range of financial and operating situations tolerated. Examination of such situations would indeed be interesting and useful but was beyond the scope of this study.

Various attempts were made to eliminate outliers. Ranges of acceptable ratio values, elimination of various size or type categories and elimination of specific observations were all attempted. As a result of nine attempts, it was clear that the same group of twelve ratios was generally found to meet the assumption of homogeneity of variance and yield significant differences, despite the decision rules used. The remaining ratios used did not meet the assumption in any of the cases.

Three decision rules, defining acceptable ranges of values, were found to be the best discriminators for analysis of variance purposes. They are presented in Table 4-1.

TABLE 4-1
DECISION RULES FOR ANALYSIS OF VARIANCE

Financial Ratio	Acceptable Range
Supply Inventory/Supply Sales	0.04 - 0.60
Total Sales/Total Assets	0.74 - 7.50
Net Operating Savings/Total Sales	-0.05 - 0.11

An observation found to violate any one of the decision rules was eliminated from the analysis completely, even if the other two ratio values were of acceptable values. This was done since observation of the raw data clearly showed that a cooperative with

one of the above ratios out of line during a given year had other ratios which were also extremely different from the mean.

Table 4-2 presents the number of observations per category both before and after the application of the decision rules. The "No information" heading means that for a particular year there was no information for a cooperative, but in at least one of the other years it had complete information. It should also be noted that the categorization procedure allowed given cooperatives to change categories from year to year.

The Findings

Fortunately, the twelve financial ratios found to meet the assumptions and evince statistically significant differences among their means covered several areas of financial analysis. Represented were six ratios which dealt with return on investment, one turnover ratio, one financial structure ratio and four ratios which measured operational efficiency.

That six of the twelve ratios dealt with return on investment was not viewed as superfluous information, but rather as strong evidence that there were significant differences in end results achieved by cooperatives. The finding of differences among the returns enjoyed by cooperatives means there are differences to be explained by other factors in their operations.

Most important for the sentiment of this study is that the ratio, Net Operating Savings/Total Assets - Investments, best

TABLE 4-2

TOTAL AND NET OBSERVATIONS, BY CATEGORY

Category	1969		1970		1971		1972		1973	
	Total	Net	Total	Net	Total	Net	Total	Net	Total	Net
00-20% Grain										
Small	30	23	28	25	23	18	21	14	18	15
Medium	6	5	6	4	5	2	4	2	3	2
Large	2	2	3	3	3	3	3	3	4	4
20-60% Grain										
Small	50	45	44	39	22	20	19	16	5	4
Medium	51	48	37	35	33	33	22	22	13	13
Large	17	16	21	20	23	23	20	20	14	14
Very Large	7	7	9	9	14	14	14	14	15	15
60-80% Grain										
Small	30	27	26	26	19	16	17	15	4	4
Medium	27	27	34	34	31	31	34	34	16	16
Large	6	6	9	9	21	21	37	37	37	35
Very Large	3	3	5	5	2	2	9	9	22	22
80-100% Grain										
Small	12	9	14	11	15	14	10	8	5	3
Medium	2	2	7	7	14	14	15	15	28	24
Large	2	2	4	4	9	8	9	9	25	25
Very Large	--	--	--	--	5	5	3	3	22	21
No Information	11	--	9	--	16	--	17	--	15	--
Total	256	222	256	231	255	224	254	221	246	217

met both the assumption of homogeneity of variance and statistically significant F-tests. Thus, this ratio which properly may be seen as the return of local operations to the assets invested in those local operations showed strong evidence of differences among the categories tested.

Table 4-3 shows the twelve financial ratios.

TABLE 4-3

TWELVE FINANCIAL RATIOS SELECTED BY ANALYSIS OF VARIANCE

Return on Investment

Net Operating Savings/Total Assets
 Net Operating Savings/Total Assets - Investments
 Net Savings/Member Equity
 Net Savings/Total Assets
 Net Savings/Net Fixed Assets
 Net Savings/Total Assets - Investment

Turnover

Supply Inventory/Supply Sales

Financial Structure

Member Equity/Total Assets

Operational Efficiency

Total Expenses/Total Sales
 Supply Margins/Supply Sales
 Grain Margins/Grain Sales
 Total Margins/Total Sales

Net Operating Savings/Total Assets

This is the first of several ratios which deal with the rate of return realized by cooperatives. This particular ratio compares the return from local operations with total assets invested both in the operation at the local level and their regional affiliates. Table 4-4 presents the results.

Results showed either homogeneity of variance at a high level with significant F-test results indicating differences among the means, or homogeneity of variance with less certainty but with F-test results showing differences at a very high level of significance.

There was a tendency for the higher percent grain cooperatives to have higher ratio values, i.e., better rates of return. Also, there appeared to be some tendencies toward economies of size, as the larger size categories generally had higher ratio values.

Through time, the tendencies were somewhat inconclusive. Again however, economies of size seemed to be present as smaller size categories exhibited more variation in ratio values and more often the changes were in a downward direction than with the larger size categories. By contrast, the larger size categories either maintained their return values or increased them.

It should be noted that analysis of the results beyond the F-test and homogeneity of variance are not backed by statistical analysis but rather are the result of studying the tabled results.

The overall return showed a constant increase through the years, increasing from .031 in 1969 to .068 in 1973. 1973 showed a bigger increase, nearly 50% over 1972, than did any of the previous years. The standard deviation was constant, about .045, until 1973 when it jumped to .054.

Net Operating Savings/Total Assets - Investments

This ratio compares savings from operations at the local level with investment in assets at that level. Thus, it gives a measure of how efficiently the local cooperative is managing its own operations. The results of the study are found in Table 4-5.

Homogeneity of variance was found in every year except 1971, where the Bartlett's test did not show strong evidence of homogeneity of variance but the F-test was significant at a very high level. F-test results showed there to be statistically significant differences among the means for each of the other years also.

The overall average return increased constantly, rising from .039 in 1969 to .081 in 1973. The standard deviation remained quite constant around 0.60. Most of the categories also followed a general upward pattern of ratio values, with the exception of those in the 80-100% grain category. There a good deal of fluctuation was exhibited, with some declines being registered.

In general, the higher percentage grain cooperative had higher ratio values, particularly in the first three years of

TABLE 4-4

NET OPERATING SAVINGS/TOTAL ASSETS

Category	1969		1970		1971		1972		1973	
	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev
00-20% Grain										
Small	.033	.046	.016	.050	.004	.037	-.001	.058	.044	.089
Medium	.010	.046	.005	.043	.051	.004	.009	.028	.030	.011
Large	.045	.024	.037	.036	.046	.042	.052	.022	.069	.052
20-60% Grain										
Small	.015	.040	.020	.040	.030	.076	.040	.066	-.018	.030
Medium	.030	.038	.028	.038	.027	.040	.014	.037	.038	.062
Large	.026	.051	.037	.032	.035	.045	.046	.038	.053	.043
Very Large	.037	.037	.042	.053	.050	.035	.061	.034	.095	.064
60-80% Grain										
Small	.032	.051	.028	.046	.043	.053	.025	.043	.056	.082
Medium	.038	.050	.054	.045	.051	.034	.049	.038	.058	.060
Large	.041	.034	.072	.031	.054	.038	.064	.041	.077	.047
Very Large	.039	.072	.036	.047	.045	.037	.056	.058	.089	.064
80-100% Grain										
Small	.061	.059	.046	.057	.071	.072	.073	.040	.019	.028
Medium	.138	.029	.073	.055	.067	.034	.058	.050	.075	.042
Large	.063	.040	.063	.060	.094	.034	.074	.048	.071	.042
Very Large	----	----	----	----	.102	.024	.043	.004	.080	.054
Overall Value	.031	.044	.034	.043	.045	.044	.046	.043	.068	.054
Bartlett's Test [*]	9.680	.720	11.100	.603	38.550	.001	23.420	.054	24.500	.040
F-Test [*]	1.900	.031	2.570	.003	3.390	.001	3.390	.001	2.150	.011

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*For each year, the first figure is the calculated value; the second figure is the level of significance.

the study. This was especially true for the 80-100% grain category in 1969. Perhaps the higher 1969 ratio values explained the downward fluctuations in latter years, as the starting values were abnormally high. Nevertheless, though some declines were registered, the returns to the 80-100% category in 1973 were among the highest found.

Again, a slight trend toward economies of size was noted, as the larger cooperatives within a particular percent grain category generally had higher ratio values. Diseconomies of size could be argued, as some of the very large categories showed declines.

Net Savings/Member Equity

This ratio compares the total net savings of the local cooperative, i.e., net operating savings plus patronage and dividend income received from the regionals, with the total member equity or the investment provided by the ownership share. This should show the total return on the capital the members have invested.

As seen in Table 4-6, the statistical results here were mixed. For the years 1969-71, the Bartlett's test results showed the assumption of homogeneity of variance to be suspect. Additionally, the years 1969 and 1970 had F-tests which did not support the hypothesis of differences among the means. The F-test for 1971 provided some support for the hypothesis but, when combined with

TABLE 4-5

NET OPERATING SAVINGS/TOTAL ASSETS - INVESTMENTS

Category	1969		1970		1971		1972		1973	
	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev
00-20% Grain										
Small	.046	.069	.022	.069	.004	.050	.003	.070	.054	.102
Medium	.011	.062	.004	.055	.063	.003	.011	.035	.041	.017
Large	.058	.028	.049	.045	.060	.054	.068	.026	.088	.064
20-60% Grain										
Small	.019	.051	.024	.052	.036	.097	.047	.076	-.025	.038
Medium	.037	.045	.035	.048	.033	.055	.015	.052	.047	.083
Large	.029	.065	.047	.039	.043	.054	.056	.046	.065	.054
Very Large	.046	.046	.051	.061	.061	.042	.074	.040	.112	.071
60-80% Grain										
Small	.041	.065	.034	.059	.055	.065	.030	.053	.064	.088
Medium	.046	.063	.065	.054	.064	.044	.059	.046	.070	.073
Large	.052	.044	.093	.040	.066	.046	.079	.052	.093	.057
Very Large	.052	.096	.042	.057	.059	.046	.066	.069	.105	.074
80-100% Grain										
Small	.078	.079	.058	.079	.089	.090	.093	.055	.027	.036
Medium	.172	.049	.095	.073	.086	.045	.074	.062	.091	.053
Large	.081	.051	.074	.069	.114	.038	.092	.060	.083	.050
Very Large	----	----	----	----	.123	.028	.052	.006	.094	.069
Overall Value	.039	.060	.043	.058	.055	.063	.056	.059	.081	.069
Bartlett's Test*	13.020	.450	13.700	.395	39.270	.001	20.290	.121	20.330	.120
F-Test*	1.850	.038	2.450	.004	3.330	.001	3.460	.001	2.060	.015

*See Page 27.

the Bartlett's test result, was suspect. For 1972-3 there was homogeneity of variance and support for the hypothesis.

There was a general trend toward an increase in the ratio value through the years, increasing from .085 in 1969 to .179 in 1973. The standard deviation remained fairly constant around .08 until 1973 when it increased to .110.

Again there were tendencies toward economies of size as the larger size categories within each percent grain category tended to have higher values. Tendencies toward diseconomies were evidenced as the Very Large category sometimes showed a decrease in value.

Through time the 20-60% and 60-80% grain categories generally showed a constant increase in value. The 0-20% categories either suffered a decline or maintained their values, usually with a wide amount of variation. In the 80-100% category, the Small and Medium size categories showed the same pattern as the 0-20% category, while the Large and Very Large size categories showed increases in value with fairly wide variation.

Net Savings/Total Assets

This ratio shows the relationship between the total return on the total assets invested in the entire operation of the local cooperative. That is, it compares the net operating savings plus patronage and dividend income with the assets invested in the local operation plus investments made in regional cooperatives. Table 4-7

TABLE 4-6

NET SAVINGS/MEMBER EQUITY

Category	1969		1970		1971		1972		1973	
	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev
00-20% Grain										
Small	.107	.100	.068	.070	.059	.082	.041	.069	.105	.146
Medium	.123	.155	.064	.057	.131	.017	.075	.054	.092	.012
Large	.207	.076	.119	.071	.167	.108	.171	.083	.190	.107
20-60% Grain										
Small	.057	.063	.061	.086	.079	.118	.113	.103	.025	.069
Medium	.100	.073	.086	.056	.095	.062	.078	.067	.124	.137
Large	.072	.076	.091	.061	.112	.090	.134	.073	.168	.096
Very Large	.086	.036	.076	.111	.115	.051	.148	.060	.234	.093
60-80% Grain										
Small	.057	.090	.071	.120	.078	.091	.082	.095	.142	.095
Medium	.090	.127	.092	.066	.112	.066	.120	.065	.136	.096
Large	.089	.045	.131	.036	.114	.049	.147	.073	.200	.095
Very Large	.080	.101	.096	.084	.110	.040	.129	.081	.220	.110
80-100% Grain										
Small	.096	.075	.068	.072	.108	.104	.123	.044	.057	.038
Medium	.170	.030	.127	.056	.124	.046	.113	.056	.174	.087
Large	.117	.061	.106	.069	.149	.038	.140	.046	.211	.111
Very Large	----	----	----	----	.196	.046	.126	.031	.217	.078
Overall Value	.085	.087	.082	.078	.105	.079	.116	.076	.179	.110
Bartlett's Test*	32.200	.002	31.900	.003	39.600	.001	16.830	.266	17.100	.251
F-Test*	1.390	.164	.995	.457	1.780	.043	2.820	.001	3.167	.001

*See Page 27.

shows the results.

Results of the Bartlett's tests and F-tests showed there to be support for the hypothesis of differences among the means for the years 1969-72. Statistical support for the hypothesis was not found in 1973, as both tests were inconclusive.

The overall values followed the same trend found with the other return ratios. The ratio values increased through the years from .056 to .095. Again the standard deviation remained quite constant until 1973 when it jumped to .06 from the .045 experienced in the other four years.

The individual categories mirrored the findings of the other return ratios. The 20-60% and 60-80% grain categories showed a general trend through time of increasing ratio values, while the 0-20% and the 80-100% categories showed slight decreases or maintenance of initial values. Economies of size were also present, as there was a tendency for the ratio values to increase as size increased.

Net Savings/Net Fixed Assets

This ratio shows the relation between the total savings of the cooperative and the investment made in fixed assets. The result here pointed out the wisdom of using several return ratios for analysis in the study. While one would reasonably expect that this return ratio would follow the pattern set by the others, it was less satisfactory. With only the results of this ratio,

TABLE 4-7

NET SAVINGS/TOTAL ASSETS

Category	1969		1970		1971		1972		1973	
	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev
00-20% Grain										
Small	.067	.046	.047	.050	.035	.040	.032	.057	.075	.090
Medium	.059	.054	.029	.041	.093	.004	.046	.034	.066	.003
Large	.127	.009	.074	.039	.083	.035	.091	.030	.113	.069
20-60% Grain										
Small	.038	.040	.038	.040	.051	.074	.066	.063	.011	.030
Medium	.056	.034	.050	.034	.054	.037	.045	.036	.069	.069
Large	.045	.046	.054	.035	.064	.045	.074	.038	.084	.046
Very Large	.059	.032	.056	.054	.071	.035	.085	.033	.121	.065
60-80% Grain										
Small	.052	.049	.041	.044	.062	.053	.045	.042	.079	.075
Medium	.061	.050	.066	.044	.074	.038	.074	.037	.083	.058
Large	.061	.039	.092	.027	.077	.036	.092	.044	.106	.051
Very Large	.064	.074	.055	.043	.069	.034	.086	.055	.115	.068
80-100% Grain										
Small	.076	.057	.058	.056	.087	.076	.091	.038	.048	.037
Medium	.148	.029	.094	.052	.091	.037	.081	.047	.096	.040
Large	.088	.056	.071	.059	.117	.032	.101	.050	.097	.047
Very Large	----	----	----	----	.120	.021	.072	.005	.102	.061
Overall Value	.056	.045	.053	.044	.069	.049	.072	.047	.095	.060
Bartlett's Test *	13.100	.439	12.300	.500	37.460	.001	20.180	.125	24.670	.038
F-Test *	2.140	.013	2.120	.014	2.790	.001	3.120	.001	1.720	.053

*See Page 27.

it would be difficult to argue there were statistically significant differences. However, in conjunction with the other ratios, it was still somewhat useful.

As seen in Table 4-8, the Bartlett's tests showed convincingly that the assumption of homogeneity of variance was not met in any of the years. The F-test results thus were not reliable. The results of the Small size category in the 0-20% grain category were very much different from the others, and most likely caused the results to be suspect. No statistical test was run to confirm this, however.

The results of the individual categories here were more mixed. There were some indications of economies of size, but weaker than previously found. Again the 20-60% and 60-80% categories showed a trend of increasing values through time. The 0-20% and 80-100% categories showed more variation, with some declines in value but also some increases.

The overall average value fluctuated between .20 and .265 during 1969-72. In 1973, the mean jumped to .443. The standard deviation showed a similar pattern, varying from .196 to .347 during 1969-72 and was .421 in 1973.

Net Savings/Total Assets - Investments

This ratio shows the relation between the total net savings of the cooperative and the assets, both fixed and current, invested in the local operation. This ratio is very similar to the previous

TABLE 4-8

NET SAVINGS/NET FIXED ASSETS

Category	1969		1970		1971		1972		1973	
	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev
00-20% Grain										
Small	.900	2.260	.675	1.580	.342	.791	.930	2.813	1.331	2.100
Medium	.167	.146	.108	.180	.421	.121	.148	.133	.248	.114
Large	.522	.069	.300	.205	.363	.156	.353	.060	.470	.312
20-60% Grain										
Small	.110	.133	.120	.140	.165	.245	.218	.231	.045	.090
Medium	.137	.094	.135	.110	.153	.116	.130	.111	.272	.316
Large	.116	.131	.143	.099	.173	.114	.202	.095	.324	.230
Very Large	.160	.107	.147	.158	.183	.099	.241	.108	.429	.242
60-80% Grain										
Small	.135	.170	.105	.131	.187	.199	.131	.128	.247	.257
Medium	.140	.131	.161	.119	.191	.117	.220	.151	.320	.291
Large	.141	.092	.217	.063	.192	.094	.273	.167	.389	.220
Very Large	.183	.210	.130	.110	.195	.097	.253	.168	.431	.327
80-100% Grain										
Small	.159	.138	.147	.144	.269	.324	.281	.156	.119	.086
Medium	.283	.023	.204	.101	.215	.090	.225	.219	.412	.376
Large	.212	.107	.169	.122	.297	.109	.266	.102	.427	.516
Very Large	----	----	----	----	.313	.094	.189	.024	.432	.204
Overall Value	.218	.347	.201	.281	.210	.196	.265	.315	.443	.421
Bartlett's Test*	557.500	0.000	498.400	0.000	222.600	0.000	559.010	0.000	251.700	0.000
F-Test*	1.710	.060	1.740	.055	.820	.647	.980	.475	2.500	.003

* See Page 27.

one, but had much better statistical results as can be seen in Table 5-6.

With the exception of 1973, which showed no support for the hypothesis of significant differences, the Bartlett's tests and F-test results gave positive support to the hypothesis.

The individual category pattern was quite similar to those patterns found in the other return ratios. The 20-60% and 60-80% categories generally showed an increase in value, while the other two type categories either maintained the 1969 value or showed a decline with much variation through time. The larger size cooperatives seemed to have higher ratio values, with some exceptions.

The overall mean value increased through the years from .072 to .115, again showing its largest increase in 1973. The standard deviation was constant around .055 during 1969-72. In 1973 it jumped to .070.

Supply Inventory/Supply Sales

This is the inverse of the inventory turnover ratio, which roughly measures the salability and probable time it will take to convert the inventory to cash. This is only a rough estimate as the inventory normally will be measured in terms of cost while the sales value will be measured at cost plus markup. Though this figure does not measure actual physical turnover of inventory, it does give similar firms a basis for making a useful comparison.

TABLE 4-9

NET SAVINGS/TOTAL ASSETS - INVESTMENTS

Category	1969		1970		1971		1972		1973	
	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev
00-20% Grain										
Small	.096	.076	.068	.072	.047	.051	.047	.075	.100	.103
Medium	.076	.071	.036	.051	.114	.002	.058	.042	.088	.011
Large	.167	.002	.099	.047	.109	.046	.119	.042	.145	.085
20-60% Grain										
Small	.049	.054	.049	.052	.064	.094	.081	.073	.014	.037
Medium	.070	.041	.063	.042	.069	.049	.057	.049	.088	.092
Large	.054	.057	.068	.044	.080	.054	.092	.046	.105	.058
Very Large	.073	.041	.068	.062	.087	.042	.103	.039	.144	.074
60-80% Grain										
Small	.066	.062	.051	.056	.081	.064	.056	.052	.095	.081
Medium	.076	.063	.080	.053	.095	.049	.091	.044	.101	.071
Large	.077	.050	.119	.036	.096	.044	.115	.056	.130	.064
Very Large	.085	.099	.067	.053	.093	.041	.103	.064	.137	.080
80-100% Grain										
Small	.097	.076	.074	.079	.109	.094	.117	.053	.067	.053
Medium	.184	.050	.122	.069	.116	.047	.103	.060	.118	.054
Large	.113	.070	.084	.067	.144	.038	.125	.064	.114	.057
Very Large	----	----	----	----	.146	.024	.088	.006	.119	.078
Overall Value	.072	.057	.068	.054	.087	.055	.090	.053	.115	.070
Bartlett's Test*	22.980	.042	16.330	.230	39.210	.001	20.130	.126	18.360	.191
F-Test*	2.210	.010	2.000	.022	2.540	.002	2.870	.001	1.430	.140

* See Page 27.

This ratio gives a good illustration of the hypothesis that overall average values of financial ratios may be misleading when applied to differing cooperatives. If one were to look at the overall values in Table 4-10, little seemed to be happening over the five years. Overall ratios varied only from .17 to .18. Furthermore, the standard deviation was also nearly constant - - varying between .067 and .075.

However, results from the analysis of variance showed there to be significant differences among the means of the categories. Bartlett's test results showed the assumption of homogeneity of variance to be met for two years. For the other three years, the results were less conclusive about homogeneity of variance. However, in those cases where the Bartlett's test was not conclusive, the F-tests were significant at a very high level. Thus, the conclusion of differences among the categories was justified.

The results for the individual cells showed mixed results. The 80-100% category generally showed a decline in ratio value. However, in 1969 these categories had values as much as double the values encountered in the 0-20% category.

In the 0-20% category, both Small and Large size categories showed a fairly constant value of about .12 throughout the years. The medium size category increased its ratio value sharply, then declined even more sharply ending at a lower value than it started.

TABLE 4-10

SUPPLY INVENTORY/SUPPLY SALES

Category	1969		1970		1971		1972		1973	
	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev
00-20% Grain										
Small	.120	.062	.124	.054	.116	.048	.128	.048	.121	.050
Medium	.134	.067	.161	.058	.196	.067	.114	.045	.112	.027
Large	.121	.061	.122	.049	.110	.050	.117	.070	.118	.060
20-60% Grain										
Small	.178	.063	.164	.055	.175	.073	.165	.056	.177	.075
Medium	.177	.062	.177	.068	.168	.057	.155	.064	.160	.074
Large	.157	.038	.150	.045	.161	.051	.182	.056	.149	.073
Very Large	.144	.058	.149	.047	.152	.069	.138	.057	.126	.043
60-80% Grain										
Small	.201	.085	.188	.080	.151	.053	.176	.064	.168	.032
Medium	.168	.050	.178	.058	.192	.053	.186	.060	.168	.042
Large	.166	.060	.183	.070	.186	.056	.197	.080	.183	.059
Very Large	.191	.073	.200	.046	.215	.070	.202	.064	.189	.076
80-100% Grain										
Small	.230	.073	.207	.105	.220	.082	.255	.078	.188	.047
Medium	.198	.065	.225	.102	.210	.080	.214	.079	.213	.105
Large	.268	.114	.217	.028	.231	.137	.213	.085	.187	.084
Very Large	----	----	----	----	.224	.077	.204	.031	.197	.067
Overall Value*	.172	.067	.170	.067	.176	.070	.180	.071	.174	.075
Bartlett's Test*	14.060	.370	24.320	.028	25.600	.029	11.450	.650	27.170	.018
F-Test*	3.040	.001	2.510	.003	3.320	.001	3.140	.001	2.380	.004

* See Page 27.

The 20-60% and 60-80% categories showed the most inconclusive variation. Most categories showed both increases and decreases in value annually, but ended in 1973 with a value lower than in 1969.

Member Equity/Total Assets

This ratio shows the financial structure of the cooperative, or what percent of the total assets are owned by members. Two conflicting motives are at work here. A lower ratio means that borrowed capital is being used and, if successfully used, will increase the return on the members' investment. However, more risk is involved for the owners since debtors have first claim on the cooperatives' assets in the event of liquidation.

The Cooperative Finance Association of Farmland Industries says this ratio should be at least .67.¹ Looking at the results as investigated here and Table 4-11, it appears that requirement may be high since the overall ratio values for the five years never achieved this value and came close only in 1969. In fact, there was a constant decline in the ratio value, while the standard deviation remained constant around .17

Bartlett's test results showed there to be homogeneity of variance throughout. Likewise, the F-Tests showed statistically significant differences among cells.

¹William H. Moon, "Primary Measurements that Apply to the Financial & Operational Position of Local Farm Cooperatives," Mimeo, Cooperative Finance Association, Inc., n.d.

TABLE 4-11

MEMBER EQUITY/TOTAL ASSETS

Category	1969		1970		1971		1972		1973	
	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev
00-20% Grain										
Small	.737	.212	.737	.207	.708	.205	.763	.185	.705	.169
Medium	.540	.225	.547	.298	.718	.125	.617	.007	.726	.131
Large	.650	.196	.642	.107	.571	.164	.572	.127	.603	.073
20-60% Grain										
Small	.633	.173	.619	.168	.577	.191	.575	.162	.500	.099
Medium	.607	.171	.574	.153	.558	.152	.554	.166	.511	.145
Large	.615	.127	.616	.159	.577	.142	.583	.146	.521	.129
Very Large	.669	.115	.586	.158	.611	.141	.600	.133	.520	.120
60-80% Grain										
Small	.747	.175	.642	.211	.715	.192	.688	.201	.548	.226
Medium	.694	.181	.680	.161	.683	.146	.623	.157	.600	.146
Large	.687	.203	.711	.123	.671	.152	.652	.150	.549	.153
Very Large	.661	.167	.536	.078	.611	.089	.613	.180	.519	.188
80-100% Grain										
Small	.753	.162	.752	.170	.768	.108	.732	.097	.727	.254
Medium	.870	.019	.742	.130	.736	.123	.689	.159	.590	.177
Large	.730	.094	.670	.251	.792	.109	.690	.148	.486	.168
Very Large	----	----	----	----	.638	.159	.582	.102	.461	.192
Overall Value	.667	.181	.647	.179	.653	.168	.635	.164	.547	.172
Bartlett's Test*	10.160	.680	14.880	.315	12.180	.590	11.860	.620	11.650	.630
F-Test*	2.050	.019	2.130	.013	3.480	.001	2.080	.014	2.530	.002

* See Page 27.

The 80-100% category started with higher values than the other categories. However, all of the size categories registered declines in value so that by 1973 their values were consistent with those of the other cells and even lower.

All of the other cells showed a decline in value through the years, with one exception. In the 0-20% grain category, the medium size category registered a large increase in value. The other size categories here also registered only small declines in value.

Total Expenses/Total Sales

This ratio might be thought of as an average cost ratio, showing what proportion of each dollar of sales was devoted to expenses to generate that dollar. Here this ratio is very much aggregated, due to data constraints which gave no breakdowns for expenses associated with farm supply or grain functions. Table 4-12 gives the results.

This ratio showed, in overall terms, a constant downward trend over the years, declining in actual value by almost one-third from .148 to .092. Standard deviations remained quite constant, around .045.

The Bartlett's test results, except for 1969, did not support the assumption of homogeneity of variance. In fact, through time, there was less support for the assumption. Thus, even though the F-tests in all cases showed significant differences among the

categories, some reservation must be maintained when viewing the results in statistical terms.

There were wide differences in values associated with the various percent of grain categories. Significant increases in the ratio were found as the relative amount of grain handled decreased.

Changes in the values related to size were less conclusive. There were some slight tendencies toward economies of size in some cases. However, they were balanced out by instances where no change in ratio values occurred, or where some tendencies toward diseconomies were noted. Thus, on an overall basis, no general tendency was noted.

Supply Margins/Supply Sales

This ratio relates what percent of each sales dollar is left after the cost of producing that dollar is subtracted. It might also be referred to as a gross profit ratio.

As seen in Table 4-13, the Bartlett's test results ranged from strong to weak support to no support for the assumption of homogeneity of variance. The F-tests were all significant, and were significant at a higher level when the Bartlett's test results were weaker. Thus, except for 1970 which had no support for the assumption of homogeneity of variance, the results may be seen as legitimate indications of differences.

TABLE 4-12

TOTAL EXPENSES/TOTAL SALES

Category	1969			1970			1971			1972			1973		
	Mean	Std Dev		Mean	Std Dev		Mean	Std Dev		Mean	Std Dev		Mean	Std Dev	
00-20% Grain															
Small	.187	.057		.203	.056		.189	.054		.194	.041		.177	.043	
Medium	.237	.053		.218	.030		.187	.014		.218	.057		.220	.031	
Large	.179	.058		.205	.051		.177	.046		.182	.049		.172	.058	
20-60% Grain															
Small	.157	.038		.162	.047		.139	.049		.150	.051		.174	.072	
Medium	.150	.040		.152	.032		.149	.034		.142	.033		.127	.034	
Large	.164	.040		.154	.038		.134	.029		.126	.019		.111	.026	
Very Large	.154	.038		.154	.044		.135	.031		.131	.024		.099	.020	
60-80% Grain															
Small	.132	.044		.132	.038		.113	.032		.095	.023		.087	.024	
Medium	.117	.026		.121	.026		.107	.024		.107	.024		.081	.017	
Large	.121	.033		.109	.025		.107	.022		.099	.025		.080	.017	
Very Large	.101	.040		.119	.024		.125	.019		.093	.019		.087	.021	
80-100% Grain															
Small	.093	.031		.087	.035		.092	.033		.085	.027		.079	.022	
Medium	.076	.006		.090	.029		.087	.027		.081	.029		.066	.019	
Large	.088	.008		.101	.018		.079	.020		.068	.019		.059	.019	
Very Large	----	----		----	----		.073	.016		.076	.016		.058	.015	
Overall Value	.148	.048		.146	.050		.125	.044		.117	.043		.092	.044	
Bartlett's Test*	20.180	.091		28.280	.008		36.010	.001		35.990	.001		62.190	0.000	
F-Test*	8.070	0.000		12.010	0.000		12.510	0.000		19.450	0.000		33.010	0.000	

*See Page 27.

The 0-20% grain category, or the mostly farm supply cooperatives, tended to have higher values than did the other grain categories. This was not true throughout, however, and some of the values found in the other grain categories had higher values than those in the 0-20% grain category.

Size seemed to have its expected effect of increasing gross profitability with increased size. This was true in all of the grain categories except the 0-20% category. There the large size category appeared to have consistently hit diseconomies of size. However, those results must be viewed cautiously as there were only two to four observations in that category.

Despite any variation which may have been associated with size or type, the overall values through the five years remained quite constant. The mean value was close to .160 throughout, with the standard deviation being around .04.

Grain Margins/Grain Sales

This ratio is similar to the previous ratio, here dealing with the gross profit of the grain handling operation. Table 5-11 presents the results.

Were only the yearly overall averages observed, it would appear that little change occurred throughout the five year period. The overall averages varied only between .042 and .045 with a standard deviation between .019 and .025.

TABLE 4-13

SUPPLY MARGINS/SUPPLY SALES

Category	1969		1970		1971		1972		1973	
	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev
00-20% Grain										
Small	.182	.049	.188	.060	.168	.044	.169	.038	.167	.033
Medium	.205	.030	.189	.011	.192	.001	.201	.032	.204	.037
Large	.161	.064	.179	.046	.162	.037	.163	.041	.164	.044
20-60% Grain										
Small	.147	.035	.150	.035	.141	.032	.149	.038	.170	.049
Medium	.167	.034	.162	.028	.157	.033	.155	.025	.155	.028
Large	.182	.035	.177	.024	.157	.026	.166	.034	.155	.024
Very Large	.172	.043	.178	.051	.169	.038	.172	.032	.161	.041
60-80% Grain										
Small	.142	.049	.136	.037	.127	.029	.133	.038	.122	.013
Medium	.162	.039	.167	.034	.155	.028	.161	.030	.150	.033
Large	.169	.042	.155	.046	.174	.034	.168	.033	.164	.024
Very Large	.162	.045	.181	.041	.170	.049	.159	.031	.185	.040
80-100% Grain										
Small	.123	.082	.068	.094	.122	.057	.126	.068	.126	.022
Medium	.132	.079	.136	.045	.163	.037	.142	.038	.140	.053
Large	.211	.045	.191	.020	.179	.019	.154	.032	.153	.043
Very Large	----	----	----	----	.174	.028	.174	.010	.175	.039
Overall Value	.161	.045	.159	.049	.156	.037	.158	.036	.160	.039
Bartlett's Test [*]	22.560	.047	60.190	0.000	31.320	.005	19.370	.150	28.150	.014
F-Test [*]	2.900	.001	6.700	0.000	3.310	.001	2.200	.009	2.400	.004

*See Page 27.

The statistical results were inconclusive and should be used only with much caution. As may be noted in Table 4-14, the Small size category of 0-20% grain handled no grain throughout the five year period and none of the 0-20% grain cooperatives handled any grain at all in 1972-3. Thus, the statistical results reflected that fact. No attempt was made to run analysis of variance ignoring the 0-20% grain type category.

Most of the cooperatives in the 0-20% category were indeed totally farm supply handlers, with only a few handling some grain in some of the years. Thus, it was expected that the margin would be smaller here since it was a sideline activity. Furthermore, the averaging process, which included those cooperatives with zero grain and thus a zero grain margin would also force the average value down.

Results otherwise were quite inconclusive. There were differences in ratio values among the categories, although not large. No general patterns due to size or type could be noted.

Total Margins/Total Sales

This ratio measures the relation between the sum of the grain and farm supply margins against the sum of the grain and farm supply sales. One would expect to find significant differences among the values, if only due to the process of combining the margin ratios. As may be noted from the previous two ratios,

TABLE 4-14

GRAIN MARGINS/GRAIN SALES

Category	1969		1970		1971		1972		1973	
	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev
00-20% Grain										
Small	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Medium	.028	.038	.024	.048	.025	.035	0.000	0.000	0.000	0.000
Large	.009	.012	.035	.040	.010	.018	0.000	0.000	0.000	0.000
20-60% Grain										
Small	.053	.018	.051	.021	.045	.017	.050	.025	.032	.031
Medium	.047	.015	.047	.021	.051	.015	.047	.018	.042	.016
Large	.055	.019	.049	.014	.042	.015	.045	.012	.051	.018
Very Large	.060	.017	.053	.013	.049	.009	.053	.012	.066	.050
60-80% Grain										
Small	.053	.026	.046	.015	.043	.020	.044	.016	.052	.015
Medium	.046	.017	.048	.013	.042	.011	.048	.010	.049	.017
Large	.052	.008	.048	.012	.047	.014	.046	.013	.052	.020
Very Large	.038	.009	.043	.011	.054	.008	.044	.017	.050	.020
80-100% Grain										
Small	.049	.010	.041	.016	.044	.013	.038	.019	.042	.010
Medium	.055	.006	.050	.011	.043	.011	.041	.007	.049	.014
Large	.046	.003	.047	.013	.054	.010	.041	.008	.045	.014
Very Large	----	----	----	----	.053	.005	.043	.005	.047	.012
Overall Value	.044	.024	.042	.023	.042	.019	.042	.019	.045	.025
Bartlett's Test*	3217.700	0.000	766.300	0.000	538.400	0.000	2328.500	0.000	617.800	0.000
F-Test*	14.590	0.000	14.530	0.000	16.500	0.000	14.680	0.000	9.150	0.000

*See Page 27.

there are wide differences between the margins on farm supplies and grain. Thus, when they are combined in differing percentages (due to the percentage of sales in each) differences could be easily manufactured and not be real differences. This must be kept in mind when reviewing the results presented in Table 4-15.

According to the F-test results, differences among the categories were found in all of the years, at a highly significant level. However, the Bartlett's test results clearly warned against using the F-test results too rigorously, as homogeneity of variance was not found in any of the years.

The overall values showed a constant decline through the five years, from .105 to .088. Likewise, the standard deviation showed a slight decline from .043 to .036. The decline in average values must be viewed cautiously, as the value of grain sales was increasing through the years. Thus, the decline may well be due to changes in the "product mix" rather than managerial changes.

The relationship was clear between the ratio value and the percent of grain categories. As percent of grain sales increased, the ratio value decreased -- due to the margin for grain being less than that for farm supplies.

The influence of size was less clear. However, for the 20-60%, 60-80%, and 80-100% grain categories, there was a tendency for the ratio to increase with increased size. For the 0-20% category,

the Medium size category had a value greater than the Small, while the Large had a lower value than the Small size category.

Through time, the 0-20% and 80-100% categories showed little change. They would be less affected by changes in product mix, and would therefore mirror the results found with respect to farm supply margins and grain margins respectively. In the other categories, there was a general downward trend noted.

Ratios not Included in the Findings

Many widely used financial ratios have not been included in this study as a result of the statistical analysis. This should not be taken as evidence that they are not important in cooperative analysis, or that they were considered unimportant in this study. For example, the Current Ratio has much theoretical and practical support to recommend it for use in cooperatives.

Rather, this study has postulated categorizations and has computed and tested selected financial ratios. Within that scope, certain ratios were found to meet the statistical criteria of acceptance. It is to be expected that improved attempts at categorizing cooperatives would show statistically that additional ratios are of vital importance in cooperative analysis.

Table 4-16 has been prepared which presents the ratios found significant in neither the analysis of variance nor the regression analysis in Chapter V. (Appendix A presents the ratios

TABLE 4-15

TOTAL MARGINS/TOTAL SALES

Category	1969			1970			1971			1972			1973		
	Mean	Std Dev		Mean	Std Dev		Mean	Std Dev		Mean	Std Dev		Mean	Std Dev	
00-20% Grain															
Small	.182	.049		.188	.060		.168	.044		.169	.038		.167	.033	
Medium	.198	.031		.187	.015		.181	.016		.201	.032		.204	.037	
Large	.159	.067		.171	.046		.159	.041		.163	.041		.164	.044	
20-60% Grain															
Small	.098	.023		.099	.026		.088	.023		.103	.030		.106	.029	
Medium	.104	.025		.104	.021		.104	.021		.100	.024		.096	.021	
Large	.117	.027		.109	.020		.092	.019		.099	.018		.098	.019	
Very Large	.124	.025		.126	.033		.108	.021		.110	.016		.105	.021	
60-80% Grain															
Small	.077	.022		.072	.016		.066	.019		.067	.020		.073	.010	
Medium	.080	.020		.083	.014		.074	.013		.080	.012		.075	.017	
Large	.084	.016		.078	.019		.080	.017		.079	.015		.081	.017	
Very Large	.077	.007		.081	.017		.091	.021		.074	.019		.086	.016	
80-100% Grain															
Small	.057	.015		.049	.018		.056	.014		.053	.014		.056	.014	
Medium	.069	.012		.061	.008		.063	.011		.056	.013		.062	.013	
Large	.064	.009		.075	.014		.075	.008		.059	.013		.061	.016	
Very Large	----	----		----	----		.069	.014		.060	.013		.066	.014	
Overall Value	.105	.043		.104	.046		.091	.037		.090	.036		.088	.036	
Bartlett's Test*	42.910	0.000		105.700	0.000		61.610	0.000		55.160	0.000		35.600	.001	
F-Test*	27.060	0.000		32.290	0.000		30.870	0.000		34.490	0.000		38.390	0.000	

* See Page 27.

found to be important by the regression analysis.) Presented here are the overall ratio values for each of the five years, which will allow some judgment as to the average values to be expected in Kansas cooperatives.

TABLE 4-16

OVERALL VALUES FOR SELECTED FINANCIAL RATIOS

Ratio	1969		1970		1971		1972		1973	
	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev
<u>Current Assets</u>										
Current Liabilities	2.500	3.000	2.280	2.230	2.180	1.650	2.140	1.660	1.790	1.170
<u>Current Assets-Inventory</u>										
Current Liabilities	1.720	2.220	1.570	1.570	1.490	.960	1.490	1.140	1.310	.680
<u>Accounts Receivable</u>										
Total Sales	.056	.044	.057	.040	.052	.037	.047	.034	.041	.031
<u>Accounts Receivable</u>										
Supply Sales	.141	.128	.139	.087	.155	.171	.134	.084	.135	.074
<u>Current Liabilities</u>										
Supply Inventory	2.380	2.710	2.820	3.970	3.420	13.880	3.400	10.180	5.640	10.650
<u>Supply Inventory</u>										
Current Assets-Current Liabilities	.676	5.630	.657	4.240	.896	2.780	1.810	15.380	1.570	8.070
<u>Total Sales</u>										
Current Assets-Current Liabilities	6.640	107.800	13.520	78.890	14.330	56.150	26.790	478.800	29.650	164.000

TABLE 4-16 CONTINUED

Ratio	1969		1970		1971		1972		1973	
	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev
Long-term Liabilities	.820	10.770	.917	8.250	.873	5.580	1.140	29.500	1.160	5.540
Current Liabilities	1.120	.482	1.120	.500	1.180	.719	1.210	.694	1.250	.461
Member Equity Fixed Assets + Investments	7.630	67.790	3.690	20.320	4.50	21.110	2.260	9.290	1.880	6.460
Long-term Liabilities	.668	.312	.670	.367	.630	.303	.603	.259	.557	.223
Net Fixed Assets										
Member Equity										
Current Liabilities	.415	.490	.469	.483	.451	.458	.590	.453	.851	.710
Member Equity										
Long-term Liabilities	.265	.398	.274	.426	.240	.340	.223	.284	.207	.258
Member Equity										
Total										
Liabilities	.680	.839	.743	.820	.691	.730	.723	.656	1.060	.806
Member Equity										
Total Expenses										
Net Operating Savings	-.964	96.330	9.120	196.050	20.270	302.700	10.230	108.470	-.198	49.160

CHAPTER V

Regression Analysis

Introduction and Procedure

While one-way analysis of variance can show whether there are statistically significant differences among category means, it says nothing about which ratios are important in determining the success of a local cooperative. Success here is defined in the narrow terms of a cooperative's ability to generate net savings.

In an attempt to determine which of the ratios were of importance in predicting cooperative success, multiple regression analysis utilizing a stepwise procedure was undertaken. Three of the return ratios, considered good indicators of cooperative success, were chosen as dependent variables. Twenty-four financial ratios thought to affect rates of return were selected as independent variables. Table 5-1 lists both the dependent and independent variables considered.

The stepwise procedure brings in the most important variable at each step. That is, the first step brings in the variable with the highest simple R^2 . At each succeeding step, the variable whose inclusion increases the R^2 most is brought in. Also, after the third step, the procedure checks to see if any of the variables already in the regression could be eliminated without

a significant decrease in R^2 . Thus, by looking at the independent variables and their order of entrance into the regression, one could determine which were most important in predicting or explaining success.

TABLE 5-1

DEPENDENT AND INDEPENDENT VARIABLES USED IN REGRESSION

Number	Variable
<u>Dependent Variables</u>	
1	Net Operating Savings/Total Assets - Investments
2	Net Savings/Total Assets
<u>Independent Variables</u>	
1	Current Assets/Current Liabilities
2	Current Assets - Inventory/ Current Liabilities
3	Accounts Receivable/Total Sales
4	Accounts Receivable/Supply Sales
5	Supply Inventory/Supply Sales
6	Current Liabilities/Supply Inventory
7	Supply Inventory/Current Assets-Current Liabilities
8	Total Sales/Current Assets-Current Liabilities
9	Long-term Liabilities/Current Assets-Current Liabilities
10	Total Liabilities/Total Assets
11	Member Equity/Total Assets
12	Member Equity/Net Fixed Assets + Investments
13	Long-term Liabilities/Net Savings
14	Net Fixed Assets/Member Equity
15	Current Liabilities/Member Equity
16	Long-term Liabilities/Member Equity
17	Total Liabilities/Member Equity
18	Total Expenses/Total Sales
19	Total Expenses/Net Operating Savings
20	Supply Margins/Supply Sales
21	Grain Margins/Grain Sales
22	Total Margins/Total Sales
23	Total Sales/Total Assets
24	Total Sales/Net Fixed Assets

Regression Results

Tables 5-2 through 5-11 present the regression results. Variables are listed in order of their entrance into the regression. All regressions had F-tests which were significant at better than the .01 level. Numbers in parentheses under the regression equations indicate t-test results.

TABLE 5-2

REGRESSION ON NET OPERATING SAVINGS/ TOTAL ASSETS - INVESTMENTS, 1969

Number	Variable	Contribution to R ²
18	Total Expenses/Total Sales	.182
22	Total Margins/Total Sales	.193
15	Current Liabilities/Member Equity	.060
21	Grain Margins/Grain Sales	.041
12	Member Equity/Net Fixed Assets+Investments	.013
	Total	<u>.489</u>

The Equation:

$$Y_1 = .063 - 1.01X_{18} + .839X_{22} - .022X_{15} + .596X_{21} + .018X_{12}$$

(-11.17) (8.06) (-3.24) (4.58) (2.36)

TABLE 5-3

REGRESSION ON NET SAVINGS/TOTAL ASSETS, 1969

Number	Variable	Contribution to R ²
18	Total Expenses/Total Sales	.166
22	Total Margins/Total Sales	.263
15	Current Liabilities/Member Equity	.035
21	Grain Margins/Grain Sales	.011
1	Current Assets/Current Liabilities	.005
	Total	<u>.480</u>

The Equation:

$$Y_2 = .103 - .878X_{18} + .803X_{22} - .019X_{15} + .193X_{21} - .001X_1$$

(-13.41) (10.44) (-3.93) (1.98) (-1.46)

TABLE 5-4

REGRESSION ON NET OPERATING SAVINGS/
TOTAL ASSETS - INVESTMENTS, 1970

Number	Variable	Contribution to R ²
18	Total Expenses/Total Sales	.221
22	Total Margins/Total Sales	.178
11	Member Equity/Total Assets	.068
21	Grain Margins/ Grain Sales	.069
14	Net Fixed Assets/Member Equity	.027
	Total	<u>.563</u>

The Equation:

$$Y_1 = -.058 - 1.03X_{18} + .894X_{22} + .154X_{11} + .738X_{21} + .041X_{14}$$

(-12.32) (9.68) (7.05) (6.08) (3.70)

TABLE 5-5

REGRESSION ON NET SAVINGS/TOTAL ASSETS, 1970

Number	Variable	Contribution to R ²
18	Total Expenses/Total Sales	.207
22	Total Margins/Total Sales	.259
11	Member Equity/Total Assets	.038
21	Grain Sales/Grain Margins	.039
14	Net Fixed Assets/Member Equity	.013
	Total	<u>.556</u>

The Equation:

$$Y_2 = .012 - .868X_{18} + .784X_{22} + .085X_{11} + .422X_{21} + .022X_{14}$$

(-13.65) (11.11) (5.10) (4.55) (2.57)

TABLE 5-6

REGRESSION ON NET OPERATING SAVINGS/
TOTAL ASSETS - INVESTMENTS, 1971

Number Variable	Contribution to R ²
18 Total Expenses/Total Sales	.340
22 Total Margins/Total Sales	.126
21 Grain Margins/Grain Sales	.063
11 Member Equity/Total Assets	.051
23 Total Sales/Total Assets	.008
Total	<u>.588</u>

The Equation:

$$Y_1 = .071 - 1.33X_{18} + .960X_{22} + .883X_{21} + .217X_{11} - .125X_{23}$$

$$(-11.02) \quad (8.06) \quad (5.71) \quad (4.61) \quad (-2.12)$$

TABLE 5-7

REGRESSION ON NET SAVINGS/TOTAL ASSETS, 1971

Number Variable	Contribution to R ²
18 Total Expenses/Total Sales	.310
22 Total Margins/Total Sales	.154
21 Grain Margins/Grain Sales	.048
15 Current Liabilities/Member Equity	.044
13 Long-term Liabilities/Net Savings	.009
Total	<u>.564</u>

The Equation:

$$Y_2 = .105 - .977X_{18} + .779X_{22} + .640X_{21} - .023X_{15} - .0002X_{13}$$

$$(-12.71) \quad (8.56) \quad (5.24) \quad (-4.74) \quad (-2.09)$$

TABLE 5-8

REGRESSION ON NET OPERATING SAVINGS/
TOTAL ASSETS - INVESTMENTS, 1972

Number Variable	Contribution to R ²
18 Total Expenses/Total Sales	.210
22 Total Margins/Total Sales	.202
11 Member Equity/Total Assets	.056
21 Grain Margins/Grain Sales	.065
14 Net Fixed Assets/Member Equity	.016
Total	<u>.548</u>

The Equation:

$$Y_1 = -.047 - 1.34X_{18} + 1.26X_{22} + .141X_{11} + .742X_{21} + .042X_{14}$$

$$(-11.52) \quad (8.90) \quad (6.14) \quad (4.80) \quad (2.74)$$

TABLE 5-9

REGRESSION ON NET SAVINGS/TOTAL ASSETS, 1972

Number Variable	Contribution to R ²
18 Total Expenses/Total Sales	.182
22 Total Margins/Total Sales	.215
15 Current Liabilities/Member Equity	.047
21 Grain Margins/Grain Sales	.044
12 Member Equity/Net Fixed Assets+Investments	.010
Total	<u>.497</u>

The Equation:

$$Y_2 = .111 - 1.15X_{18} + 1.11X_{22} - .027X_{15} + .471X_{21} - .008X_{12}$$

$$(-12.0) \quad (9.45) \quad (-5.09) \quad (3.64) \quad (-2.04)$$

TABLE 5-10

REGRESSION ON NET OPERATING SAVINGS/
TOTAL ASSETS - INVESTMENTS, 1973

Number	Variable	Contribution to R ²
23	Total Sales/Total Assets	.265
21	Grain Margins/Grain Sales	.120
12	Member Equity/Net Fixed Assets+Investments	.114
20	Supply Margins/Supply Sales	.049
18	Total Expenses/Total Sales	.028
22	Total Margins/Total Sales	.170
	Total	<u>.746</u>

The Equation:

$$Y_1 = - .033 + .024X_{23} + .379X_{21} + .011X_{12} + .108X_{20} - 1.56X_{18} + 1.70X_{22}$$

(7.16) (3.25) (1.82) (1.50) (-12.55) (11.85)

TABLE 5-11

REGRESSION ON NET SAVINGS/TOTAL ASSETS, 1973

Number	Variable	Contribution to R ²
23	Total Sales/Total Assets	.277
21	Grain Margins/Grain Sales	.099
22	Total Margins/Total Sales	.018
18	Total Expenses/Total Sales	.283
15	Current Liabilities/Member Equity	.086
	Total	<u>.763</u>

The Equation:

$$Y_2 = .065 + .016X_{23} + .145X_{21} + 1.65X_{22} - 1.52X_{18} - .018X_{15}$$

(5.33) (1.54) (16.90) (-16.27) (-5.62)

Summary of Regression Results

The stepwise regression procedure brought the most important variables, according to R^2 values, in first. Regressions computed for years 1969-72 identified two variables as being the most important. They were Total Expenses/Total Sales and Total Margins/Total Sales. In 1973, those two ratios entered the equations later but were very important. Thus, for all ratios considered, those two can be confidently said to be the most important.

It should be noted that both of these ratios are aggregated values. In the case of expenses, no other ratios were included in the stepwise analysis which dealt with that area. In the case of margins, however, two disaggregated ratios were included but did not show up as significant predictors of return ratios.

The magnitude of the R^2 values was somewhat disappointing. The R^2 values were in the .5 range for years 1969-72, while 1973 data produced values in the .7 range. Thus, only about one-half of the variation in dependent variables was explained by independent variables used.

The low explanatory power of the ratios may be explained in several ways. Perhaps the choice of ratios was poor. As noted above, the two ratios which best explained return on investment

were very much aggregated ratios. Inclusion of ratios dealing with all aspects of expenses and margins might improve the equations. Inclusion of other ratios might also improve the analysis. Part of the purpose of this study was to indicate which of the many financial ratios available could profitably be used by cooperatives. Hopefully, future studies will be able to improve on the results found here.

The use of ratios to predict return on investment may be limited when used alone. Indeed, in this study, it was attempted to use both ratio and dollar values to predict the rate of return on investment. Unfortunately, problems internal to the statistical computer programs forced abandonment of this effort. It would seem reasonable that both the value of a particular ratio, as well as the level of its dollar components, would be important in predicting the rate of return. For example, both the value of the Current Ratio as well as the level of Current Assets and Current Liabilities should have an effect on the ability to predict levels of return on investment.

Linear regression analysis was used in this study. However, the relationship between some ratios and return on investment generally is thought to be curvilinear. Perhaps a larger R^2 could be achieved with non-linear regression techniques.

Beyond financial ratios and values, there ought to be significant influence, especially in cooperatives, caused by the human

components. Quality of the management team, capacity of the board of directors and depth of interest by the member-owners could be expected to play important roles in determining the return on investment enjoyed by the cooperative.

One attempt was made to improve the value of the R^2 . Since it was noted that the dollar amount of patronage and dividend income was generally greater than the net operating savings for an individual cooperative, the ratio Return on Investments was calculated. It was felt that this return ratio might be highly correlated with the overall return enjoyed by local cooperatives. However, the inclusion of this ratio in the regressions did not significantly increase the R^2 . In fact, it rarely was even brought into the regression by the stepwise procedure.

CHAPTER VI

Summary and Conclusions

Summary

The major hypothesis of this study was that agricultural cooperatives, in order to improve their management, should be studied within well-defined categories. A second and related hypothesis was that financial ratios can be used successfully in the financial analysis of cooperatives. It was strongly felt that one reason ratio analysis has been largely ignored in cooperatives was that previous studies had not differentiated adequately among differing cooperatives.

While an overly elaborate system of categorizing was neither postulated nor attempted, a simple breakdown on the basis of two variables, type and size, was formulated and studied. Type of cooperative was represented by the percent of grain sales. Four categories were determined. Each of those categories was further subdivided by the second variable, size. The smallest percent of grain sales category, or basically farm supply cooperatives, had three size categories, while the other type categories each were subdivided by four size categories. Size was based on the volume of total sales.

The data used in this study were considered to be consistent throughout, as they came from an accounting firm which does audits for the cooperatives included in this study. Differing accounting

procedures could obviously introduce another source of variation into the study.

The literature on financial ratios, both in business and in cooperatives, was reviewed to obtain a list of ratios which might be used in analyzing cooperative performance. Average ratio values were calculated for each of the categories for each of the thirty-seven ratios studied.

One-way analysis of variance was chosen as the statistical technique which would allow testing of the hypothesis that there were significant differences among the category means for the various ratios. A major problem encountered in the analysis of variance was that the assumption of homogeneity of variance among the categories often was violated. Analysis of the raw data made clear that a few of the observations had ratio values far different from most of the observations. Much effort was spent in devising some simple decision rules which would eliminate them from the study.

Even after the attempts to eliminate the outliers from the analysis, not all of the ratios met the assumption of homogeneity of variance. Twelve ratios, representing various types of ratios, were found to meet the assumptions and showed statistically significant differences among their means.

Two reasons for the assumption of homogeneity of variance not being met for many of the ratios may be suggested. Most obvious is that those particular ratios may not be useful for cooperative analysis. Somewhat less obvious, but perhaps more valid, is that the categorization scheme was not dividing cooperatives into the most advantageous grouping. Certainly the categorization process here was only tentative and ignored many possible variables upon which cooperatives could be divided.

Following the analysis of variance, multiple regression analysis utilizing a stepwise procedure was undertaken to determine which ratios were most important in predicting return on investment. Twenty-four of the ratios thought to affect return on investment were the independent variables considered.

It was consistently found that two ratios, Total Expenses/Total Sales and Total Margins/Total Sales, were the most important predictive ratios. The R^2 values obtained were somewhat disappointing, ranging from .4 to .7. This was not a cause for alarm, as this analysis was intended only to give an indication of which ratios were most important in predicting a cooperative's ability to generate net savings.

Several reasons may be postulated for the low R^2 values. First, linear regression was used. Certainly some of the ratios must have curvilinear relationships with return ratios. Second,

other financial ratios not considered in this study or the inclusion of the dollar components of the financial ratios might improve the regression. (Data on the dollar components of ratios investigated here are found in Appendix B.) Finally, non-financial considerations such as quality of management, capacity of the board of directors and interest of the members may play an especially large role in cooperatives and their relative success.

Thus, one can argue that the main hypotheses of the study have been verified. First analysis of variance in twelve of the ratios showed there to be statistically significant differences among the means of the categories. Second, regression analysis showed that the financial ratios can, to a degree, predict the return on investments. The results of this study agree with previous studies which warned against indiscriminate use of general financial ratios in cooperatives. Equally, however, the findings here can fault prior efforts for not going far enough, and thus casting aside a potentially valuable tool which could be used by local cooperatives to improve financial success.

Implications for Future Research

Certainly it would be difficult to argue that this study has identified the exact financial ratios which ought to be used by all types and sizes of cooperatives, or even any of them.

It has, however, given added evidence to the claim that financial ratios, used with well-defined standards, can be of great use in improving cooperative performance.

The most important ratios found here for analysis purposes were two aggregated ratios dealing with expenses and margins. It would seem fruitful to consider disaggregating these ratios, as well as considering any other ratios which deal with those two areas.

In addition to ratios measuring expenses and margins, other ratios not investigated in this study should also be considered. The regression analysis, with its low R^2 results, suggests that they could add explanatory power to the equations. Other use of the ratios, such as using previous years' values in current year prediction, might also be useful.

The low R^2 values also suggest that ratios alone, or used on an overall basis, cannot adequately explain cooperatives' return on investment. It might be that the addition of dollar financial statement items would prove superior in predictive ability. It would seem reasonable that cooperatives with identical ratio values but different dollar values in the components of that ratio might show differing rates of return.

The proper categorization of cooperatives is an area that needs further exploration. In this study, some important ratios

had such wide differences among the category variances that statements backed by statistical significance could not be made. More precise categorization should reduce or eliminate this problem.

Finally, once the best ratios and other financial variables were determined and a useful categorization scheme defined, regression analysis could be run on each category. It would be expected that the categories would yield differing regression results in terms of coefficients as well as independent variables.

Financial ratio analysis is widely and successfully used in corporate organizations. The provision of standards for various categories would allow the same for cooperatives.

APPENDIX A

OTHER FINANCIAL RATIOS INDICATED AS
IMPORTANT BY REGRESSION ANALYSIS

TABLE A-1
LONG-TERM LIABILITIES/MEMBER EQUITY

Category	1969		1970		1971		1972		1973	
	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev
00-20% Grain										
Small	.149	.242	.132	.239	.146	.240	.094	.179	.139	.209
Medium	.554	.528	.501	.563	.023	.017	.156	.205	.178	.103
Large	.280	.302	.250	.148	.283	.245	.291	.200	.147	.162
20-60% Grain										
Small	.297	.327	.258	.274	.418	.704	.377	.570	.202	.157
Medium	.379	.459	.383	.367	.409	.300	.382	.317	.376	.297
Large	.262	.146	.297	.428	.317	.320	.292	.221	.295	.234
Very Large	.204	.184	.308	.228	.268	.196	.262	.192	.241	.146
60-80% Grain										
Small	.214	.687	.451	.917	.212	.429	.176	.329	.709	.977
Medium	.226	.303	.215	.316	.173	.229	.233	.274	.206	.253
Large	.170	.255	.142	.145	.216	.270	.164	.227	.182	.198
Very Large	.173	.174	.379	.150	.229	.254	.160	.130	.246	.254
80-100% Grain										
Small	.161	.214	.133	.185	.073	.089	.110	.102	.026	.029
Medium	.032	.006	.117	.148	.109	.149	.176	.224	.120	.185
Large	.015	.011	.154	.278	.052	.087	.084	.115	.197	.273
Very Large	----	----	----	----	.142	.195	.160	.267	.124	.134
Overall Value	.265	.398	.274	.426	.240	.340	.223	.284	.207	.258
Bartlett's Test*	74.450	0.000	114.270	0.000	100.650	0.000	58.130	0.000	64.540	0.000
F-Test*	.943	.509	1.181	.295	2.048	.016	1.700	.058	2.430	.004

* See Page 27.

TABLE A-2

CURRENT LIABILITIES/MEMBER EQUITY

Category	1969		1970		1971		1972		1973	
	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev
00-20% Grain										
Small	.376	.506	.377	.427	.424	.430	.324	.324	.382	.299
Medium	.588	.378	.942	1.033	.390	.263	.466	.185	.223	.150
Large	.331	.183	.335	.102	.578	.325	.511	.198	.528	.163
20-60% Grain										
Small	.441	.382	.499	.361	.612	.461	.548	.390	.866	.496
Medium	.463	.352	.532	.393	.537	.335	.607	.390	.726	.330
Large	.424	.223	.515	.494	.577	.435	.553	.365	.745	.436
Very Large	.325	.139	.632	.749	.479	.361	.523	.426	.811	.519
60-80% Grain										
Small	.440	1.031	.539	.814	.554	1.233	.599	1.069	.463	.229
Medium	.368	.404	.397	.398	.371	.263	.507	.419	.571	.383
Large	.424	.351	.303	.161	.367	.224	.492	.421	.820	.627
Very Large	.407	.238	.521	.200	.424	.012	.602	.462	1.005	.775
80-100% Grain										
Small	.234	.157	.270	.213	.253	.148	.278	.132	.505	.639
Medium	.118	.031	.270	.140	.289	.142	.355	.185	.759	.587
Large	.366	.189	.571	.591	.237	.144	.429	.348	1.118	.740
Very Large	----	----	----	----	.509	.289	.597	.106	1.500	1.240
Overall Value	.415	.490	.469	.483	.451	.458	.500	.453	.851	.710
Bartlett's Test*	95.830	0.000	73.450	0.000	140.160	0.000	72.810	0.000	64.810	0.000
F-Test*	.291	.993	.967	.485	1.029	.425	.616	.850	2.927	.001

*See Page 27.

TABLE A-3

NET FIXED ASSETS/MEMBER EQUITY

Category	1969		1970		1971		1972		1973	
	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev
00-20% Grain										
Small	.359	.329	.374	.299	.367	.304	.251	.206	.288	.253
Medium	.759	.359	.802	.664	.330	.135	.579	.158	.428	.247
Large	.389	.095	.453	.162	.445	.221	.474	.186	.412	.120
20-60% Grain										
Small	.680	.292	.649	.226	.727	.536	.689	.387	.648	.171
Medium	.777	.311	.727	.270	.718	.287	.697	.240	.630	.273
Large	.718	.168	.708	.276	.716	.241	.683	.240	.570	.157
Very Large	.633	.179	.744	.278	.698	.232	.642	.179	.590	.196
60-80% Grain										
Small	.669	.401	.891	.748	.659	.507	.629	.442	.739	.591
Medium	.720	.263	.679	.244	.624	.170	.629	.228	.564	.237
Large	.700	.244	.622	.146	.640	.192	.577	.152	.556	.168
Very Large	.539	.131	.748	.054	.587	.089	.557	.094	.614	.211
80-100% Grain										
Small	.681	.166	.594	.209	.552	.176	.505	.157	.535	.123
Medium	.598	.056	.655	.198	.594	.143	.659	.270	.547	.225
Large	.546	.013	.645	.256	.530	.104	.546	.109	.610	.190
Very Large	----	----	----	----	.649	.154	.675	.170	.547	.143
Overall Value	.668	.312	.670	.367	.630	.303	.603	.259	.557	.223
Bartlett's Test*	28.240	.008	102.220	0.000	76.530	0.000	53.93	0.000	28.590	.012
F-Test*	2.775	.001	2.477	.004	2.000	.019	2.990	.001	2.548	.002

* See Page 27.

TABLE A-4

TOTAL LIABILITIES/MEMBER EQUITY

Category	1969		1970		1971		1972		1973	
	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev
00-20% Grain										
Small	.525	.644	.508	.583	.570	.596	.418	.486	.521	.473
Medium	1.142	.905	1.444	1.569	.414	.247	.621	.020	.401	.253
Large	.611	.485	.585	.241	.861	.570	.802	.362	.675	.200
20-60% Grain										
Small	.737	.638	.757	.575	1.030	1.051	.925	.757	1.068	.445
Medium	.842	.765	.915	.729	.946	.612	.989	.680	1.102	.583
Large	.686	.317	.813	.911	.894	.733	.845	.576	1.040	.551
Very Large	.528	.264	.939	.942	.747	.520	.785	.597	1.052	.637
60-80% Grain										
Small	.654	1.709	.990	1.490	.766	1.651	.775	1.378	1.172	1.174
Medium	.595	.669	.612	.681	.544	.399	.740	.596	.777	.503
Large	.593	.565	.445	.245	.583	.462	.656	.581	1.003	.720
Very Large	.580	.411	.900	.289	.653	.242	.762	.527	1.250	1.003
80-100% Grain										
Small	.395	.358	.402	.358	.327	.188	.387	.182	.531	.666
Medium	.150	.025	.387	.262	.399	.267	.531	.376	.879	.682
Large	.381	.177	.725	.850	.289	.219	.513	.338	1.315	.819
Very Large	----	----	----	----	.651	.431	.757	.323	1.620	1.237
Overall Value	.680	.839	.743	.820	.691	.730	.723	.656	1.058	.807
Bartlett's Test*	88.920	0.000	79.910	0.000	114.060	0.000	59.330	0.000	37.820	.001
F-Test*	.528	.906	1.173	.301	1.568	.090	.995	.459	2.112	.013

* See Page 27.

TABLE A-5

TOTAL SALES/TOTAL ASSETS

Category	1969		1970		1971		1972		1973	
	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev
00-20% Grain										
Small	2.003	1.163	1.901	.994	2.111	.883	2.191	1.016	2.273	1.126
Medium	1.595	.409	1.727	.321	1.605	.181	1.719	.404	1.976	.344
Large	1.905	.656	1.756	.504	1.975	.505	1.903	.441	2.018	.479
20-60% Grain										
Small	1.533	.553	1.582	.569	2.013	.758	1.927	.500	2.132	.879
Medium	1.664	.501	1.642	.370	1.862	.421	1.985	.410	2.450	.825
Large	1.590	.446	1.742	.337	2.033	.336	2.057	.340	2.278	.554
Very Large	1.800	.754	1.610	.482	1.923	.416	1.982	.355	2.450	.574
60-80% Grain										
Small	1.796	.933	1.850	.906	2.193	.870	2.500	.904	2.819	.492
Medium	1.875	.643	1.795	.451	2.061	.528	2.029	.611	2.464	.638
Large	1.753	.591	1.983	.511	2.231	.415	2.361	.607	2.461	.789
Very Large	2.238	.581	1.951	.300	1.917	.424	2.305	.446	2.505	.736
80-100% Grain										
Small	1.888	.648	2.244	.694	2.169	.721	2.736	1.205	3.239	1.780
Medium	1.911	.367	2.285	.519	2.531	.590	2.621	.796	2.839	1.118
Large	1.927	.532	1.625	.237	2.552	.432	2.891	1.224	2.826	.957
Very Large	-----	-----	-----	-----	2.354	.304	2.145	.340	2.440	.828
Overall Value	1.738	.699	1.784	.624	2.099	.598	2.224	.712	2.520	.858
Bartlett's Test*	37.910	.001	59.970	0.000	42.040	.001	56.43	0.000	23.620	.051
F-Test*	.940	.512	1.583	.091	1.741	.050	2.566	.002	1.082	.375

* See Page 27.

TABLE A-6

TOTAL SALES/CURRENT ASSETS - CURRENT LIABILITIES

Category	1969		1970		1971		1972		1973	
	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev
00-20% Grain										
Small	4.907	6.347	5.785	6.816	4.372	11.613	2.576	11.939	32.026	108.773
Medium	15.185	11.778	8.806	18.225	6.293	3.702	10.942	.688	7.640	4.819
Large	5.976	1.927	8.208	3.994	12.440	11.029	11.027	8.911	14.886	15.444
20-60% Grain										
Small	13.449	27.853	-5.111	128.887	10.939	12.921	-13.031	80.641	603.605	1151.887
Medium	-20.144	223.822	9.266	47.277	21.817	37.046	98.435	433.606	40.648	79.500
Large	32.978	63.689	18.497	11.657	10.416	75.024	20.547	36.137	16.627	9.685
Very Large	13.169	8.815	14.800	15.091	16.203	13.198	11.921	4.800	8.205	22.786
60-80% Grain										
Small	13.781	11.759	34.939	132.867	-25.671	162.340	-5.595	92.535	11.692	3.557
Medium	9.796	44.896	13.059	41.398	24.823	26.288	16.457	18.736	19.111	14.549
Large	19.763	10.339	15.451	5.897	29.205	52.749	16.000	8.612	18.852	12.176
Very Large	14.776	6.146	17.654	9.127	16.167	3.523	-7.855	63.149	24.304	22.718
80-100% Grain										
Small	17.656	25.579	8.111	17.089	16.888	16.854	12.868	3.455	22.399	2.314
Medium	12.309	8.299	79.550	161.457	15.495	30.568	130.030	1809.793	17.100	22.746
Large	16.051	1.930	16.068	12.856	12.744	4.630	18.490	8.472	-1.066	84.567
Very Large	-----	-----	-----	-----	23.072	15.474	25.603	7.301	24.161	20.103
Overall Value	6.640	107.75	13.518	78.889	14.325	56.146	26.785	478.840	29.651	164.000
Bartlett's Test*	443.320	0.000	328.380	0.000	266.710	0.000	1035.610	0.000	657.556	0.000
F-Test*	.335	.986	.721	.742	.867	.596	.102	.999	4.441	.001

* See Page 27.

TABLE A-7

MEMBER EQUITY/NET FIXED ASSETS + INVESTMENTS

Category	1969		1970		1971		1972		1973	
	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev
00-20% Grain										
Small	1.745	.963	1.730	1.033	2.079	2.133	2.435	2.153	1.879	.880
Medium	.963	.464	1.010	.753	1.777	.624	1.126	.197	1.363	.411
Large	1.325	.235	1.209	.302	1.251	.439	1.205	.397	1.316	.271
20-60% Grain										
Small	1.047	.385	1.030	.305	1.042	.423	1.086	.515	.909	.106
Medium	.957	.291	.964	.302	.953	.320	.957	.314	1.053	.521
Large	.990	.280	1.016	.280	.981	.265	1.016	.236	1.092	.244
Very Large	1.171	.374	1.075	.360	1.072	.273	1.121	.267	1.187	.347
60-80% Grain										
Small	1.164	.340	.985	.343	1.162	.339	1.176	.319	1.258	.858
Medium	1.060	.290	1.134	.344	1.122	.288	1.146	.391	1.256	.420
Large	1.052	.249	1.095	.208	1.124	.301	1.183	.255	1.198	.257
Very Large	1.119	.244	.905	.185	.992	.216	1.202	.322	1.199	.420
80-100% Grain										
Small	1.028	.259	1.181	.362	1.294	.321	1.346	.367	1.202	.110
Medium	1.241	.186	1.085	.196	1.169	.264	1.133	.391	1.308	.439
Large	1.178	.046	1.164	.333	1.333	.229	1.239	.233	1.170	.420
Very Large	-----	-----	-----	-----	1.097	.187	1.022	.194	1.276	.260
Overall Value	1.119	.482	1.121	.499	1.179	.719	1.211	.694	1.251	.461
Bartlett's Test*	80.013	0.000	107.140	0.000	250.020	0.000	220.190	0.000	63.500	0.000
F-Test*	4.514	.001	4.191	.001	2.965	.001	4.330	.001	3.096	.001

*See Page 27.

APPENDIX B

FINANCIAL STATEMENT ITEMS

TABLE B-1

GRAIN SALES (IN THOUSANDS OF DOLLARS)

Category	1969		1970		1971		1972		1973	
	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev
00-20% Grain										
Small	0	0	0	0	0	0	0	0	0	0
Medium	34	48	22	43	50	70	0	0	0	0
Large	24	33	98	125	32	56	0	0	0	0
20-60% Grain										
Small	354	116	355	127	377	112	376	119	399	157
Medium	767	196	704	187	732	224	769	183	758	239
Large	1,415	365	1,457	356	1,497	377	1,566	367	1,547	440
Very Large	2,379	952	2,561	1,840	3,285	1,998	3,768	2,362	3,637	1,386
60-80% Grain										
Small	452	155	443	147	478	112	537	135	452	111
Medium	984	214	1,043	194	1,037	212	1,067	230	1,169	237
Large	1,867	338	1,945	493	1,965	444	1,926	378	2,085	392
Very Large	3,310	775	3,510	686	4,729	1,972	4,009	1,138	6,140	5,162
80-100% Grain										
Small	604	229	614	184	673	122	700	163	774	25
Medium	1,487	130	1,346	363	1,249	212	1,212	268	1,218	238
Large	2,266	463	2,231	677	2,517	262	2,549	575	2,750	468
Very Large	-----	----	-----	----	4,333	407	3,858	134	5,234	2,204
Overall Value	744	673	858	854	1,212	1,155	1,434	1,279	2,426	2,607
Bartlett's Test*	812.970	0.000	1039.000	0.000	818.650	0.000	3240.700	0.000	1576.900	0.000
F-Test *	97.900	0.000	54.260	0.000	50.290	0.000	39.650	0.000	15.860	0.000

* See Page 27.

TABLE B-2

SUPPLY SALES (IN THOUSANDS OF DOLLARS)

Category	1969		1970		1971		1972		1973	
	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev
00-20% Grain										
Small	231	131	239	130	257	141	242	143	280	132
Medium	634	179	634	158	570	41	578	97	551	53
Large	1,143	241	1,146	186	1,222	245	1,366	223	1,444	349
20-60% Grain										
Small	317	133	329	126	295	89	358	135	403	209
Medium	673	221	682	175	703	213	751	282	651	146
Large	1,447	499	1,303	421	1,170	355	1,298	374	1,255	269
Very Large	3,556	1,725	3,576	1,564	3,290	1,579	3,847	2,035	3,861	2,422
60-80% Grain										
Small	167	63	184	68	175	45	183	57	183	39
Medium	403	100	431	98	408	100	426	105	422	96
Large	663	164	747	217	704	230	714	215	759	201
Very Large	1,521	224	1,423	649	2,132	865	1,477	593	2,286	2,208
80-100% Grain										
Small	64	47	73	45	97	46	111	61	150	26
Medium	202	244	160	77	242	103	203	99	199	78
Large	308	231	527	171	515	58	426	164	466	177
Very Large	-----	-----	-----	-----	690	372	586	392	924	495
Overall Value	590	730	624	774	707	863	802	1,030	1,001	1,362
Bartlett's Test*	313.360	0.000	369.400	0.000	402.200	0.000	410.100	0.000	497.500	0.000
F-Test*	56.660	0.000	66.240	0.000	46.900	0.000	38.600	0.000	15.410	0.000

* See Page 27.

TABLE B-3

GRAIN MARGINS (IN THOUSANDS OF DOLLARS)

Category	1969		1970		1971		1972		1973	
	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev
00-20% Grain										
Small	0	0	0	0	0	0	0	0	0	0
Medium	2	3	2	4	2	3	0	0	0	0
Large	1	1	7	10	1	2	0	0	0	0
20-60% Grain										
Small	19	9	18	9	17	7	20	11	16	16
Medium	36	14	33	17	38	17	35	12	33	19
Large	77	29	72	27	62	25	70	27	78	35
Very Large	157	96	141	108	160	99	200	141	226	141
60-80% Grain										
Small	22	11	20	10	21	11	24	12	24	10
Medium	45	18	51	17	43	12	51	13	57	24
Large	97	20	96	43	92	36	89	33	106	41
Very Large	121	19	153	53	250	69	173	74	297	225
80-100% Grain										
Small	30	12	26	15	29	10	27	15	33	9
Medium	82	2	68	30	55	19	50	16	19	20
Large	104	27	103	34	135	16	106	36	121	35
Very Large	----	----	----	----	232	30	168	24	237	85
Overall Value	37	39	42	46	57	60	66	67	119	126
Bartlett's Test*	845.100	0.000	983.980	0.000	3205.800	0.000	3107.200	0.000	1411.100	0.000
F-Test*	40.330	0.000	30.490	0.000	45.300	0.000	23.300	0.000	16.400	0.000

* See Page 27.

TABLE B-4

SUPPLY MARGINS (IN THOUSANDS OF DOLLARS)

Category	1969		1970		1971		1972		1973	
	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev
00-20% Grain										
Small	43	27	46	30	45	29	42	28	48	25
Medium	127	27	119	26	109	8	114	1	113	31
Large	192	112	210	82	201	79	224	77	231	71
20-60% Grain										
Small	48	27	51	26	43	20	56	34	70	45
Medium	114	51	111	36	111	47	118	55	102	32
Large	264	106	230	82	186	70	216	81	196	59
Very Large	608	285	631	273	555	286	639	325	566	268
60-80% Grain										
Small	25	15	26	13	23	9	25	13	22	2
Medium	65	23	72	24	63	19	68	20	63	19
Large	114	45	118	56	124	48	123	52	124	38
Very Large	253	109	247	93	342	43	231	85	416	351
80-100% Grain										
Small	9	9	8	7	13	9	17	12	19	7
Medium	36	48	24	17	40	18	30	17	29	16
Large	60	35	102	39	92	14	68	32	75	34
Very Large	----	----	----	----	120	74	104	70	175	146
Overall Value	101	129	106	138	116	149	132	171	164	208
Bartlett's Test*	254.390	0.000	310.190	0.000	366.000	0.000	337.900	0.000	398.300	0.000
F-Test*	49.940	0.000	63.470	0.000	39.380	0.000	38.500	0.000	17.700	0.000

* See Page 27.

TABLE B-5

NET OPERATING SAVINGS (IN THOUSANDS OF DOLLARS)

Category	1969		1970		1971		1972		1973	
	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev
00-20% Grain										
Small	4	7	2	8	1	6	1	6	3	8
Medium	3	21	1	15	20	1	5	11	9	4
Large	26	1	22	12	23	22	36	8	42	27
20-60% Grain										
Small	6	16	8	19	7	21	12	21	-13	21
Medium	30	38	26	33	27	32	13	27	19	30
Large	48	86	57	54	48	57	69	65	67	56
Very Large	134	209	159	215	179	166	256	213	283	179
60-80% Grain										
Small	11	19	11	16	16	21	12	20	13	17
Medium	27	34	45	35	37	27	35	27	38	47
Large	55	44	111	82	66	59	70	37	87	46
Very Large	107	206	92	107	143	97	121	126	298	294
80-100% Grain										
Small	16	15	14	20	29	27	22	13	2	9
Medium	121	24	48	37	39	20	33	29	38	22
Large	82	39	95	74	114	48	78	47	81	52
Very Large	----	----	----	----	216	44	90	17	192	132
Overall Value	26	59	35	65	48	73	55	89	105	151
Bartlett's Test*	278.63	0.000	283.790	0.000	225.900	0.000	286.400	0.000	309.500	0.000
F-Test*	4.850	.001	8.090	0.000	13.690	0.000	12.580	0.000	10.600	0.000

* See Page 27.

TABLE B-6

NET SAVINGS (IN THOUSANDS OF DOLLARS)

Category	1969		1970		1971		1972		1973	
	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev
00-20% Grain										
Small	9	9	7	9	5	6	5	8	8	8
Medium	23	23	11	14	36	1	19	18	19	2
Large	84	37	51	19	50	5	63	3	72	28
20-60% Grain										
Small	17	17	16	19	15	19	23	20	-1	17
Medium	52	37	44	31	44	33	38	29	37	35
Large	84	79	84	60	86	58	108	67	104	58
Very Large	221	213	219	248	250	195	349	262	359	181
60-80% Grain										
Small	19	18	16	17	22	22	19	21	19	15
Medium	45	35	55	34	53	28	55	27	55	47
Large	84	41	137	80	95	59	102	40	122	50
Very Large	166	230	145	113	230	7670	1195	119	386	366
80-100% Grain										
Small	22	13	18	20	35	28	28	13	12	8
Medium	131	28	62	35	54	23	46	29	51	23
Large	114	53	111	74	142	44	107	44	111	53
Very Large	----	----	----	----	258	54	154	50	246	152
Overall Value	45	68	50	76	70	88	84	111	141	183
Bartlett's Test*	267.870	0.000	316.200	0.000	256.580	0.000	321.100	0.000	350.500	0.000
F-Test*	10.990	0.000	11.720	0.000	19.170	0.000	17.600	0.000	11.800	0.000

* See Page 27.

TABLE B-7

CURRENT ASSETS (IN THOUSANDS OF DOLLARS)

Category	1969			1970			1971			1972			1973		
	Mean	Std Dev		Mean	Std Dev		Mean	Std Dev		Mean	Std Dev		Mean	Std Dev	
00-20% Grain															
Small	62	34		68	39		65	33		66	36		74	33	
Medium	176	24		172	21		225	15		163	94		129	29	
Large	335	134		332	112		362	164		404	207		406	176	
20-60% Grain															
Small	174	72		179	75		152	63		170	63		190	93	
Medium	323	91		347	117		316	102		327	113		285	100	
Large	676	202		626	175		544	140		601	167		691	370	
Very Large	1,368	534		1,673	548		1,471	752		1,758	903		1,860	1,033	
60-80% Grain															
Small	129	60		127	61		121	57		133	83		108	28	
Medium	274	115		333	119		278	102		342	152		343	154	
Large	573	266		510	270		493	193		521	185		687	319	
Very Large	930	312		998	171		1,309	110		1,182	465		1,811	1,006	
80-100% Grain															
Small	92	29		106	32		151	75		129	27		175	186	
Medium	290	220		211	100		229	115		211	81		307	181	
Large	530	175		817	505		491	163		503	239		727	365	
Very Large	-----	-----		-----	-----		922	297		906	201		1,866	1,137	
Overall Value	299	296		347	371		387	404		471	493		830	867	
Bartlett's Test*	193.590	0.000		225.090	0.000		274.100	0.000		275.400	0.000		262.700	0.000	
F-Test*	60.32	0.000		74.020	0.000		38.660	0.000		34.300	0.000		18.100	0.000	

* See Page 27.

TABLE B-8

INVESTMENTS (IN THOUSANDS OF DOLLARS)

Category	1969		1970		1971		1972		1973	
	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev
00-20% Grain										
Small	39	28	38	26	37	29	36	33	39	32
Medium	100	37	94	25	73	13	70	29	70	21
Large	170	114	207	95	167	91	178	92	171	89
20-60% Grain										
Small	115	55	112	52	93	48	98	53	114	77
Medium	191	65	189	44	187	68	181	57	144	57
Large	400	145	332	116	276	93	276	80	240	48
Very Large	783	522	686	473	632	395	675	406	469	173
60-80% Grain										
Small	83	42	88	41	76	35	69	37	47	33
Medium	159	64	159	52	153	46	155	57	123	39
Large	316	113	330	159	245	110	227	89	202	67
Very Large	565	232	560	383	949	340	482	327	495	387
80-100% Grain										
Small	101	75	89	73	76	30	71	37	69	32
Medium	162	14	168	101	136	66	118	44	94	43
Large	302	64	299	119	222	45	213	73	176	67
Very Large	----	----	----	----	380	71	399	107	316	192
Overall Value	180	185	184	188	197	194	209	203	220	204
Bartlett's Test*	226.100	0.000	298.300	0.000	247.700	0.000	250.200	0.000	250.600	0.000
F-Test*	29.200	0.000	24.000	0.000	27.100	0.000	20.500	0.000	12.800	0.000

* See Page 27.

TABLE B-9

NET FIXED ASSETS (IN THOUSANDS OF DOLLARS)

Category	1969		1970		1971		1972		1973	
	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev
00-20% Grain										
Small	35	32	38	33	34	30	25	26	30	26
Medium	149	45	115	41	89	27	119	17	81	28
Large	166	93	223	112	158	72	184	35	178	55
20-60% Grain										
Small	203	117	186	96	132	68	153	103	148	109
Medium	408	174	337	102	301	123	286	99	189	106
Large	842	339	678	280	514	144	561	262	362	104
Very Large	1,569	839	1,602	812	1,424	767	1,409	735	907	378
60-80% Grain										
Small	186	105	180	93	137	71	125	67	78	45
Medium	375	134	372	124	302	100	287	102	222	107
Large	718	310	641	289	510	188	430	155	349	107
Very Large	794	349	1,031	340	1,243	257	823	363	968	736
80-100% Grain										
Small	191	99	145	71	161	72	122	53	125	57
Medium	468	138	325	127	268	101	240	84	176	94
Large	540	20	669	255	502	111	427	176	346	150
Very Large	----	----	----	----	876	239	824	274	637	342
Overall Value	363	368	363	387	378	397	392	397	401	404
Bartlett's Test*	192.800	0.000	259.100	0.000	272.800	0.000	249.700	0.000	269.200	0.000
F-Test*	34.100	0.000	42.400	0.000	35.700	0.000	29.400	0.000	14.900	0.000

* See Page 27.

TABLE B-10

CURRENT LIABILITIES (IN THOUSANDS OF DOLLARS)

Category	1969		1970		1971		1972		1973	
	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev
00-20% Grain										
Small	28	29	33	33	31	24	25	28	33	28
Medium	111	51	121	77	104	61	110	82	42	19
Large	123	31	152	36	188	42	203	57	222	43
20-60% Grain										
Small	106	63	119	65	105	64	108	58	166	81
Medium	205	87	224	101	200	76	216	83	202	71
Large	452	212	405	160	367	132	403	222	478	325
Very Large	723	374	1,005	478	861	617	1,040	693	1,286	869
60-80% Grain										
Small	67	38	81	48	63	32	74	60	48	11
Medium	150	76	190	96	161	87	217	156	212	131
Large	409	317	307	246	279	158	314	163	492	315
Very Large	531	179	673	175	894	25	777	517	1,234	802
80-100% Grain										
Small	60	34	62	46	74	60	62	27	134	182
Medium	99	61	125	57	121	52	126	64	218	184
Large	368	209	587	601	220	121	304	224	577	369
Very Large	----	----	----	----	637	325	717	131	1,492	1,077
Overall Value	179	193	217	255	231	275	293	344	599	702
Bartlett's Test*	191.900	0.000	246.500	0.000	299.900	0.000	262.100	0.000	267.500	0.000
F-Test*	29.690	0.000	33.880	0.000	21.360	0.000	17.700	0.000	12.700	0.000

* See Page 27.

TABLE B-11

SUPPLY INVENTORY (IN THOUSANDS OF DOLLARS)

Category	1969		1970		1971		1972		1973	
	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev
00-20% Grain										
Small	26	15	28	17	28	15	29	17	33	17
Medium	79	26	96	20	110	31	68	37	61	9
Large	146	99	146	82	142	94	167	122	171	108
20-60% Grain										
Small	56	28	53	24	52	28	60	33	83	80
Medium	116	46	119	47	116	46	112	45	104	50
Large	223	73	194	74	185	70	225	61	180	71
Very Large	475	183	511	184	493	309	475	247	435	236
60-80% Grain										
Small	33	19	36	22	26	11	31	14	31	17
Medium	66	22	78	34	77	26	79	30	72	28
Large	113	52	146	90	135	72	139	65	140	63
Very Large	300	152	273	100	428	37	290	112	396	270
80-100% Grain										
Small	14	10	14	10	22	14	29	18	29	11
Medium	48	61	40	28	51	30	46	30	40	23
Large	70	27	114	37	121	76	92	49	88	52
Very Large	----	----	----	----	135	65	121	90	171	96
Overall Value	94	102	101	114	118	143	130	136	157	171
Bartlett's Test*	181.700	0.000	203.300	0.000	327.000	0.000	230.100	0.000	256.850	0.000
F-Test*	55.300	0.000	58.800	0.000	26.100	0.000	31.200	0.000	17.220	0.000

* See Page 27.

TABLE B-12

TOTAL OPERATING EXPENSES (IN THOUSANDS OF DOLLARS)

Category	1969		1970		1971		1972		1973	
	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev
00-20% Grain										
Small	44	29	51	32	51	34	49	33	52	29
Medium	153	31	140	13	116	14	123	12	122	29
Large	215	105	261	93	228	100	253	103	254	123
20-60% Grain										
Small	108	49	110	46	94	40	113	52	141	78
Medium	216	71	209	49	211	57	215	56	175	47
Large	469	146	419	117	356	98	364	101	303	49
Very Large	916	378	903	354	867	407	950	422	738	295
60-80% Grain										
Small	80	33	81	31	71	18	67	19	55	22
Medium	163	49	179	50	154	39	159	44	129	35
Large	306	87	299	116	290	103	264	102	225	57
Very Large	477	148	597	224	832	226	521	220	683	473
80-100% Grain										
Small	61	26	60	28	70	22	66	19	73	22
Medium	129	38	137	65	133	55	115	50	92	29
Large	226	1	282	109	236	47	200	63	190	69
Very Large	-----	-----	-----	-----	374	112	341	95	357	171
Overall Value	191	194	205	206	229	232	248	249	277	278
Bartlett's Test*	202,200	0.000	239,500	0.000	294,100	0.000	270,500	0.000	340,030	0.000
F-Test*	61,000	0.000	67,200	0.000	45,400	0.000	41,600	0.000	20,400	0.000

* See Page 27.

TABLE B-13

TOTAL MEMBER EQUITY (IN THOUSANDS OF DOLLARS)

Category	1969		1970		1971		1972		1973	
	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev
00-20% Grain										
Small	97	62	102	63	93	58	94	64	96	52
Medium	217	57	198	88	277	30	218	88	205	53
Large	470	353	502	242	421	304	465	299	465	235
20-60% Grain										
Small	310	167	296	150	215	117	242	122	226	133
Medium	568	255	504	188	455	206	446	183	313	146
Large	1,175	398	1,007	374	770	261	828	289	654	176
Very Large	2,529	1,469	2,387	1,490	2,157	1,308	2,311	1,379	1,592	628
60-80% Grain										
Small	305	173	265	155	247	122	229	127	118	40
Medium	577	261	590	220	509	189	479	175	409	157
Large	1,030	334	1,055	496	832	309	765	280	644	168
Very Large	1,575	964	1,377	452	2,108	119	1,461	506	1,735	1,512
80-100% Grain										
Small	282	131	245	109	298	112	239	84	229	63
Medium	796	306	543	256	473	206	390	133	334	153
Large	989	60	1,041	21	951	162	776	249	596	274
Very Large	----	----	----	----	1,351	266	1,204	100	1,172	627
Overall Value	553	578	561	592	613	623	657	659	727	752
Bartlett's Test*	205.050	0.000	278.400	0.000	264.500	0.000	264.800	0.000	321.300	0.000
F-Test*	31.270	0.000	31.090	0.000	28.050	0.000	26.100	0.000	12.300	0.000

* See Page 27.

TABLE B-14

LONG-TERM LIABILITIES (IN THOUSANDS OF DOLLARS)

Category	1969		1970		1971		1972		1973	
	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev
00-20% Grain										
Small	11	18	10	16	12	23	7	18	14	23
Medium	98	83	62	63	7	5	25	31	34	12
Large	78	43	107	65	77	29	98	49	68	67
20-60% Grain										
Small	76	78	62	52	56	53	70	59	60	69
Medium	149	119	147	95	149	80	133	77	103	75
Large	291	181	223	151	198	125	208	146	161	92
Very Large	468	455	569	404	509	412	493	333	357	207
60-80% Grain										
Small	26	34	49	51	24	23	24	27	67	83
Medium	81	71	83	89	62	63	88	86	67	65
Large	169	234	119	89	137	134	99	114	102	101
Very Large	182	179	539	301	498	563	249	298	306	313
80-100% Grain										
Small	42	54	32	44	16	17	22	17	7	8
Medium	25	5	37	33	38	47	54	60	24	26
Large	14	10	157	283	45	74	62	88	77	78
Very Large	----	----	----	----	190	238	207	349	156	198
Overall Value	109	155	117	173	118	182	122	175	125	173
Bartlett's Test*	199.560	0.000	234.100	0.000	280.100	0.000	199.500	0.000	196.900	0.000
F-Test *	10.397	0.000	19.260	0.000	13.210	0.000	11.030	0.000	7.580	0.000

* See Page 27.

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FINANCIAL RATIOS IN THE EVALUATION
OF KANSAS AGRICULTURAL COOPERATIVES

by

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B.B.A., University of Wisconsin-Madison, 1970

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This study had the objective of determining the return on investments for Kansas agricultural cooperatives for the years 1969 through 1973, and attempting to find financial ratios which were crucial in the determination of those rate of return values. Rates of return for the cooperatives were determined from the actual financial data of the individual cooperatives.

The financial data for the 250 Kansas farmer cooperatives in the study was obtained from an accounting firm which does audits of Kansas cooperatives. Included in the data was condensed information from both Balance Sheets and Income Statements. From this data, financial ratios were calculated which were used to measure various areas of performance.

As the use of financial ratios had not been previously judged satisfactory in cooperative analysis, an attempt was made to reduce the generality of the ratios by categorizing the cooperatives. There were four levels based on the percentage grain sales were of total sales, and likewise four levels based on total sales. The final result was, due to the makeup of the data, fourteen or fifteen categories -- depending upon the year.

One-way analysis of variance was used to test whether there were statistically significant differences among the means of the cells for each of the different financial items and ratios studied. Multiple regression analysis, utilizing a stepwise

procedure, was employed in an attempt to select the most important of the financial ratios for prediction of rates of return.

Findings of the study would indicate that, under the categories chosen, there are statistically significant differences among the rates of return of the various cells. The ratio of Net Operating Savings/Net Operating Assets ranged from -.025 for Small cooperatives handling 20-60% grain in 1973 to .172 for Medium cooperatives handling 80-100% grain in 1969. Overall values for the years 1969-73 respectively were .039, .043, .055, .056, and .081.

Of the 37 financial ratios considered in the study, only 12 met the assumptions of analysis of variance and showed significant differences among the means, while the remaining either did not meet the assumptions or were insignificant.

Regression analysis showed two ratios, Total Expenses/Total Sales and Total Margins/Total Sales, to be the most important predictors of rates of return. Analysis of variance also showed the two ratios to be useful discriminators. The Total Expenses/Total Sales ratios had values ranging from .058 for the Very Large 80-100% grain cooperatives in 1973 to .237 for Medium 0-20% grain cooperatives in 1969. The ratio of Total Margins/Total Sales ranged from .049 for Small 80-100% grain cooperatives in 1970 to .204 for Medium 0-20% grain cooperatives in 1973.

Financial ratio analysis has been criticized in cooperative literature as being too general for effective use. Positive results of this study would suggest that financial ratios might profitably be used where standard ratio values are available for different categories of cooperatives.