A Comparative Financial Ratio Analysis of U.S. Farmer Cooperatives Using Nonparametric Statistics

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A comparative ratio analysis using nonparametric statistical methods provides no evidence to support the hypothesis that U.S. farmer cooperatives generally are financially weaker than other firms. Although some cooperative groups had lower current ratios than industry standards, most of these groups consisted of marketing associations for which differences may be explained largely by the unique business relationships between the associations and their patrons. Comparisons of debt/equity ratios indicate that, except for regional grain and farm supply associations, cooperatives generally are less leveraged than other firms. The overall financial strength of cooperatives appears better than during the early 1980s.

Farmer cooperatives are unique business organizations in that they are owned by the farmers they serve and they return their earnings to owners on the basis of patronage instead of stock ownership. As a result, there is little incentive for direct investment in cooperatives, and they generally must rely heavily on retained patronage refunds or per-unit capital retains for accumulating equity capital. Fundamental differences in how cooperatives are financed have led some researchers to conclude that cooperatives must operate differently than other firms and that new methods for measuring cooperative performance should be developed. Others maintain that cooperatives must measure up well against conventional standards of performance if they are operating in a financially sound manner. Empirical evidence from the early 1980s supported the conclusion that cooperatives generally were financially weaker than other firms when conventional methods of financial performance were applied.

Empirical analyses of the comparative financial performance of farmer cooperatives usually have been limited to small samples of firms operating in a few commodity areas. Data collected in a recent U.S. Department of Agriculture (USDA) financial profile study of farmer cooperatives are much more represen-

tative of cooperatives overall in terms of the number of cooperatives, their size, the products they handle, and the services they provide. In addition, the USDA data provide a basis for assessing changes in the comparative financial performance of cooperatives since the early 1980s.

This article reports on an analysis of the comparative financial performance of U.S. farmer cooperatives based on data from the USDA financial profile study. Cooperative financial ratios are compared with published industry standards for firms operating in the same or similar industries. The objectives of this analysis are to: (1) determine whether there are significant differences in the financial strength of farmer cooperatives compared with industry standards, (2) assess whether the relative financial condition of cooperatives generally has improved since the early 1980s, and (3) demonstrate the usefulness of nonparametric statistical methods in performing comparative financial ratio analyses. The results of this analysis provide important insights into the financial differences between cooperatives and other firms. The purpose of this article is not to provide cooperatives benchmarks with which they can compare their performance. Readers interested in comparing individual financial performance to that of cooperatives engaged in similar activities are referred to the USDA report (Royer, Wissman, and Kraenzle).

Previous Research

The comparative financial performance of farmer cooperatives has been a subject of scrutiny since the early 1980s when some writers expressed concern over the negative impact on cooperatives of high interest rates and the high level of borrowed capital relative to competing firms. Haugen compared 19 of the largest cooperatives in the United States with 13 large competitors during the period 1974–80. He found that the cooperatives were relying increasingly on the use of long-term debt in place of equity relative to competing firms and that cooperative returns were below those of competitors. Brown compared marketing cooperatives operating on a pooling basis, farm supply cooperatives, dairy cooperatives, and large grain cooperatives with food processing corporations from 1977 to 1981. He found that there was a decline in the proportion of net worth in all five groups but that the food processing corporations had a substantially higher proportion than the four cooperative groups. He also cited data showing that the proportion of net worth in the 100 largest cooperatives and the 100 largest industrial corporations had declined between 1962 and 1981 but that the proportion for the industrial corporations was substantially higher than for the cooperatives. Royer compared the average 1981 debt/equity ratios of farm supply cooperatives and marketing cooperatives in six commodity groups with median and quartile statistics from industry samples and concluded that the debt/equity ratios of marketing cooperatives generally were greater than the medians for the industry samples, but the ratio for farm supply cooperatives was slightly less.

Other comparisons of cooperative financial ratios with those of other firms have focused on testing hypotheses about cooperative performance based on differences in organizational objectives. Schrader et al. reported that in comparisons of small cheese plants and grain elevators/farm supply businesses, proprietary firms had greater average leverage ratios than did cooperatives although

the results were not statistically significant. On the other hand, they cited data used by Chen that indicated the leverage of large diversified cooperatives was substantially greater than for similar proprietary agribusinesses. Parliament, Lerman, and Fulton tested several hypotheses concerning comparative cooperative financial performance using median and quartile data on nine regional dairy cooperatives from 1971 to 1987. Although cooperatives were hypothesized to have less liquidity and greater leverage than an industry sample of dairy product manufacturers, actual cooperative liquidity was found to be greater and cooperative leverage was found to be less than the industry standards.[1] The hypothesis that cooperatives would be expected to have greater leverage ratios was based in part on the idea that they are "equity bound," i.e., it is more difficult for them to generate funds internally because of the lack of secondary markets for cooperative stock (see Staatz, pp. 15–16).

Recently Royer, Wissman, and Kraenzle published the results of the latest USDA financial profile of farmer cooperatives. Motivation for that study, which was based on a survey of fiscal 1987 operating and balance sheet information, stemmed from changes in the economic environment, large operating losses experienced by many cooperatives, and the significant restructuring that had occurred since the 1970s, when data for the last study (Griffin et al.) were collected. The 1987 study used ratio analysis in analyzing the financial condition of cooperatives and concluded that average 1987 cooperative current and debt/equity ratios were stronger than in 1976 for all three major functional classifications (marketing, farm supply, and marketing/farm supply). Only marketing cooperatives had greater debt/equity ratios than in 1970. On the other hand, all three categories had weaker interest coverage ratios than in previous years. The study also concluded that the strength of the current and debt/equity ratios was inversely related to cooperative size. The study made no comparisons with industry standards. Thus, it was not possible to assess whether the financial condition of cooperatives had improved relative to other firms with which they compete.

This article extends the analysis of the 1987 USDA financial profile study by comparing the current and debt/equity ratios of cooperatives with industry standards to evaluate the comparative financial strength of cooperatives. It also assesses whether the relative financial condition of cooperatives generally has improved since the early 1980s.

Methodology

To assess the liquidity and solvency of farmer cooperatives relative to other firms in the industries in which they operate, the current and debt/equity ratios for 13 cooperative classifications at the end of fiscal 1987 were compared with Dun & Bradstreet Credit Services industry standards.[2] Cooperative ratios were imputed using data from USDA's Agricultural Cooperative Service (ACS) 1987 financial profile study of U.S. farmer cooperatives (Royer, Wissman, and Kraenzle). In that study, survey questionnaires were mailed to all organizations identified by ACS as meeting the definition of a farmer cooperative. All 461 cooperatives with annual sales of $15 million or more were selected for inclusion in the study. Usable responses were obtained from 89 percent of these cooperatives. Data for nonrespondents were estimated by expanding the averages for other

cooperatives in the same principal product or function classification and farm credit district according to annual sales data obtained by ACS.

A sample of the cooperatives with annual sales of less than $15 million was taken according to guidelines recommended by USDA's National Agricultural Statistics Service. Using standard statistical methods, sampling rates were determined for each combination of principal product or function classification and farm credit district. In some cases, centralized accounting services were able to provide detailed financial data for affiliated local cooperatives. All cooperatives for which these data were available were included in the study. Centralized services provided data for a total of 31 local grain and 211 local farm supply cooperatives. Data were collected on 36 percent of the other 3,870 cooperatives with annual sales of less than $15 million.

Data for all cooperatives with annual sales of less than $15 million were pooled and expanded by the proportion of observations in each combination of principal product or function classification and farm credit district to derive population estimates. For combinations for which there was an insufficient number of respondents, questionnaires received but not in the sample were edited and included. In total, data were collected and analyzed for 2,028 cooperatives, 44 percent of those identified in the population. The cooperatives for which data were collected represented 79.3 percent of total cooperative sales and 79.4 percent of estimated total assets.

Because Dun & Bradstreet, as well as other published sources of industry standard data, present only median and quartile financial ratios, this analysis is based largely on the use of nonparametric statistical methods instead of methods requiring additional information about the distributions of the industry samples. Nonparametric methods include a variety of statistical procedures for analyzing data that do not satisfy all the requirements of classical statistical methods. Generally, both procedures appropriately labeled nonparametric and those more appropriately termed distribution-free are referred to as nonparametric methods. To be exact, nonparametric methods do not involve testing a hypothesis about the specific value of a parameter, whereas distribution-free methods do not require assumptions about the precise form of the sampled population. Knowledge about the distribution of the test statistic is necessary in all cases, but for distribution-free tests this knowledge is based on sample properties instead of the population. Nonparametric statistical tests often are based on a randomization distribution, which is the probability distribution of a statistic determined by considering all possible sample outcomes and computing their probabilities under the null hypothesis.

Nonparametric methods frequently employ ordinal or nominal measurements, such as rank, position, and frequency, instead of continuous measurements. Thus, nonparametric tests are concerned with medians rather than means, interquartile ranges rather than variances, and sign rather than size. Nonparametric procedures have several advantages over other methods, most important of which is that they often can be applied in situations where the assumptions of classical statistical methods are not valid. However, in situations where the classical assumptions are met, nonparametric tests usually are less efficient, particularly for large samples.

In many situations, there may be considerable justification for preferring the comparison of the medians of two groups to the comparison of the means

(Wilcox, p. 336). This is because the median may be a better measure of central location than the mean. If a distribution is symmetric, the mean and median are equal. However, if the distribution is asymmetric, the median is closer to the center or bulk of the distribution and therefore is more typical of possible observed values. In addition, the sample median is less sensitive to outliers or extreme values, which occur relatively frequently in heavy-tailed distributions and can occur when there are errors in recording data.

Choice of Financial Ratios and Industry Standards

The current ratio is a standard measure of liquidity, or the ability of a firm to meet its current obligations as they come due. It is computed by dividing total current assets by total current liabilities. Generally, a higher current ratio indicates a greater cushion between current obligations and the firm's ability to pay them, although the composition and quality of current assets are critical factors in determining a firm's liquidity. The debt/equity ratio used in this analysis is defined as total liabilities divided by total equity. It is a measure of solvency, or the ability of a firm to meet its total obligations over the long run, and it represents the relationship between the amount of capital provided by creditors and that contributed by owners. Usually, a higher debt/equity ratio indicates greater vulnerability to business downturns and greater risk to creditors. On the other hand, a low debt/equity ratio implies greater borrowing flexibility in the future. Although a low debt/equity ratio may indicate greater long-term financial safety, desirable ratios may vary substantially depending on the particular requirements of different industries, and a low debt/equity ratio may indicate an inefficient mix of borrowed and equity capital. The debt/equity ratio used in this analysis was chosen over other measures of solvency, such as borrowed capital divided by equity, in part because of the availability of published industry data.

Dun & Bradstreet annually publishes solvency, efficiency, and profitability ratios as well as average balance sheets and data on sales, profits, taxes, and working capital for more than 800 manufacturing, wholesaling, retailing, and other industries according to Standard Industrial Classification (SIC) codes. Three values, the lower quartile, the median, and the upper quartile, are presented for each financial ratio. These values are determined by computing the ratio for each firm in the sample for an industry and ordering them from highest to lowest. The value that falls halfway between the highest and lowest values is the median. The value that falls halfway between the highest value and the median is the upper quartile. The lower quartile is the value that falls halfway between the median and the lowest value. Thus, the upper quartile, median, and lower quartile divide an industry into four groups, each containing a fourth of the firms. Values falling above the upper quartile belong to firms with the highest ratios. Values falling below the lower quartile belong to firms with the lowest.[3]

Dun & Bradstreet was chosen as the source of the industry standards over similar information published by Robert Morris Associates (RMA) because it included data for more classifications and its samples generally were substantially larger. In some cases, RMA combines two or more SICs into a single group, and sometimes these combined groups matched particular cooperative

classifications better than similar Dun & Bradstreet groups did. However, the RMA industry standards often included values that appeared extreme in comparison with the Dun & Bradstreet standards. Thus, for consistency among comparison groups, Dun & Bradstreet data were used exclusively. Given the sample sizes, the comparative size of the firms in the samples, and the descriptions of the samples, the Dun & Bradstreet data appeared appropriate for the purposes of this analysis.

The cooperative classifications, the industry comparison groups, their definitions, and the number of firms in each are presented in table 1. Selection of comparison groups was fairly straightforward for most of the cooperative classifications. However, for some classifications the selection of a specific comparison group was difficult because of the variety of activities in which cooperatives within the classification engage. Most comparisons are imprecise because of this and the fact that industry samples themselves do not consist of firms participating in only one activity. Rather, the industry groups are defined by the activity in which firms are primarily engaged. With these points in mind, an attempt was made to select the most representative comparison group from among any alternatives. Generally, the results of the cooperative comparisons were fairly robust with respect to the choice of comparison group from among related SICs.[4]

The dairy cooperative group includes associations involved in a variety of manufacturing and processing, assembly, and bargaining activities. According to Ling and Roof (p. 1), in 1987, 41 percent of all dairy cooperatives manufactured or processed dairy products, 15 percent operated only milk or cream receiving stations, and 44 percent did not physically handle milk or other dairy products. Classifications of firms engaged in manufacturing and processing comprise SIC 2021–24 and 2026 and include creamery butter, natural and processed cheese, condensed and evaporated milk, ice cream and frozen desserts, and fluid milk. Processed fluid milk and cream and related products (SIC 2026) was chosen as the comparison group because packaged fluid milk products represented the most important cooperative manufactured and processed products in terms of poundage (Ling and Roof, pp. 8–9 and 12) and its standards generally were near the middle of the range of standards for the several classifications. None of the manufacturing and processing SICs include independently operated milk receiving stations primarily engaged in the assembly and reshipment of bulk milk for use in manufacturing or processing plants. These firms are included in the wholesale distribution of dairy products (SIC 5143). Debt/equity ratios for SIC 5143 generally were somewhat greater than for SIC 2026. The manufacturing and processing SICs also do not include firms that do not physically handle milk and other dairy products. However, the cooperative data used in this study exclude a large number of small bargaining associations with few assets and little or no allocated equity.

Similar considerations affected selection of an appropriate comparison group for the fruits, vegetables, and nuts cooperatives. Establishments primarily engaged in the wholesale distribution of fresh fruits and vegetables (SIC 5148) were chosen as the comparison group most representative of cooperative activities. Although the wholesaling function represents a later stage in the marketing channel, it was selected because its physical asset requirements are similar to those for assembling and marketing fresh fruits and vegetables. SIC 5148 does

Table 1.—Cooperative Classifications and Industry Comparison Groups

Cooperative Classification[a]	Number	Comparison Group	Number
Cotton marketing: Cooperatives primarily engaged in marketing cotton and cotton products.	20	**Cotton wholesaling (SIC 5152):** Establishments primarily engaged in buying and/or marketing cotton and cotton linters.	36
Cotton ginning: Cooperatives primarily engaged in ginning cotton.	330	**Cotton ginning (SIC 0724).**	163
Dairy: Cooperatives primarily engaged in marketing and processing milk.	244	**Fluid milk processing (SIC 2026):** Establishments primarily engaged in processing (e.g., pasteurizing, homogenizing, vitaminizing, and bottling) fluid milk, cream, and related products, including cottage cheese, yogurt (except frozen), and other fermented milk.	120
Fruits, vegetables, and nuts: Cooperatives primarily engaged in marketing or processing fruits, vegetables, or nuts.	274	**Fresh fruits and vegetables wholesaling (SIC 5148).**	954
Regional grain: Regional cooperatives primarily engaged in marketing or processing grain, rice, or soybeans. Does not include cooperatives primarily engaged in drying rice.	9	**Grain wholesaling (SIC 5153):** Establishments primarily engaged in buying and/or marketing grain (e.g., corn, wheat, oats, barley, and unpolished rice), dry beans, soybeans, and other inedible beans. Includes country grain elevators primarily engaged in buying or receiving grain from farmers as well as terminal elevators and other merchants marketing grain.	2,205
Local grain: Local cooperatives primarily engaged in marketing grain, rice, or soybeans. Includes local grain marketing cooperatives with farm supply activities not exceeding grain marketing sales volume.	1,538	**Grain wholesaling (SIC 5153).**	2,205

Sugar: Cooperatives primarily engaged in marketing or processing sugar or sugar products. ... 20

Farm-product raw materials wholesaling, not elsewhere classified (nec) (SIC 5159): Includes establishments primarily engaged in buying and/or marketing raw sugar, unprocessed or shelled nuts, tobacco leaf, wool, or other raw farm products (except grain, field beans, and livestock) at the wholesale level as well as tobacco auctioning and warehousing. ... 149

Livestock, wool, and poultry: Cooperatives primarily engaged in marketing or processing livestock, wool, or poultry and products. ... 109

Livestock wholesaling (SIC 5154): Establishments primarily engaged in buying and/or marketing cattle, hogs, sheep, and goats as well as the operation of livestock auction markets. ... 148

Miscellaneous marketing: Cooperatives primarily engaged in marketing or processing commodities not otherwise classified. Includes dry edible beans and peas, tobacco, and miscellaneous products. ... 67

Farm-product raw materials wholesaling, nec (SIC 5159). ... 149

Interregional manufacturing: Cooperatives primarily engaged in the manufacture of farm supplies and serving a membership consisting of regional cooperatives. ... 6

Phosphatic fertilizers manufacturing (SIC 2874). ... 29

Regional farm supply: Regional cooperatives primarily engaged in the distribution of farm supplies. ... 11

Farm supplies wholesaling (SIC 5191): Establishments primarily engaged in the wholesale distribution of animal feeds, fertilizers, agricultural chemicals, pesticides, seed, and other farm supplies except grain. ... 1,725

Local farm supply: Local cooperatives primarily engaged in the distribution of farm supplies. Includes local farm supply cooperatives with grain marketing activities not exceeding farm supply sales volume. ... 1,835

Retail nurseries, lawn and garden supply stores (SIC 5261): Includes establishments primarily engaged in selling seed, fertilizers, pesticides, garden tools, and other supplies to the public. ... 1,945

Table 1.—*Continued*

Cooperative Classification[a]	Number	Comparison Group	Number
Service: Cooperatives primarily providing trucking, storage, grinding, drying, or similar services related to marketing or farm supply activities. Includes cooperatives primarily engaged in drying rice.	107	**Farm product warehousing and storage (SIC 4221).**	218
Large diversified: Large multiproduct cooperatives engaged in both substantial marketing and farm supply activities.	3	No comparison.	

[a]A regional cooperative is defined as one that serves a wide geographical area consisting of many counties, a state, or a larger area. A local cooperative is defined as one that serves a geographical area consisting of a local area, community, or small number of counties.

not include firms primarily engaged in processing activities such as canning fruits, vegetables, and juices (SIC 2033); sun-drying or artificially dehydrating fruits and vegetables (SIC 2034); or freezing fruits, fruit juices, and vegetables (SIC 2037). Industry standards for SIC 5148 generally were within the range of ratios for these groups and were very similar to those for SIC 2033, the group with the highest current ratios and the lowest debt/equity ratios. Establishments primarily engaged in the grading and marketing of farm-dried fruits, such as prunes and raisins, are included in SIC 5149, wholesaling of groceries and related products, not elsewhere classified.

Interregional manufacturing cooperatives produce a wide variety of products. However, fertilizer manufacturing and petroleum refining are dominant activities. Although nitrogenous fertilizer manufacturing is the most important single activity, phosphatic fertilizers manufacturing (SIC 2874) was chosen for the comparison group because its industry standard statistics generally were between those for nitrogenous fertilizers manufacturing (SIC 2873) and petroleum refining (SIC 2911) and therefore were judged to be more representative of all three activities.

Both regional and local grain cooperatives were compared with grain wholesaling (SIC 5153) because it includes both country grain elevators and terminal elevators. Livestock wholesaling (SIC 5154) was chosen as the comparison group for livestock, wool, and poultry cooperatives. SIC 5154 generally had greater current ratios and lower debt/equity ratios than poultry and poultry products wholesaling establishments (SIC 5144) and poultry dressing plants (SIC 2016). No attempt was made to compare three large diversified cooperatives with industry standards because of the broad scope of marketing and farm supply activities in which they engage.

Comparison of Cooperative Statistics with Industry Standards

The mean and median current and debt/equity ratios are compared with their respective industry standards in tables 2 and 3 for each of the 13 cooperative classifications. In computing the mean ratios, the larger cooperatives were weighted more heavily than smaller ones. This resulted, in the case of debt/equity ratios, from dividing a group's total debt by its total equity in determining its mean ratio instead of averaging the ratios of individual cooperatives. Because the industry standards are based on an ordered array of firms, irrespective of size, the median cooperative ratios are the most appropriate for comparison with the standards. In instances where the median ratio is stronger than the mean ratio, comparison of the mean ratio with the industry standards would indicate a relatively weaker financial situation for the cooperatives than would the median ratio. For example, to the extent that large cooperatives within a group are more heavily leveraged than smaller ones, comparisons based on the weighted mean might suggest a high degree of overall leverage relative to other firms although a majority of cooperatives have comparatively lower debt/equity ratios. For more than half the classifications, as shown in the tables, the median current ratio is greater than the mean ratio, and in all but one, the median debt/equity ratio is less than the mean. In some cases, the differences between the median and mean ratios are substantial.

Table 2.—Comparison of Cooperative Current Ratios with Industry Standards

Principal Product or Function	Cooperatives		Industry Standards[a]		
	Weighted Mean	Median	Lower Quartile	Median	Upper Quartile
Cotton Marketing	1.24	1.38	1.2	1.6	3.5
Cotton Ginning	2.19	1.36	1.0	1.8	3.5
Dairy	1.29	1.45	1.2	1.5	2.1
Fruits, Vegetables, and Nuts	1.30	1.30	1.2	1.7	3.1
Regional Grain	1.31	1.12	1.2	1.7	2.8
Local Grain	1.50	1.65	1.2	1.7	2.8
Sugar	1.30	1.30	1.2	1.6	3.2
Livestock, Wool, and Poultry	1.54	1.77	1.2	1.9	5.2
Miscellaneous Marketing	1.26	1.54	1.2	1.6	3.2
Interregional Manufacturing	1.95	1.74	1.3	1.5	4.9
Regional Farm Supply	1.48	1.46	1.2	2.0	4.2
Local Farm Supply	1.93	2.35	1.3	2.0	4.2
Service	2.60	3.23	1.2	1.8	3.8

[a]Industry standards from Dun & Bradstreet Credit Services.

Ten of the 13 cooperative median current ratios were less than the corresponding median industry standard, indicating that the average cooperative had less ability to service current obligations than a majority of the firms in its industry. Only the interregional manufacturing, local farm supply, and service cooperatives had median current ratios greater than the corresponding industry standards, indicating that the average cooperative in each of these groups had a greater ability to service current obligations than a majority of the firms in its industry.

Eight of the 10 cooperative classifications with median current ratios that were below the median industry standards consisted of marketing cooperatives. In fact, all eight of the marketing cooperative classifications had median current ratios below the median industry standards. These differences may be attributable in large part to the unique business relationships that exist between marketing cooperatives and their patrons. Marketing cooperatives often have substantial proceeds payable to patrons at the end of their fiscal years due to settling patron accounts and closing marketing pools. These items appear on balance sheets as current liabilities until final payment is made.

The median debt/equity ratios for seven of the cooperative classifications were less than the respective industry standard ratios, indicating that the average cooperative had a greater ability to meet its debt obligations than a majority of

Table 3.—Comparison of Cooperative Debt/Equity Ratios with Industry Standards

Principal Product or Function	Cooperatives		Industry Standards[a]		
	Weighted Mean	Median	Lower Quartile	Median	Upper Quartile
Cotton Marketing	1.72	1.39	0.345	1.186	2.528
Cotton Ginning	0.45	0.27	0.179	0.474	1.111
Dairy	1.55	0.71	0.449	1.034	1.940
Fruits, Vegetables, and Nuts	2.13	1.11	0.370	0.976	2.309
Regional Grain	1.60	1.52	0.317	0.652	1.253
Local Grain	0.66	0.51	0.317	0.652	1.253
Sugar	1.37	1.18	0.318	1.066	2.201
Livestock, Wool, and Poultry	1.00	0.21	0.182	0.731	1.823
Miscellaneous Marketing	3.55	0.60	0.318	1.066	2.201
Interregional Manufacturing	0.91	1.56	0.206	0.814	2.241
Regional Farm Supply	1.38	1.24	0.261	0.768	1.785
Local Farm Supply	0.53	0.33	0.316	0.875	2.190
Service	0.36	0.21	0.268	0.741	1.567

[a]Industry standards from Dun & Bradstreet Credit Services.

the firms in its industry. The median debt/equity ratio for the service cooperatives was less than the lower quartile industry standard, indicating that the average service cooperative had a greater ability to meet its total debt obligations than three-quarters of the firms in its industry. Six of the cooperative classifications had median debt/equity ratios that were greater than the corresponding median industry standards, indicating that the average cooperative in each of these groups had less ability to service debt obligations than a majority of the firms in its industry.

The regional grain cooperative group is notable because its median current ratio was less than the lower quartile industry standard and its median debt/equity ratio was greater than the upper quartile industry standard, indicating that the average regional grain cooperative had less ability to meet both current and total obligations than three-fourths of the firms in the industry. Local grain cooperatives compared much more favorably with the industry standards, having a median current ratio near the industry median standard and a median debt/equity ratio below the median standard.

It might be argued that the use of a single industry comparison group for both regional and local grain marketing cooperatives is biased against the relative performance of the regional cooperatives because it does not take into consideration the greater investment these cooperatives must make in terminal elevators

and other large fixed assets. However, a comparison of the balance sheets for these two groups (Royer, Wissman, and Kraenzle, p. 19) indicates that their investments in fixed assets do not differ greatly and that the most striking differences are in the proportion of assets held as current and long-term liabilities in comparison with equity capital. The regional grain cooperatives also had the lowest median current ratio of the 13 cooperative groups as well as the second highest debt/equity ratio. Thus, not only were they financially weaker than the industry sample, they also were weaker than the other cooperative groups.

There appears to be some association between the ranking of the 13 cooperative groups according to their current ratios and their ranking according to their debt/equity ratios. The Spearman coefficient for rank correlation between the strength of the median current and debt/equity ratios is .53 and is significant at the .05 level.[5] In other words, there seems to be a relationship between a group's ability to meet current debt obligations and its ability to meet total obligations over the long run, notwithstanding differences in the financial requirements of various industries.[6]

Measuring and Testing Distributional Differences

Use of the median cooperative ratio in comparisons with industry standard statistics focuses knowledge about the cooperatives on a single value and disregards information on the rest of the distribution. To incorporate this additional information into an analysis of the differences between cooperative and industry sample distributions, the cooperatives in each of the 13 cooperative classifications were sorted and individually placed into one of four categories, or quartiles, defined by the three industry standards. The four quartiles (first, second, third, and fourth) consist of the firms with ratios less than the lower quartile industry standard, greater than the lower quartile standard but less than the median, greater than the median but less than the upper quartile standard, and greater than the upper quartile standard.

By definition, 25 percent of the firms in the industry sample fall into each of the four quartiles. If the cooperatives in the industry were distributed identically to the firms in the industry sample, 25 percent of them also would fall into each quartile. Some random variation in the percentage of cooperatives falling into each quartile normally would be expected. However, a substantial discrepancy between the cooperative and industry sample distributions would indicate a significant difference in the cooperative ratios relative to the industry. For example, if substantially fewer than 25 percent of the cooperative debt/equity ratios fell in each of the first two quartiles and substantially more than 25 percent fell in the third and fourth quartiles, one could conclude that cooperatives generally were significantly more leveraged than the firms in the industry sample. Tables 4 and 5 present the distributions of cooperatives according to the industry standards for the current and debt/equity ratios.

To assess as objectively as possible whether the cooperative distributions conform to the industry sample distributions or whether the cooperative ratios generally are higher or lower than those in the industry samples, three additional analyses were performed: (1) calculation of an index to indicate if the cooperative ratios generally are greater or less than the industry sample medi-

Table 4.—Distribution of Cooperatives According to Industry Standards for Current Ratio

Principal Product or Function	First Quartile	Second Quartile	Third Quartile	Fourth Quartile
		Percent		
Cotton Marketing	40.0	45.0	15.0	0.0
Cotton Ginning	14.5	37.0	26.7	21.8
Dairy	31.1	22.5	17.6	28.7
Fruits, Vegetables, and Nuts	40.5	26.3	11.3	21.9
Regional Grain	44.4	33.3	22.2	0.0
Local Grain	19.2	33.4	27.3	20.1
Sugar	40.0	25.0	25.0	10.0
Livestock, Wool, and Poultry	34.9	17.4	21.1	26.6
Miscellaneous Marketing	34.3	20.9	19.4	25.4
Interregional Manufacturing	33.3	0.0	66.7	0.0
Regional Farm Supply	9.1	81.8	9.1	0.0
Local Farm Supply	16.8	24.9	32.7	25.6
Service	18.7	5.6	33.6	42.1

ans, (2) the Pearson goodness-of-fit test, and (3) a binomial test of the proportion of cooperatives with ratios less than the industry sample median.

The index is essentially a weighted average of the difference between the proportion of cooperatives and the proportion of the firms in the industry sample (.25) in each of the four quartiles. It can be expressed as:

$$g = \sum_{j=1}^{4} (j-2.5)(f_j - .25) = \sum_{j=1}^{4} (j-2.5)f_j$$

where j represents the quartile (first, second, . . . , fourth) and f_j represents the proportion of cooperatives in the jth quartile. The proportion of cooperatives in each quartile is weighted by $j - 2.5$, which represents the distance between the midpoint of the quartile and the median industry standard (-1.5, -0.5, 0.5, and 1.5). Conceivably, the index could vary from -1.5, if all the cooperatives were in the first quartile, to 1.5, if all the cooperatives were in the fourth quartile. A value of zero would indicate that, weighted, half the cooperatives were below and half were above the median for the industry sample. The index indicates whether the cooperatives tend to be greater or less than the industry sample, as defined by the median and quartile statistics. The index does not distinguish between equally weighted distributions that differ in their conformity to the industry sample distribution (e.g., {.5, 0, 0, .5} versus {.25, .25, .25, .25}).

Values of the weighted index are presented in tables 6 and 7. Ten of the 13 cooperative groups had negative index values for the current ratio, indicating

Table 5.—Distribution of Cooperatives According to Industry Standards for Debt/Equity Ratio

Principal Product or Function	First Quartile	Second Quartile	Third Quartile	Fourth Quartile
		Percent		
Cotton Marketing	0.0	50.0	45.0	5.0
Cotton Ginning	27.6	31.5	30.0	10.9
Dairy	43.0	15.2	16.0	25.8
Fruits, Vegetables, and Nuts	25.9	19.7	34.3	20.1
Regional Grain	0.0	11.1	22.2	66.7
Local Grain	28.4	33.6	23.9	14.2
Sugar	20.0	30.0	40.0	10.0
Livestock, Wool, and Poultry	47.7	27.5	13.8	11.0
Miscellaneous Marketing	32.8	20.9	10.4	35.8
Interregional Manufacturing	0.0	16.7	50.0	33.3
Regional Farm Supply	0.0	9.1	63.6	27.3
Local Farm Supply	49.6	32.0	15.1	3.3
Service	58.9	25.2	8.4	7.5

that the cooperatives generally had lower current ratios than the industry samples. All the marketing categories had lower current ratios than the corresponding industry samples. Interregional manufacturing and regional farm supply cooperatives also had lower current ratios while cotton ginning, local farm supply, and service cooperatives had higher current ratios. Nine of the cooperative groups had negative index values for the debt/equity ratio. The weighted index generally supported the conclusions resulting from comparison of the cooperative and industry sample medians. There were only two differences each for the current and debt/equity ratios.

The correlation between the groups' ranking according to the weighted index of their current ratios and their ranking according to the weighted index of their debt/equity ratios supports the conclusion that there is a relationship between a group's ability to meet current obligations and its ability to meet total obligations over the long run. In fact, the correlation between the rankings is greater when the groups are ranked by their financial strength relative to industry standards (as measured by the weighted index) than when they are ranked according to absolute strength. The Spearman coefficient for rank correlation based on the weighted index values is .87 and is significant at the .005 level.

The Pearson goodness-of-fit test and the binomial test were used to assess whether the distribution of cooperatives in each of the 13 classifications was significantly different from the distribution of the industry sample given the

Table 6.—Weighted Index, Goodness-of-Fit Test, and Binomial Test for Current Ratios

Principal Product or Function	Weighted Index (g)	Goodness-of-Fit (X^2)	Significance Level[a]	Binomial Hypothesis	Significance Level[a]	Conclusion[b]
Cotton Marketing	− 0.750	10.80	.025	p>.5	.001	**Less**
Cotton Ginning	0.058	35.04	.005	p>.5	[c]	Fail
Dairy	− 0.061	10.92	.025	p>.5	[c]	Less
Fruits, Vegetables, and Nuts	− 0.354	48.13	.005	p>.5	.001	**Less**
Regional Grain	− 0.722	3.89	[c]	p>.5	.100	Fail
Local Grain	− 0.017	82.55	.005	p>.5	.025	**Less**
Sugar	− 0.450	3.60	[c]	p>.5	[c]	Fail
Livestock, Wool, and Poultry	− 0.106	7.51	.100	p>.5	[c]	Less
Miscellaneous Marketing	− 0.142	3.63	[c]	p>.5	[c]	Fail
Interregional Manufacturing	− 0.167	7.33	.100	p<.5	[c]	Fail
Regional Farm Supply	− 0.500	19.18	.001	p>.5	.010	**Less**
Local Farm Supply	0.171	93.31	.005	p<.5	.001	**Greater**
Service	0.491	33.45	.005	p<.5	.001	**Greater**

[a]Significance level (α) at which one would reject the null hypothesis that the distribution of cooperative ratios is identical to that of the industry sample or that p=.5 given the respective probability of a Type I error.
[b]Conclusions can be read:
    Fail: Fail to reject the hypothesis that the distribution of cooperative ratios is identical to that of the industry sample.
    . Less: Accept the hypothesis that cooperative ratios generally are less than the industry standards.
    Greater: Accept the hypothesis that cooperative ratios generally are greater than the industry standards.
Strong conclusions are presented in boldface.
[c]Greater than .100 level of significance.

Table 7.—Weighted Index, Goodness-of-Fit Test, and Binomial Test for Debt/Equity Ratios

Principal Product or Function	Weighted Index (g)	Goodness-of-Fit (X²)	Significance Level[a]	Binomial Hypothesis	Significance Level[a]	Conclusion[b]
Cotton Marketing	0.050	16.40	.001	p = .5		Fail
Cotton Ginning	− 0.258	35.99	.005	p > .5	.001	**Less**
Dairy	− 0.254	49.18	.005	p > .5	.010	**Less**
Fruits, Vegetables, and Nuts	− 0.015	15.31	.005	p < .5	.100	Fail
Regional Grain	1.056	9.22	.050	p < .5	.025	**Greater**
Local Grain	− 0.262	125.04	.005	p > .5	.001	**Less**
Sugar	− 0.100	4.00	c	p = .5		Fail
Livestock, Wool, and Poultry	− 0.619	36.80	.005	p > .5	.001	**Less**
Miscellaneous Marketing	− 0.007	10.91	.025	p > .5	c	Less
Interregional Manufacturing	0.667	3.33	c	p < .5	c	Fail
Regional Farm Supply	0.682	10.45	.025	p < .5	.010	**Greater**
Local Farm Supply	− 0.788	896.59	.005	p > .5	.001	**Less**
Service	− 0.855	74.05	.005	p > .5	.001	**Less**

[a]Significance level (α) at which one would reject the null hypothesis that the distribution of cooperative ratios is identical to that of the industry sample or that p = .5 given the respective probability of a Type I error.
[b]Conclusions can be read:
    Fail: Fail to reject the hypothesis that the distribution of cooperative ratios is identical to that of the industry sample.
    Less: Accept the hypothesis that cooperative ratios generally are less than the industry standards.
    Greater: Accept the hypothesis that cooperative ratios generally are greater than the industry standards.
Strong conclusions are presented in boldface.
cGreater than .100 level of significance.

median and quartile statistics for the sample.[7] The Pearson test statistic is defined as:

$$X^2 = \sum_{j=1}^{k} \frac{(f_j - e_j)^2}{e_j}$$

where f_j is the observed frequency and e_j is the expected frequency of cooperatives in the jth class (quartile) under the null hypothesis that the distributions are identical. The test statistic can be used to test the goodness-of-fit of an observed distribution to any theoretical distribution and is approximately distributed as a chi-square for large samples. If the observed distribution fits the theoretical distribution identically, with some random variation, the test statistic will tend toward zero. If the observed distribution is not equal to the theoretical distribution, the test statistic will be significantly different from zero. In this case, the theoretical distribution is a uniform distribution and 25 percent of the observations should fall into each quartile.

It is generally recommended that the goodness-of-fit test based on the chi-square distribution is appropriate only in cases where the expected frequency of each class is at least five. Therefore, for testing the distributions of the five cooperative classifications with 20 or fewer firms, the test statistics were compared with the exact probability distributions of X^2 computed with the aid of a high-level programming language in a manner consistent with the method outlined by Pierce (pp. 189–92).

A limitation of the Pearson test is that it is only a test of goodness-of-fit and for $k<2$ it is insensitive to the effects of order. An alternative is a binomial test of the proportion of cooperatives with ratios less than the industry sample median. In the binomial test, the cooperatives in the lower two quartiles are combined into one cell and the upper two quartiles are combined into another. The binomial distribution is used to test whether the proportion p of cooperatives in the lower cell (i.e., those with ratios less than the industry sample median) is equal to one-half. If p is significantly less than one-half, the cooperative ratios are generally greater than the industry median. If p is significantly greater than one-half, the cooperative ratios are less than the industry median. Thus, although the binomial test is sensitive to order, it is less powerful than the Pearson goodness-of-fit test because four classes are combined into two and information about the quartiles is disregarded.

In applying the binomial test, the probability $P[r \leq x \leq n]$ is determined from a binomial probability table where r is the number of cooperatives in the larger of the two cells and n is the total number of cooperatives in the classification. If the largest number of observations is below the industry median, the test is whether to accept the null hypothesis $p = .5$ against the alternative $p > .5$. If the largest number of observations is above the industry median, the test is whether to accept $p = .5$ against the alternative $p < .5$. If $P[r \leq x \leq n] > \alpha$, where α is the significance level, the alternative hypothesis is accepted. Otherwise, there is failure to reject the null hypothesis.

Under the null hypothesis $p = .5$, the binomial distribution is symmetric and, for large samples (usually $n > 10$), the binomial distribution can be approximated by the normal distribution. Thus, the test of $p = .5$ is essentially equivalent to testing the statistic:

$$z = \frac{\hat{p} - p_0}{\sqrt{\dfrac{p_0(1 - p_0)}{n}}}$$

where $\hat{p}$ is the observed proportion of cooperatives below the industry median and p_0 is the proportion under the null hypothesis (.5). This statistic is approximately distributed as a standard normal variable and is equivalent to the square root of the Pearson X^2 statistic for $k = 2$. For samples of 20 or fewer cooperatives, the exact binomial distribution was used for the test. Otherwise, the standard normal approximation was used.

Results of Goodness-of-Fit Tests

Results of both the goodness-of-fit and binomial tests are presented in tables 6 and 7. In addition to the weighted index and test results, the tables present a subjective conclusion about whether each cooperative distribution conforms to the industry sample distribution or whether the cooperative ratios generally are higher or lower than those in the industry sample. In the tables, conclusions that the cooperative ratios generally are higher or lower are further characterized as strong or weak. For a strong conclusion, both the X^2 and p statistics had to be significantly different from zero. In addition, the sign of the weighted index had to be consistent with the direction of the binomial hypothesis. For a weak conclusion, the X^2 statistic had to be significant and the weighted index and the binomial hypothesis had to be consistent with each other, but the p statistic did not have to be significant. As it turned out, insignificance of the p statistic generally was accompanied by small values for the weighted index. For all weak conclusions, the absolute value of g was less than 0.11. If the X^2 statistic was insignificant or the X^2 statistic was significant but the sign of the weighted index was inconsistent with the binomial hypothesis, it was judged that the tests failed to reject the hypothesis that the cooperative and industry sample distributions were identical.

The results of the tests indicate that cooperative current ratios were weaker than the industry standards in several categories. Although the tests failed to show a significant difference in five of the groups, six cooperative groups were judged to have current ratios significantly lower than the standards. However, marketing associations accounted for five of the six groups. Only two cooperative groups had current ratios significantly greater than the standards.

Given the debt/equity ratio comparisons, there was no evidence that cooperatives generally are more highly leveraged than other firms. The statistical tests failed to show significant differences in the debt/equity ratios in four categories. The debt/equity ratios of cooperatives were judged to be less than the industry standards in seven of the categories.[8] Only the debt/equity ratios of the regional grain and regional farm supply cooperatives were judged to be greater than their industry standards.

The relatively greater debt/equity ratios of the regional cooperatives are in sharp contrast to those of the local cooperatives. Both local grain and local farm supply cooperatives were judged to have lower debt/equity ratios than their industry standards. This leads to the conclusion that regional grain and farm supply cooperatives generally were in a weaker financial position relative to

industry standards than their local counterparts, a conclusion reinforced by the fact that local farm supply cooperatives were judged to have greater current ratios than their industry standards while the current ratios of regional farm supply cooperatives were judged to be smaller.

Conclusions

The preceding analysis demonstrates the usefulness of nonparametric statistical methods in performing financial ratio comparisons, particularly when published industry standard data are used and there is only limited information available about the sample distributions. Results of the analysis provide no evidence to support the hypothesis that cooperatives generally are financially weaker than other firms in the industries in which they operate. Although several cooperative groups had lower current ratios than their industry standards, most of these groups consisted of marketing associations. The lower current ratios among marketing cooperatives may be explained largely by the unique business relationships that exist between these associations and their patrons and the extent to which proceeds payable to patrons appear on year-end balance sheets as current liabilities.

If anything, a comparative analysis of cooperative debt/equity ratios indicates that cooperatives generally are less leveraged than other firms in their industries. Several cooperative groups had debt/equity ratios judged to be less than their respective industry standards. Of the remaining groups, only two had debt/equity ratios judged greater than the standards. These two groups were the regional grain and regional farm supply cooperatives.

That these groups had higher leverage ratios than their industry standards deserves further comment, particularly in light of the fact that their local cooperative counterparts were judged to have lower debt/equity ratios than their industry standards. Cooperatives in each of the two regional groups experienced major operating losses during the 1980s, and many of these losses were written off against the equity accounts of their local affiliates. No overall explanation for the losses can be offered. General economic conditions certainly played a role in them, but in some cases, specific circumstances unique to individual organizations appeared to be more important. Thus, although these losses may explain some of the difference in leverage between the regional cooperatives and their industry standards, it does not explain all of it, nor does it explain the difference in relative leverage between the regional and local groups.

Another factor that may be useful in explaining these differences is that the equity position of local cooperatives handling grain and farm supplies is artificially enhanced by the double counting of earnings they receive from their regional affiliates but which are retained by the regionals as capital investments. Despite recent equity write-offs by regionals, local grain and local farm supply cooperatives combined held more than $1.4 billion in intercooperative investments at the end of fiscal 1987, an amount equal to nearly 27 percent of the local cooperatives' equity (Royer, Wissman, and Kraenzle, p. 18).

A third potential factor is that, although there may not be evidence that cooperatives in general are "equity bound," regional cooperatives in federated ownership structures indeed may be. In other words, cooperatives at the

regional level, which are owned by local cooperatives, may have greater difficulty acquiring equity capital to finance the size and scope of services they provide their local cooperatives than do the local cooperatives in providing services to their producer members. No substantive evidence supporting this conclusion is presented here, and it is offered only as a hypothesis worthy of further investigation. No research on the comparative financial performance of federated and centralized organizational structures is known to exist, and such analysis might be fruitful in offering further insight into this question.

Finally, it seems that the overall financial strength of cooperatives compared with other firms in their industries is better than that portrayed by authors writing in the early 1980s. There definitely has been a rebuilding of financial strength among cooperatives, as demonstrated by the 1987 financial profile. However, it is possible that some of the apparent improvement in the financial strength of cooperatives relative to other firms since the early 1980s is due either to the fact that earlier authors compared weighted mean cooperative ratios to median industry standards or their conclusions were based on comparisons of large cooperatives for which current and debt/equity ratios generally are weaker.

Notes

1. In a related study, Lerman and Parliament analyzed nine fruit and vegetable processing cooperatives and nine dairy processing and manufacturing cooperatives during the same period and in a similar manner. They concluded that the leverage ratios of the cooperatives were not greater than the industry standards and that the dairy cooperatives had greater liquidity. However, they concluded that the fruit and vegetable cooperatives were less liquid.

2. Cooperative data were collected for business years ending in calendar 1987. Dun & Bradstreet data are based on business years ending between July 1, 1987, and June 30, 1988. This period was chosen as the appropriate comparison because an earlier examination of ACS records indicated that 68 percent of cooperatives ended their business years during the last six months of the calendar year. The six-month lag could potentially bias evaluation of relative performance against cooperatives during a period of general economic improvement.

3. Here the quartiles are defined according to their use in the following analysis instead of how they are defined by Dun & Bradstreet. Dun & Bradstreet actually order individual ratios from strongest to weakest so that the ratios falling above the upper quartile are the strongest and not necessarily those with the highest numerical values. Although it is convenient in the following analysis to present the ratios according to their numerical rank, high current ratios and low debt/equity ratios are assumed to represent relative financial strength, a judgment that is consistent with Dun & Bradstreet and common practice.

4. The SICs used in this article and by Dun & Bradstreet are as they existed prior to the 1987 revision (U.S. Office of Management and Budget). In that revision, SIC 5152 (cotton wholesaling) was eliminated and cotton wholesaling activities were included in SIC 5159 (farm-product raw materials, not elsewhere classified).

5. Spearman's rank correlation coefficient measures the association between two rankings of a set of items and is defined as:

$$r_s = 1 - \frac{6 \sum_{i=1}^{n} d_i^2}{n(n^2 - 1)}$$

where d_i is the difference between the rankings of the ith item and n is the number of

items ranked. The coefficient ranges from -1 to $+1$ and is interpreted in a manner analogous to the standard correlation coefficient. The statistic used to test the hypothesis that the two rankings are independent is:

$$D = \sum_{i=1}^{n} d_i^2$$

and ranges from zero to $n(n-1)/3$. Tables of the exact critical values of D are available for small sample sizes, including $n = 13$. For large samples, test statistics based on r_s and approximately distributed according to the standard normal and t distributions can be used. Spearman's coefficient was chosen for this analysis over Kendall's tau coefficient, another measure of association between rankings, because its interpretation as the correlation between rankings has intuitive appeal and it weights large differences in rank more heavily than smaller ones.

6. This association is substantially greater between rankings based on the weighted mean ratios. The corresponding Spearman coefficient is .91 and is significant at the .005 level.

7. Both the Pearson goodness-of-fit and binomial tests are based on random sampling with replacement, a condition impossible to meet given the stratified sampling method used in collecting the data upon which the ratio estimates are based. Thus, the validity of the following depends on acceptance of the estimated cooperative distributions as representative of the true populations. Also, the power of each test was increased by the fact that estimated observations were considered. One reason for using a combination of criteria in evaluating the results of the tests (as described later) was that this conservative approach would offset the increase in power.

8. The conclusions for the dairy cooperative group are consistent with those of Parliament, Lerman, and Fulton with respect to the debt/equity ratio but inconsistent with their conclusion that dairy cooperatives were significantly more liquid than the industry sample. The conclusions regarding cooperatives handling fruits, vegetables, and nuts are consistent with the findings of Lerman and Parliament with respect to both leverage and liquidity.

References

Brown, Gail N. "Current Cooperative Financial Ratios and Capital Formation." *Cooperative Accountant*, Summer 1983, pp. 16–32.

Chen, Kwo-Shin. "The Growth of Large Cooperative and Proprietary Firms in the U.S. Food Sector." Ph.D. thesis, Purdue University, 1984.

Dun & Bradstreet Credit Services. *Industry Norms and Key Business Ratios*, 1987–88 ed. Dun & Bradstreet, Inc., 1988.

Griffin, Nelda, et al. *The Changing Financial Structure of Farmer Cooperatives*. Washington, D.C.: USDA ESCS Farm. Coop. Res. Rep. 17, Mar. 1980.

Haugen, Rolf E. "Financing Growth while Coping with Inflation—A Financial Perspective." *Cooperative Accountant*, Winter 1981, pp. 68–74.

Lerman, Zvi, and Claudia Parliament. "Comparative Performance of Cooperatives and Investor-Owned Firms in U.S. Food Industries." *Agribusiness* 6(1990):527–40.

Ling, K. Charles, and James B. Roof. *Marketing Operations of Dairy Cooperatives*. Washington, D.C.: USDA ACS Res. Rep. 88, Nov. 1989.

Parliament, Claudia; Zvi Lerman; and Joan Fulton. "Performance of Cooperatives and Investor-Owned Firms in the Dairy Industry." *Journal of Agricultural Cooperation* 5(1990):1–16.

Pierce, Albert. *Fundamentals of Nonparametric Statistics.* Belmont, Calif.: Dickenson Publishing Co., 1970.

Robert Morris Associates. *Annual Statement Studies,* 1988 ed. Philadelphia, Sept. 1988.

Royer, Jeffrey S. "Questions Arise Concerning the Role of Debt Financing." *American Cooperation 1984,* pp. 181–87. Washington, D.C.: American Institute of Cooperation, 1984.

Royer, Jeffrey S.; Roger A. Wissman; and Charles A. Kraenzle. *Farmer Cooperatives' Financial Profile, 1987.* Washington, D.C.: USDA ACS Res. Rep. 91, Sept. 1990.

Schrader, Lee F.; Emerson M. Babb; Robert D. Boynton; and Mahlon G. Lang. *Cooperative and Proprietary Agribusinesses: Comparison of Performance.* Agr. Exp. Sta. Res. Bull. 982, Purdue University, Apr. 1985.

Staatz, John M. *Farmer Cooperative Theory: Recent Developments.* Washington, D.C.: USDA ACS Res. Rep. 84, June 1989.

U.S. Office of Management and Budget. *Standard Industrial Classification Manual, 1987.* Springfield, Va.: National Technical Information Service.

Wilcox, Rand R. *New Statistical Procedures for the Social Sciences: Modern Solutions to Basic Problems.* Hillsdale, N.J.: Lawrence Erlbaum Associates, 1987.