Equity retirement and other determinants impact on return on equity in US local farm supply and grain marketing cooperatives

by

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Abstract

The environment surrounding cooperatives is evolving and becoming more challenging due to financial concerns stemming from a turbulent agricultural economy, trade uncertainty, and the need to update infrastructure. In addition, cooperatives are financed differently than typical agribusinesses which makes financial decision making even more challenging. To remain competitive and successful in profitability, cooperatives need to operate with efficient assets and sound financial decisions regarding investments, business dealings, and equity.

This study analyzes the profitability of cooperatives utilizing 5 different regression models. The first model uses more current cooperative data to update the article by Boyd, Boland, Dhuyvetter, and Barton (2007), which focuses on the financial ratios and performance measures of current ratio (*CR*), assets-to-equity (*ATE*), lagged return on equity (*ROE*), net profit margin (*NPM*), asset turnover (*AT*), times-interest-earned (*TIE*), risk, and total assets (*Assets*) and their impact on *ROE*. Four additional models are used in this study to explore the relationship between retiring equity back to patrons and *ROE*. The added variables are equity retirement as reported by cooperatives, a state interaction term which is a dummy variable that is set to 1 if a state has a law requiring equity retirement upon death of the member.

The results find there are four statistically significant variables at the .10 level in all the models that impact future *ROE* which are lagged inverted current ratio (*CRinv*), lagged Assets-to-equity (*ATE*), lagged *ROE*, and lagged Net Profit Margin (*NPM)*. The results between Boyd et al. and this study are results in relation to the profitability ratios and liquidity ratios. Lagged *ROE* and *NPM* are the profitability variables that impact future *ROE* in a positive manner as do lower levels of liquidity demonstrated by the variable *CRinv*. A difference from Boyd et al. (2007) is the result that higher leverage ratios demonstrated by *ATE*, are correlated with an increase in

future profitability. This difference warrants additional research to discover the potential reason. Equity retirement was shown to have no effect on future *ROE*. However, adding "net" allocated equity corresponds with higher future profitability. The analysis found that cooperatives within states with legislation requiring them to retire equity would have lower future *ROE*, on average, than cooperatives in states with no legislation.

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Chapter 1 - Introduction

Agricultural cooperatives benefit their members by providing greater market access, access to more competitive prices, and a claim to a portion of the profits through patronage refunds or patronage. In addition, cooperatives benefit their communities by providing employment, added community income, and increased use of the rural community's industry as most cooperative plants and facilities are based in rural locations. The benefits do not conclude there as several cooperatives have extended benefits overseas by helping international farmers become more educated and even build some facilities such as a large cooperative nitrogen plant in India (USDA, Cooperative Benefits & Limitations 1980). The far-reaching benefits of cooperatives demonstrates the need for cooperatives to remain in rural communities locally and globally. Continuing to provide and sustain these benefits require the cooperative to generate adequate profits to support the business.

Cooperatives finance their business through a combination of debt and equity. The equity is comprised of two kinds, allocated and unallocated. Unallocated equity is retained earnings tied to the cooperative. Allocated equity is retained patronage or profits generated by members. What is unique about allocated equity for a cooperative is that this equity should be paid back or redeemed to the member sometime in the future. A cooperative will redeem equity based on their equity retirement program, the future profitability outlook, and the growth needs of the cooperative. Retiring equity benefits the member because the member receives the funds but the cooperative no longer has these equity funds available for use to finance growth or build liquidity.

Across the nation, there is no blanket policy for equity redemption or retirement. Cook (1976) argues that uncertainty of equity retirement programs for cooperatives caused frustration

among members in the 1960s and 1970s, which led them to approach state and federal legislators demanding change. In response, Iowa, Nebraska, New Mexico, Rhode Island, and South Carolina created state statutes requiring equity retirement within a certain timeframe after the relationship with the cooperative has been terminated (either at death of the member or if the member is no longer in production agriculture).

There has been a large amount of research done that discusses the different factors that impact profitability but very limited research on the impact of equity retirement on profitability. The purpose of this study is to examine the impact equity retirement and state statutes that require equity retirement on future profitability or return on equity (ROE). Results from this research will help cooperative board members and policy makers determine if legislation is the most beneficial for the cooperative with respect to profitability. Furthermore, the study will use more current data to update a similar cooperative profitability study conducted by Boyd, Boland, Dhuyvetter, and Barton (2007).

Boyd et al. examined how certain financial determinants impact ROE for cooperatives using data provided by Farmland Industries and CoBank. This study was beneficial, but the data ended in 2004 and cooperatives have changed significantly in recent years as argued by Briggeman et al. (2016).

Adding the components of equity retirement and new equity to the Boyd et al. study will benefit cooperatives' board of directors when determining the method of equity redemption and retirement to enable the cooperative to have a greater chance of meeting its needs and being profitable despite the uncertainty of situations regarding equity retirement. Results show that there is a positive relationship between cooperatives with effective equity redemption and retirement plans in place and an increase in new members due to the ability of the patrons to see

the equity working for the members (Cobia, Royer, Ingalsbe, 1989). By having a larger number of members invested, the cooperative will have more access to capital to provide necessary cash flow and remain profitable.

This study is comprised of 5 chapters and will begin with background information to ensure familiarity with cooperatives financial method involving equity in Chapter 2. This chapter will also include a literature review regarding cooperatives' financial status, equity redemption, and mergers and acquisitions. Chapter 3 will discuss the data, methodology, and share results of these in table format. This will then lead into results from the analysis in Chapter 4 and concluding remarks and implications for cooperatives, policy makers, and members in Chapter 5.

Chapter 2 - Background & Literature Review

2. Background and Literature Review

  The cooperative business model is different than a publicly held entity, and this difference is illustrated through 3 cooperative principles. They are as follows: 1. The User-Owner Principle: People who own and finance the cooperative are those who use it, 2. The User-Control Principle: People who control the cooperative are those who use it, and 3. The User-Benefits Principle: The cooperative's sole purpose is to provide and distribute benefits to users on the basis of their use (USDA Understanding Cooperatives: Cooperatives Business Principles, 1994).

  For purposes of this study, it is important to note that cooperatives are financed through a combination of debt, allocated equity, and unallocated equity. Allocated equity is assigned equity on a proportional manner dependent on the amount of business the member does with the cooperative. Unallocated equity is capital that is not assigned to a particular member and can come from nonmember business, patronage income that is not allocated to a particular member, or occur through an event such as a merger or acquisition or sale of an asset (USDA, 1995). Allocated equity is intended to be retired at some point in the future, whether due to equity redemption payments or special situations such as member retirement or death. In addition, most cooperatives utilize open membership which allows producers the ability to join at any time. The unique manner of financing cooperatives makes long term growth and profitability challenging and creates a greater need for informed decisions regarding equity retirement, investments, and other management decisions.

2.1 Cooperatives Financial Status

Cooperatives have seen lower commodity and input prices in recent years which has decreased volume. In 2015, cooperatives experienced a net income loss of $192.1 million which was a drastic decrease from 2014 where cooperatives experienced a net income of $6.5 billion. (Wadsworth and Hoang, 2017). These losses are due in part to the difficulties that were found within farming in recent years. The current uncertainty with interest rates and the economy could indicate there could be potential for future financial stress within cooperatives. As Pokharel et al (2020) discussed, cooperatives are in a stage of evolution due to the challenges that are being faced such as minimal profit margins, smaller number of cooperatives which leads to high competition, and commodity price volatility. This creates an even greater need for appropriate decision making within cooperatives to maximize profits and growth.

Cooperatives have a challenge to determine the best method for generating equity. There can be a mixed method combining unallocated equity and allocated equity. Unallocated equity can help reduce the amount of equity redemption that is required but can have a negative impact in reducing total benefits to members because they do not receive these funds unless the cooperative is sold or reorganizes in a non-cooperative structure.

2.2 Mergers and Acquisitions

Due to the differences in cooperatives' business structure, they have seen some significant challenges since the 1800's. As time has evolved, they have had to learn how to handle globalization, food safety concerns and regulations, technology advancements, and consumer demands evolving. These changes have forced cooperatives to adapt in order to survive. Barton et al (2011), identified challenges facing cooperatives are, first, the ability to continue to have financial growth to finance the assets required for their members' success,

second, the ability to have consistency with profitability, and lastly, the ability to uphold the beliefs and traditions of a cooperative while acquiring more capital to fund the business. The more recent challenges have created situations which have caused more cooperatives to create alliances in order to better meet their financial needs. Some of the alliances have led to mergers or acquisitions resulting in the top ten largest cooperatives accounting for 41 percent of total gross business volume in 2015 and a reduction of 59 cooperatives nationwide from 2014 to 2015 (USDA, Agricultural Cooperative Statistics 2015). Mergers and acquisitions have allowed cooperatives to become larger to achieve economies of size (horizontal) or more diversified (congeneric) to mitigate risk (Parliament and Taitt, 1989).

Mergers and acquisitions have enabled cooperatives to be more strategic with their capital and created more opportunities to purchase and update technology and storage. Basnet and Kenkel (2014) found that 74 percent of steel structures and 91 percent of the concrete storage structures used in Oklahoma for cooperatives' storage are outdated and need renovations or to be replaced. Cooperatives are attempting to update or purchase technology and storage as demonstrated by an increase in assets owned by cooperatives of 3.6 percent from 2014 to 2015 reported to the USDA (USDA- Agricultural Cooperative Statistics, 2015).

Hudson and Herndon (2000) found the majority of mergers and acquisitions occurred horizontally in an attempt to reduce costs of duplicate personnel and also eliminates local competition, but this does not result in a reduction of risk. Parliament and Taitt (1989) found this tends to benefit the cooperatives' liquidity in the short run but in the long run has less of an impact on profitability unless the merger is more congeneric in nature. Although the potential for decreasing risk is more significant when cooperatives with differing specializations merge, Van der Krogt et al (2007) found that cooperative members and boards are more risk adverse which

would lead to being less willing to merge if merger creates diversification. In addition, most mergers occur due to the desire of the cooperative to gain access to each other's resources that will benefit the cooperative only if they are operating in the same manner.

2.3 Equity Redemption

Prior to the 1970's, cooperatives rarely redeemed equity and it was shown that only 37% redeemed equity upon the death of the member (Cobia, Royer, and Ingalsbe, 1989). This caused greater outcry for legislature mandating redemption by cooperatives and led to Iowa, Nebraska, New Mexico, Rhode Island, and South Carolina creating legislation requiring cooperatives to retire equity upon death of the member within a specified time frame which varied from 1 year up to a maximum of 5 years (Cook, 1976). There is minimal change in the requirements today and those states still maintain those laws with no additional states requiring retirement upon death of the member. As interest increased in the best manner of equity redemption, more research was done to advise cooperatives with the best method to maintain positive financial relationships with the members and most cooperatives strive to have consistent equity redemption plans in place.

As Brown and Volkin discovered in 1977 that 71 percent of the 857 farmer cooperatives surveyed had some program in place for redeeming equity and one-third of those had a program for equity retirement. Mandatory equity redemption has some benefits such as ensuring the members would receive funds in a timelier manner and eliminate any overinvested member problems. In addition, members would be able to use their equity as collateral in accessing additional credit. Some challenges that are present would be that cooperatives would lose the flexibility needed to accommodate changing financial operating results. If a cooperative experiences a financially challenging year, they would be able to delay equity redemption or

retirement to allow for recovery (Boland and Brown, 2013). This may have been the reasoning behind limited legislature requiring equity retirement and redemption.

The challenge to create a cooperative equity redemption plan that enables financial growth is ever present. The board of directors has a significant number of factors that need to be considered before implementing that plan. The board must consider if the plan will allow the cooperative to maintain adequate capital to ensure needed growth, ensure that a member's equity is proportional to patronage, must be flexible to allow for changing financial operating results, must be flexible with member's needs, recognize tax and other statutes to ensure the best outcome for the cooperative and members, a plan that members easily understand, and the ease of administration of the final plan (Cobia, Royer, and Ingalsbe, 1989).

USDA has been periodically surveying cooperatives to monitor the equity redemption programs in place across the United States. The most recent one discovered that of the 792 cooperatives, almost all the cooperatives have a program in place, and most utilized multiple methods (Eversull, 2010). According to Briggeman et al (2016), the average cooperative's plan involves revolving equity on an 18-year basis. This involves paying off or retiring equity on a first in, first out method and the timeframe depends on the time it takes to accumulate additional equity. The two most common methods used are the revolving fund plan, as mentioned above, and the special situation plan which occurs due to special situations such as death, retirement, moving away, hardship or resignation to name a few. The challenge with the latter plan is the unpredictability of those events so it is usually used with other plans (Cobia, Royer, and Ingalsbe, 1989).

Requirements for equity retirement were different among cooperatives, some cooperatives require only the husband to have passed away and others require both husband and

wife to pass away for payments to occur. There are also multiple methods of retiring the equity and most involve a cap annually and the payments to take years to fully retire the equity (Eversull, 2010). This manner would allow for cooperatives to retire the equity while continuing to see positive growth. However, very little is known about the potential or if any impact retiring equity might have on future growth or profitability. The purpose of this study is to explore those potential impacts.

Chapter 3 - Data & Methodology

3. Data & Methodology

3.1 Methodology

The Boyd et al. paper and literature review show that future financial performance is impacted by measurements that involve liquidity, solvency, profitability, efficiency, and risk. This is demonstrated using the theoretical model shown as:

$$(1) \qquad \overline{ROE_{i,t}} = f(\overline{Liquidity_{i,t-2}}, \overline{Solvency_{i,t-2}}, \overline{Profitability_{i,t-2}}, \overline{Efficiency_{i,t-2}}, \overline{Risk_{i,t-2}})$$

All variables are the 2-year average for each financial measure for each cooperative. This is done to ensure the variable is smoothed and not as affected by single events. Also, the independent variables are lagged by 2 years, t-2. This is done because of the time lag assumption between managerial decisions being implemented and the financial impact on the cooperative. Previous research from Haden and Johnson (1989) shows that management decisions impact on profitability occurs in the future rather than immediately. So, for example, the $ROE_{i,1999}$ would be the 2-year average (1999 and 1998) of ROE for the ith cooperative. Then, each independent variable would be the t-2, 2-year average (1997 and 1996) for the ith cooperative.

While it is expected that these financial measures will have an impact on future profitability, the expected impact can be ambiguous. Boyd et al. (2007) and Haden and Johnson (1989) argue that past profitability and efficiency will positively impact future ROE. Past management decisions that drive profitability and efficiency, on average, should positively impact future profitability. Liquidity, solvency, and risk are more ambiguous. An increase in

liquidity might increase future profitability but it also could decrease future profitability because the business is not using working capital to fund growth projects. An increase in solvency might decrease future profitability because the business is building up too much equity and not using it to fund future profitability. Higher levels of risk could positively impact future ROE because of getting a higher return from higher risk investments or those high risk investments could decline future ROE.

This study adds the additional component of members' equity to the theoretical model above due to the important role equity plays in cooperatives' business models. After model 1, the theoretical model used for the remainder of the study is as follows:

$$(2) \quad \overline{ROE_{i,t}} = f(\overline{Liquidity_{i,t-2}}, \overline{Solvency_{i,t-2}}, \overline{Profitability_{i,t-2}}, \overline{Efficiency_{i,t-2}},$$

$$\overline{Risk_{i,t-2}}, \overline{Equity_{i,t-2}})$$

The first model used in this study was originally used by Boyd et al. (2007) and the other models are modifications of the original model. One difference between the Boyd et al. model and the model used for this study is the use of inverting the current ratio and times interest earned. Inverting these variables is done due to cooperative's financing causing components of the bottom of the ratio to equal zero during some time periods which causes problems when the ratio is divided by zero.

The models are given as:

$$(3) \quad ROE_{i,t} = f(CRinv_{i,t-2}, ATE_{i,t-2}, ROE_{i,t-2}, NPM_{i,t-2}, AT_{i,t-2}, TIEinv_{i,t-2},$$

$$Risk_{i,t-2}, Assets_{i,t-2}).$$

The first independent variable is the inverted current ratio (*CRinv*). This ratio gives a view into the liquidity of the cooperative or a measure of the cooperative's ability to meet financial obligations. It is computed by dividing current liabilities with current assets, which enables an analysis of the short-term ability of a cooperative to fulfill their obligations or the amount of liquidity a cooperative maintains. The second variable is the Assets-to-Equity (*ATE*) ratio, which measures the amount of leverage a firm possesses. This variable determines how much of the assets being utilized by the cooperative are owned through equity.

Both return on equity (*ROE*) and net profit margin (*NPM*) are profitability variables. *ROE* is lagged and captures past management decisions that affected past return on equity or net income divided by total equity. *NPM* measures the amount of profit that is generated from revenue and is calculated by means of dividing net income prior to sales by sales.

Asset turnover (*AT*) and Times Interest Earned (*TIE*) are both efficiency measurements. *AT* determines how efficiently a cooperative is utilizing assets to generate sales. It is computed by dividing total sales revenue by total assets. *TIEinv* evaluates the cooperatives ability to pay interest expense from income earned and is calculated through dividing interest expense by the sum of net income and interest expense.

As discussed previously, this is inverted due to the occasions when interest expense is zero. *Risk* for cooperatives is found by calculating the standard deviation of *ROE* for each cooperative during the time frame of the data (1996-2014) and this measures the variability of *ROE* for the cooperative over time. The final variable used in the Boyd et al. (2007) paper is Total Assets (*Assets*) and is used to account for the potential economies of size. These variables will all be utilized in the models throughout this study.

The second model incorporates an additional variable to see the impact on the cooperatives return on equity. This model is:

$$(4) \quad ROE_{i,t} = f(CRinv_{i,t-2}, ATE_{i,t-2}, ROE_{i,t-2}, NPM_{i,t-2}, AT_{i,t-2}, TIEinv_{i,t-2},$$
$$Risk_{i,t-2}, Assets_{i,t-2}, EquityRetirement_{i,t-2}).$$

The *EquityRetirement* variable is the amount of allocated equity that is retired back to patrons annually by each cooperative within the dataset. Since cooperatives are member owned and financed, equity retirement is an important component in analyzing profitability. As cooperatives retire equity, it reduces the amount of funds available to purchase additional assets, fund growth, or use for other needs to increase profitability. This demonstrates the need to analyze how it impacts profitability.

The third model adds a State dummy variable and an additional interaction term *ER_State* and to equation 4:

$$(5) \quad ROE_{i,t} = f(CRinv_{i,t-2}, ATE_{i,t-2}, ROE_{i,t-2}, NPM_{i,t-2}, AT_{i,t-2}, TIEinv_{i,t-2},$$
$$Risk_{i,t-2}, Assets_{i,t-2}, EquityRetirement_{i,t-2}, State_{i,t-2}, ER\_State_{i,t-2})$$

Two states within the dataset, Iowa and Nebraska, require that allocated equity be paid back to the member upon death or the member no longer being an active agricultural producer. The *State* dummy variable indicates if the ith cooperative is in either Iowa or Nebraska. In order to analyze the impact of those states' legislation on *ROE*, an interaction term was created called

ER_State which interacts the *State* variable along with the ith cooperative's equity retirement variable.

The fourth model estimated considers the impact of total new member equity generated (*NewEquity*) has on a cooperative's profitability as shown by:

$$(6) \quad ROE_{i,t} = f(CRinv_{i,t-2}, ATE_{i,t-2}, ROE_{i,t-2}, NPM_{i,t-2}, AT_{i,t-2}, TIEinv_{i,t-2},$$
$$Risk_{i,t-2}, Assets_{i,t-2}, NewEquity_{i,t-2}).$$

NewEquity reflects the "net" gain in allocated equity for the ith cooperative. Each year, a cooperative board of directors could retain patronage profits as allocated equity and retire allocated equity. Therefore, *NewEquity* reflects the difference between retained patronage and retired equity.

Similar to equation 5 above, the last model to estimate includes the *State* and *NE_State*, which interacts *State* and *NewEquity* for each cooperatives and is shown as:

$$(7) \quad ROE_{i,t} = f(CRinv_{i,t-2}, ATE_{i,t-2}, ROE_{i,t-2}, NPM_{i,t-2}, AT_{i,t-2}, TIEinv_{i,t-2},$$
$$Risk_{i,t-2}, Assets_{i,t-2} NewEquity_{i,t-2}, State_{i,t-2}, NE\_State_{i,t-2}).$$

All regression variables discussed were differenced by the 2-year industry average across all the cooperatives within the dataset. Including this differencing in the analysis removes potential industry effect in the model and allows for market changes throughout time. Removing industry effect from the model allows the study to analyze the individual firm's financial performance. In addition, cooperatives face variability in prices and weather which can impact trade. This would

create significant market changes from year-to-year that would need to be removed to isolate and analyze the variables that impact ROE.

The models were estimated by OLS in STATA. To test for heteroskedasticity, a Breusch-Pagan test was run and heteroskedasticity was found. To correct this issue, the regressions were re-run with a robust variance estimator. A Durbin Watson test was run to check for autocorrelation and a variance inflator factor was run to check for multicollinearity. Neither were detected in any of the models.

3.2 Description of Data

This study utilizes fiscal year-end financial data from CoBank, a primary lender to agricultural cooperatives and part of the Farm Credit System. A total of 155 cooperatives within 21 states including Arkansas, California, Colorado, Florida, Illinois, Indiana, Iowa, Kansas, Louisiana, Minnesota, Missouri, Montana, Nebraska, Ohio, Oklahoma, Pennsylvania, South Dakota, Tennessee, Texas, Virginia, and Wisconsin. The data are a balanced panel as each cooperative is present each year in the data. These cooperatives are local farm supply and grain marketing cooperatives with 133 cooperatives comprised of Farm Supply/Marketing and the remaining 22 were Grain Marketing and were in operation spanning from 1996 until 2014. The total number of observations is 2,560.

Table 1 analyzes the average financial variables across two time periods utilizing the CoBank data. The first time period encompasses the time period during the Boyd et al. paper and the second time period is the time following the end of the data used by Boyd et al. The purpose of this table is to demonstrate the changes that have occurred over time regarding cooperatives. The two profitability variables, return on equity and net profit margin, both have increased indicating that cooperatives have become more profitable in recent years. The leverage ratio of asset to

equity has increased as well indicating cooperatives in the second time period are more leveraged than the first time period and will be discussed more in later sections. The liquidity and efficiency ratios have all decreased as seen in the results of current ratio, asset turnover, and times interest earned indicating that cooperatives are less liquid and efficient during the second time period. These will also be discussed further in the results section with potential reasoning why the decrease has occurred.

Table 1. Average Financial Variables for Farmer Cooperatives Across Two Time Periods

Variable	1996-2004	2005-2014
Current Ratio	1.94	1.77
Assets-to-Equity	1.93	2.37
Return on Equity	0.07	0.13
Net Profit Margin	1.91	2.62
Asset Turnover	0.35	0.32
Times interest earned	3.23	5.88
Total Assets	$12,597,948	$34,236,808
Equity Retirement	$212,994	$249,934
New Allocated Equity Generated	$14,968	$351,584
Net Income	$487,546	$1,980,791
Sales	$32,164,417	$87,669,001
Total Equity	$6,066,121	$13,135,869
Return on Assets	0.04	0.06

*Data source is farmer cooperative financial statement data from CoBank

Time period 1996-2004 relates to Boyd, et al. (2007) study and 2005-2014 reflects updated data

Table 2 Summary Statistics has descriptive statistics about the variables used in the

regressions and additional descriptive statistics about balance sheet components that were used in

calculating the financial ratios for the regressions.

Table 2. Summary Statistics of Financial Variables from 155 Local Farm Supply and Marketing Cooperatives 1996-2014.

Variable	Units	Mean	SD
Return on equity	%	10.51	10.26
Current Ratio (inv)		0.66	0.20
Assets-to-equity		2.16	0.99
Lagged Return on Equity	%	10.26	8.94
Net Profit margin	%	2.24	2.42
Asset turnover		0.33	0.12
Times-interest-earned (inv)		0.23	2.82
Risk		0.08	0.04
Total assets	$	24,752,176	43,842,600
Equity retirement	$	234,160	447,814
New Allocated Equity	$	203,988	773,417
Sales	$	63,571,751	115,537,475.4
Return on Assets	%	5.00	5.00
Net Income	$	1,330,828	2,671,045
Interest Expense	$	440,703	966,613
Total Equity	$	10,181,423	15,705,977

*Bold variables are variables used in the regressions. The others are used for the purpose of calculating variables.

The CoBank data used in the study is representative of U.S. farmer cooperatives. Table 3

reports the average financial variables for the 2014 CoBank data and the 2014 Cooperative

Statistics published by the USDA. The average for ROE is 17.29% in the USDA data and the

CoBank data ROE is 10.9%. This indicates a slightly lower ROE for the cooperatives in this

dataset than industry. The average for the variable current ratio (*CR)* is 1.45. The mean for the

CR in the dataset is 1.8 indicating the liquidity is on par with the industry. Assets-to-equity ratio

(*ATE*) in the USDA is calculated as Equity to assets and is larger in this dataset than reported by

USDA by 0.18 which could indicate the cooperatives in this study have more assets being funded

by members than the national average. Asset turnover (*AT*) is larger based on the average of

11.20 and this could potentially be due to investment in assets and storage. Times interest earned ratio (*TIE*) mean for the industry was 8.11 which is higher than this dataset. This just means the industry will be more able to meet the current interest debt given current earnings. This dataset *TIE* is smaller but still positive which indicates the cooperatives are still capable of fulfilling those debt obligations. Total Assets is smaller than the reported number to USDA but that is expected given the USDA has a greater number of cooperatives reporting their balance sheets than this dataset. Smart et al. (2019) found the financial comparison between CoBank Data and USDA Nationwide Data were comparable in key areas involving profitability.

Table 3. Comparison between CoBank Data and USDA Nationwide Data for 2014.

Variables	CoBank Data	USDA Nationwide Data
Current Ratio	1.88	1.45
Equity to assets	0.56	0.38
Return on Equity	0.11	0.17
Net Profit Margin	2.0	1.73
Asset Turnover	0.33	0.11
Times interest earned	2.17	8.11
Return on Assets	0.05	0.09

The summary statistics for the industry differenced variables, which are the variables used in the regression analysis and are discussed in section 3.1, are shown in Table 4. The majority of variables that are differenced by the industry average have a mean of zero. The two variables with value greater than zero indicate that those states that require equity retirement by law, will have on average, paid out $37,000 of retired equity more than the industry and also see an increase in new equity by $26,293 more annually than the industry.

Table 4. Summary Statistics of Industry Differenced Variables from 155 Local Farm Supply and Marketing Cooperatives 1996-2014.

Variable	Mean	SD
Return on equity	0	0.08
Current ratio (inv)	0	0.20
Assets-to-equity	0	0.88
Lagged return on equity	0	0.08
Net profit margin	0	195
Asset turnover	0	0.11
Times interest earned (inv)	0	2.14
Risk	0	0.04
Total assets	0	3.69e.07
Equity retirement	0	372,548
Equity retirement with states interaction term	37,109	268,004
New equity	0	544,614
New equity with states Interaction term	26,293	363,340

*Data source is CoBank fiscal year-end financial statements

Chapter 4 - Results

Table 5 shows the regression results. As seen in the table, R^2 is consistent across all models. Model 1 had some similar and different results to Boyd et al. (2007) with statistical significance in relation to inverted current ratio, assets-to-equity, lagged return on equity, and net profit margin. The coefficient for the inverted current ratio was positive, which suggests that less liquidity leads to higher ROE. This finding is similar to Boyd et al. (2007) and suggests that cooperatives use liquidity for future growth. Potentially, cooperatives in our data are using liquidity to fund future ROE growth.

The coefficient for *ATE* was positive which suggest that on average, cooperatives with higher leverage tend to see an increase in future profitability. The coefficient for *NPM* was positive which indicates higher past profit margins on average increase future *ROE*. Lagged *ROE* is positive and similar to the findings of Boyd et al. (2007). Past profitability plays a significant role in future profitability.

Models 2-5 show similar results as Model 1, except with the addition of the equity retirement variables. Model 2 evaluates the effect of retiring allocated equity on future *ROE*. While the parameter estimate is positive, this variable is not statistically significant. Furthermore, model 3 includes the *State* and interaction term to evaluate the potential impact of equity retirement legislation in Iowa and Nebraska on cooperative future profitability. As in model 2, the equity retirement variable, the *State* dummy variable, and interaction term are not statistically significant.

Model 4 analyzes the impact new member equity has on future *ROE*. The *NewEquity* coefficient is positive and statistically significant which indicates that a "net" increase of new member equity is on average correlated with increases in future *ROE*. This is important for

cooperative board of directors because it suggests that reinvesting patronage back into the cooperative as allocated equity helps boost future *ROE*. However, the increase in *ROE* would be expected to be relatively small on average as shown by one unit of new member equity increases future *ROE* by .00000596%.

Model 5 incorporates the relationship between *NewEquity* and the states interaction term. Similar to model 4, *NewEquity* has on average a positive correlation with future *ROE*. Interestingly, the interaction between *NewEquity* and the *State* dummy variable has a negative parameter estimate. So, on average, as Nebraska and Iowa cooperatives within the sample increase "net" allocated equity, they tend to have lower future *ROE*s than other cooperatives in other states. It is difficult to identify why this result occurred. Could it be because Nebraska and Iowa cooperatives are bound by state statutes to retire this allocated equity? And because they must retire this equity, does this requirement hinder these cooperatives' ability to effectively grow and generate, higher future *ROE*? More research is needed to fully understand the reason for this regression result. But past research does support the need to effectively manage new, "net" allocated equity. Cobia, Royer, and Ingalsbe (1989) state that efficient equity redemption and retirement plans indicate a more effective financial plan in place that would allow for more asset investments and future cooperative growth.

Table 5. Regression Results for Models with Financial Ratios that Impact Future Return on Equity.

Variable	Parameter Estimate	Standard.Error	Parameter Estimate	Standard.Error	Parameter Estimate	Standard.Error	Parameter Estimate	Standard.Error	Parameter Estimate	Standard.Error
Intercept	-2.30e-11	0.001	-2.29e-11	0.0014	-0.0002	0.001	-3.04e-11	0.001	0.0002	0.001
Lagged inverted current ratio	0.019	0.009*	0.019	0.009*	0.019	0.009*	0.019	0.009*	0.019	0.009*
Lagged assets-to-equity ratio	0.013	0.003*	0.013	0.003*	0.013	0.003*	0.013	0.003*	0.013	0.003*
Lagged return on equity ratio	0.291	0.049*	0.291	0.050*	0.292	0.050*	0.282	0.050*	0.279	0.050*
Lagged net profit margin	0.005	0.001*	0.005	0.001*	0.005	0.001*	0.005	0.001*	0.005	0.001*
Lagged asset turnover ratio	-0.014	0.015	-0.014	0.015	-0.015	0.015	-0.014	0.015	-0.012	0.015
Lagged inverted times-to-interest earned ratio	-0.0002	0.001	-0.0002	0.001	-0.0002	0.001	-0.0002	0.001	-0.0002	0.001
SD of return on equity	0.056	0.093	0.056	0.093	0.056	0.094	0.056	0.093	0.057	0.093
Assets	-1.46e-11	3.46e-11	-2.27e-11	4.89e-11	-3.28e-11	4.79e-11	-5.73e-11	3.40e-11*	-5.02e-11	3.48e-11
Lagged equity retirement			1.14e-09	4.41e-09	-1.26e-09	5.72e-09				
New Equity							5.96e-09	2.66e-09*	1.08e-08	4.08e-09*
R^2	0.183		0.182		0.183		0.184		0.185	
Root mean squared error	0.070		0.070		0.070		0.070		0.070	

Chapter 5 - Conclusions

 The benefits of cooperatives demonstrate the importance of continuing operations in the United States. Yet, as Pokharel et al. (2019) stated, times are becoming much more challenging for managers of cooperatives and their board due to changes in size from mergers and acquisitions, variations in debt-equity structure, and the need to update infrastructure requiring adequate investments. These challenges make it even more necessary for research regarding member equity in all forms; new, current, and retirement as access to capital would benefit the cooperatives' ability to be profitable.

 The study updated the findings of Boyd et al. (2007) with more current data. A similar finding is that past profitability is a good indicator for future profitability. The present study, like Boyd et al., found that the lagged ROE and lagged net profit margin had a positive impact on future ROE. Another similarity is that cooperatives that have lower liquidity tend to have higher future ROEs. Finally, one difference is that the present study found that higher levels of leverage are correlated with higher, future ROEs. Potentially cooperatives in the updated data are utilizing leverage to build additional infrastructure. Support for this potential reason requires further research to fully understand the positive relationship between leverage and future ROE.

 This paper also analyzed the impact of both new allocated equity and equity retirement's impact on ROE for the cooperatives within the dataset used from CoBank. Results suggest that retiring equity does not impact future profitability of the cooperatives analyzed. However, adding additional amounts of "net" allocated equity is correlated with future profitability. Furthermore, if a cooperative adds "net" allocated equity and resides in a state with legislation requiring them to retire equity, then those cooperatives on average tend to have lower future ROE compared to

cooperatives in other states. This finding motivates the need for future research to better understand the result and to develop key takeaways for directors of cooperatives.

Limitations of the analysis include only having data for two states with legislation in place requiring equity retirement. Having a broader data set would help improve these results, which indicate the need for policy makers to evaluate how beneficial these policies are for the cooperatives and their members. This would allow policy makers, cooperatives' boards, and members make more educated decisions regarding the proper policies and procedures regarding equity retirement to utilize in order to ensure all parties receive the benefits from the relationship.

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