

**DETERMINING THE APPROPRIATE
CAPITAL LEVEL FOR FARM CREDIT MID-
AMERICA**

by

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ABSTRACT

Farm Credit Mid-America is experiencing strong growth due to the success of the farming sector in our four state territory of Tennessee, Kentucky, Indiana, and Ohio. The company is well positioned to meet the financial demands of its customers and they have an aggressive growth plan to increase total assets from \$18 billion to \$25 billion in five years. They also plan to add 600 new employees in that time period. Determining the appropriate level of capital to sustain growth and meet the demands of its customers will be a primary objective of the organization over the next five years.

Permanent capital is viewed as a percentage of total assets at Farm Credit Mid-America with the ideal amount between 14% and 16%. A detailed analysis of the current capital level, regulatory requirements, and the projected future financial position of the company was completed to:

- Define and understand capital as it applies to Farm Credit Mid-America;
- Research the current capital levels for Farm Credit Mid-America;
- Compare capital levels of Farm Credit Mid-America to capital levels of other Farm Credit Associations and other banks;
- Understand Basel III Accords and how it applies to Farm Credit Mid-America's capital requirements;
- Complete sensitivity analysis with multiple scenarios applied to the current Farm Credit Mid-America loan portfolio to determine the effect certain events may have on capital levels;

- Determine if Farm Credit Mid-America is appropriately capitalized based on the other objectives.

When looking at the results, it is determined that current capital levels are in line with other Farm Credit associations and competitors. Also, Farm Credit Mid-America has met the Basel III guidelines for minimum capital requirements. The sensitivity analysis included a wide range of scenarios from normal growth rates to extreme loan portfolio distress and the effects those scenarios would have on permanent capital. The permanent capital ratio exceeded the minimum standard of 12% on all sensitivity analysis scenarios. Therefore, based on the objectives of this thesis Farm Credit Mid-America appears to be adequately capitalized.

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CHAPTER I: INTRODUCTION

Farm Credit Mid-America is experiencing strong growth due to the success of the farming sector in the four state territory of Tennessee, Kentucky, Indiana, and Ohio. Commodity prices are at all-time highs so most farmers have the means to borrow funds for additional acreage, new equipment, or for operations. The company is well positioned to meet the financial demands of its customers and they have an aggressive growth plan to increase total assets from \$18 billion to \$25 billion in five years. They also plan to add 600 new employees in that time period. Determining the appropriate level of capital to sustain growth and meet the demands of its customers will be a primary objective of the organization over the next five years.

The permanent capital ratio is the percentage of a bank's capital to its risk-adjusted assets. The Basel Accords provide the framework for lending institutions regarding the calculations and minimum standards for banks and lending institutions. During the financial crisis in 2008-2009 many institutions struggled because they were not capitalized well enough. Strong growth from 2002-2007 reduced the level of capital for some of these companies and ultimately put some out of business. Farm Credit Mid-America uses the Basel III system as it is the most recent outline provided by the Switzerland based group. The guidelines provided by Basel III and strong management will help the company avoid the problems some financial companies experienced during the financial crisis.

A recent annual meeting revealed Farm Credit Mid-America is growing faster than its plan. While this is positive news, the permanent capital ratio is currently under budget due to the higher growth rate. A closer look into the Basel III requirements and at other

financial institutions capital levels and the Farm Credit Mid-America loan portfolio will help determine the appropriate level of capital for the organization going forward.

Capital is essentially equity relative to assets and helps a lending institution ensure viability in the event of unexpected losses. The value of this equity is it lowers costs to provide loanable funds, absorbs financial losses, and funds growth for the organization. Capital adequacy should reflect organizational risk as some institutions require a higher percentage of capital than others due to greater risk. Since Farm Credit is a single industry lender, meaning they strictly finance agriculture, Farm Credit has more risk than banks because banks have a more diversified portfolio (Bruce, 2011).

Farm Credit Mid-America focuses on two ratios to determine the appropriate level of capital. The permanent capital ratio is unrestricted and is defined as the permanent capital divided by risk-adjusted assets. The core surplus ratio deducts Agribank investment and stock from the permanent capital ratio. Agribank is the source of funds at Farm Credit Mid-America and stock is the participation stock that customers purchase when they borrow money from the organization. These ratios are very similar in the way they are calculated with the core surplus ratio being slightly more conservative. The charts below compare the core surplus ratio between the top six Farm Credit associations in the country and then six banks. While the charts are from 2005, they still display the difference between the surplus ratios of a single industry lender like Farm Credit with a higher percentage of capital versus a more diversified lender like a bank (Bruce, 2011).

Figure 1.1: Core Surplus Ratio of Six Farm Credit Associations

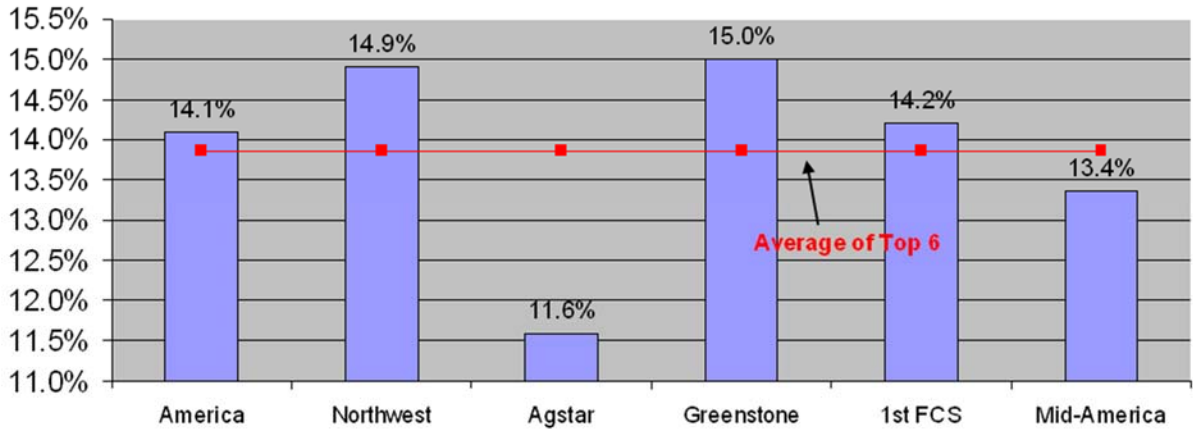
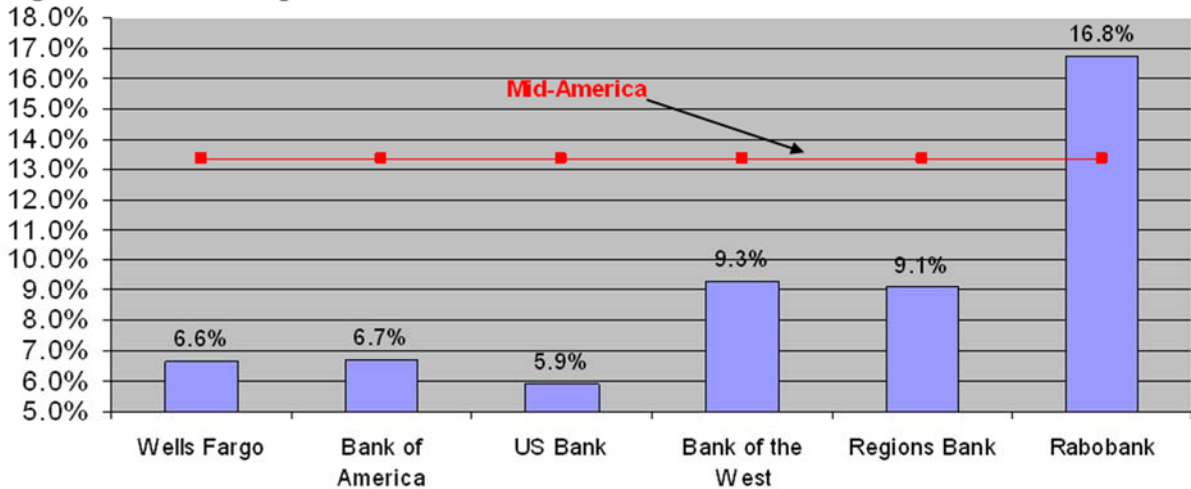


Figure 1.2: Core Surplus Ratio of Six Banks



The objectives of this thesis are as follows:

- Define and understand capital as it applies to Farm Credit Mid-America;
- Research the current capital levels for Farm Credit Mid-America;
- Compare capital levels of Farm Credit Mid-America to capital levels of other Farm Credit Associations and other banks;
- Understand Basel III Accords and how it applies to Farm Credit Mid-America's capital requirements;

- Complete sensitivity analysis with multiple scenarios applied to the current Farm Credit Mid-America loan portfolio to determine the effect certain events may have on capital levels;
- Determine if Farm Credit Mid-America is appropriately capitalized based on the other objectives.

CHAPTER II: LITERTURE REVIEW

The depth of literature addressing the issue of capital levels for the Farm credit System is significant with much of the analysis centered on the bailout of Farm credit in the 1980s due to the agricultural crisis. There are also several articles providing general history of the Farm Credit System and the evolvement into today's system. Recent works discuss the volatility of the agricultural market with today's high commodity prices and the potential risk producers and lenders face regarding a reduction in those commodity prices. What follows is not a complete discussion of the prior research conducted related to capital levels for Farm Credit; however, the works cited provide a foundation for the Farm Credit System. Factors around capital levels of Farm Credit Associations during the turbulent 1980s and current capital levels are emphasized.

The Farm Credit System was created by Congress in 1916 to provide American agriculture with a dependable source of credit and is the oldest government sponsored enterprise (GSE). The System is comprised of a network of borrower-owned cooperative financial institutions in all 50 states and in Puerto Rico. Congress intended for Farm Credit to improve the income and well-being of the American farmer and rancher by forming the farmer-owned System to ensure that farmers and ranchers participate in the management, control, and ownership of the associations. The System helps meet rural America's needs by preserving liquidity and competition in rural credit markets during good and bad economic times. Farm Credit is also charged with helping serve the needs of young, beginning, small, and minority farmers to provide credit to the next generation of farmers and ranchers (Farm Credit Administration 2012).

As of January 1, 2012 the Farm Credit System was composed of 87 banks and associations with Farm Credit Mid-America being the largest association in terms of total assets. The four banks that provide loans to the different Farm Credit associations across the country include:

- CoBank, ACB
- AgriBank, FCB
- AgFirst Farm Credit Bank
- Farm Credit Bank of Texas

AgriBank is the funding source for Farm Credit Mid-America. These four banks have merged over the years decreasing from 37 banks down to four banks. As a government sponsored enterprise, Farm Credit is exempt from state and federal taxes so if Farm Credit were to ever lose the GSE status, the consolidation of banks and associations would likely occur rapidly (Johnson 2013).

2.1 1980s

The 1980s were a difficult time for farmers and agricultural lenders like Farm Credit due to the agricultural credit crisis. Consolidation of associations was frequent during this decade due to a credit crunch as more than 1,000 local lending associations existed in the early 1980s and now there are 80 associations. Farm Credit Mid-America was created in 1985 by the merger of local Production Credit Associations and Federal Land Bank Associations (Lynn 2013).

The cause of the agricultural credit situation in the 1980s derived from the rapid inflation during the 1970s. Farmland prices escalated during the 1970s due to strong export demand from a single foreign country (the former U.S.S.R.) which created high commodity prices. Farmland prices rose with the increase in grain demand and prices. Agricultural

lenders loosened credit requirements in attempt to keep up with the demand in agriculture and farmland transactions. This easy access to credit for U.S. farmers and heavier debt loads ultimately put many farmers and ranchers out of business during the 1980s (Regier Carr & Monroe, L.L.P. 2013).

President Carter enacted a grain embargo to the U.S.S.R. in 1980 that banned the export of grain and technology to the Soviet Union in response to the invasion of Afghanistan in 1979. The effects of the grain embargo to the Soviet Union were negligible as they simply purchased grain from South America and Europe. However, the effects to the U.S. agriculture markets were catastrophic. Commodity prices in the U.S. dropped significantly which created a ripple effect on farmland prices. Many farmers and ranchers were depending on the higher grain prices to repay debts so when commodity prices dropped, some farmers could not afford to pay back loans and other obligations. Banks and the Farm Credit System were greatly affected by these events. Farmland prices dropped more than 27% in many areas significantly reducing the collateral value Farm Credit lent on their loans. Ultimately the Farm Credit System was bailed out by the U.S. government in similar fashion to the more recent bailouts of Fannie Mae and Freddie Mac during the housing crisis of 2008 (Paarlberg 2008).

After the devastating period of rising inflation and collapsing farmland values Congress made several major revisions to the structure and operation of the Farm Credit System. In addition to providing financial assistance in the form of fully repayable, privately financed line of credit guaranteed by the federal government, legislation made the following adjustments to the Farm Credit System.

- Farm Credit Administration became a fully independent arm's length regulator

- Risk-based capital standards were mandated, to be determined by FCA
- The Farm Credit System Insurance Fund was created, financed by annual contributions from System banks

Farm Credit and the agricultural economy began to stabilize during the late 1980s and early 1990s. In 1992 after petitioning Congress, Farm Credit was allowed to repay the financial assistance early provided by legislation in 1987. During 1992, all System banks met or exceeded the new 7 percent risk-weighted permanent capital standard mandated by FCA which was an achievement that came nearly a year ahead of schedule (Farm Credit Council n.d.).

The Farm Credit System has improved financially since the late 1980s, through the 1990s, and into the 2000s. Today, the System's earnings, assets, and capital levels are all strong as exhibited in table 2.1 (Farm Credit Administration 2012).

Table 2.1: Farm Credit System Financial Information as of December, 31, 2011

Dollars in thousands	2007	2008	2009	2010	2011
<u>Total Farm Credit System</u>					
Gross Loan Volume	142,906,000	161,423,000	164,830,000	175,351,000	174,664,000
Bonds and notes	155,295,000	179,769,000	178,358,000	189,575,000	186,889,000
Nonperforming loans	621,000	2,416,000	3,535,000	3,386,000	2,997,000
Nonaccrual loans	512,000	2,282,000	3,369,000	3,229,000	2,738,000
Net income	2,703,000	2,916,000	2,850,000	3,495,000	3,940,000
Nonperforming loans/gross loans	0.43%	1.50%	2.14%	1.93%	1.72%
Permanent Capital Ratio	14.17%	12.65%	13.90%	14.46%	15.60%
Core Surplus/Assets	11.52%	10.80%	11.48%	11.80%	12.90%
Return on assets	1.53%	1.41%	1.32%	1.59%	1.71%
Return on equity	10.38%	10.70%	9.86%	10.85%	11.17%
Net interest margin	2.43%	2.41%	2.65%	2.82%	2.86%

Sources: Farm Credit System Call Report as of December 31, 2011, and the Farm Credit System Annual Information Statement provided by the Federal Farm Credit Banks Funding Corporation.

The agricultural economy has performed extremely well over the last three to five years. Grain prices have increased and remain at record highs due to ethanol on the local level and increased global economic growth and a relatively weak dollar to support more agricultural exports. High feed costs have challenged livestock and dairy producers however strong hog, cattle, and milk prices have offset these higher feed costs to some extent enabling producers to have profitable years. Farmland prices have mirrored commodity prices and risen significantly in areas of high cash grain growth like the Corn Belt (Johnson 2013).

High commodity and farmland prices experienced by farmers and ranchers over the last 3 to 5 years provide similarities to the inflationary period of the 1970s. Many economists debate whether or not the current agriculture economy is in a bubble that will soon burst creating another agricultural credit crisis like the U.S. saw during the 1980s. Dr. David M. Kohl, Professor Emeritus of Agricultural Finance and Small Business Management at Virginia Tech, notes that the U.S. has been in a commodity price super-cycle for the past 10 years that has helped insulate many rural and agricultural communities from the worst of the Great Recession. “Only four of these super-cycles have occurred in the past 100 years, and they typically only last about three to four years” (Regier Carr & Monroe, L.L.P. 2013). The super-cycle has resulted in many young farmers having never experienced a downturn in agriculture and some lenders getting complacent (Regier Carr & Monroe, L.L.P. 2013).

Interestingly discussions with Farm Credit Mid-America employees during the 1980s, then called Federal Land Bank and Production Credit Association, reveal significant differences in the financial position of the association now versus then. While financial statements from the 1980s were not available for this research, the Association’s financial position was weaker compared to today’s position (Bruce 2011). Prior to the merger in 1985 to Farm Credit Mid-America, the Federal Land Banks and Production Credit Associations across the four state territories were smaller organizations who had limited amounts of capital. Permanent Capital was not a common financial ratio during those times, however it is estimated to have been around 5% on average for several of the associations (Bruce 2011).

Currently Farm Credit Mid-America is very strong financially and has made changes over the last 3-5 years to avoid a crisis if the agricultural commodity price bubble were to burst. Farm Credit Mid-America has reduced advanced rates to 65% loan to appraised value on farmland, down from 75% or even 85% in some cases. Also lending caps are in place in areas of higher farmland prices to loan no more than \$6,500 per acre on ground. Management has increased the permanent capital ratio significantly in this time period as well, going from 12% to 16%. These strategies differ from the 85% loan to value standards much of the association had during the 1980s and will help reduce risk of default if agricultural commodity prices fall (Bruce 2011).

CHAPTER III: THEORY

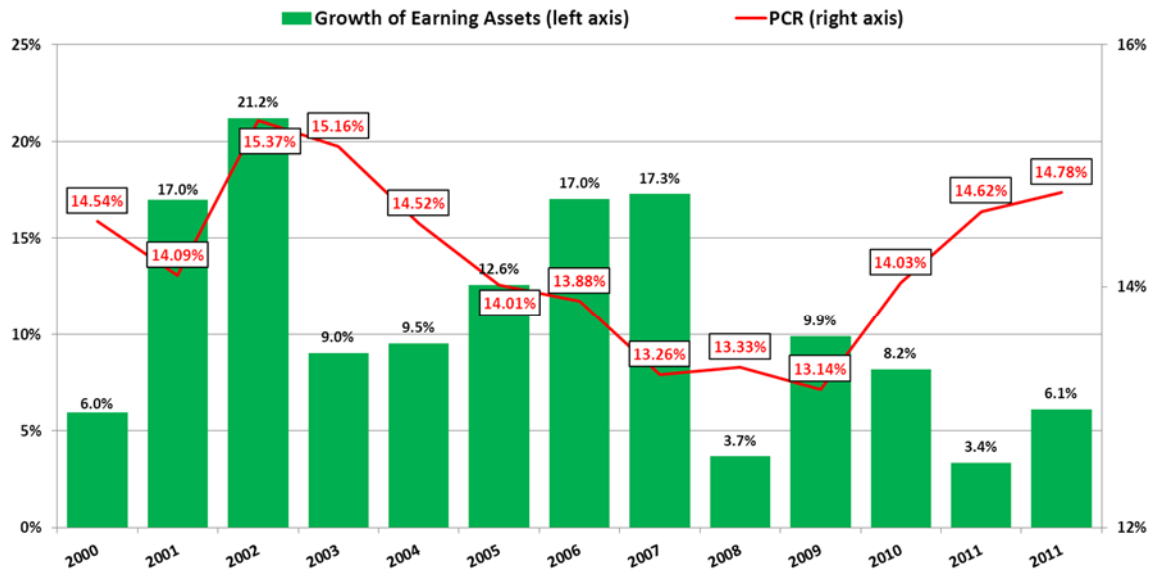
3.1 How Much Capital is Needed?

To determine capital adequacy goals and targets, Farm Credit Mid-America must evaluate exposure to the following risks:

- Operational risk – Over the next five years FCMA will add 300 new employees and replace 300 retiring employees so 50 percent of the projected 1,200 employees will have less than 5 years' experience. Facilities to house these additional employees must be added as well.
- Interest rate risk – Interest rates are at all-time lows so what will happen to the margin when the Prime and LIBOR rates increase along with long-term mortgage rates?
- Credit risk – Adverse credit is 3.8% and is projected to improve to 3.4% by 2016. What happens if agricultural commodity prices decrease and Farm Credit customers experience financial problems causing the adverse credit to increase?
- Risk associated with rapid growth – Farm Credit Mid-America has projected growth of approximately 7% over the next five years so what happens if growth is faster or slower than projected?

These four risk factors go into long-term and short-term planning and ultimately help determine the appropriate percentage of permanent capital necessary for Farm Credit Mid-America. The relationship of the Permanent Capital Ratio to Growth of Earning Assets was evaluated to analyze historical trends and validate the assumed interdependency. Figure 3.1 shows the correlation between growth and capital from the year 2000 until 2011 (Hancock 2012). Numerically the correlation is a .02 indicating there is no significant correlation between the growth rate and permanent capital rate.

Figure 3.1: Growth and Capital Correlation 2000-2011



In general there is an inverse relationship between permanent capital ratio and growth rate. Permanent capital builds in periods of slow growth and deteriorates in times of rapid growth to fund loan assets. There are always a few exceptions like in 2001 when an IRS refund was paid to Farm Credit Mid-America and contributed over \$71 million in capital (Hancock 2012). After adjusting for the unusual events, the interdependent relationship of Permanent Capital Ratio to growth provides the following conclusions:

- Growth environments can change dramatically from year to year as growth ranged from 3% to 21% between 2000 and 2011
- Permanent Capital Ratio fluctuated between 13.3% and 15.4% and would have been significantly lower if not for unusual events like the IRS refund discussed above
- Certain cycles create opportunities to build capital
- Certain cycles deplete capital

Planning capital adequacy in the future requires consideration of Farm Credit Mid-America's mission, "to be a dependable source of constructive credit and high quality service at the best possible value for farmers and rural residents." To achieve this mission, it is necessary for the organization to take a longer-term view to ensure dependability.

The association has recently made changes to focus on the long-term risk management success of the organization. A few of the risk management initiatives implemented are as follows:

- Implementing the "risk rating guidance" – A new risk rating system that categorizes loans on a 1 – 14 scale based on credit risk when the loan is closed. In the past the rating system was on a 4 point scale.
- Critical Thinking training – All employees go through critical thinking training to improve credit skills. This training takes a lot of time, however the long-term benefit should pay off for the organization.

3.2 Regulatory Conditions

Basel III was initiated to be the new global regulatory standard on banking adequacy and liquidity after weaknesses were exposed during the financial crisis of 2008. The latest Basel accord is expected to increase minimum capital requirements from 2% to 4.5% for common equity and increase Tier 1 capital from 4% to 6% by 2015. Basel III remains consistent with Basel II with the standard for total capital remaining at 8%. The difference between the total capital requirement and the Tier 1 capital requirement can still be met with Tier 2 capital. Tier 1 capital and Tier 2 capital are the same for Farm Credit Mid-America because the difference between Tier 1 and Tier 2 is the excess investment in AgriBank which Mid-America has none (Hancock 2012).

In addition to the new minimums, Basel III also requires banks to hold a conservation buffer of 2.5% as additional protection against future stress. Another buffer of up to 2.5% could be implemented depending on national economic circumstances, bringing the total minimum capital plus buffers to be 9.5% for common equity and up to 13% for total capital. The chart below breaks down the new requirements (Hancock 2012).

Table 3:1 BASEL III-Capital Requirements and Buffers

(all numbers in percentages)	<u>Common Equity</u> (after deductions)	<u>Tier 1 Capital</u>	<u>Total Capital</u>
BASEL II Minimum	2.0	4.0	8.0
BASEL III Minimum	4.5	6.0	8.0
Conservation Buffer	2.5	2.5	2.5
Minimum Plus Buffer	7.0	8.5	10.5
Countercyclical Buffer Range*	0 - 2.5		
Total (Minimum + Buffers)	9.5	11.0	13.0
Critical Banks**	up to 10.0	11.5 - 12.5	13.5 - 15.0

* Common equity or other fully loss absorbing capital

** The Independent Commission on Banking (ICB) estimates that systemically important banks should have an equity ratio of at least 10% provided that they also have genuinely loss-absorbing debt; "Unfenced" businesses to operate with 17% capital ratio

Farm Credit Administration, which writes policy for all Farm Credit associations is developing proposals to change system capital regulations in response to Basel III and has indicated as much as an 18 to 20% Permanent Capital Ratio may be required for associations to be well capitalized. Since Farm Credit Mid-America is the largest association and represents about 10% of the system assets, Farm Credit Administration considers it systemically important and it is reasonable to expect the threshold to be higher than other associations (Hancock 2012).

3.3 Solution Development

Regulatory requirements, economic factors, and peer benchmarking continue to factor into capital targets for Farm Credit Mid-America in the future. Based on the Basel III requirements currently in place and the current economic climate, it is hypothesized that Farm Credit Mid-America increase capital and establish a broader range of Permanent Capital Ratio targets with potential strategies to initiate as Permanent Capital Ratio moves out of the target range (Hancock 2012).

The charts below give an overview of the new capital targets for the association.

Figure 3.2 shows averages, minimums, and maximums for Farm Credit associations.

Figure 3.3 shows the new range (Hancock 2012).

Figure 3.2: Average, Minimum, and Maximum Capital Percent for Farm Credit Associations

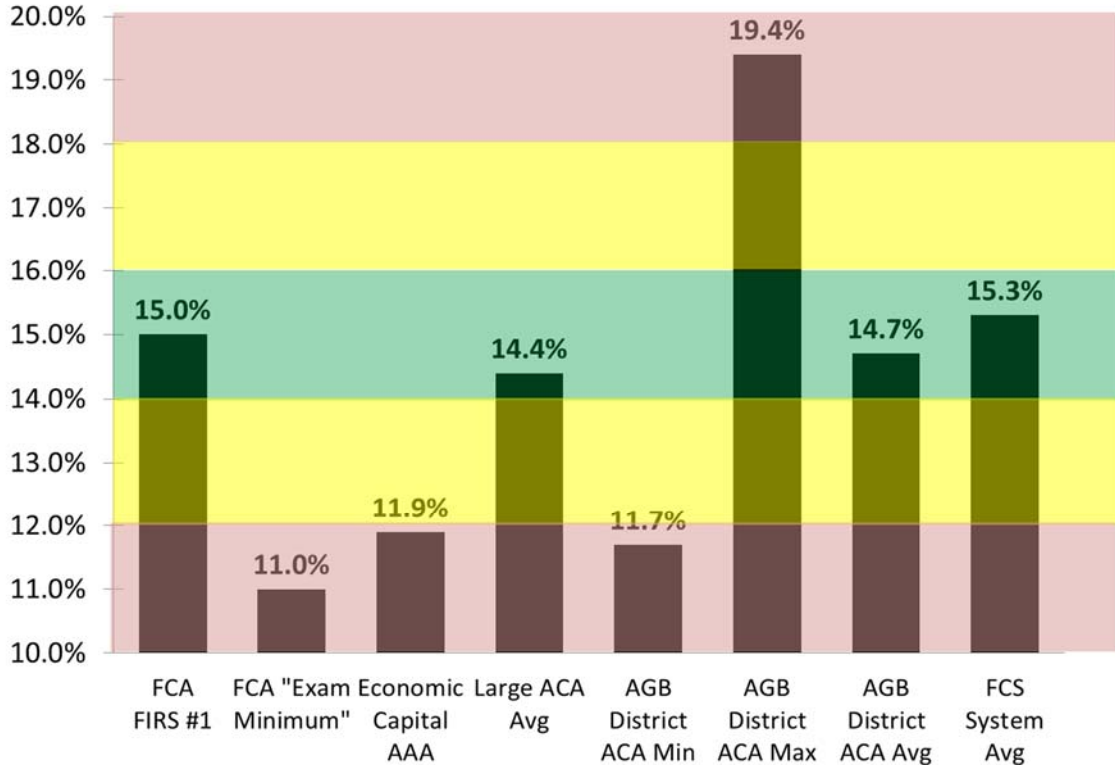


Figure 3.3: Capital Percentage Ranges for Farm Credit Mid-America

< 12 %	12 - 14 %	14 - 16 %	16 - 18 %	> 18 %
<ul style="list-style-type: none"> ● Capital Management Strategies ● No Special Rates or Payouts ● Sell Assets ● Slam Brakes on Growth 	<ul style="list-style-type: none"> ● Moderate Increases in Spreads ● Tap Brakes on Growth 	<p>COMFORT ZONE</p>	<ul style="list-style-type: none"> ● Consider One-Time Payouts ● Stimulate Growth 	<ul style="list-style-type: none"> ● Patronage ● Take More Risk ● Buy Assets ● Really Stimulate Growth

Figure 3.3 above was put together by the Farm Credit Mid-America finance team as a proposal to increase the capital percentage for the association. After the credit crisis in 2008, the finance team knew the organization needed a higher percentage of capital to offset risk so the chart above is a result of the changes. The bullets below describe the chart in detail (Hancock 2012).

- Change the Permanent Capital Ratio from the current range of 11 to 15% to 12 to 18% with a desired range or “comfort zone” of 14 to 16% and target of 15%. The current target is 13%.
- The comfort zone will be monitored on an ongoing basis and may change as capital needs and regulatory environments evolve.
- If the Permanent Capital Ratio remains above the desired range maximum and forecasts suggest it will continue, then Farm Credit Mid-America will take steps to reduce in 0.25% increments, mainly by reducing customer interest rates.
- If the Permanent Capital Ratio falls to within 1% of the range minimum, then the organization will implement strategies to slow growth to increase capital. The response would most likely be to raise interest rates.

The recommended new capital targets gives the association the following benefits:

- A more consistent marketplace presence with greater ability to absorb and respond to economic conditions
- More flexibility to avoid moderating or stimulating growth
- A longer term view to evaluate where the anticipated Permanent Capital Ratio is to be at least three years out based on growth, risk, and sensitivity analysis
- Additional capital may be necessary given the current regulatory environment with Basel III

The December 31, 2012 permanent capital ratio for Farm Credit Mid-America is 15.76% which fits into the comfort zone of figure 3.3.

CHAPTER IV: METHODS

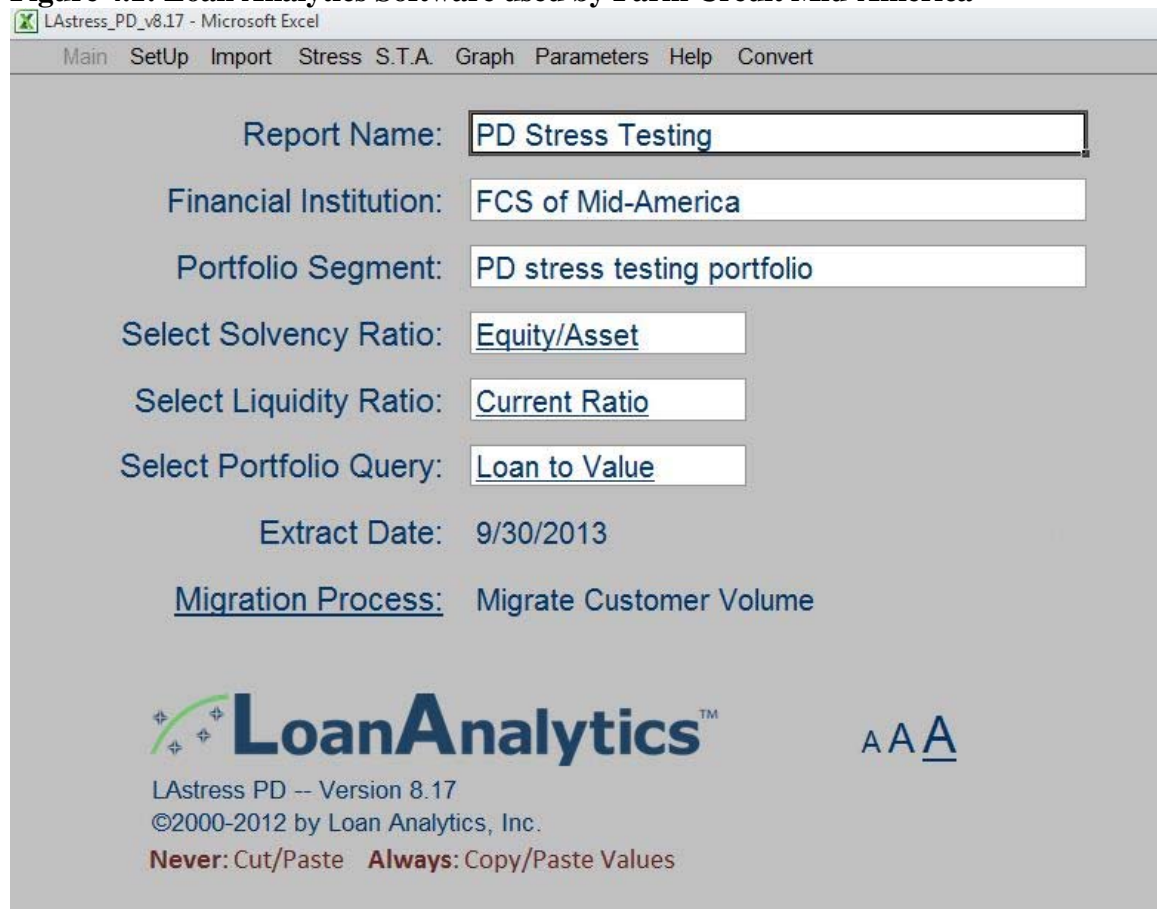
The new capital targets are based on the association's projected growth rate of approximately 7% and adverse credit ranging from 3.8% to 3.4% over the next five years. Also the agricultural economy is projected to be strong during that time period. The association evaluates exposure to operational risk, interest rate risk, credit risk, and risk associated with growth so sensitivity analysis and stress testing was performed on six scenarios involving different types of risk (Bruce, 2011).

The stress testing allows Farm Credit Mid-America to run different scenarios and determine the effect on the entire loan portfolio. Most lending institutions use a form of stress testing when budgeting for upcoming years or prior to a change in underwriting standards. Farm Credit Mid-America typically completes two thorough stress tests annually during planning for the upcoming year in June and at the beginning of the calendar year (Gerstle 2013).

The loan analytics software used by Farm Credit Mid-America allows the organization to group customers by farm type whether that is grains, cattle, dairy, or rural residents. Customer loan and lease information is stored in an Excel database that the software pulls from to determine earnings, net worth, working capital, solvency, and other financial calculations. Stress testing is applied to the latest information for a customer to determine the affect certain events will have on that customer's financial position. For example, if a grain farmer earns \$100,000 in annual gross income and their income is stressed by 10% then the new income used in scenario is \$90,000. Analysis is then completed to see how the reduction in revenue affects their cash flow if expenses remain the same and how that impacts their financial situation in the future (Gerstle 2013).

The screen shot below shows the loan analytics software used by Farm Credit Mid-America. This software was created by Tim Wilberding who is a former AgriBank employee. Farm Credit Mid-America can adjust the type of liquidity and solvency ratios to stress as well as other queries like loan to appraised value ratios on this screen (Gerstle 2013).

Figure 4.1: Loan Analytics Software used by Farm Credit Mid-America



Each loan at Farm Credit Mid-America has a probability of default or PD which is based on factors like the customers' income, net worth, liquidity position, risk level of farming operation, and the advanced loan rate. Currently the PD scale used by Mid-America ranges from 1-14 with PD of one having the least amount of risk. An example PD for a loan of \$100,000 where the customer is a part-time beef cattle farmer who earns

\$300,000 per year in the medical field, has \$400,000 in working capital, a net worth of over \$1 million, and a loan to appraised value is less than 50% would be group 1. A PD of 14 would be a loan where the customer may be upside down in the property financed, where the property is worth \$50,000 and they owe \$100,000, they lost their job so have no income, have zero savings, and are about to file for bankruptcy (Gerstle 2013).

The screen shot below displays where Farm Credit Mid-America can make adjustments to the loan portfolio by stressing specific agricultural industries. Each Farm Credit customer has a corresponding farm type associated with it based on the percentage of revenue generated by that customer. The loan analytics software can then stress specific industries based on current agricultural economic events. For example if the poultry industry is predicted to be more negatively affected by increased operating expenses and decreased earnings then Farm Credit Mid-America can stress the industry accordingly (Gerstle 2013).

Figure 4.2: Input Screen for Loan Analytics Software

LAstress_PD_v8.17 - Microsoft Excel

Main S.T.A. Export Clear Print Extract

Comprehensive S.T.A. - Probability of Default Stress Create extract with export?

Year One

Industry	Business Revenue	Business Expense	Subsidy Payments	Wage & Salary	Interest Rate	Current Assets	Non-Current Assets	Credit Score	Stress Magnitude
Grain Processing & Mktng	-5.0%	1.3%			0.3%	-2.0%	-3.0%		25%
Food Processors	-5.0%	1.3%			0.3%	-2.0%	-3.0%		25%
Fruit Citrus & Nuts	-5.0%	2.5%			0.3%	-2.5%	-5.0%		25%
Timber-Wood Products	-2.5%	1.0%			0.3%	-0.5%	-2.5%		25%
Poultry-Meat	-5.0%	1.3%			0.3%	-2.5%	-5.0%		25%
									25%
All Others	-5.0%	2.5%			0.3%	-3.8%	-3.8%		25%

Year Two

Industry	Business Revenue	Business Expense	Subsidy Payments	Wage & Salary	Interest Rate	Current Assets	Non-Current Assets	Credit Score	Stress Magnitude
Grain Processing & Mktng	-2.5%	2.5%			0.5%	-1.0%	-2.0%		25%
Food Processors	-2.5%	2.5%			0.5%	-1.0%	-2.0%		25%
Fruit Citrus & Nuts	-5.0%	2.5%			0.5%	-1.5%	-3.0%		25%
Timber-Wood Products	-2.5%	1.0%			0.5%	-1.0%	-1.3%		25%
Poultry-Meat	-2.5%	1.0%			0.5%	-1.5%	-3.0%		25%
									25%
All Others	-2.5%	2.5%			0.5%	-1.0%	-2.0%		25%

Year Three

Industry	Business Revenue	Business Expense	Subsidy Payments	Wage & Salary	Interest Rate	Current Assets	Non-Current Assets	Credit Score	Stress Magnitude
Grain Processing & Mktng	-1.3%	0.3%			0.8%	-0.5%	-1.0%		25%
Food Processors	-1.3%	0.3%			0.8%	-0.5%	-1.0%		25%
Fruit Citrus & Nuts	-2.5%	2.5%			0.8%	-1.0%	-2.0%		25%
Timber-Wood Products	-1.5%	0.5%			0.8%	0.5%	-1.3%		25%
Poultry-Meat	-1.3%	0.5%			0.8%	-1.0%	-2.0%		25%
									25%
All Others	-1.3%	0.3%			0.8%	0.5%	-1.0%		25%

Note: Interest Rate stress is entered in basis points, i.e. 1.00% equals a 100 point increase in interest expense.

Farm Credit Mid-America uses the probability of default to determine the credit strength of a particular loan and the entire loan portfolio. The PDs may be pulled at any time based on the latest information received from the customer. Also regulators for Farm Credit Mid-America’s funding source AgriBank and Farm Credit Administration review the PDs of the loan portfolio to determine the credit rating for the organization. Another use of the PD is in the loan approval system. When a loan scores a PD of 5 or less, that loan is typically approved by the automated system instead of being reviewed by an underwriter.

This automation makes the system more efficient and helps provide a better customer experience (Hammond 2013).

The Farm Credit System determines a percentage associated for each probability of default based on past data. Percentages vary and increase as the PD increases. Each PD also has an associated loss given default or LGD. Farm Credit Mid-America determines the LGD based on past data. Mid-America also uses a calculation to estimate the loss of each loan for the next 12 months and then they set aside capital to match that amount. The calculation is the $PD * LGD * \text{loan balance}$ equals the amount of capital set aside for potential losses in the next 12 months. An example of this calculation is a PD of 9 has a 2% probability of default and a 6% loss given default with a loan balance of \$150,000, meaning Farm Credit would set aside \$180 of capital as the estimated loss for the next 12 months (Gerstle 2013).

This type of stress testing gives Farm Credit Mid-America an idea of the potential credit risks of the entire loan portfolio. The organization can analyze the results of a particular test and determine the percentage of acceptable credits, non-acceptable credits, and charge-offs they may have if a particular situation were to occur. For example, this testing may tell Farm Credit that if grain prices fall by 25% then acceptable credit quality will be down to 95% from 97%, non-acceptable credit will increase to 5% from 3%, and charge-offs will be \$50 million (Gerstle 2013).

Stress testing at Farm Credit Mid-America has two parts, the credit impact as mentioned above, and the financial impact that results from the credit side. The finance team looks at the predicted results of a stress test to determine the outcome to the corporate balance sheet and income statement. One of the primary concerns for the

finance team is to look at the impact these credit changes may have on capital for the association in the future. Two of the biggest drivers of capital changes are charge-offs or loan losses and net earnings. Loan losses are due to a reduction in a customer's owner equity or the collateral being under-secured when a lender collects a loan. Typically a change to capital occurs over time due to reduction in credit quality as credit quality is a lagging variable. This proves true when analyzing the results of the stress testing (Hammond 2013).

A detailed look at each scenario will show how the stress testing was completed. Each test was compared to the preliminary "base" plan to measure the association's sensitivity to changes in key performance measures like permanent capital. All scenarios were applied to the Farm Credit Mid-America loan portfolio as of the 9/30/2012 balance sheet.

A summary of the scenarios is below:

- **Scenario 1: Series of Catastrophic Events**
 - Increase in charge-offs (loan losses) – Additional \$40 million (2013), \$36 million (2014), and \$20 million (2015 – 2016)
 - Growth rate of 0% in 2013 and 2.5% in 2014 – 2016
 - Nonaccrual (loans that are not being charged interest daily due to non-performance): Additional \$200 million (2013), \$150 million (2014), \$100 million, (2015) and \$75 million (2016)
 - Reduction in interest rate margin by 0.25% in 2013 and 2014, with remaining years same as 2014
 - Operating expenses: 1% annual increase each year

The nature of this test is to determine the impact of a severely negative economic environment that is sustained for multiple years resulting elevated losses, reduced earnings, and higher costs of servicing higher risk assets (Bruce, 2011).

- **Scenario 2: Growth rate of 2.5%** from 2013 – 2016

The nature of this test is to determine how years of relatively little portfolio growth will change capital strength assuming no other changes in planned operating expenses (Bruce, 2012).

- **Scenario 3: Growth rate of +12%** from 2013 – 2016

The nature of this test is to determine how years of higher than planned growth at a level above the associations sustainable growth rate will erode capital strength assuming no changes in planned operating expenses (Bruce, 2011).

- **Scenario 4: Growth rate ramping from 4% to 12%** between 2013 and 2016

The nature of this test is to determine how portfolio growth accelerating above planned rates will change capital strength assuming no changes in planned operating expenses. This is a hybrid of scenario 3 and may be more likely due to an improved market focus and additional resources creating increased productivity during the five year period (Bruce, 2011).

- **Scenario 5: Extreme Portfolio Stress:** Applied extreme stress to customer earnings, reflecting what may occur if current grain prices are not sustainable and are significantly reduced due to increased production and/or decreased demand. Lower grain prices will directly impact real estate values with lower returns through direct production and cash rents (Hammond 2013).

- Reduced customer revenue by 30% which is supported by the agricultural futures markets showing a 20% - 25% reduction in corn and soybean prices due to an increase in production in 2013 (www.agriculture.com 2013).
- Reduced customer non-current assets by 15% which includes real estate as the majority of these assets.
- These changes were applied to 75% of the Farm Credit Mid-America loan portfolio as not every customer experiences the same level of income or asset reduction.
- Growth rate was reduced from the base of 7% down to 3.5%.
- Allowance for loan loss at 1% of total loan portfolio.
- Association patronage from AgriBank reduced to 15 basis points.
- **Scenario 6: Less severe portfolio stress**

The nature of this test is to determine the impact of a significant, but not as significant as scenario 5, reduction in commodity prices to the loan portfolio. This scenario is more likely than scenario 5 as the adjustments are more realistic based on the current commodity price cycle (www.agriculture.com 2013).

- Customer income was reduced by 20% based on an anticipated decrease in grain prices (www.agriculture.com 2013).
- Charge-offs increased by \$121 million and adverse credit increased from 3.8% to 6.5% (Bruce, 2011).
- Reduced customer noncurrent assets by 10%.
- Applied these changes to 75% of the loan portfolio including all loan sectors.

- Allowance for loan loss at 1% of portfolio.

The nature of this test is to assess the impact of specific less severe commodity stress scenarios.

Sensitivity analysis like the 6 scenarios above help Farm Credit Mid-America plan for the unexpected on an annual basis. Typically the company runs scenarios like these at annual planning meetings for the next year or if the organization is off target in financial categories like permanent capital.

CHAPTER V: RESULTS

The statement of financial condition in Table 5.1 shows the estimated forecast and budget or “base” estimate for Farm Credit Mid-America from 2011 to 2017. The finance team at Farm Credit put the budget together after market research was completed to estimate growth rates for the next five to ten years. Loan types are broken down into accrual, which means loans that are performing, and nonaccrual or substandard loans. Then, different loan types are identified as mortgage, commercial, or leases. Other assets include mission related investments that are participations with other lenders and tobacco investments which is money from the tobacco buyout program. Also included are leased equipment and acquired property and interest receivable and the investment in Agribank which is participation stock that customers purchase.

Liabilities on the balance sheet include a note payable to Agribank which is the largest liability. Agribank renews a line of credit annual for Farm Credit Mid-America which is how the organization is funded. They also have accrued interest owed to Agribank and other liabilities on the financial statement. Other liabilities include payroll, taxes, and other miscellaneous operating expenses.

Table 5.1: Statement of Financial Condition, 2011-2017, Forecast and Budget

	2011	2012	2013	2014	2015	2016	2017
Accrual Mortgage Loans	11,560,207	13,090,399	14,763,471	16,406,554	18,182,827	20,249,104	22,628,908
Accrual Commercial Loans	2,883,597	2,880,199	2,970,085	3,054,732	3,134,155	3,212,509	3,286,397
Accrual Finance Leases	280,361	320,618	266,004	220,783	183,250	152,097	126,241
Accrual Loans	14,724,164	16,291,216	17,999,560	19,682,069	21,500,232	23,613,710	26,041,546
Nonaccrual Mortgage Loans	238,523	195,564	163,600	140,000	120,000	120,000	128,000
Nonaccrual Comm Loans & Leases	47,963	40,095	36,400	35,000	30,000	30,000	32,000
Nonaccrual Loans	286,486	235,659	200,000	175,000	150,000	150,000	160,000
Gross Loans	15,010,651	16,526,875	18,199,560	19,857,069	21,650,232	23,763,710	26,201,546
Allowance for Losses On Loans	80,734	60,650	70,216	76,710	83,738	92,019	101,572
Loans, Net	14,929,917	16,466,224	18,129,344	19,780,359	21,566,494	23,671,691	26,099,974
Mission Related Investments	1,410,903	1,450,877	1,367,038	1,306,895	1,241,787	1,184,705	1,134,661
Tobacco Investments	210,945	144,199	74,499	0	0	0	0
Lease Equipment, Net	281,646	323,065	290,759	261,683	235,515	211,963	190,767
Accrued Interest Receivable	128,900	129,699	143,604	155,250	167,831	182,545	199,505
Investment in Agribank	422,124	440,925	464,128	495,600	527,343	565,675	611,076
Acquired Property, Net	30,309	14,350	12,000	8,000	5,000	4,000	4,000
Property and Equipment, Net	32,851	42,380	80,601	106,789	120,417	128,970	135,922
Other Assets	57,678	45,320	22,717	21,651	22,650	23,772	25,031
Total Assets	17,505,272	19,057,040	20,584,690	22,136,226	23,887,038	25,973,321	28,400,936
Note Payable	14,578,386	15,818,603	17,071,952	18,306,600	19,687,020	21,349,639	23,289,251
Accrued Interest Payable	92,107	81,645	86,740	94,717	102,840	112,240	123,971
Other Liabilities	122,015	152,905	155,068	153,567	159,832	167,161	175,634
Liabilities	14,792,507	16,053,153	17,313,760	18,554,884	19,949,692	21,629,040	23,588,856
Protected Stock	0	0	0	0	0	0	0
At Risk Stock	82,000	84,541	87,217	89,857	92,497	95,137	97,777
Surplus	2,630,765	2,919,345	3,183,713	3,491,484	3,844,849	4,249,144	4,714,303
Capital	2,712,765	3,003,886	3,270,930	3,581,341	3,937,346	4,344,281	4,812,080
Liabilities And Capital	17,505,272	19,057,040	20,584,690	22,136,226	23,887,038	25,973,321	28,400,936

The base financial statement displays roughly 6% growth in total assets between 2011 and 2017, and 7% between 2013 and 2017. The growth rate is the main component in completing sensitivity analysis on a loan portfolio to stress test for capital adequacy. The scenarios demonstrate that the growth rate has a major effect on capital when comparing the base balance sheet for Farm Credit Mid-America's 5 year business plan versus the extreme scenario 5 balance sheet (Table 5.2). The remaining scenario balance sheets are in the appendix.

Table 5.2: Statement of Financial Condition, 2011-2017, Sensitivity 5

(In Thousands)	2011	2012	2013	2014	2015	2016	2017
Accrual Mortgage Loans	11,560,207	12,835,115	14,510,093	14,677,591	14,865,627	15,511,425	16,164,219
Accrual Commercial Loans	2,883,597	3,047,292	3,135,666	3,163,574	3,196,159	3,324,325	3,454,306
Accrual Finance Leases	280,361	292,859	243,073	245,237	247,763	257,698	267,774
Accrual Loans	14,724,164	16,175,267	17,888,833	18,086,402	18,309,548	19,093,447	19,886,299
Nonaccrual Mortgage Loans	238,523	188,000	163,600	601,760	1,023,760	1,010,480	1,030,080
Nonaccrual Comm Loans & Leases	47,963	41,500	36,400	150,440	255,940	252,620	257,520
Nonaccrual Loans	286,486	229,500	200,000	752,200	1,279,700	1,263,100	1,287,600
Gross Loans	15,010,651	16,404,767	18,088,833	18,838,602	19,589,248	20,356,547	21,173,899
Allowance for Losses On Loans	80,734	63,126	69,726	189,835	197,359	205,094	213,331
Loans, Net	14,929,917	16,341,641	18,019,107	18,648,767	19,391,889	20,151,453	20,960,568
Mission Related Investments	1,410,903	1,465,862	1,381,158	1,393,450	1,407,803	1,464,255	1,521,508
Tobacco Investments	210,945	144,349	74,807	0	0	0	0
Lease Equipment, Net	281,646	303,794	273,414	275,848	278,689	289,864	301,198
Accrued Interest Receivable	128,900	131,612	143,350	144,895	146,646	152,876	159,179
Investment in Agribank	422,124	441,648	462,050	475,225	489,507	506,905	525,433
Acquired Property, Net	30,309	16,975	12,000	8,000	5,000	4,000	4,000
Property and Equipment, Net	32,851	38,382	77,996	104,789	120,360	131,417	141,186
Other Assets	57,678	35,296	20,413	17,856	18,494	19,222	19,976
Total Assets	17,505,272	18,919,560	20,464,295	21,068,829	21,858,389	22,719,992	23,633,048
Note Payable	14,578,386	15,699,485	16,968,640	17,489,168	18,173,042	18,968,314	19,808,782
Accrued Interest Payable	92,107	85,631	86,971	97,855	102,560	106,493	111,171
Other Liabilities	122,015	134,734	143,742	137,914	139,096	139,697	140,060
Liabilities	14,792,507	15,919,850	17,199,353	17,724,936	18,414,698	19,214,503	20,060,013
Protected Stock	0	0	0	0	0	0	0
At Risk Stock	82,000	84,577	87,217	89,857	92,497	95,137	97,777
Surplus	2,630,765	2,915,132	3,177,725	3,254,036	3,351,193	3,410,352	3,475,258
Capital	2,712,765	2,999,709	3,264,942	3,343,893	3,443,690	3,505,489	3,573,035
Liabilities And Capital	17,505,272	18,919,560	20,464,295	21,068,829	21,858,389	22,719,992	23,633,048

Despite the increase in loan losses in the scenario, the capital percentage remains the same as the actual budget for one year until decreasing slightly in 2014 to 15.3% versus the

actual budget of 15.5%. The increase in bad loans in scenario 5 has a greater effect on capital percentage in years 4 and 5 as credit quality is a lagging variable meaning it takes time for a bad loan to negatively impact the loan portfolio. Since growth was half as much in this scenario at 3.5% as the forecasted growth rate of 7%, the capital percentage had less of an impact than if the growth rates were the same (Gerstle 2013).

Table 5.3 compares the capital percentage of the actual Farm Credit Mid-America budget to the capital percentage of scenario 5. As mentioned previously, scenario 5 capital remains in line with budget until 2014 when it decreases to 15.3% from the budgeted 15.5%. The increase in allowance for loan losses begins to have a greater impact in 2015 to 2017 in scenario 5.

Table 5.3: Permanent Capital Ratio – Base Budget vs. Sensitivity Analysis 5

	2011	2012	2013	2014	2015	2016	2017
<u>CAPITAL</u>							
5 year forecasted budget-Permanent Capital Ratio	14.8%	15.5%	15.5%	15.5%	15.7%	15.9%	16.1%
Sensitivity Analysis 5-Permanent Capital Ratio	14.8%	15.5%	15.5%	15.3%	15.2%	14.9%	14.5%

While stress testing loan portfolios encompass several factors including a reduction in customer’s assets and earnings and the market price of commodities, the only two that have a direct impact on the actual capital percentage of Farm Credit Mid-America are growth and loan and lease losses. The other factors have an indirect impact on capital adequacy as they can lower or increase probability of default which is a lagging factor to determine future growth and potential loan losses (Gerstle 2013).

Farm Credit Mid-America views capital adequacy as a leverage ratio. The numerator is the net worth or total risk weighted assets minus total liabilities and the

denominator is risk weighted assets. Loan and lease losses have a direct impact on this calculation as a loss reduces the capital or numerator to cover that loss while the risk weighted asset or denominator remains the same. Growth on the other hand has a direct impact on the denominator as the risk weighted assets grow when making more loans and leases however capital “declines” when assets grow although the organization has not “lost” any capital. For example, currently Farm Credit Mid-America has about \$20 billion in assets and about \$3.5 billion in capital. This equates to 17.5% in a permanent capital ratio. If the organization grows to \$22 billion this year and capital remained the same at \$3.5 billion then the permanent capital ratio declined to 15.9% even though the association did not lose any capital (Gerstle 2013).

Table 5.4 shows the impact of these scenarios on the Permanent Capital Ratio. It also includes 2011 and 2012 which the capital levels are unchanged since the test is for years 2013 – 2017. Based on the new plan of increasing capital as shown on Figure 5.1, and discussed in chapter 3, all capital levels exceed the minimum 12% capital target. Table 5.5 shows the Core Surplus Ratio of the stress tests. Core Surplus is a more conservative ratio as it deducts the customers’ stock purchase. While these ratios are lower than the Permanent Capital Ratio, they still exceed the 12% minimum requirement for capital (Bruce, 2011).

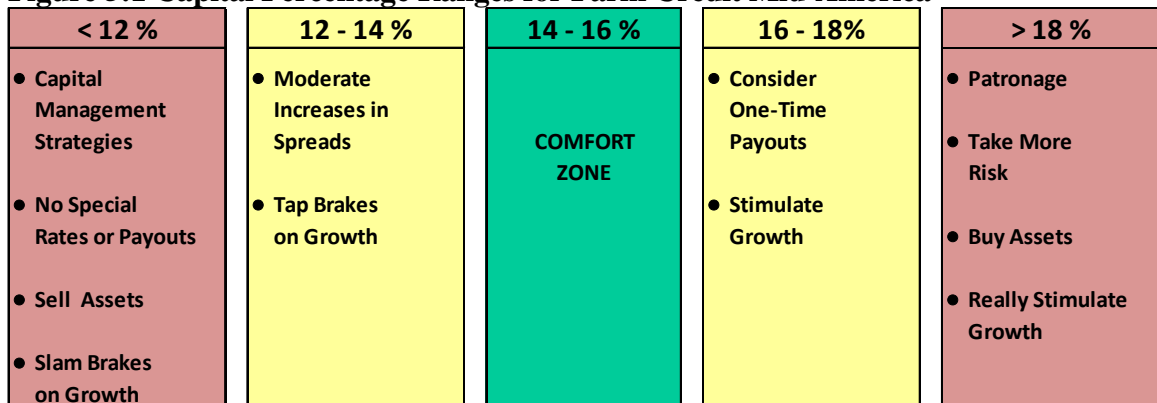
Table 5.4: Scenarios Permanent Capital Ratios

	2011	2012	2013	2014	2015	2016	2017
<u>CAPITAL</u>							
5 year forecasted budget-Permanent Capital Ratio	14.8%	15.5%	15.5%	15.5%	15.7%	15.9%	16.1%
Scenario 1(Catastrophic Events)	14.8%	15.5%	15.6%	16.3%	17.0%	17.7%	18.4%
Scenario 2 (Growth @ 2.5%)	14.8%	15.5%	16.1%	17.2%	18.4%	19.5%	20.7%
Scenario 3 (Growth @ 12%)	14.8%	15.5%	14.9%	14.6%	14.2%	13.9%	13.5%
Scenario 4 (Growth @ +4-12%)	14.8%	15.5%	15.9%	16.2%	16.1%	15.6%	15.1%
Scenario 5 (Extreme Portfolio Stress)	14.8%	15.5%	15.5%	15.3%	15.2%	14.9%	14.5%
Scenario 6 (Less Severe Portfolio Stress)	14.8%	15.5%	15.4%	16.3%	17.1%	17.9%	18.5%

Table 5.5: Scenarios Core Surplus Ratio

	2011	2012	2013	2014	2015	2016	2017
<u>CAPITAL</u>							
5 year forecasted budget-Permanent Capital Ratio	14.3%	15.0%	15.0%	15.0%	15.27%	15.4%	15.7%
Scenario 1(Catastrophic Events)	14.3%	15.0%	15.1%	15.9%	16.6%	17.2%	17.9%
Scenario 2 (Growth @ 2.5%)	14.3%	15.0%	15.7%	16.7%	17.9%	18.9%	20.2%
Scenario 3 (Growth @ 12%)	14.3%	15.0%	14.2%	14.1%	13.8%	13.4%	12.9%
Scenario 4 (Growth @ +4-12%)	14.3%	15.0%	15.5%	15.7%	15.8%	14.6%	14.5%
Scenario 5 (Extreme Portfolio Stress)	14.3%	15.0%	15.0%	14.8%	14.7%	14.4%	14.0%
Scenario 6 (Less Severe Portfolio Stress)	14.3%	15.0%	15.0%	15.8%	16.7%	17.4%	18.0%

Figure 5:1 Capital Percentage Ranges for Farm Credit Mid-America



Scenario 3 has the greatest potential to reduce Permanent Capital Ratio and is the only scenario to decrease below the 14% minimum target. Scenario 3 is highly optimistic and does demonstrate the impact of growth but the association may choose to consider strategies to manage capital to a higher level were growth at this or higher levels to occur. An asset pool sale, like selling a portion of the loan portfolio, might be a strategy applied if growth were at this level or higher in the future.

Conversely, scenarios 1, 2, and 6 have the greatest impact to increase Permanent Capital Ratio above the maximum of 18% due to negative portfolio growth. The sustainable growth rate given current net earnings assumptions is higher than planned at 8.3% while the compound growth rate for earning assets in the plan is around 7.2%. Therefore, Farm Credit Mid-America expects to grow capital over the five year planning period.

In summary, permanent capital appears to adequately sustain such significant events as shown in these scenarios. Permanent capital is also sufficient to meet the minimum standards set aside by the Basel III Accords. Loan growth remains the factor with the greatest impact to Permanent Capital Ratio.

CHAPTER VI: CONCLUSIONS

An advantage Farm Credit has over some institutions is the availability of customers' recent financial information that allows for a realistic impact of economic stress on the loan portfolio. Scenarios are based on actual financial information from the customer base and the projected migration of probability of default and loss given default leads to a more meaningful capital adequacy test.

The sensitivity analysis completed displays the large impact growth and credit risk have on Farm Credit Mid-America's loan portfolio. While credit and growth challenges can create problems for well capitalized institutions, they can have devastating impacts on organizations that do not have enough capital. The economic crisis in 2008-2009 displayed the importance of appropriate capital levels to lenders across the globe that will be a lesson for financial companies for generations to come.

The main objectives covered in this thesis are as follows.

- Objective one of this thesis was to define and understand capital as it applies to Farm Credit Mid-America. Capital is essentially total assets minus total liabilities or the equity that the company has at a given moment in time.
- Objective two was to research the current capital levels for Farm Credit Mid-America. Based on the December 31, 2012 financial statement the permanent capital ratio was 15.76%.
- Objective three was to compare the capital levels for Farm Credit Mid-America to capital levels of other Farm Credit Associations and banks. Figures 1.1, 1.2, and 2.1 display permanent capital ratios and core surplus ratios of other Farm Credit Associations and banks. Mid-America compares favorably to these organizations at 15.76% permanent capital. Most of the Farm Credit Associations have similar

capital and core surplus percentages however banks are significantly lower. Banks do not have as stringent of a capital requirement because they have a more diverse asset base and less risk than Farm Credit as Farm Credit associations are single asset agricultural lenders.

- Objective four was to understand Basel III Accords and how it applies to Farm Credit Mid-America's capital requirements. As documented in table 3.1, the new Basel III standards require a maximum of 13.5% to 15% capital. Farm Credit Mid-America currently has 15.76% capital and exceeds the threshold recommended by Basel III.
- Objective five was to complete sensitivity analysis with multiple scenarios applied to the current Farm Credit Mid-America loan portfolio to determine the effect certain events may have on capital levels. The only scenario to decrease capital below the comfort zone was scenario 3 which was 12%+ growth. Growth rates have the greatest impact on capital levels with high assets rates decreasing capital and low growth rates increasing capital. The remaining scenarios were either within the comfort zone or above the comfort zone.
- Objective six was to determine if Farm Credit Mid-America is appropriately capitalized based on the other objectives. Current capital level of 15.76% and the estimated capital levels of the base budget show that Farm Credit Mid-America is well capitalized to meet the growth estimates and regulatory standards in the future.

In addition to the objectives covered ,there were additional takeaways from this research. First is the substantial impact that growth rate has on capital. When completing the stress testing, it was assumed that scenario 5 would have the greatest negative impact

on capital percentage due to the large loan losses. However because of the slow growth rate for that scenario the capital percentage was not as negatively impacted as the scenarios with high growth rates.

Next is the reaction Farm Credit Mid-America made in 2007 during a period of high growth rates. From 2005 through 2007 Farm Credit Mid-America experienced very fast growth which decreased the capital percentages. Leadership surprised employees during that time by increasing interest rates on certain loan products which slowed growth by making the organization less competitive. Farm Credit Mid-America also sold loans during that time to Agribank in an attempt to increase capital. As employees reflect back on those years they realize the reason behind the decision to increase interest rates and sell assets was to boost capital.

Lastly, it would be interesting to research what potential effects on Farm Credit Mid-America's loan portfolio would decrease capital percentages below the minimum 12% requirement. Although it is highly unlikely for the sake of research actual loan losses were increased to \$1 billion dollars to analyze the result on capital. Asset growth was set at 2.5% for this scenario. Permanent capital began at 18.39% with risk adjusted assets at roughly \$17.5 billion and \$3.2 billion in capital which is similar to the levels in scenario 2. Permanent Capital Ratio dropped to 14.18% in year one with this scenario. When actual losses of \$1 billion were applied in year two as well then Permanent Capital decreased to 9.25% which is below the minimum 12% requirement. This scenario is not likely as Farm Credit Mid-America would hold those assets and wait for the market to rebound instead of selling at such substantial losses of \$1 billion in consecutive years. It is interesting to see

the level of losses required to decrease capital below the minimum 12% requirement (Gerstle 2013).

Figure 6.1: Capital Results Based on \$1 Billion Loss in Consecutive Years

Risk III v8.11_CM_5 - Microsoft Excel					
Main S.T.A. PDmatrix LGDmatrix Growth Print Extract Help					
Beginning Date	Sep-2013	Year 1	Year 2	Year 3	
A Capital	3,225,000,000	3,225,000,000	2,341,196,372	1,439,281,328	Previous year ending capital
Capital ratio	18.39%	18.39%	14.18%	9.25%	Calculated capital/risk-adjusted assets
Allowance for loss	41,000,000	41,000,000	4,401,814	3,158,429	Previous year ending total allowance
Risk-adjusted assets	17,541,000,000	17,541,000,000	16,508,598,186	15,559,589,757	Previous year ending risk-adjusted assets

It would be interesting to research the effects on capital with a period of sustained high growth rate like scenario 3 and substantial loan losses like in scenario 5. It is hypothesized that the capital percentages would be negatively impacted more in this scenario than any of the six scenarios in this stress test. Also, it would be interesting to research this topic again in 3-4 years to compare Farm Credit Mid-America's 5 year plan with the actual results. Overall, it appears Farm Credit Mid-America is adequately capitalized to meet Basel III regulations and to withstand potential financial turmoil over the next five years.

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APPENDIX A: STRESS TEST 1

2011-2017 Forecast and Budget							
Farm Credit Mid-America	Stress Test 1						
(In Thousands)							
	2011	2012	2013	2014	2015	2016	2017
Accrual Mortgage Loans	11,560,207	12,835,115	14,510,093	14,734,887	16,054,969	17,732,008	19,747,838
Accrual Commercial Loans	2,883,597	3,047,292	3,135,666	3,175,489	3,443,501	3,786,129	4,199,574
Accrual Finance Leases	280,361	292,859	243,073	246,160	266,936	293,496	325,546
Accrual Loans	14,724,164	16,175,267	17,888,833	18,156,537	19,765,406	21,811,633	24,272,959
Nonaccrual Mortgage Loans	238,523	188,000	163,600	540,000	528,000	480,000	448,000
Nonaccrual Commercial Loans	47,192	41,500	36,400	135,000	132,000	120,000	112,000
Nonaccrual Finance Leases	771	0	0	0	0	0	0
Nonaccrual Loans	286,486	229,500	200,000	675,000	660,000	600,000	560,000
Gross Loans	15,010,651	16,404,767	18,088,833	18,831,537	20,425,406	22,411,633	24,832,959
Allowance for Losses On Loans	80,734	63,126	69,726	189,770	257,296	225,862	250,272
Loans, Net	14,929,917	16,341,641	18,019,107	18,641,767	20,168,110	22,185,771	24,582,687
Investments	1,410,903	1,465,862	1,381,158	1,398,698	1,516,749	1,667,665	1,849,774
Invest. In AgriBank-Common/Required	422,124	441,648	462,050	476,977	513,562	561,402	620,017
Invest. In AgriBank-Pref./Excess	0	0	0	0	0	0	0
Investment in FCI Intrasystem	11	11	11	11	11	11	11
Accrued Interest Receivable	128,900	131,612	143,350	145,455	158,268	174,575	194,197
Acquired Property, Net	30,309	16,975	12,000	8,000	5,000	4,000	4,000
Property and Equipment, Net	32,851	38,382	77,996	104,789	120,360	131,417	141,186
Lease Equipment, Net	281,646	303,794	273,414	276,887	300,256	330,131	366,182
Deferred Tax Asset, Net	0	0	0	0	0	0	0
Accounts Receivable	49,904	31,549	21,897	12,142	12,432	13,028	13,811
Miscellaneous Other Assets	218,708	148,085	73,311	6,993	7,659	8,342	9,032
Assets	17,505,272	18,919,560	20,464,295	21,071,718	22,802,408	25,076,343	27,780,897
Bonds and Notes	14,578,386	15,699,485	16,968,640	17,569,308	19,235,788	21,295,474	23,789,648
Accrued Interest Payable	92,107	85,631	86,971	98,067	106,217	116,259	129,153
Other Liabilities	122,015	134,734	143,742	140,553	141,474	148,876	155,102
Liabilities	14,792,507	15,919,850	17,199,353	17,807,928	19,483,479	21,560,610	24,073,903
Protected Stock	0	0	0	0	0	0	0
At Risk Stock	82,000	84,577	87,217	89,857	92,497	95,137	97,777
Surplus	2,630,765	2,915,132	3,177,725	3,173,933	3,226,431	3,420,596	3,609,218
Capital	2,712,765	2,999,709	3,264,942	3,263,790	3,318,928	3,515,733	3,706,995
Liabilities And Capital	17,505,272	18,919,560	20,464,295	21,071,718	22,802,408	25,076,343	27,780,897

APPENDIX B: STRESS TEST 2

2011-2017 Forecast and Budget							
Farm Credit Services of Mid-America	Stress Test 2						
(In Thousands)							
	2011	2012	2013	2014	2015	2016	2017
Accrual Mortgage Loans	11,560,207	12,835,115	14,510,093	14,958,039	15,376,703	15,803,210	16,237,910
Accrual Commercial Loans	2,883,597	3,047,292	3,135,666	3,214,058	3,294,410	3,376,770	3,461,189
Accrual Finance Leases	280,361	292,859	243,073	249,150	255,379	261,763	268,307
Accrual Loans	14,724,164	16,175,267	17,888,833	18,421,247	18,926,491	19,441,743	19,967,407
Nonaccrual Mortgage Loans	238,523	188,000	163,600	167,690	171,882	176,179	180,584
Nonaccrual Commercial Loans	47,192	41,500	36,400	37,310	38,243	39,199	40,179
Nonaccrual Finance Leases	771	0	0	0	0	0	0
Nonaccrual Loans	286,486	229,500	200,000	205,000	210,125	215,378	220,763
Gross Loans	15,010,651	16,404,767	18,088,833	18,626,247	19,136,616	19,657,121	20,188,169
Allowance for Losses On Loans	80,734	63,126	69,726	71,803	73,773	75,783	77,833
Loans, Net	14,929,917	16,341,641	18,019,107	18,554,445	19,062,843	19,581,338	20,110,336
Investments	1,410,903	1,465,862	1,381,158	1,376,047	1,410,449	1,445,710	1,481,853
Invest. In AgriBank-Common/Required	422,124	441,648	462,050	468,314	472,559	476,979	481,563
Invest. In AgriBank-Pref./Excess	0	0	0	0	0	0	0
Investment in FCI Intrasystem	11	11	11	11	11	11	11
Accrued Interest Receivable	128,900	131,612	143,350	147,333	151,330	155,409	159,573
Acquired Property, Net	30,309	16,975	12,000	8,000	5,000	4,000	4,000
Property and Equipment, Net	32,851	38,382	77,996	104,789	120,360	131,417	141,186
Lease Equipment, Net	281,646	303,794	273,414	280,250	287,256	294,437	301,798
Deferred Tax Asset, Net	0	0	0	0	0	0	0
Accounts Receivable	49,904	31,549	21,897	12,058	11,911	11,788	11,670
Miscellaneous Other Assets	218,708	148,085	73,311	6,993	7,659	8,342	9,032
Assets	17,505,272	18,919,560	20,464,295	20,958,239	21,529,377	22,109,432	22,701,021
Bonds and Notes	14,578,386	15,699,485	16,968,640	17,167,992	17,440,147	17,714,224	17,989,610
Accrued Interest Payable	92,107	85,631	86,971	95,410	96,861	98,052	99,750
Other Liabilities	122,015	134,734	143,742	144,635	149,964	156,195	163,339
Liabilities	14,792,507	15,919,850	17,199,353	17,408,036	17,686,973	17,968,472	18,252,699
Protected Stock	0	0	0	0	0	0	0
At Risk Stock	82,000	84,577	87,217	89,857	92,497	95,137	97,777
Surplus	2,630,765	2,915,132	3,177,725	3,460,346	3,749,908	4,045,823	4,350,546
Capital	2,712,765	2,999,709	3,264,942	3,550,203	3,842,404	4,140,960	4,448,323
Liabilities And Capital	17,505,272	18,919,560	20,464,295	20,958,239	21,529,377	22,109,432	22,701,021

APPENDIX C: STRESS TEST 3

2011-2017 Forecast and Budget							
Farm Credit Services of Mid-America (In Thousands)	Stress Test 3						
	2011	2012	2013	2014	2015	2016	2017
Accrual Mortgage Loans	11,560,207	12,835,115	14,510,093	16,394,956	18,457,835	20,762,657	23,338,786
Accrual Commercial Loans	2,883,597	3,047,292	3,135,666	3,511,946	3,933,380	4,405,386	4,934,032
Accrual Finance Leases	280,361	292,859	243,073	272,242	304,911	341,500	382,481
Accrual Loans	14,724,164	16,175,267	17,888,833	20,179,145	22,696,126	25,509,543	28,655,298
Nonaccrual Mortgage Loans	238,523	188,000	163,600	183,232	205,220	229,846	257,428
Nonaccrual Commercial Loans	47,192	41,500	36,400	40,768	45,660	51,139	57,276
Nonaccrual Finance Leases	771	0	0	0	0	0	0
Nonaccrual Loans	286,486	229,500	200,000	224,000	250,880	280,986	314,704
Gross Loans	15,010,651	16,404,767	18,088,833	20,403,145	22,947,006	25,790,529	28,970,002
Allowance for Losses On Loans	80,734	63,126	69,726	78,656	88,470	99,439	111,704
Loans, Net	14,929,917	16,341,641	18,019,107	20,324,489	22,858,536	25,691,090	28,858,298
Investments	1,410,903	1,465,862	1,381,158	1,503,584	1,684,014	1,886,095	2,112,427
Invest. In AgriBank-Common/Required	422,124	441,648	462,050	511,829	570,297	645,509	731,419
Invest. In AgriBank-Pref./Excess	0	0	0	0	0	0	0
Investment in FCI Intrasystem	11	11	11	11	11	11	11
Accrued Interest Receivable	128,900	131,612	143,350	161,343	181,376	203,772	228,819
Acquired Property, Net	30,309	16,975	12,000	8,000	5,000	4,000	4,000
Property and Equipment, Net	32,851	38,382	77,996	104,789	120,360	131,417	141,186
Lease Equipment, Net	281,646	303,794	273,414	306,224	342,971	384,127	430,223
Deferred Tax Asset, Net	0	0	0	0	0	0	0
Accounts Receivable	49,904	31,549	21,897	12,539	13,324	14,285	15,392
Miscellaneous Other Assets	218,708	148,085	73,311	6,993	7,659	8,342	9,032
Assets	17,505,272	18,919,560	20,464,295	22,939,800	25,783,547	28,968,648	32,530,807
Bonds and Notes	14,578,386	15,699,485	16,968,640	19,125,529	21,604,489	24,371,455	27,451,305
Accrued Interest Payable	92,107	85,631	86,971	104,363	117,184	131,108	147,345
Other Liabilities	122,015	134,734	143,742	145,031	151,455	158,910	167,422
Liabilities	14,792,507	15,919,850	17,199,353	19,374,922	21,873,127	24,661,473	27,766,073
Protected Stock	0	0	0	0	0	0	0
At Risk Stock	82,000	84,577	87,217	89,857	92,497	95,137	97,777
Surplus	2,630,765	2,915,132	3,177,725	3,475,021	3,817,924	4,212,038	4,666,957
Capital	2,712,765	2,999,709	3,264,942	3,564,878	3,910,420	4,307,175	4,764,734
Liabilities And Capital	17,505,272	18,919,560	20,464,295	22,939,800	25,783,547	28,968,648	32,530,807

APPENDIX D: STRESS TEST 4

2011-2017 Forecast and Budget							
Farm Credit Services of Mid-America (In Thousands)	Stress Test 4						
	2011	2012	2013	2014	2015	2016	2017
Accrual Mortgage Loans	11,560,207	12,835,115	14,510,093	15,185,714	16,270,316	17,859,754	20,087,534
Accrual Commercial Loans	2,883,597	3,047,292	3,135,666	3,261,093	3,479,586	3,803,188	4,259,570
Accrual Finance Leases	280,361	292,859	243,073	252,796	269,734	294,819	330,197
Accrual Loans	14,724,164	16,175,267	17,888,833	18,699,604	20,019,636	21,957,761	24,677,302
Nonaccrual Mortgage Loans	238,523	188,000	163,600	170,144	181,544	198,427	222,238
Nonaccrual Commercial Loans	47,192	41,500	36,400	37,856	40,392	44,149	49,447
Nonaccrual Finance Leases	771	0	0	0	0	0	0
Nonaccrual Loans	286,486	229,500	200,000	208,000	221,936	242,576	271,685
Gross Loans	15,010,651	16,404,767	18,088,833	18,907,604	20,241,572	22,200,337	24,948,987
Allowance for Losses On Loans	80,734	63,126	69,726	72,888	78,035	85,592	96,195
Loans, Net	14,929,917	16,341,641	18,019,107	18,834,716	20,163,537	22,114,745	24,852,791
Investments	1,410,903	1,465,862	1,381,158	1,396,185	1,489,729	1,628,274	1,823,667
Invest. In AgriBank-Common/Required	422,124	441,648	462,050	475,203	500,319	541,865	603,747
Invest. In AgriBank-Pref./Excess	0	0	0	0	0	0	0
Investment in FCI Intrasystem	11	11	11	11	11	11	11
Accrued Interest Receivable	128,900	131,612	143,350	149,551	160,042	175,463	197,113
Acquired Property, Net	30,309	16,975	12,000	8,000	5,000	4,000	4,000
Property and Equipment, Net	32,851	38,382	77,996	104,789	120,360	131,417	141,186
Lease Equipment, Net	281,646	303,794	273,414	284,351	303,402	331,619	371,413
Deferred Tax Asset, Net	0	0	0	0	0	0	0
Accounts Receivable	49,904	31,549	21,897	12,134	12,270	12,711	13,493
Miscellaneous Other Assets	218,708	148,085	73,311	6,993	7,659	8,342	9,032
Assets	17,505,272	18,919,560	20,464,295	21,271,931	22,762,330	24,948,447	28,016,452
Bonds and Notes	14,578,386	15,699,485	16,968,640	17,477,883	18,652,132	20,489,308	23,157,032
Accrued Interest Payable	92,107	85,631	86,971	96,828	102,609	111,501	125,196
Other Liabilities	122,015	134,734	143,742	144,698	150,312	157,157	165,294
Liabilities	14,792,507	15,919,850	17,199,353	17,719,409	18,905,053	20,757,965	23,447,523
Protected Stock	0	0	0	0	0	0	0
At Risk Stock	82,000	84,577	87,217	89,857	92,497	95,137	97,777
Surplus	2,630,765	2,915,132	3,177,725	3,462,666	3,764,780	4,095,344	4,471,153
Capital	2,712,765	2,999,709	3,264,942	3,552,523	3,857,277	4,190,481	4,568,930
Liabilities And Capital	17,505,272	18,919,560	20,464,295	21,271,931	22,762,330	24,948,447	28,016,452

APPENDIX E: STRESS TEST 6

2011-2017 Forecast and Budget							
Farm Credit Services of Mid-America	Stress Test 6						
(In Thousands)							
	2011	2012	2013	2014	2015	2016	2017
Accrual Mortgage Loans	11,560,207	12,835,115	14,510,093	14,998,749	15,542,696	16,154,670	16,814,324
Accrual Commercial Loans	2,883,597	3,047,292	3,135,666	3,230,364	3,336,966	3,458,097	3,589,505
Accrual Finance Leases	280,361	292,859	243,073	250,414	258,678	268,068	278,254
Accrual Loans	14,724,164	16,175,267	17,888,833	18,479,527	19,138,339	19,880,835	20,682,084
Nonaccrual Mortgage Loans	238,523	188,000	163,600	258,720	301,280	324,160	336,320
Nonaccrual Commercial Loans	47,192	41,500	36,400	64,680	75,320	81,040	84,080
Nonaccrual Finance Leases	771	0	0	0	0	0	0
Nonaccrual Loans	286,486	229,500	200,000	323,400	376,600	405,200	420,400
Gross Loans	15,010,651	16,404,767	18,088,833	18,802,927	19,514,939	20,286,035	21,102,484
Allowance for Losses On Loans	80,734	63,126	69,726	189,510	196,682	204,452	212,680
Loans, Net	14,929,917	16,341,641	18,019,107	18,613,417	19,318,257	20,081,583	20,889,804
Investments	1,410,903	1,465,862	1,381,158	1,422,869	1,469,823	1,523,178	1,581,059
Invest. In AgriBank-Common/Required	422,124	441,648	462,050	474,062	484,921	497,013	510,222
Invest. In AgriBank-Pref./Excess	0	0	0	0	0	0	0
Investment in FCI Intrasystem	11	11	11	11	11	11	11
Accrued Interest Receivable	128,900	131,612	143,350	148,033	153,263	159,162	165,531
Acquired Property, Net	30,309	16,975	12,000	8,000	5,000	4,000	4,000
Property and Equipment, Net	32,851	38,382	77,996	104,789	120,360	131,417	141,186
Lease Equipment, Net	281,646	303,794	273,414	281,671	290,966	301,529	312,987
Deferred Tax Asset, Net	0	0	0	0	0	0	0
Accounts Receivable	49,904	31,549	21,897	10,846	10,781	10,747	10,733
Miscellaneous Other Assets	218,708	148,085	73,311	6,993	7,659	8,342	9,032
Assets	17,505,272	18,919,560	20,464,295	21,070,691	21,861,043	22,716,981	23,624,564
Bonds and Notes	14,578,386	15,699,485	16,968,640	17,431,872	17,965,366	18,552,531	19,178,267
Accrued Interest Payable	92,107	85,631	86,971	96,730	99,665	102,494	106,024
Other Liabilities	122,015	134,734	143,742	136,212	141,471	147,571	154,566
Liabilities	14,792,507	15,919,850	17,199,353	17,664,814	18,206,502	18,802,597	19,438,856
Protected Stock	0	0	0	0	0	0	0
At Risk Stock	82,000	84,577	87,217	89,857	92,497	95,137	97,777
Surplus	2,630,765	2,915,132	3,177,725	3,316,020	3,562,044	3,819,248	4,087,931
Capital	2,712,765	2,999,709	3,264,942	3,405,877	3,654,540	3,914,385	4,185,708
Liabilities And Capital	17,505,272	18,919,560	20,464,295	21,070,691	21,861,043	22,716,981	23,624,564