

**SIMULATION MODELS OF BANK RISK  
MANAGEMENT**

by

KELLEY AYRES

B.S., Kansas State University, 1981

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A THESIS

Submitted in partial fulfillment of the requirements

for the degree

**MASTER OF AGRIBUSINESS**

Department of Agricultural Economics

College of Agriculture

**KANSAS STATE UNIVERSITY**

Manhattan, Kansas

2015

Approved by:

Major Professor  
Dr. Bryan Schurle

## **ABSTRACT**

Quantifying the impact of various economic events is essential for risk management in community banks. Interest rate shocks of either rapidly increasing or decreasing rates, in magnitudes of at least 200 basis points, is one of the more common risks modeled. Liquidity crises that impact deposits or loan demand can arise from either local or national economic events is another risk factor that regulators are requiring banks to quantify and plan for.

Excel spreadsheets can be used to develop models to measure and quantify these risks. Simulation tools and what-if analysis using data table and scenario manager identify possible outcomes for differing interest rate scenarios, interest rate shocks and liquidity stresses. Data table was used for simulation of a stochastic model to produce a cumulative distribution function of two hundred results each on three different interest rate environments. Scenario manager was used to narrow the simulation to a certain set of expectations affecting the balance sheet of the bank and another set of expectations from an interest rate shock. Changes in the bank's balance sheet resulting from three different commodity price expectations were modeled. An interest rate shock of four hundred basis points over a two year period was also modeled.

These models are simple and cost effective. Once data are captured, the time required to develop and generate scenarios is manageable. The model can be used for a wide range of what-if alternatives as an individual bank may see fit. These models are adequate to meet present regulatory requirements for a community bank of smaller size that is not complex and does not possess a high risk profile.

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## **ACKNOWLEDGMENTS**

The author wishes to acknowledge individuals that have been instrumental in the completion of the Masters of Agribusiness program and this thesis.

Some years ago I was a young college student and Dr. Schurle was a young college professor. I had the privilege of taking Dr. Schurle's Principals of Ag Economics course and was impressed with his teaching ability. I was never surprised as I noted his many teaching awards over the years. I thoroughly enjoyed the Risk Management course in the MAB program and that course was the inspiration for this thesis. Dr. Schurle's council, support and encouragement contributed to the completion of this thesis

Dr. Featherstone and Dr. Fox who were on my committee were both excellent instructors. Dr. Featherstone's leadership of the MAB program as well as his teaching ability, especially in the area of finance, is appreciated. Dr. Fox's teaching of statistics and econometrics was interesting, enlightening and practical.

All of the MAB staff were always professional, helpful and encouraging. Deborah and Mary's quick response and problem solving abilities were always appreciated.

I thoroughly enjoyed developing relationships with the members of my MAB cohort. Many of you were very helpful as we discussed and worked on all of the classes throughout the program.

I would like to thank the Directors, Officers and Staff of First Bank and Trust Company for allowing me the opportunity to complete this program. Their support and assistance were invaluable in the completion of the MAB program and this thesis.

Finally, and most importantly, I would like to thank my family for all of their support throughout this program. There were many hours I spent working on various



assignments as well as this thesis. Allowing for this time as well as the support and encouragement was a key component in the completion of the MAB program.

## **CHAPTER I: INTRODUCTION**

### **1.1 Situation**

First Bank and Trust Company is a community bank located in Minden, Nebraska. The bank was chartered in 1883 and descendants of the original founder still have significant ownership of the bank. The bank paid its first dividend to shareholders in 1884 and has paid a dividend 120 of the bank's 131 years in existence. Minden is a rural community with agriculture, primarily corn and soybean production, as the most significant economic driver. The primary trade area of the bank has generally very good soils with good access to ground and surface water for irrigation. Kearney County consistently ranks as one of the top counties in the state in terms of net farm income. The bank has consistently operated with a relatively low loan to deposit ratio.

The following will further illustrate the importance of row crop production as an economic driver of the area, as well as a potential risk factor to the bank. Kearney County produces about 160,000 acres of corn and about 80,000 acres of soybeans annually according to the USDA National Agricultural Statistics Service. Assuming corn yields of 200 bushels per acre and soybean yields of 65 bushels per acre; total grain production for the county is about 37 million bushels. Changing the price of grain just \$2.00 per bushel results in a change in wealth of \$74 million for Kearney County farmers.

This potential volatility of wealth in the county is just one risk factor that is significant to the bank. The Federal Deposit Insurance Corporation deposit market share report for June, 2014 indicates total bank deposits of \$157,847,000 for the county. First Bank and Trust Company's share of the county deposits is 28.18%. Volatility of grain

prices as the above illustration indicates totals nearly 50% of the bank deposits in Kearney County.

The bank has enjoyed stable ownership and has an experienced board of directors. Four outside directors have served on the board from four to forty-eight years. The four senior management positions who are also directors have banking experience ranging from twenty to thirty-three years. The vast majority of this experience was obtained at First Bank and Trust Company. Both the board and management are risk averse as most were involved in agricultural banking during the farm crisis of the 1980s. The combination of generally low historical loan to deposit ratios and risk aversion has contributed to the bank having generally low levels of profitability.

Figure 1.1 shows the declining loans to asset ratio during the time period studied. This decline in loans to assets is attributable to strong farm income for the period. Many farm producers used strong cash flows to pre-pay debt as well as retain cash to meet operating expenses. In addition, interest rates fell during this period of time. This resulted in the refinance of long term loans such as real estate loans. The market for this type of loan was very competitive.

The peer data was obtained from the Uniform Bank Performance Reports. First Bank and Trust Company is in a peer group of banks with \$50 million to \$100 million in assets with two or fewer offices and not located in a Metropolitan Statistical Area. In 2003, there were 674 banks in this peer group. That number has steadily declined and in 2013 there were 462 banks in this peer group.

**Figure 1.1 Loans to assets ratio of First Bank and Trust Company compared to UBPR peer group at year end.**

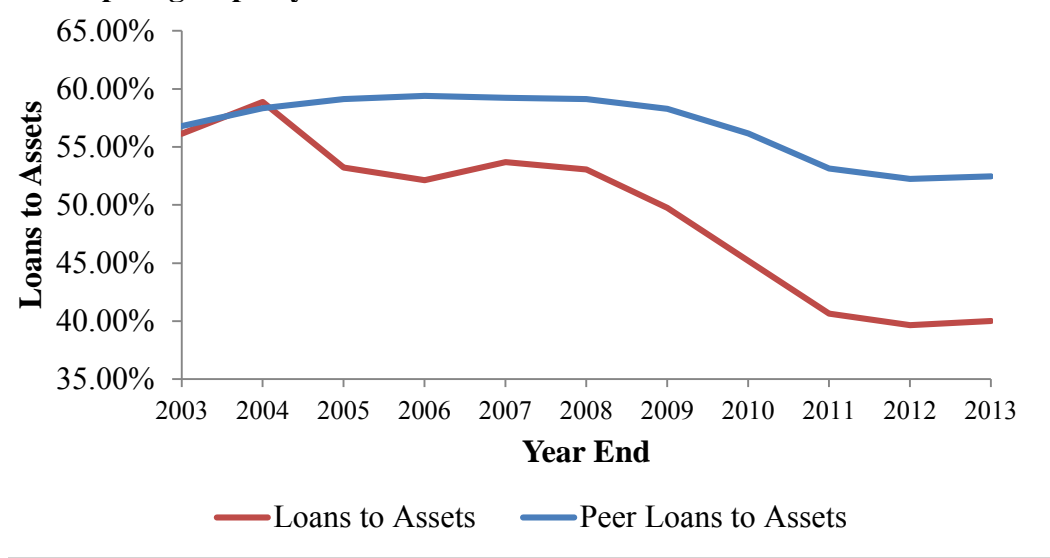
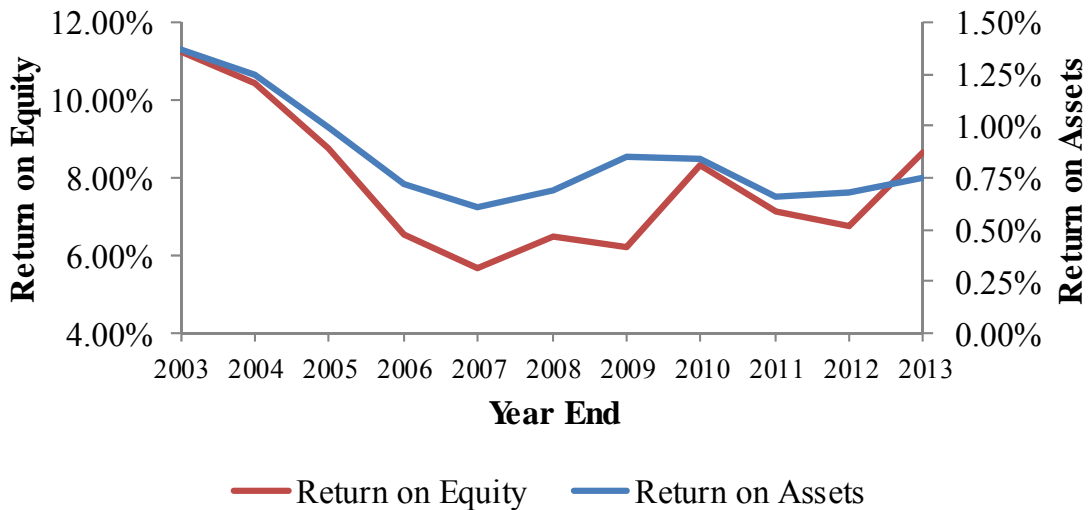


Figure 1.2 shows the return on equity and return on assets for the period studied.

Declining loan volume, re-financing of long term loans and declining interest rates were the major factors that contributed to the falling levels of profitability.

**Figure 1.2 Return on equity and return on assets of First Bank and Trust Company.**



In 2006, the bank analyzed the benefits of converting its charter from a national bank, regulated primarily by the Office of the Comptroller of the Currency, to a state

chartered bank. With that conversion, the bank could chose it's primary federal regulator of either the Federal Reserve or the Federal Deposit Insurance Corporation. Since majority control of the bank was owned by a holding company, the holding company was regulated and examined by the Federal Reserve. Since the bank had this existing relationship, the Federal Reserve was chosen as the primary federal regulator. The bank converted to a state charter January 1, 2007. The bank is also regulated by the Nebraska Department of Banking and Finance.

### **1.2 Need and Use of the Model to be Developed**

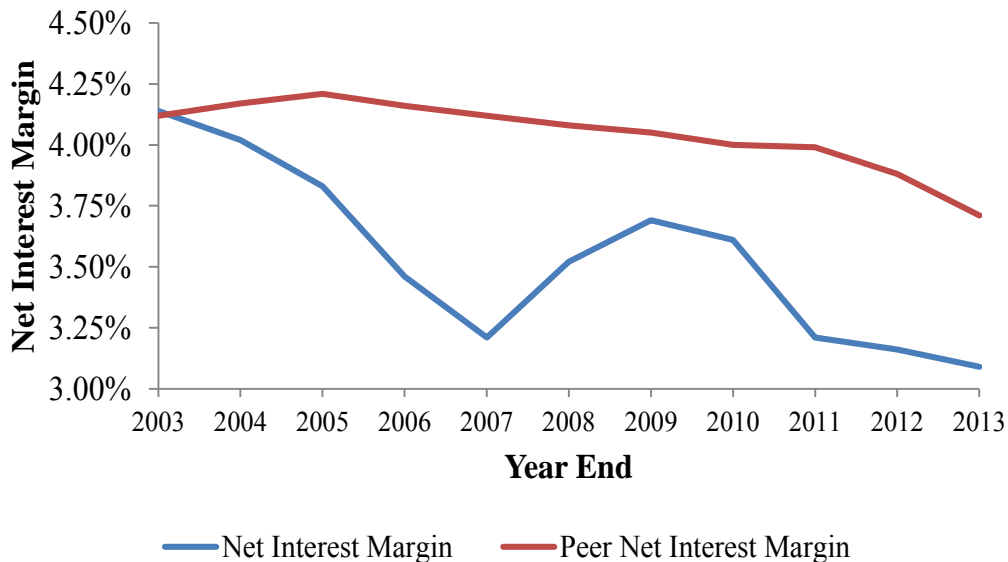
The bank has various policies that address certain financial criteria of the institution. This model will aide in administrating several of these including the Asset/Liability Management Policy, Liquidity Contingency Plan, Capital Plan and quarterly GAP and interest rate risk board reports. Regulators require that risk limits be set in these policies and monitored to insure the risk limits are not exceeded. The bank has some latitude in setting the metrics. The metrics and limits must be adequate to measure and manage the risk given the bank's risk characteristics and profile. Generally interest rate shocks of two hundred to four hundred basis points are evaluated to determine if these shocks generate excessive risk.

One of the primary rating scales bank regulators use is the CAMELS rating. CAMELS is an acronym for capital, asset quality, management, earnings, liquidity and sensitivity to market risk. The models developed in this thesis can be used to measure capital, earnings and liquidity. The effects of asset quality can also be modeled using provision for loan losses. The bank has traditionally had strong capital and liquidity so those items are not the focus of this analysis and thesis. Earnings have trailed peers so the primary focus of the models for this thesis is on earnings.

The purpose of this thesis is to create a comprehensive model using cumulative distribution functions and modeling tools in Excel to assist management of the bank assess various risk factors. Risk management is important in the banking industry due to low margins and volatile interest rates. The goal of the bank, and many community banks, is to have a net interest margin of approximately 4.0% to cover overhead expense, provide for loan loss reserves, plowback of earnings into capital to support growth, and cash dividends to shareholders.

Figure 1.3 shows the net interest margin of First Bank and Trust company as compared to peers. The declining trends are due largely to falling interest rates and low loan demand. As shown in Figure 1.1 the relatively low loans to assets ratio of First Bank and Trust Company is the primary reason for the difference between the bank and the peer group.

**Figure 1.3 Net interest margin of First Bank and Trust Company compared to peer group at year end.**



The maturity and duration of assets and liabilities are also often miss-matched which creates a risk factor. It has been the pattern at First Bank and Trust Company that the duration of assets often is longer than the duration of liabilities. This is due to the desire of many customers to use bank deposits as transaction accounts and a liquid store of wealth all of which are short term in nature. Many loan purposes require repayment terms of longer duration due to the cash flow available for debt service. These conflicting needs of depositors versus borrowers create the miss-match. This creates a problem for the bank when interest rates increase as the cost of deposits increases faster than the income from loans and other assets.

Properly ascertaining and managing many risk factors is essential to improve income opportunities as well as protect the capital of the bank. Risk management has been a focus of regulators for some time and this focus has increased in the extremely low interest rate environment of recent years. The financial crisis beginning in 2008 further increased the focus on risk management as did the rapid inflation of farm real estate values.

The management tools used by First Bank and Trust Company are very robust. However, these tools exceed what is necessary given the risk profile of the bank. The complexity of these tools demands an inordinate amount of time to manipulate to produce information for management that will satisfy regulatory requirements. This project is designed to develop a tool that is simple and more efficient in time and other resources that will generate relevant simulations for a multitude of risk management challenges.

### **1.3 Goal of the Thesis**

The goal of this thesis is to simplify the process of measuring various risk factors and present the information in a clear and concise manner. Even though the process will be simplified, the model will be comprehensive and include the major risk factors of the bank.

Cumulative distribution functions will quantify scenarios that will capture worst case situations in which multiple adverse conditions are present as well as individual catastrophic risk occurrences. Scenario manager was used to narrow the focus on individual risk factors affecting the balance sheet or a shock to interest rates. This provides an effective management tool that can be used to communicate and educate the board of directors as to the risk profile of the bank. This model satisfies current regulatory requirements.

There are alternative solutions for measuring and reporting risk. One solution is of course to continue with the present system that has been effectively used despite the time requirement. However it is management's desire to have other staff members assist with this process. Additional licenses will need to be purchased to allow others to utilize the program. Considerable training will be required to make other staff members proficient with the software. Other solutions are to analyze other software products currently on the market. The initial cost of these products is high. Compatibility of the data download from the core processing system is challenging. Investment in staff and management time to be adequately trained to effectively use a new product would also be high. Outsourcing can also be considered however customization to the bank's requirements is limited. Outsourcing may also prove to be cost prohibitive.

The primary execution challenge is to develop a model that is technically correct and valid. Output must be adequate for management decisions and in a form that communicates risk factors and scenario modeling with bank staff, directors and regulators. Results should be in a form that can be back tested to further validate the model. In addition, independent third party verification should be obtained if feasible. The model



should be in a form so that other staff can be trained to provide tasks such as reliable data collection and execution of the model and presentation of results.

The bank has high quality monthly data for the period beginning January 2004 through December 2013. The data includes all balance sheet categories of assets, liabilities and capital accounts of the bank. Data for rates of return on all assets as well as interest rates for all liability accounts are available. Actual loan loss and loan loss recovery data is available. Although data are available for all non-interest income and non-interest expense items, these factors are not analyzed in this thesis. Non-interest income and non-interest expense are much less volatile.

The data represent a wide range of situations experienced by the bank that are thought to be reliable indicators for simulation analysis. During this time period, the bank experienced growth in total assets due to the strong agricultural economy of the early 2010s. A wide range of asset volume produces a wide set of possible scenario results. Interest rates fluctuated over 500 basis points during this time period. This provides an adequate range of rates to model an interest rate shock of over 400 basis points desired by regulators. Loan losses in general have been low but the actual experience should provide a wide enough range to model all but truly catastrophic results.

In addition to historical bank data, historical six month United States Treasury Bill market interest rates are obtained and used in the analysis in this thesis. These rates are obtained from the Federal Reserve System.

The model is available for use by bank management to ascertain various risks. Once the nature and magnitude of risks are identified and quantified, bank management can

utilize the model periodically to analyze these risks and present to the board of directors as well as documentation for the regulators.

## **CHAPTER II: LITERATURE REVIEW**

The Board of Governors of the Federal Reserve System issues Supervision and Regulation Letters periodically. SR 11-7, Guidance on Model Risk Management, issued April 4, 2011 outlines guidelines for banks to assess management of model risk. Factors to be considered in assessing the adequacy of the risk model include the organization's size, nature and complexity. Also assessed are the extent and sophistication of the organization's use of models.

Models that are incorrect or misused can produce results that lead to adverse consequences including financial loss. Models that are developed should include disciplined model development and an implementation processes consistent with the situation and goals of the institution. Models should have a degree of independence in validation to insure the model is working as intended and is sufficient. Validation should also include evaluation of conceptual soundness, ongoing monitoring of implementation and performance and outcome analysis such as back-testing (Board of Governors of the Federal Reserve System 2011).

The Federal Reserve System publishes Community Banking Connections, A Supervision and Regulations Resource. The series of three articles from the Federal Reserve Bank of Kansas City focus more specifically on interest rate risk measurement and management as well as asset/liability management (Gray, Community Banking Connections 2012).

The model risk analysis in this thesis is based on cumulative distribution functions, assigning probabilities to a range of outcomes. This article explains Monte Carlo Simulation which uses randomly generated numbers, based on a data set, to produce multiple simulation results (Palisade Corporation 2014).

The textbook, *Using Econometrics, A Practical Guide*, Sixth Edition by A.H. Studenmund was the resource used to reference statistical methods and formulas to analyze the data presented in this thesis. Concepts such as range, mean, standard deviation, regressions and correlation coefficients are defined and explained.

The notebook and class materials from Agribusiness Risk Management, AGEC 720, 2013, Dr. Bryan Schurle, Kansas State University, 2013 was the resource used to develop the theory and methods to construct the models presented in this thesis. Concepts of risk measurement using Excel functions of Scenario Manager and Data Table are defined and explained.

An editorial, *Stress Tests Won't Prevent the Next Financial Crisis*, Rosa M Abrantes-Metz, *Wall Street Journal*, March 19, 2014 opines on the fallacies of stress testing of banks and financial institutions. Stress tests can be manipulated to produce desired results. In addition, stress tests completed when conditions are favorable produce results that are favorable and fail to identify potential areas of vulnerability. Conversely, when stress tests, such as interest rate shocks and high levels of loan losses, are completed in adverse economic conditions, the results are poor and likely to further erode confidence and worsen the situation. Furthermore, stress tests focus on what is believed to be the primary causes of losses. However, losses often arise from factors that are not considered.

An article in *Northwestern Financial Review*, *Regulators Share Expectations for Handling Rising Rates*, Jim Broucek, April 2014, summarizes regulatory expectations for various risk factors banks are currently facing. The first point of the article is that bankers must focus on exam comments and what the regulators are asking to be done. These comments, such as matters requiring attention, can require formal actions from the

management and directors of the bank. Less formal comments such as best practices suggested should also be taken seriously.

Asset/Liability Management Issues, United Missouri Bank, John A. McQueen, CFA, 4<sup>th</sup> Quarter 2014 discusses model adequacy and sufficiency, more specifically for interest rate risk management. The need for board of director education and stress testing is also discussed.

IRR Regulatory Update, The Baker Group, Jeffrey F. Caughron discusses the need for a sound process and independent review of interest rate risk models. Goals of an independent review are outlined. These goals include verifying the adequacy of the internal control system and appropriateness of the risk measurement system. Accuracy of data is assessed as is the reasonableness and validity of scenarios used as well as the validity of the actual calculation. In addition, a process for performing an independent review of an interest rate risk management system is presented. There are eleven specific steps identified for management to use as a guide in designing an independent review.

## **CHAPTER III: THEORY**

### **3.1 Continuous Cumulative Distribution Functions**

Continuous cumulative distribution functions can be used to determine the range of possible outcomes of a mathematical formula. A cumulative distribution function is a mathematical relationship that indicates the probability that the outcome of a random variable will be less than or equal to any particular value (Schurle 2013). From this, the probability of an unacceptable outcome can be quantified.

To determine the probabilities, an estimate of the likelihoods must be developed. The population for this thesis is actual monthly data collected from the bank from January 2004 through December 2013.

Frequency distributions identify the number of times a result occurs over a given time period are used to determine the probability associated with a certain result. For instance, if the interest rate on six month Treasury bills is determined to be a risk factor, a frequency distribution can be constructed for ranges of this interest rate over a given time period. A histogram can graphically illustrate the distribution.

The cumulative distribution can then be identified. A cumulative distribution is the cumulative frequency distribution of the number of observations with values less than or equal to the upper class limit of each class (Schurle 2013). This can be used to determine the probability that an unacceptable event will occur. Bank management can then focus on the specific causes of the unacceptable result. Strategy can be changed to correct the cause of the unacceptable result or steps can be taken to mitigate the risk of its occurrence.

To complete the cumulative distribution function, basic statistical measures must be used. The mean of a data population is a measure of the central tendency of a data distribution (Schurle 2013). Mean is calculated by the following formula:

$$(X_1 + X_2 + X_3 + \dots + X_n) / N$$

where X is the outcomes and

where N is the number of observations.

Mean calculations can be subject to outliers in the data population. There were no outliers in the population of data that were omitted. There were instances where zero values were typical or logical in the data set. These zero values were retained. There were other instances where zero values were not typical. These occurred when an asset or liability was added or deleted from the bank's balance sheet. These zero values were not considered in calculation of the mean.

Variability of data, or dispersion, is an important statistical factor in cumulative distribution functions. The minimum is the smallest value of the data set. The maximum is the largest value of the data set. The range is the difference calculated by subtracting the minimum value from the maximum values of the data population.

Standard deviation is the square root of the variance (Studenmund 2011, 2006, 2001). Standard deviation is expressed in the same data units as the original data, thereby more easily compared to the mean and other statistics (Schurle 2013). A large standard deviation indicates greater ranges in possible outcomes while a smaller standard deviation indicates smaller ranges in possible outcomes.

Many decisions a manager makes have more than one potential result. Each possible result has some degree of probability that it will occur. It is likely that each potential result will have a different probability with some higher and some lower. Therefore, understanding probabilities are critical in the study of risk and thinking in a

probabilistic mode is a characteristic of decision making when evaluating risk (Schurle 2013).

Probability is a measure, expressed numerically, that a result will occur. The probability of each result must be between zero and one. Probabilities must add up to one (Schurle 2013). In risk management, probability requires that one evaluates all of the potential results that may occur in a given scenario. Each result must then be assigned a non-negative number and the sum of all of the probabilities is exactly one (Schurle 2013).

Probabilities can be either objective or subjective. Objective probabilities are when a potential result will occur with the same relative frequency under constant conditions. The probability that heads will be the result of a coin flip is constant if the experiment is repeated enough times. Subjective probabilities arise when conditions are not held constant. The probability that the bank will return the same net income for any year is dependent upon many factors that change from year to year, such as interest rates. Objective probabilities are rare in business decision making situations. All of the probabilities in this study are subjective.

Probabilities can either be discrete or continuous. A discrete probability has a fixed number of possible results. A continuous probability has an infinite number of possible results. All of the variables in this study are bound by a range determined by the stochastic formula used in the model and are discrete.

A cumulative distribution function is a mathematical relationship that calculates the probability that the result of a random variable will be less than or equal to any particular value. Cumulative distribution functions and probability distributions are very similar with the cumulative distribution function being a derivative of the probability distribution. The



beginning of the cumulative distribution function is the minimum result and the highest result is where the cumulative distribution function equals one.

To properly evaluate risk, the outcome should be calculated on a meaningful scale. This allows one to properly measure the risk associated with some variable. Results measured in certain rates or ratios are unlikely to accomplish this goal. Results expressed in dollar amounts such as net income or total of capital accounts are more likely to be a meaningful scale to measure risk. Since the bank is well capitalized and this is less of a risk at this point in time, dollars of net income will be the calculation used to translate risk into a meaningful scale.

### **3.2 Major Risk Factors**

Changes in interest rates are a risk factor for the bank. The balance sheet structure of the bank historically has been liability sensitive. This means that liabilities (deposits) mature or contractually re-price faster than assets (loans and securities) mature or contractually re-price. When interest rates increase the dollar cost of the liabilities (deposits) increases faster than the income generated by assets (loans and securities). This results in less net income.

When interest rates change, often the change is not parallel. This means that short term interest rates will change at either a lessor or greater degree than long term rates. Community banks typically borrow short term (have shorter term liabilities) and lend long term (have longer term assets). If short term rates increase more than long term rates then the yield curve flattens. Interest expense on liabilities increases to a degree greater than interest income increases on assets. This also results in less net income.

Changes in the size of the bank as well as asset mix and balance sheet composition are also risk factors. Larger size allows the bank to spread non-interest expense over a

larger asset base and more efficiently use resources such as employees. Loans are the highest yielding assets the bank has. If loan volume declines and is replaced by lower yielding securities, then net income will be reduced.

### **3.3 Using Scenario Manager**

The Excel function of scenario manager can be used to calculate the effect of a change in one or more variables and any number of results. The balance sheet of the bank will change as economic events and conditions impact bank customers. Since the bank serves a rural agricultural community with grain crops as the primary product, significant changes in grain prices will cause changes in the bank's balance sheet. Lower commodity prices will cause farm customers to borrow to support their business as they have lower cash flow. The bank will likely respond by reducing investment in securities. If commodity prices increase, the opposite will occur.

Scenario manager can be used to simulate the effects of changes in selected values of the model that are expected to change. These are referred to as the changing cells. The results that are to be measured are determined and these are referred to as the results cells. Multiple scenarios can be identified and simulated at the same time so that results can be compared.

Another component of this model is the interest rate of the balance sheet accounts. Interest rates may change rapidly. Interest rates of the balance sheet accounts do not necessarily change at the same time and in the same amount. Periods of rapidly decreasing rates usually cause prepayment of long term loans as lower rate alternatives are available to borrowers. Securities with call options will see these options exercised and the bonds will be paid early. The bank will suffer from reduced income as a result of the lower rates. Rates on liabilities will also fall but not necessarily at the same time and in the same

amount. Estimating these expected changes is often more art than science which causes the need for effective models.

### **3.4 Regulatory Requirements**

On April 4, 2011 the Board of Governors of the Federal Reserve System issued Supervision and Regulation Letter SR11-7, Guidance on Model Risk Management. Financial loss and other adverse consequences can result if a bank uses a model for decision making purposes that are incorrect. Modeling risk management includes robust model development, implementation, use, effective validation along with adequate policies and controls (Board of Governors of the Federal Reserve System 2011). Managing model risk includes “effective challenge” of the model which includes critical analysis by objective and informed individuals that can identify errors and limitations and provide effective corrections.

Models should be adequate to reflect the size, complexity and risk profile of the individual bank. Validation of the model should be independent and ongoing to determine conceptual soundness, appropriate implementation and back-testing to compare projected outcomes to actual. Independent validation of the model is problematic for small banks. Regulators consider the experience and performance of management as well as documentation of adequate reporting to the board of directors when they consider the adequacy of risk models.

## CHAPTER IV: METHODS

### 4.1 Data Collection

Data were collected from the First Bank and Trust Company for the period beginning January 2004 and ending December 2013. The data used is captured monthly from the bank's core data processing platform. From this platform, the data is downloaded into Profitstar, the software product currently used for board reporting, budgeting and asset/liability management. From Profitstar, the data was downloaded into Excel. The data consists of monthly average balance sheet data of all asset, liability and capital accounts. Monthly average yields on all assets as well as monthly average cost of all liability accounts were also obtained.

The data were reorganized and simplified with balance sheet items being consolidated into broader categories. Loans were consolidated into four broad categories; Ag Loans Fixed, Ag Loans Variable, Real Estate, and All Other Loans. The first three categories represent those with larger volumes and are considered most critical to the bank. All other loans consist of minor lending areas such as consumer and commercial which the bank has not had significant loan volume during the period studied.

Loan volumes for December of each year are shown in Table 4.1. Ag loans at year end are influenced heavily by customer's need to pre-pay operating expense to take advantage of early pricing opportunities as well as efficient tax planning. High farm profitability in the later years of the data set contributed to higher year-end loan volumes. High farm profitability allowed farm customers to prepay farm real estate loans which contributed to the downward trend in real estate loans. Mean values were used in the various simulation models since mean values even out year-end events and other seasonal

patterns that are prevalent. The high level of farm profitability of the last several years reflected in the data set should not be considered as “normal” for simulation modeling.

**Table 4.1 Sample data. The data shown is December loan category balances. The statistical measurements are for the complete data set from January 2004 through December 2013.**

Month	Ag Loans Fixed	Ag Loans Variable	Real Estate Loans	All Other Loans
Dec-04	3,542,687	5,123,476	18,267,262	3,488,038
Dec-05	3,714,851	4,481,659	15,526,593	3,488,810
Dec-06	4,604,715	4,856,794	13,785,971	3,717,120
Dec-07	4,532,784	5,367,125	14,768,824	4,997,293
Dec-08	4,326,865	6,353,002	13,595,527	5,591,341
Dec-09	6,111,524	4,762,337	14,790,798	4,350,787
Dec-10	5,442,097	5,467,027	13,751,848	3,983,702
Dec-11	6,025,568	6,164,335	13,592,426	3,365,090
Dec-12	6,346,689	6,936,524	13,220,871	4,060,082
Dec-13	7,070,438	4,710,281	14,746,389	3,987,352
Minimum	2,803,557	3,066,970	12,519,910	3,052,637
Maximum	7,070,438	9,091,659	18,633,153	5,637,465
Range	4,266,881	6,024,689	6,113,243	2,584,828
Mean	4,261,984	5,691,081	14,598,507	4,121,490
Std. Dev.	799,776	1,299,316	1,535,996	670,576

Securities were consolidated into: Taxable, Tax Free, Mutual Funds, Unrealized Gains/(Losses), and Fed Funds Sold. Taxable securities include U.S. Treasury securities, agency securities, taxable municipal securities and mortgage backed securities. These were consolidated as the decision to purchase is driven by relative value considerations at the time of purchase. Maturity dates and other characteristics of the various securities are similar.

Trends for year-end data as shown in Table 4.2 indicate the impact high farm profitability had on the bank’s balance sheet. As deposits increased as shown in Table 4.3,

the deposits were invested in securities. The trend of increasing unrealized gains in the securities portfolio was caused by declining interest rates. The value of bonds is an inverse relationship to interest rates. As interest rates decrease, the value of the bond increases.

**Table 4.2 Sample Data. The data shown is December securities category balances. Statistical measurements are for the complete data set from January 2004 through December 2013.**

Month	Taxable Securities	Tax Free Securities	Unrealized Gain(Loss)	Fed Funds Sold
Dec-04	17,076,192	1,615,903	(34,975)	430,645
Dec-05	18,842,602	2,090,411	(301,813)	455,645
Dec-06	19,903,203	2,806,010	(191,903)	5,645
Dec-07	20,271,949	2,454,516	88,880	592,581
Dec-08	18,952,872	3,232,632	170,559	338,065
Dec-09	23,770,776	4,182,747	549,492	239,516
Dec-10	28,241,093	4,179,364	430,834	62,903
Dec-11	34,358,175	5,695,483	938,497	130,065
Dec-12	32,863,833	6,993,205	1,077,497	31,452
Dec-13	31,624,303	8,100,277	136,881	51,290
Minimum	16,575,084	1,220,191	(520,214)	0
Maximum	43,909,710	8,533,415	1,126,463	1,655,000
Range	27,334,626	7,313,224	1,646,677	1,655,000
Mean	25,343,461	3,859,221	246,750	234,157
Std. Dev.	7,328,874	1,942,572	440,962	334,242

Less consolidation was modeled on the deposit and other liability portion of the model. This is due to more variation in the characteristics of the various categories. Also the bank has traditionally been liability sensitive, meaning that the bank has more liabilities, primarily deposits, which re-price more often than assets re-price.

All deposit account balances in transaction accounts and short term investment accounts were increasing in the time frame of the data set as shown in Table 4.3. This was due to the generally strong profitability of the agriculture sector both nationally and locally

during this time period. Certificate of deposit balances were steady and show little growth as the interest rate premium versus transaction and short term investment account was insufficient to attract new deposits. Bank deposits were also in favor due to the stock market volatility that accompanied the financial crisis beginning in 2008. Most bank deposits are insured by the Federal Deposit Insurance Corporation (FDIC) and considered a risk free asset. At December 31<sup>st</sup> 2013, 87.29% of the bank's deposits were estimated to be insured from call report data submitted to the FDIC.

IRA accounts did not experience similar growth trends. Despite the volatility of the stock market as referenced above, bank clients were investing IRA accounts in equities. These accounts are held in the trust department of the bank. Although no data is presented in this thesis, the bank experienced growth in its trust department during this time frame. The majority of this growth was in self-directed retirement products using common stocks and mutual funds.

**Table 4.3 Sample Data. The data shown is December deposit category balances. Statistical measurements are for the complete data set from January 2004 through December 2013.**

Month	Demand Deposits	NOW Accounts	Savings Accounts	MMA Accounts	Certificates of Deposit	IRA Accounts
Dec-04	3,000,790	6,273,222	1,919,330	6,111,553	15,736,674	4,363,092
Dec-05	3,326,143	6,014,964	1,631,326	5,831,811	15,036,344	4,352,147
Dec-06	3,108,978	5,695,138	1,536,966	6,238,538	16,771,318	4,679,547
Dec-07	3,615,631	5,351,807	1,938,831	8,347,460	17,370,715	3,535,146
Dec-08	3,483,694	6,363,075	1,954,770	6,250,711	17,997,728	3,687,683
Dec-09	4,009,332	7,541,216	2,608,204	7,950,957	18,939,184	4,265,167
Dec-10	4,853,577	8,004,121	3,447,246	9,393,474	19,440,950	4,418,021
Dec-11	5,735,729	8,642,363	3,979,811	9,316,415	17,958,641	4,601,790
Dec-12	7,335,663	9,918,721	4,932,296	10,297,127	17,834,033	4,553,718
Dec-13	8,106,275	11,045,453	5,519,728	11,170,661	16,759,051	3,673,849
Minimum	2,248,340	4,956,922	1,505,803	4,974,015	14,934,047	3,396,248
Maximum	10,915,011	12,446,385	6,802,274	15,180,772	19,694,385	4,679,547
Range	8,666,671	7,489,463	5,296,471	10,206,757	4,760,338	1,283,299
Mean	4,691,641	7,516,319	2,933,472	8,804,333	17,550,211	4,163,883
Std. Dev.	2,232,446	1,949,891	1,505,832	2,361,690	1,221,952	355,592

Other liability accounts as shown in Table 4.4 are commercial and retail repurchase agreement accounts and borrowed funds. Borrowed funds can be either long term or short term. Both commercial and retail repurchase agreements are funds invested in the bank in which the bank pledges securities to the customer as a substitute for FDIC insurance coverage. Commercial repurchase agreements are effectively short term transaction accounts of businesses and political subdivisions. These funds are needed for the day-to-day liquidity needs of the entity. The balances in these accounts can change both daily and seasonally due to the nature of the entity. Retail repurchase agreements have traditionally been used as a substitute for certificates of deposit by customers with deposits in excess of FDIC limits. The need for these accounts diminished with the liberalization of FDIC coverage rules in 2008.



Money borrowed long term is Federal Home Loan Bank advances that are longer term with a maturity of one to ten years and have a fixed interest rate. These have been used to offset and reduce the risk of longer term assets with fixed interest rates such as real estate loans. Fed Funds purchased are overnight borrowings of the bank to meet day-to-day liquidity needs. Fed Funds have been held to a minimum and generally not used due to strong liquidity provided by other sources.

**Table 4.4 Sample Data. The data shown is December other liability category balances. Statistical measurements are for the complete data set from January 2004 through December 2013.**

Month	Comm. Repo.	Retail Repo	Borrowed Long Term	Fed Funds Purchased
Dec-04	3,241,589	1,908,336	2,698,684	31,452
Dec-05	4,688,556	1,203,949	2,420,000	41,935
Dec-06	3,719,649	1,097,485	1,980,000	829,032
Dec-07	6,459,485	966,130	1,472,355	55,645
Dec-08	6,413,820	1,026,919	1,772,966	126,935
Dec-09	6,666,337	785,760	2,163,465	23,387
Dec-10	5,598,665	367,361	1,406,239	43,548
Dec-11	13,433,549	721,753	1,151,278	23,452
Dec-12	10,109,096	271,321	650,000	0
Dec-13	8,039,391	871,842	400,000	0
Minimum	1,555,817	271,321	400,000	0
Maximum	13,433,549	1,908,336	2,880,596	2,980,833
Range	11,877,732	1,637,015	2,480,596	2,980,833
Mean	5,160,478	988,889	1,751,232	382,085
Std. Dev.	2,826,771	362,158	749,296	675,154

The data were further reviewed and analyzed to eliminate the possibility of outliers by calculating the minimum, maximum, range, mean and standard deviation of the data. Some balance sheet items will be at a zero balance for the month in the normal course of business. These data points were left at zero to accurately reflect the results. Other balance

sheet items were at zero and were outliers. For instance, the category of Mutual Funds was zero for much of the time period studied. The balance of the Mutual Fund has been consistent once the asset was acquired and is not projected to change. Therefore, all zero data points for mutual funds were eliminated.

Whenever balance sheet data points were zero for any asset or liability category, the yield of that asset or cost of that liability was zero since there was no income from the asset or cost of the liability. The zero rates skewed the statistical data so all zero data points were removed by deleting the observations.

#### **4.2 Development of the Model**

The balance sheet for the model was then constructed. Asset accounts for loans were consolidated into ag loans fixed, ag loans variable, real estate loans and all other loans. Assets account for securities were consolidated into taxable securities, tax free securities, mutual funds, unrealized gain/(loss), and fed funds sold. Non-earning assets were also included. These are totaled to arrive at total assets.

Deposit and Liability categories were not consolidated as much due to variations in the characteristics of these items. The deposit categories include Demand Deposits, NOW Accounts, Savings Accounts, Money Market Accounts (MMA), Certificates of Deposit, and IRA Accounts. The other liability categories include Commercial Repurchase Agreements, Retain Repurchase Agreements, Borrowed Short Term, Borrowed Long Term and Fed Funds Purchased. All deposit and other liability categories were totaled to arrive at Total Liabilities.

Capital categories include Capital, Surplus, Undivided Profits, Unrealized Gain/(Loss) and Net Income. All were totaled to arrive at Total Capital. Capital accounts are shown in Table 4.5.

**Table 4.5 Sample Data. The data shown are December capital category balances. Statistical measurements are for the complete data set from January 2004 through December 2013.**

Month	Capital	Surplus	Undivided Profits	Unrealized Gain(Loss )	Net Income	Total Capital
Dec-04	400,000	600,000	4,486,335	(34,975)	695,238	6,146,597
Dec-05	400,000	600,000	4,472,233	(301,813)	526,808	5,697,228
Dec-06	400,000	2,406,452	2,768,406	(191,903)	381,233	5,764,188
Dec-07	400,000	4,600,000	281,023	88,880	313,916	5,683,819
Dec-08	400,000	4,600,000	329,062	170,559	435,604	5,935,224
Dec-09	400,000	4,600,000	464,160	549,492	457,852	6,471,504
Dec-10	400,000	4,600,000	434,410	430,834	525,736	6,390,981
Dec-11	400,000	4,600,000	578,505	938,497	511,832	7,028,834
Dec-12	400,000	4,600,000	750,316	1,077,497	441,383	7,269,196
Dec-13	400,000	5,100,000	439,464	136,881	601,325	6,677,671
Minimum	400,000	600,000	281,023	(520,214)	313,916	5,313,108
Maximum	400,000	5,100,000	4,899,524	1,126,463	695,238	7,406,425
Range	0	4,500,000	4,618,501	1,646,677	381,322	2,093,317
Mean	400,000	3,438,109	1,913,900	246,750	489,093	6,251,876
Std. Dev.	0	1,842,209	1,853,952	440,961	108,938	552,584

Once the balance sheet was constructed, the income statement followed. The respective rates were multiplied by the balance sheet balances to arrive at the income produced by the assets and the expense due to the liabilities. Additional categories of Non-Interest Income, Non-Interest Expense and Net Loan Losses were included to compute Net Income to complete the Income Statement. Non-interest income includes origination fees and late charges on loans as well as service charges on deposit accounts and income from the trust department. Non-interest expense is the overhead of the bank with personnel expense, building and equipment, and data processing and professional fees for tax, auditing and compliance being the major expense items. Net loan losses are any provision to the loan loss reserve less any recoveries from previous loan losses.

### **4.3 Verification of the Model**

The first model was developed using the mean values of all of the asset, liability and capital accounts from the data. Likewise, mean rates for all of the categories were captured to apply to the respective asset and liability categories. Asset and liability accounts were multiplied by the respective interest rates to determine the income or expense associated with each account. Variables were changed to make sure that income or expense was calculated appropriately. This verified that the model was operating correctly.

Data for non-interest income as well as non-interest expense were not captured and therefore are not variables in the model. These items are fairly consistent and not considered to be a risk factor that will be included as variables in this model.

Table 4.6 shows the results of the model using mean values of the entire data set. Mean values are used for all of the balance sheet accounts and all of the interest rates. The values used in all of the models for non-interest income and non-interest expense were fixed values determined to be representative of future expectations. Both could easily be variables that could be simulated in any of the models if the user desired to do so. The results shown in this model are representative of the bank's condition and performance for the time period studied.

**Table 4.6 Mean values of balance sheet accounts and interest rates for the entire data set of January 2004 through December 2013.**

	Mean Data		
	<u>Balance</u>	<u>Rate</u>	<u>Income</u>
Ag Loans Fixed	4,261,984	6.88%	293,051
Ag Loans Variable	5,691,081	6.41%	364,967
Real Estate Loans	14,598,507	6.41%	935,881
All Other Loans	4,121,490	6.69%	275,769
Taxable Securities	24,353,142	3.07%	748,569
Tax Free Securities	3,859,221	3.30%	127,358
Mutual Funds	333,333	1.68%	5,616
Unrealized Gain (Loss)	246,750	0.00%	0
Fed Funds Sold	234,157	0.69%	1,616
Non-Earning Assets	<u>5,130,875</u>	<u>0.00%</u>	<u>0</u>
Total Assets	62,830,541	4.38%	2,752,827
	<u>Balance</u>	<u>Rate</u>	<u>Expense</u>
Demand Deposits	4,691,641	0.00%	0
NOW Accounts	7,516,319	0.42%	31,220
Savings Accounts	2,933,472	0.55%	16,172
MMA	8,804,333	1.39%	122,261
Certificates of Deposit	17,550,211	2.36%	414,261
IRA Accounts	4,163,883	2.29%	95,357
Comm. Repo	5,160,478	1.59%	82,302
Retail Repo	988,889	2.61%	25,768
Borrowed Short Term	671,444	0.39%	2,623
Borrowed Long Term	1,751,232	3.80%	66,538
Fed Funds Purchased	<u>382,085</u>	<u>1.73%</u>	<u>6,622</u>
Total Liabilities	54,613,987	1.58%	863,123
Capital	400,000		
Surplus	5,100,000		
Undivided Profits	1,913,900		
Unrealized Gain (Loss)	246,750		
Net Income	555,904	6.77%	ROE
Total Capital	<u>8,216,554</u>	0.88%	ROA
Total Liabilities and Capital	62,830,541	13.08%	Capital to Assets
Non-Interest Income			240,000
Non-Interest Expense			1,500,000
Net Loan Losses			<u>73,800</u>
Net Income			555,904

#### **4.4 The Stochastic Model**

The next step that was completed was the stochastic model. In this model all balance sheet accounts and their corresponding rates are stochastic numbers. The NORMINV(RAND) function was used. Each data item's mean and standard deviation were used to generate random numbers for the balance sheet and income statement calculation. Using Excel, anytime a change is made in the spreadsheet, new random numbers are generated.

Table 4.7 is a representative example of the model with values as generated. All balance sheet accounts and all interest rates are random numbers. Net loan losses is also a random number. Non-interest income and non-interest expense are fixed values.

**Table 4.7 Example of stochastic model used for data table calculations.**

Stochastic Model			
	<u>Balance</u>	<u>Rate</u>	<u>Income</u>
Ag Loans Fixed	4,788,631	6.69%	320,492
Ag Loans Variable	6,584,176	6.70%	440,900
Real Estate Loans	14,143,581	6.57%	929,548
All Other Loans	3,688,526	6.84%	252,329
Taxable Securities	29,788,656	2.98%	888,694
Tax Free Securities	3,824,247	3.68%	140,662
Unrealized Gain (Loss)	-133,335	0.00%	0
Fed Funds Sold	0	1.83%	0
Non-Earning Assets	<u>4,500,000</u>	<u>0.00%</u>	<u>0</u>
Total Assets	67,184,483	4.42%	2,972,624
	<u>Balance</u>	<u>Rate</u>	<u>Expense</u>
Demand Deposits	4,040,118	0.00%	0
NOW Accounts	9,476,562	0.34%	32,022
Savings Accounts	3,479,974	0.67%	23,395
MMA	8,417,476	2.13%	179,648
Certificates of Deposit	18,878,885	2.99%	564,130
IRA Accounts	3,538,989	1.38%	48,935
Comm. Repo	5,789,316	1.67%	96,676
Retail Repo	1,225,859	2.41%	29,530
Borrowed Long Term	1,935,808	4.53%	87,761
Fed Funds Purchased	<u>4,034,832</u>	<u>1.55%</u>	<u>62,403</u>
Total Liabilities	60,817,818	1.85%	1,124,501
Capital	400,000		
Surplus	5,100,000		
Undivided Profits	1,000,000		
Unrealized Gain (Loss)	-133,335		
Net Income	<u>0</u>		
Total Capital	6,366,665	8.79%	ROE
Total Liabilities and Capital	67,184,483	0.83%	ROA
Non-Interest Income			240,000
Non-Interest Expense			1,500,000
Net Loan Losses			<u>28,784</u>
Net Income			559,339
Balancing Account	4,034,832		
Positive = Fed Funds Sold: Negative = Fed Funds Purchased			

As with the base model, Non-Interest Income as well as Noninterest Expense was held constant. Even though capital accounts have varied over the period, the data was collected, the capital accounts of Capital, Surplus and Undivided Profits are held constant. Any variances in these accounts in the past were due to strategic reasons to position capital for lending limit purposes.

#### **4.5 The Cumulative Distribution Function Model (CDF)**

The final model is the CDF model. It is driven from the stochastic model with the additional feature in that IF/THEN statements are used to insure that no negative numbers for the balance sheet are generated. The mean, standard deviation and variance experienced in a number of balance sheet accounts may produce a negative result using the NORMINV(RAND) function. It is not possible for the balance sheet accounts to be negative.

#### **4.6 Correlation of Interest Rates**

Pricing decisions for deposits are based not only on competitive forces outside the bank but also national interest rate markets. Short-term deposits such as NOW accounts, money market accounts and six month certificates of deposit compose a high percentage of the liabilities of the bank. Management has focused on the market rate of six month United States Treasury rates for deposit pricing decisions. The rate paid on deposits is the primary factor in determining loan pricing as well as security purchasing decisions. Six month United States Treasury rates are determined to be the rate that is most critical in driving both liability and assets rates.

Table 4.8 shows the correlation coefficients of all of the earning asset accounts and paying liability accounts to the Six Month U.S. Treasury Bill rate. The correlation coefficients of assets and liabilities that are shorter term such as ag loans variable,



commercial repurchase agreements, short term borrowed funds and fed funds purchased are highly correlated. Asset and liabilities that have longer maturities have lower correlation coefficients but they are still significant. Tax free securities have a low coefficient as these are generally longer in maturity and the rates compared were book yields which were not adjusted to tax equivalent yields. Mutual funds have very little data history to compare.

**Table 4.8 Correlation coefficients of all earning asset account and all paying liability accounts to the Six Month U.S. Treasury bill rate.**

Asset Account	Correlation Coefficient
Ag Loans Fixed	0.737728747
Ag Loans Variable	0.944457333
Real Estate Loans	0.761799398
All Other Loans	0.846456505
Taxable Securities	0.726648848
Tax Free Securities	0.341982774
Mutual Funds	0.115473157
Liability Account	
NOW Accounts	0.747687527
Savings Accounts	0.765094005
MMA	0.817045555
Certificates of Deposit	0.809393619
IRA Accounts	0.857747326
Comm. Repo	0.985095879
Retail Repo	0.804878017
Borrowed Short Term	0.914224488
Borrowed Long Term	0.635855614
Fed Funds Purchased	0.918870246

Interest rates of all of the balance sheet accounts are related. A regression equation was estimated for all interest rates for the balance sheet accounts. The dependent variable is the interest rate to be predicted from the equation. The independent variable is the six month United States Treasury (UST) rate. The regression equation for Ag Loans Fixed (AgLF) is as follows;

$$AgLF = \alpha + \beta UST + \varepsilon$$

where AgLF is the dependent variable,

$\alpha$  is the constant, or intercept,

$\beta$  is the coefficient for UST which is the independent variable, and

$\varepsilon$  is the standard error.

Each interest rate was calculated as the dependent variable. The independent variable of the six month United States Treasury rate was used for each equation. See Appendices C through R for the regression summaries for each interest rate.

Correlation coefficients were calculated for all balance sheet accounts. The coefficients were calculated to the average rate of all loans, all securities, all deposits and all liabilities. This was done to verify the hypothesis that pricing of all earning asset accounts and all paying liability accounts is highly related. Loan and deposit accounts were highly correlated to each other. Correlations of securities were also high but not as significant. Appendix S shows correlation coefficients of all asset and liability account rates to portfolio rate of loans, securities, deposits, total liabilities and the Six Month U.S. Treasury T-bill.

Regression analysis was used to calculate the coefficient for the independent variable of each interest rate used in the model (the Y variable), the intercept (X) and the standard error. Appendices C through R show all of the regression estimates calculated.

Each rate was then determined using the formula;

=NORMINV(RAND(),intercept + (beta \* selected T-bill rate), standard error)

This produces a rate for each balance sheet account that has a mean provided by the regression equation and a standard deviation provided by the standard error of the

regression equation that is related to the selected six month United States Treasury rate to model.

#### **4.7 Simulations Modeled With Data Table**

The data table feature of Excel was used to calculate 200 results for each simulation.

Appendix B shows a simple data table illustration. An income statement was developed in cells A1 through C11. Total assets (cell B5) and total liabilities (cell B8) are random numbers using the NORMINV function of Excel. In each equation, RAND() is used for the probability. Total assets have a mean of \$500,000. Total liabilities have a mean of \$400,000. Both have a standard deviation of \$25,000.

Interest rates are calculated using the same function. The interest rate applied to total assets (cell B6) has a mean of 6.0%. The interest rate applied to total liabilities (cell B9) has a mean of 2.0%. Both have a standard deviation of 0.5%. Net income is total income less total expense.

The data table was developed in cells E1 through M9. Two columns were formed; the first for probability of each result and the second for the cumulative probabilities of results to insure the total cumulative probability equal one. In column E the probability of each result was defined. Column F shows the cumulative probability.

Next a row was created that included all of the variables of the model. Each column above the row was named to refer to the variable. This row referred each variable with the formula “=cell reference”. These are in cells G4 through M4. When this was completed, this row reflects all of the selected variables of the model.

Then the portion of the spreadsheet to the left of the cumulative probability column and below the row of model values is selected. These are cells F5 through M9.

The tab “DATA” is then selected and then the drop down box “What-If-Analysis”, then “Data\_Table”. A pop-up box appears and “Column input cell” is selected. An empty cell, in the vicinity of the table, is then identified (cell D3). The data table is then calculated by selecting “OK”.

This model uses random numbers exclusively. Any change to the spreadsheet causes the model to be recalculated, including the data table constructed. This requires that the output of the data table be copied to fix the results. The table is selected, and then values only are copied to an area next to the table. These numbers can then be sorted for further analysis. The results for this model were sorted by net income from lowest to highest.

This model was used for interest rates reflecting three interest rate scenarios, the current extreme low rate environment of 25 basis points, a low rate environment of 200 basis points and a moderate rate environment of 400 basis points.

#### **4.8 Scenario Manager Model**

The Excel feature of scenario manager was also used. Two scenario manager models were completed. One model calculated changes to the balance sheet only, with interest rates being held constant at the mean of the data set. Three scenarios were calculated with projected changes to selected balance sheet accounts. Another model calculated changes in interest rates only, with balance sheet accounts being held constant at the mean for the data set. Three scenarios were calculated with projected changes to the interest rates.

#### **4.9 Scenario Manager and the Balance Sheet**

The model focusing on the balance sheet changes is a forecast of the bank under three scenarios. The scenarios calculated were; Moderately Low Commodity Prices, Very

Low Commodity Prices, and Moderately Higher Commodity Prices. The values for the current values column are the mean values of the data set. The scenario summary for the changes to the balance sheet is shown in Appendix T.

The first scenario of moderately lower commodity prices models made changes in agricultural loans fixed, agricultural loans variable, taxable securities, demand deposits, now accounts and money market accounts. If commodity prices are moderately lower then farm customers are expected to borrow more money to finance their farming operation. Lower prices are expected to result also in lower deposits from farm customers. This change in assets (loans) and liabilities (deposits) of the bank will cause the bank to invest in fewer other types of assets, therefore the reduction in taxable securities. Table 4.9 shows the base line values, the values used for the moderately low commodity prices scenario, and the change.

**Table 4.9 Balance sheet account values used in scenario manager. Historical mean values, expected values with moderately low commodity prices and the change from the mean.**

Balance Sheet Account	Current Values	Moderately Low Commodity Prices	Change
Ag_Loans_Fixed	4,261,984	8,261,984	4,000,000
Ag_Loans_Variable	5,691,081	10,691,081	5,000,000
Taxable_Securities	24,353,142	15,353,142	(9,000,000)
Demand_Deposits	4,691,641	2,891,641	(1,800,000)
Now_Accounts	7,516,319	3,916,319	(3,600,000)
MMA_Accounts	8,804,333	5,204,333	(3,600,000)
Certificates_of_Deposit	17,550,211	17,550,211	0

The second scenario of very low commodity prices makes larger changes to the balance sheet accounts. If commodity prices are very low then farm customers are expected to borrow even more to sustain their farming operation. Deposits would also be expected to

decrease further. This scenario also includes the expectation that the lower deposits will also affect balances in certificates of deposit. These expected changes in the bank's assets and liabilities will cause the bank to invest even less in other assets such as taxable securities. Table 4.10 shows the base line values, the values used for the very low commodity prices scenario, and the change.

**Table 4.10 Balance sheet account values used in scenario manager. Historical mean values, expected values with very low commodity prices and the change from the mean.**

Balance Sheet Account	Current Values	Very Low Commodity Prices	Change
Ag_Loans_Fixed	4,261,984	12,261,984	8,000,000
Ag_Loans_Variable	5,691,081	15,691,080	9,999,999
Taxable_Securities	24,353,142	6,353,142	(18,000,000)
Demand_Deposits	4,691,641	2,891,640	(1,800,001)
Now_Accounts	7,516,319	3,916,319	(3,600,000)
MMA_Accounts	8,804,333	5,204,333	(3,600,000)
Certificates_of_Deposit	17,550,211	8,550,210	(9,000,001)

The third scenario of moderately higher commodity prices models changes in the bank's balance sheet accounts opposite of the first two scenarios. If farm customers enjoy higher commodity prices they are expected to borrow less and have more funds to deposit. The bank will then invest more in other assets such as taxable securities. Table 4.11 shows the base line values, the values used for the moderately higher commodity prices scenario, and the change.

**Table 4.11 Balance sheet account values used in scenario manager. Historical mean values, expected values with moderately higher commodity prices and change from the mean.**

Balance Sheet Account	Current Values	Moderately Higher Commodity Prices	Change
Ag_Loans_Fixed	4,261,984	2,261,984	(2,000,000)
Ag_Loans_Variable	5,691,081	3,191,081	(2,500,000)
Taxable_Securities	24,353,142	28,853,142	4,500,000
Demand_Deposits	4,691,641	5,591,640	899,999
Now_Accounts	7,516,319	9,316,318	1,799,999
MMA_Accounts	8,804,333	10,604,333	1,800,000
Certificates_of_Deposit	17,550,211	17,550,210	(1)

#### **4.10 Scenario Manager and Interest Rates**

The scenario manager model focusing on interest rate changes was designed to model shocks of rapidly increasing interest rates to the bank. Balance sheet accounts were held constant at the mean of the data set. The current values for interest rates were the mean interest rates for the data set. Three scenarios were modeled, low rate, up 2% rate shock and up 4% rate shock. The scenario summary for the changes to interest rates is shown in Appendix U.

The first scenario of low rate used the portfolio rates of the bank as of December 2013. That is the interest rate environment the bank experienced at that particular point in time. The low portfolio rates from December 2013 are shown in Table 4.12.

**Table 4.12 Portfolio interest rates in December 2013, low rate environment.**

<u>Balance Sheet Account</u>	<u>Low Rate</u>
Ag_Loans_Fixed_Rate	5.14%
Ag_Loans_Variable_Rate	5.57%
Real_Estate_Loans_Rate	5.16%
All_Other_Loans_Rate	4.77%
Taxable_Securities_Rate	1.40%
Tax_Free_Securities_Rate	2.88%
Mutual_Funds_Rate	1.76%
Fed_Funds_Sold_Rate	0.22%
NOW_Accounts_Rate	0.02%
Savings_Accounts_Rate	0.98%
MMA_Accounts_Rate	0.21%
COD_Rate	0.40%
IRA_Accounts_Rate	0.29%
Comm._Repo_Rate	0.13%
Retail_Repo_Rate	0.43%
Borrowed_Short_Term_Rate	0.21%
Borrowed_Long_Term_Rate	3.98%
Fed_Funds_Purchased_Rate	0.76%

The up 2% rate shock models the expected change to portfolio rates if national interest rates markets, such as the fed funds rate, were to increase by 2% in an immediate shock. Asset and liability accounts have differing maturity and re-pricing structures. In addition, the local market for some asset and liability accounts adjusts faster to changes in national markets than others. The expected differences of these changes were taken into account with the model. Some rates were expected to fully reflect the change in the national markets. Other rates reflect slower responses in varying degrees. This model is the expected change in the first year of the interest rate shock.

Table 4.13 shows the December 2013 low portfolio rates, the portfolio rates expected in one year as a result of a 2% rate shock and the change from the low rate scenario. In both scenarios in which rates increase, some activity such as originating new



fixed rate long term loans would be reduced or curtailed. Therefore the lack of new volume at higher rates would prevent the portfolio average from increasing in these asset accounts. More variable rates loans would be made and the rate for these loans should change more in line with changes in interest rate. The changes in portfolio rates for the various securities accounts would be dependent upon the speed that securities in the portfolio reached their contractual maturity date and be replaced. Most deposit accounts are either variable rate or shorter term maturity and would re-price more in step as interest rates change.

**Table 4.13 Portfolio interest rates in low rate environment, up 2% rate shock and change from low rate.**

Balance Sheet Account	Low Rate	Up 2% Rate Shock	Change
Ag_Loans_Fixed_Rate	5.14%	6.14%	1.00%
Ag_Loans_Variable_Rate	5.57%	7.07%	1.50%
Real_Estate_Loans_Rate	5.16%	5.56%	0.40%
All_Other_Loans_Rate	4.77%	5.77%	1.00%
Taxable_Securities_Rate	1.40%	2.90%	1.50%
Tax_Free_Securities_Rate	2.88%	3.88%	1.00%
Mutual_Funds_Rate	1.76%	3.25%	1.49%
Fed_Funds_Sold_Rate	0.22%	2.22%	2.00%
NOW_Accounts_Rate	0.02%	2.02%	2.00%
Savings_Accounts_Rate	0.98%	2.98%	2.00%
MMA_Accounts_Rate	0.21%	2.21%	2.00%
COD_Rate	0.40%	2.15%	1.75%
IRA_Accounts_Rate	0.29%	2.29%	2.00%
Comm._Repo_Rate	0.13%	2.13%	2.00%
Retail_Repo_Rate	0.43%	2.18%	1.75%
Borrowed_Short_Term_Rate	0.21%	2.21%	2.00%
Borrowed_Long_Term_Rate	3.98%	3.00%	-0.98%
Fed_Funds_Purchased_Rate	0.76%	2.76%	2.00%

The third scenario of up 4% rate shock is the expected change in rates if rates continue to increase for the second year. This scenario forecasts more dramatic changes that would be expected from a more severe and prolonged interest rate shock. Many of the

asset and liability accounts reflect the entire 4% rate increase. These are accounts that are variable rate and typically more in tandem with national interest rate markets. The accounts that do not reflect the entire 4% rate shock are accounts that either have longer maturity structures or re-pricing characteristics or are such that competitive pressures typically prevent changing rates in lock step with national interest rate markets. Table 4.14 shows the December 2013 low portfolio rates, the portfolio rates expected in the second year as a result of a 4% rate shock and the change from the low rate scenario.

**Table 4.14 Portfolio interest rates in low rate environment, up 4% rate shock and change from low rate.**

Balance Sheet Account	Low Rate	Up 4% Rate Shock	Change
Ag_Loans_Fixed_Rate	5.14%	8.14%	3.00%
Ag_Loans_Variable_Rate	5.57%	9.07%	3.50%
Real_Estate_Loans_Rate	5.16%	6.16%	1.00%
All_Other_Loans_Rate	4.77%	7.77%	3.00%
Taxable_Securities_Rate	1.40%	4.90%	3.50%
Tax_Free_Securities_Rate	2.88%	4.88%	2.00%
Mutual_Funds_Rate	1.76%	4.75%	2.99%
Fed_Funds_Sold_Rate	0.22%	4.22%	4.00%
NOW_Accounts_Rate	0.02%	2.02%	2.00%
Savings_Accounts_Rate	0.98%	3.98%	3.00%
MMA_Accounts_Rate	0.21%	4.21%	4.00%
COD_Rate	0.40%	3.90%	3.50%
IRA_Accounts_Rate	0.29%	4.29%	4.00%
Comm._Repo_Rate	0.13%	4.13%	4.00%
Retail_Repo_Rate	0.43%	3.93%	3.50%
Borrowed_Short_Term_Rate	0.21%	4.21%	4.00%
Borrowed_Long_Term_Rate	3.98%	4.50%	0.52%
Fed_Funds_Purchased_Rate	0.76%	4.76%	4.00%

## **CHAPTER V: RESULTS**

### **5.1 Data Table Results**

The data table results were used to determine the probability that an unacceptable result would occur. Any result that is negative is unacceptable. Negative net income would erode capital and prevent the distribution of any dividend. Consecutive years of negative net income could threaten the viability of the bank remaining independent. Consecutive years of negative net income could also threaten the solvency of the bank.

Any result that is less than \$400,000 of net income is cause for concern and considered undesirable. This level of net income is necessary at a minimum to support the dividend payment typically made to the shareholders. This level of income is also necessary to provide a very minimal plowback of earnings to increase capital for growth. Results below \$400,000, and still positive, are clearly undesirable as they would prevent distribution of the normal dividend if those types of results occurred in consecutive years.

With the present low interest rate environment and the low level of loans to assets, there are results generated that are determined to be unrealistic. Unrealistic results are defined as any result of greater than \$1,000,000 of net income.

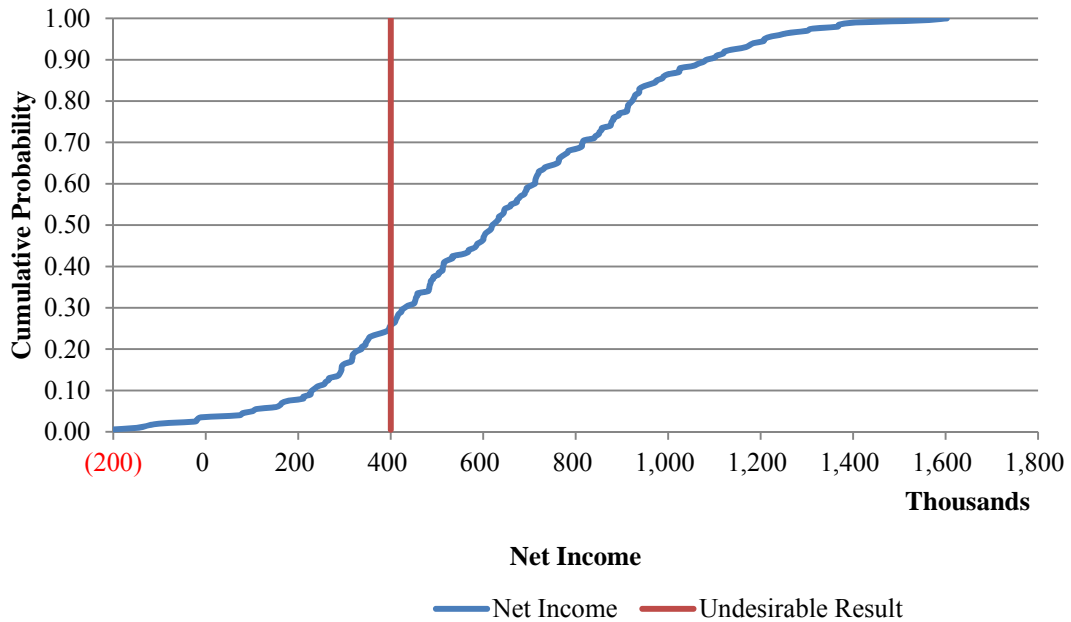
### **5.2 Interest Rates Modeled**

Three models of differing six month United States Treasury bill rates using data table were calculated. The rates were the current level of interest rate at 0.10% and then two higher rates of 2.0% and 4.0%. This is intended as a simulation of possibilities at higher interest levels. The model could be used to simulate rates between these examples as well as higher rates.

The cumulative distribution function shown in Figure 5.1 illustrates the range of results of the 200 calculations. The 0.10% interest rate calculation produced a result that

has a 3.5% probability of being unacceptable as these results are negative. There is a 22.0% probability of being in the undesirable range of positive but less than \$400,000 net income. The results that produced unacceptable or undesirable results were generally characterized by balance sheet values of less total assets and less loans in relation to total assets. Interest rates were generally lower for asset accounts and higher for liability accounts. Loan losses were also generally higher for the less than acceptable results. The complete results are shown in Appendix V.

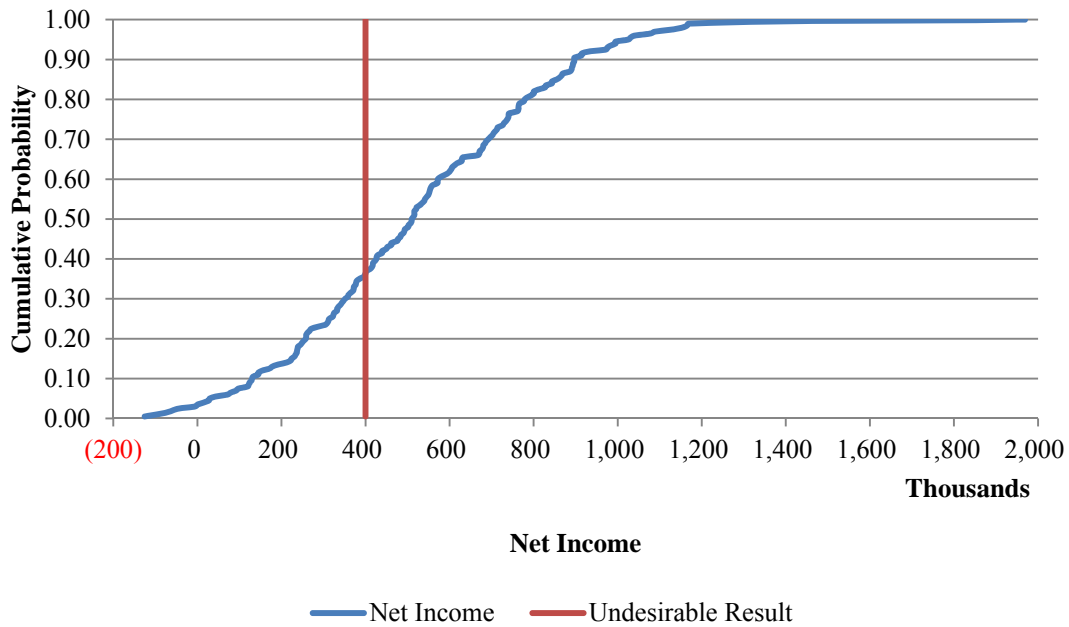
**Figure 5.1 Cumulative Distribution Function of Net Income with a 0.10% United States Treasury Bill Rate.**



The 2.0% interest rate calculation produced a result that has a 3.0% probability of being negative and unacceptable. There is a 33.0% probability of being in the undesirable range of positive but less than \$400,000 net income. All three models were consistent in factors that contributed to less than acceptable results. Low asset base and a low concentration of the higher yielding loans do not generate sufficient income to adequately

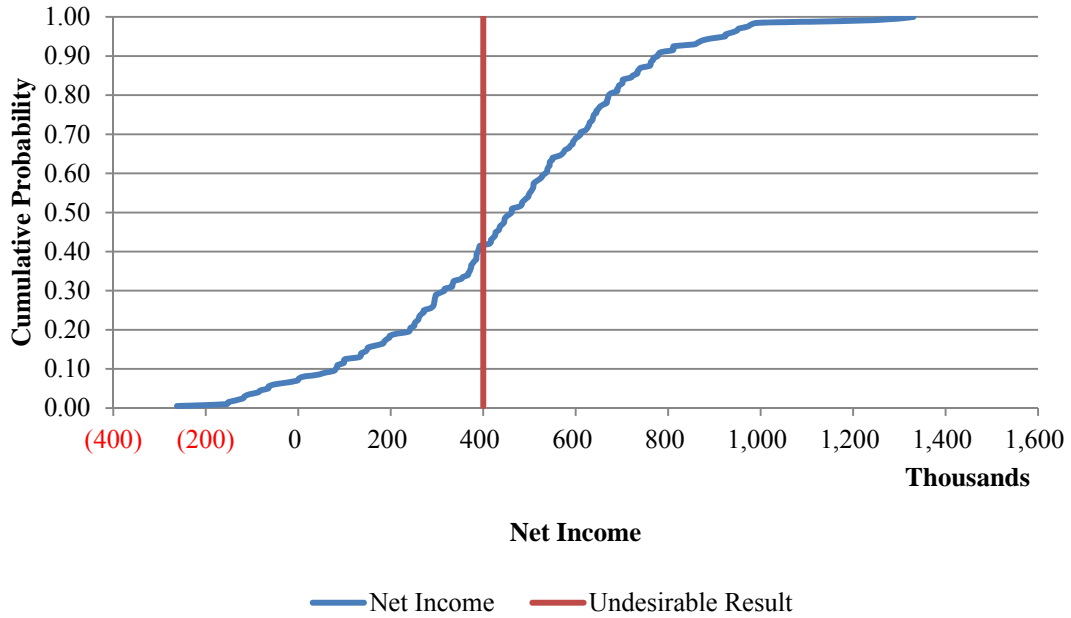
cover overhead costs as represented by non-interest expense. Also the relationship of interest rates on assets to liabilities is a flat yield curve which makes profitability difficult. The results of the 2% six month United States Treasury Bill rates are shown in Table 5.2. The complete results are shown in Appendix W.

**Figure 5.2 Cumulative Distribution Function of Net Income with a 2.0% United States Treasury Bill Rate.**



The 4.0% interest rate calculation produced a result that has a 7.0% probability of being negative which is unacceptable. There is a 41.5% probability of being in the undesirable range of positive but less than \$400,000 net income. The range of outcomes is wider as higher six month United States Treasury Bill rates are modeled. The normal distribution of interest rates is wider and there is a higher likelihood of the model producing a range of asset and liability rates that result in a flat yield curve. The results of the 4.0% six month United States Treasury Bill rate is shown in Table 5.3. The complete results are shown in Appendix Y.

**Figure 5.3 Cumulative Distribution Function of Net Income With a 4.0% United States Six Month Treasury Rate.**



**5.3 Scenario Manager Balance Sheet Model Results.**

The scenario summary for the changes to the balance sheet is shown in Appendix T. Moderately low commodity prices are expected to increase loan demand from farm customers. Assets of the bank are shifted away from securities into loans. The lower commodity prices are expected to result in lower deposits from farm customers. Loans have a higher interest rate than securities. Higher net income will result as assets of the bank are shifted to loans.

Table 5.1 shows the results of the expected change in the balance sheet accounts. Net income is projected to increase \$383,987 which is significant and desirable for the bank. The bank has adequate capacity for the additional loan volume from the baseline starting mean values. If the bank gets to the position of a higher loan to deposit baseline, the model could be used also to analyze bank capital levels.

**Table 5.1 Results from scenario manager. Effect on balance sheet accounts and performance measurements from expected changes of moderately low commodity prices.**

Balance Sheet Account	Current Values	Moderately Low Commodity Prices	Change
Total_Assets	62,830,541	62,830,541	0
Total_Capital	8,216,554	8,600,542	383,987
Capital_to_Assets	13.08%	15.86%	2.79%
Net_Income	555,904	939,891	383,987
Return_on_Equity	6.77%	10.93%	4.16%
Return_on_Assets	0.88%	1.73%	0.85%

Much lower commodity prices are expected to cause even more loan demand from farm customers. A larger shift from securities to loans was projected. Deposits were also expected to decline because of very low commodity prices.

Table 5.2 shows this model projects a net income of \$1,471,372 which is an even larger gain in net income of \$915,468 for the bank. As in the first example, the baseline mean values of loans used for the starting point are low enough that the bank has capacity to handle this shift in assets. Capital is also adequate. This model did not adjust the level of loan losses. The model could be used in the same manner to evaluate higher loan losses as a result of very low commodity prices. Higher loan losses would off-set the gain from higher interest rates of loans as compared to securities.

**Table 5.2 Results from scenario manager. Effect on balance sheet accounts and performance measurements expected from expected changes of very low commodity prices.**

Balance Sheet Account	Current Values	Very Low Commodity Prices	Change
Total_Assets	62,830,541	62,830,540	(1)
Total_Capital	8,216,554	9,132,023	915,468
Capital_to_Assets	13.08%	19.96%	6.89%
Net_Income	555,904	1,471,372	915,468
Return_on_Equity	6.77%	16.11%	9.35%
Return_on_Assets	0.88%	3.22%	2.33%

Moderately higher commodity prices are expected to lower loan demand from farmers. The bank would shift assets into securities. Also deposits would increase.

The opposite effect of the first two models would be the result. Table 5.3 shows that as the bank has a lower investment in loans, income would decrease to \$363,911, a decrease in net income of \$191,994 for the bank.

**Table 5.3 Results from scenario manager. Effects on balance sheet accounts and performance measurements expected from expected changes of moderately higher commodity prices.**

Balance Sheet Account	Current Values	Moderately Higher Commodity Prices	Change
Total_Assets	62,830,541	62,830,541	0
Total_Capital	8,216,554	8,024,561	(191,994)
Capital_to_Assets	13.08%	11.95%	-1.13%
Net_Income	555,904	363,911	(191,994)
Return_on_Equity	6.77%	4.53%	-2.23%
Return_on_Assets	0.88%	0.54%	-0.34%

#### 5.4 Scenario Manager Interest Rates Results

Scenario manager was also used to model changes in interest rates. The models calculated were the present low interest rate environment of mean portfolio rates in December 2013. The scenario summary for the changes to interest rates is shown in



Appendix U. From these values a simulated interest rate shock was modeled. In the first year interest rates increased 2.0%. In the second year interest rates increased an additional 2.0% for a total interest rate shock of 4%.

The present low rate interest rate environment produces the following results in Table 5.4.

**Table 5.4 Results from scenario manager. Balance sheet accounts and performance measurements with portfolio interest rates in December 2013, low rate environment.**

<u>Balance Sheet Account</u>	<u>Low Rate</u>
Total_Assets	62,830,541
Total_Capital	8,055,269
Capital_to_Assets	12.85%
Net_Income	394,618
Return_on_Equity	4.90%
Return_on_Assets	0.63%

If an interest rate shock of 2% happened, various portfolio interest rates would change in differing amounts. Some interest rates that are closely related to national interest rate markets and are also variable rate would change immediately. These would include Fed Funds Sold, NOW Accounts, Savings Accounts and MMA Accounts, IRA Accounts, Commercial Repo Accounts, Borrowed Short Term and Fed Funds Purchased. Other rates are balance sheet accounts that are less sensitive to changes in national interest rates and are fixed maturity.

Table 5.5 shows the change in the first year of a 2% rate shock. As interest rates increase by 2% in the first year net income is projected to decrease to \$135,840 a decrease of \$258,778. The bank is liability sensitive so rates on deposits increase faster than rates on assets.

**Table 5.5 Results from scenario manager. Balance sheet accounts and performance measurements expected from up 2% rate shock and change from low rate.**

Balance Sheet Account	Low Rate	Up 2% Rate Shock	Change
Total_Assets	62,830,541	62,830,541	0.00%
Total_Capital	8,055,269	7,796,490	(258,778)
Capital_to_Assets	12.85%	12.49%	-0.36%
Net_Income	394,618	135,840	(258,778)
Return_on_Equity	4.90%	1.74%	-3.16%
Return_on_Assets	0.63%	0.22%	-0.41%

As the rate shock continues into the second year, some asset and liability accounts would continue to increase and reflect the change in national rates. Other rates would increase at a faster pace while some rates would top out and not fully reflect the full 4% shock.

The second year of a 2.0% rate shock is projected to lower income by \$118,040 to \$276,578 as shown in Table 5.6. The model indicates the bank is still liability sensitive but to a less degree than the initial shock of 2% in the first year.

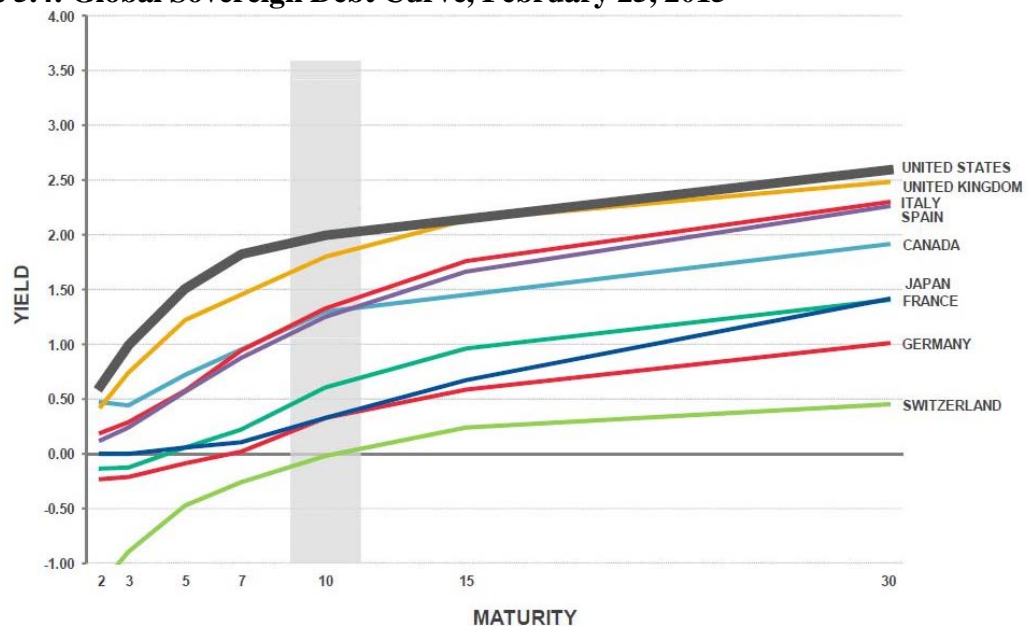
**Table 5.6 Results from scenario manager. Balance sheet accounts and performance measurements expected from up 4% rate shock and change from low rate.**

Balance Sheet Account	Low Rate	Up 4% Rate Shock	Change
Total_Assets	62,830,541	62,830,541	0.00%
Total_Capital	8,055,269	7,937,229	(118,040)
Capital_to_Assets	12.85%	12.69%	-0.16%
Net_Income	394,618	276,578	(118,040)
Return_on_Equity	4.90%	3.48%	-1.41%
Return_on_Assets	0.63%	0.44%	-0.19%

These models that change only the interest rates keep the balance sheet static since the values of the balance sheet accounts are constant. Regulators demand a static analysis so that growth projections do not hide the effects of changing interest rates. This model meets this requirement.

This model could be used to project various scenarios of changing rates. Falling rates are also a risk and could be modeled. Even though rates are very low, it is possible rates could fall further. Very short term rates could remain near zero while the yield curve flattens from falling long term interest rates. Negative interest rates in the United States have been extremely unusual and limited to very short term rates. Rates in some European countries and Japan have been negative and rates have been negative for sovereign debt with maturities of several years.

**Figure 5.4: Global Sovereign Debt Curve, February 25, 2015**



Source: Bloomberg

Other risk factors such as different levels of loan losses could be modeled to quantify that risk under different assumptions. Non-interest income and expense could also be modeled. This model is very flexible and allows the user to quickly and easily analyze changes in balance sheet composition, changes in interest rates, as well as changes in other profitability factors such as non-interest income, non-interest expense and loan loss assumptions.

## CHAPTER VI: CONCLUSION

This model is a useful tool for the bank. The model accomplishes the objective of being easy to use to project different what if scenarios so that risk to net income can be quantified. It can also identify a range of likely outcomes and the probability of occurrence that some of these outcomes would yield an unacceptable result. Identifying the cause of the unacceptable result will enable bank management to develop and implement strategies to mitigate the risk of unacceptable results.

These models are adequate for the bank due to the size of the bank, type of bank and community, risk profile and tolerance, lack of complexity in loan and investment products, current liquidity and capital levels.

This model could also be used as a training tool for bank staff as well as members of the board of directors. A base line model and assumptions could be provided as the starting point. The individual being trained would then be able to make changes to balance sheet or interest rate assumptions or forecasts and then view the calculated results.

Areas for improvement include developing a more efficient download of historical data from the bank's core processing platform. The Excel spreadsheets could be simplified and refined for ease of use and aesthetic appeal.

The concept of data table and cumulative distribution functions would need to be explained. It might be difficult to explain the theory and all of the "moving parts" for this type of simulation analysis.

There are limitations of these models. These models do not include the actual maturity of all of the components of the balance sheet asset or liability accounts. Some assets such as variable rate agricultural loans have rates that are variable and can be

changed quickly. However, many assets have maturities that are months, if not years into the future. All of these also have differing interest rates. If interest rates are falling for an extended period of time, it is possible that higher rate assets that have been on the books for some time will mature earlier and re-price more rapidly. This model does not quantify the actual maturity amounts and rates, it only provides for an “educated guess” on what the effect might be.

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## APPENDIX A

CDF Model			
Random Data			
	Balance	Rate	Income
Ag Loans Fixed	=NORMINV(RAND()),Loans!B130,Loans!B131)	=NORMINV(RAND()),'Rate on Loans'!B130,'Rate on Loans'!B131)	=B4*C4
Ag Loans Variable	=NORMINV(RAND()),Loans!C130,Loans!C131)	=NORMINV(RAND()),'Rate on Loans'!C130,'Rate on Loans'!C131)	=B5*C5
Real Estate Loans	=NORMINV(RAND()),Loans!G130,Loans!G131)	=NORMINV(RAND()),'Rate on Loans'!G130,'Rate on Loans'!G131)	=B6*C6
All Other Loans	=NORMINV(RAND()),Loans!K130,Loans!K131)	=NORMINV(RAND()),'Rate on Loans'!K130,'Rate on Loans'!K131)	=B7*C7
Taxable Securities	=NORMINV(RAND()),Securities!L130,Securities!L131)	=NORMINV(RAND()),'Rate on Sec.'!L129,'Rate on Sec.'!L130)	=B10*C10
Tax Free Securities	=NORMINV(RAND()),Securities!M130,Securities!M131)	=NORMINV(RAND()),'Rate on Sec.'!M129,'Rate on Sec.'!M130)	=B11*C11
Mutual Funds	=NORMINV(RAND()),Securities!N130,Securities!N131)	=NORMINV(RAND()),'Rate on Sec.'!N129,'Rate on Sec.'!N130)	=B12*C12
Unrealized Gain (Loss)	=NORMINV(RAND()),Securities!Q130,Securities!Q131)	0	=B13*C13
Fed Funds Sold	=NORMINV(RAND()),Securities!O130,Securities!O131)	=NORMINV(RAND()),'Rate on Sec.'!O129,'Rate on Sec.'!O130)	=B14*C14
Non Earning Assets	4500000	0	=B16*C16
Total Assets	=SUM(B4:B16)	=SUMPRODUCT(B4:B16,C4:C16)/B18	=SUM(D4:D16)
	Balance	Rate	Expense
Demand Deposits	=NORMINV(RAND()),Deposits!B128,Deposits!B129)	0	=B21*C21
NOW Accounts	=NORMINV(RAND()),Deposits!C128,Deposits!C129)	=NORMINV(RAND()),'Rate on Deposits'!B129,'Rate on Deposits'!B130)	=B22*C22
Savings Accounts	=NORMINV(RAND()),Deposits!D128,Deposits!D129)	=NORMINV(RAND()),'Rate on Deposits'!C129,'Rate on Deposits'!C130)	=B23*C23
MMA	=NORMINV(RAND()),Deposits!E128,Deposits!E129)	=NORMINV(RAND()),'Rate on Deposits'!D129,'Rate on Deposits'!D130)	=B24*C24
Certificates of Deposit	=NORMINV(RAND()),Deposits!J128,Deposits!J129)	=NORMINV(RAND()),'Rate on Deposits'!I129,'Rate on Deposits'!I130)	=B25*C25
IRA Accounts	=NORMINV(RAND()),Deposits!K128,Deposits!K129)	=NORMINV(RAND()),'Rate on Deposits'!J129,'Rate on Deposits'!J130)	=B26*C26
Comm. Repo	=NORMINV(RAND()),'Other Liab.'!B130,'Other Liab.'!B131)	=NORMINV(RAND()),'Rate on Other Liab.'!B129,'Rate on Other Liab.'!B130)	=B27*C27
Retail Repo	=NORMINV(RAND()),'Other Liab.'!C130,'Other Liab.'!C131)	=NORMINV(RAND()),'Rate on Other Liab.'!C129,'Rate on Other Liab.'!C130)	=B28*C28
Borrowed Short Term	=NORMINV(RAND()),'Other Liab.'!D130,'Other Liab.'!D131)	=NORMINV(RAND()),'Rate on Other Liab.'!D129,'Rate on Other Liab.'!D130)	=B29*C29
Borrowed Long Term	=NORMINV(RAND()),'Other Liab.'!E130,'Other Liab.'!E131)	=NORMINV(RAND()),'Rate on Other Liab.'!E129,'Rate on Other Liab.'!E130)	=B30*C30
Fed Funds Purchased	=NORMINV(RAND()),'Other Liab.'!F130,'Other Liab.'!F131)	=NORMINV(RAND()),'Rate on Other Liab.'!G129,'Rate on Other Liab.'!G130)	=B31*C31
Total Liabilities	=SUM(B21:B30)	=SUMPRODUCT(B21:B30,C21:C30)/B32	=SUM(D21:D31)
Capital	=Capital!B130		
Surplus	5100000		
Undivided Profits	=NORMINV(RAND()),Capital!D130,Capital!D131)		
Unrealized Gain (Loss)	=B13		
Net Income	=D46		
Total Capital	=SUM(B34:B38)	=D46/B39	ROE
Total Liabilities and Capital	=B32+B39	=D46/B40	ROA
Non-Interest Income			240000
Non-Interest Expense			1500000
Net Loan Losses			=NORMINV(RAND()),Capital!J17,Capital!J18)
Net Income			=D18-D32+D42-D43-D44

## APPENDIX B

	A	B	C	D	E	F	G	H	I	J	K	L	M
1	Example Data Table Spreadsheet				Data Table								
2						Cumulative	Interest		Total		Interest		
3	Income Statement				Probability	Probability	Total Assets	Rate	Income	Liabilities	Rate	Expense	Net Income
4							\$ 483,463	5.65%	\$ 27,319	\$ 390,329	1.86%	\$ 7,255	\$ 20,064
5	Total Assets	\$483,463			0.20	0.20	\$ 464,238	6.08%	\$ 28,217	\$ 414,095	1.55%	\$ 6,429	\$ 21,788
6	Interest Rate	5.65%			0.20	0.40	\$ 480,993	5.57%	\$ 26,774	\$ 374,830	1.20%	\$ 4,510	\$ 22,264
7	Income		\$ 27,319		0.20	0.60	\$ 570,976	7.69%	\$ 43,919	\$ 381,809	2.60%	\$ 9,919	\$ 33,999
8	Total Liabilities	\$390,329			0.20	0.80	\$ 534,696	6.09%	\$ 32,554	\$ 414,854	1.80%	\$ 7,469	\$ 25,085
9	Interest Rate	1.86%			0.20	1.00	\$ 467,379	5.23%	\$ 24,437	\$ 410,686	1.71%	\$ 7,013	\$ 17,423
10	Expense		\$ 7,255										
11	Net Income		\$ 20,064										



## APPENDIX C

Ag Loans Fixed  
SUMMARY OUTPUT

<i>Regression Statistics</i>	
Multiple R	0.73772874
R Square	0.54424370
Adjusted R Square	0.54038136
Standard Error	0.00690795
Observations	120

<i>ANOVA</i>					
	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>
Regression	1	0.006724226	0.00672422	140.910301	7.23485E-22
Residual	118	0.005630949	4.77199E-05		
Total	119	0.012355175			

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>	<i>Lower 95.0%</i>	<i>Upper 95.0%</i>
Intercept	0.06197238	0.000851206	72.8054256	6.4765E-100	0.06028677	0.06365800	0.06028677	0.06365800
T-bill	0.39542792	0.033311636	11.8705645	7.23485E-22	0.32946182	0.46139403	0.32946182	0.46139403

## APPENDIX D

Ag Loans  
Variable  
SUMMARY OUTPUT

<i>Regression Statistics</i>	
Multiple R	0.94445733
R Square	0.89199965
Adjusted R Square	0.89108439
Standard Error	0.00516692
Observations	120

### ANOVA

	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>
Regression	1	0.026018715	0.02601871	974.589085	7.27015E-59
Residual	118	0.003150259	2.66971E-05		
Total	119	0.029168975			

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>	<i>Lower 95.0%</i>	<i>Upper 95.0%</i>
Intercept	0.05077937	0.000636674	79.7573086	1.6989E-104	0.04951858	0.05204016	0.04951858	0.05204016
T-bill	0.77783792	0.024916001	31.2184093	7.27015E-59	0.72849745	0.82717838	0.72849745	0.82717838

## APPENDIX E

Real Estate  
Loans  
SUMMARY OUTPUT

<i>Regression Statistics</i>	
Multiple R	0.76179939
R Square	0.58033832
Adjusted R Square	0.57678186
Standard Error	0.00363523
Observations	120

### ANOVA

	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>
Regression	1	0.002156403	0.00215640	163.178879	5.39161E-24
Residual	118	0.001559366	1.3215E-05		
Total	119	0.003715769			

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>	<i>Lower 95.0%</i>	<i>Upper 95.0%</i>
Intercept	0.06026462	0.000447938	134.537939	5.4616E-131	0.05937758	0.06115166	0.05937758	0.06115166
T-bill	0.22392941	0.017529889	12.7741488	5.39161E-24	0.18921545	0.25864336	0.18921545	0.25864336

## APPENDIX F

All Other Loans  
SUMMARY OUTPUT

<i>Regression Statistics</i>	
Multiple R	0.84645650
R Square	0.71648861
Adjusted R Square	0.71408597
Standard Error	0.00523086
Observations	120

### ANOVA

	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>
Regression	1	0.008159583	0.00815958	298.209034	4.34224E-34
Residual	118	0.003228711	2.7362E-05		
Total	119	0.011388294			

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>	<i>Lower 95.0%</i>	<i>Upper 95.0%</i>
Intercept	0.05943373	0.000644552	92.2093022	8.1749E-112	0.05815734	0.06071012	0.05815734	0.06071012
T-bill	0.43559227	0.025224338	17.2687299	4.34224E-34	0.38564122	0.48554333	0.38564122	0.48554333

## APPENDIX G

Taxable  
Securities  
SUMMARY OUTPUT

<i>Regression Statistics</i>	
Multiple R	0.72664884
R Square	0.52801854
Adjusted R Square	0.52401870
Standard Error	0.00729805
Observations	120

ANOVA					<i>Significance F</i>
	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>F</i>
Regression	1	0.007031061	0.00703106	132.009824	5.78292E-21
Residual	118	0.006284874	5.32616E-05		
Total	119	0.013315935			

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>	<i>Lower 95.0%</i>	<i>Upper 95.0%</i>
Intercept	0.02379811	0.000899274	26.4636973	1.89072E-51	0.02201730	0.02557892	0.02201730	0.02557892
T-bill	0.40434922	0.035192773	11.4895528	5.78292E-21	0.33465795	0.47404049	0.33465795	0.47404049

## APPENDIX H

Tax Free Securities  
SUMMARY OUTPUT

<i>Regression Statistics</i>	
Multiple R	0.34198277
R Square	0.11695221
Adjusted R Square	0.10946876
Standard Error	0.00249381
Observations	120

### ANOVA

	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>
Regression	1	9.71931E-05	9.71931E-05	15.6281029	0.00013186
Residual	118	0.000733857	6.21912E-06		
Total	119	0.00083105			

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>	<i>Lower 95.0%</i>	<i>Upper 95.0%</i>
Intercept	0.03218513	0.000307291	104.738401	2.8957E-118	0.03157661	0.03279364	0.03157661	0.03279364
T-bill	0.04754052	0.012025712	3.95323955	0.00013186	0.02372633	0.07135470	0.02372633	0.07135470

**APPENDIX I**

Fed Funds Sold  
SUMMARY OUTPUT

<i>Regression Statistics</i>	
	0.91887024
Multiple R	6
	0.84432252
R Square	8
Adjusted R Square	0.84249102
	9
	0.00622170
Standard Error	7
Observations	87

**ANOVA**

	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>
			0.01784516	461.000645	
Regression	1	0.017845166	6	2	4.37904E-36
Residual	85	0.003290319	3.87096E-05		
Total	86	0.021135485			

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>	<i>Lower 95.0%</i>	<i>Upper 95.0%</i>
	0.00524636				0.00351109	0.00698163	0.00351109	0.00698163
Intercept	2	0.000872755	6.01126355	4.45523E-08	1	4	1	4
	0.83056287		21.4709255		0.75365042	0.90747532	0.75365042	0.90747532
T-bill	3	0.038683142	8	4.37904E-36	2	4	2	4

## APPENDIX J

NOW Accounts  
SUMMARY OUTPUT

<i>Regression Statistics</i>	
	0.74768752
Multiple R	7
	0.55903663
R Square	8
Adjusted R Square	0.55529966
	0.00172757
Standard Error	6
Observations	120

### ANOVA

	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>
Regression	1	0.000446472	0.00044647	149.595927	1.01929E-22
Residual	118	0.000352173	2.98452E-06		
Total	119	0.000798645			

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>	<i>Lower 95.0%</i>	<i>Upper 95.0%</i>
Intercept	0.00240484	0.000212874	11.2970704	1.65594E-20	0.0019833	0.00282639	0.0019833	0.00282639
T-bill	0.10189271	0.008330734	12.2309414	1.01929E-22	0.08539559	0.11838984	0.08539559	0.11838984



## APPENDIX K

Savings Accounts  
SUMMARY OUTPUT

<i>Regression Statistics</i>	
	0.76509400
Multiple R	5
	0.58536883
R Square	6
Adjusted R	0.58185501
Square	2
	0.00199394
Standard Error	3
Observations	120

### ANOVA

	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>
			0.00066233	166.590282	
Regression	1	0.000662331	1	1	2.63567E-24
Residual	118	0.000469146	3.97581E-06		
Total	119	0.001131477			

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>	<i>Lower 95.0%</i>	<i>Upper 95.0%</i>
	0.00338288		13.7686078		0.00289634	0.00386943	0.00289634	0.00386943
Intercept	8	0.000245696	3	2.62968E-26	3	2	3	2
	0.12410345		12.9069857		0.10506270	0.14314419	0.10506270	0.14314419
T-bill	3	0.009615216	9	2.63567E-24	8	8	8	8

## APPENDIX L

MMA Accounts  
SUMMARY OUTPUT

<i>Regression Statistics</i>	
Multiple R	0.81704555
R Square	0.66756343
Adjusted R Square	0.66474617
Standard Error	0.00616397
Observations	120

### ANOVA

	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>
Regression	1	0.009003009	0.00900300	236.954940	5.39345E-30
Residual	118	0.004483363	3.79946E-05		
Total	119	0.013486373			

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>	<i>Lower 95.0%</i>	<i>Upper 95.0%</i>
Intercept	0.00603339	0.000759531	7.94357012	1.29212E-12	0.00452931	0.00753746	0.00452931	0.00753746
T-bill	0.45755155	0.029723993	15.3933407	5.39345E-30	0.39868995	0.51641315	0.39868995	0.51641315

## APPENDIX M

Certificates of Deposit  
SUMMARY OUTPUT

<i>Regression Statistics</i>	
	0.80939361
Multiple R	9
R Square	0.65511803
Adjusted R Square	0.65219530
	1
	0.00785959
Standard Error	1
Observations	120

ANOVA					
	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>
			0.01384621	224.146039	
Regression	1	0.013846211	1	1	4.75985E-29
Residual	118	0.007289234	6.17732E-05		
Total	119	0.021135445			

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>	<i>Lower 95.0%</i>	<i>Upper 95.0%</i>
	0.01386532		14.3167864		0.01194750	0.01578315	0.01194750	0.01578315
Intercept	9	0.000968467	1	1.45276E-27	2	7	2	7
	0.56742916		14.9715075		0.49237565	0.64248268	0.49237565	0.64248268
T-bill	9	0.037900603	8	4.75985E-29	6	2	6	2

## APPENDIX N

IRA Accounts  
SUMMARY OUTPUT

<i>Regression Statistics</i>	
	0.85774732
Multiple R	6
	0.73573047
R Square	6
Adjusted R Square	0.73349090
	4
	0.00690781
Standard Error	5
Observations	120

### ANOVA

	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>
			0.01567599	328.513840	
Regression	1	0.015675995	5	1	6.77964E-36
Residual	118	0.005630714	4.77179E-05		
Total	119	0.021306709			

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>	<i>Lower 95.0%</i>	<i>Upper 95.0%</i>
			14.7305668		0.01085289	0.01422406	0.01085289	0.01422406
Intercept	0.01253848	0.000851188	5	1.66578E-28	6	4	6	4
	0.60375917		18.1249507		0.53779444	0.66972391	0.53779444	0.66972391
T-bill	7	0.033310942	6	6.77964E-36	4	1	4	1

## APPENDIX O

Commercial  
Repo  
SUMMARY OUTPUT

<i>Regression Statistics</i>	
Multiple R	0.98509587
R Square	0.97041389
Adjusted R Square	0.97016316
Standard Error	0.00303897
Observations	120

ANOVA					
	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>
Regression	1	0.035744082	0.03574408	3870.35826	4.63098E-92
Residual	118	0.00108977	9.23534E-06		
Total	119	0.036833852			

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>	<i>Lower 95.0%</i>	<i>Upper 95.0%</i>
Intercept	0.00030082	0.000374465	0.80333873	0.42339422	-0.00044072	0.00104236	-0.00044072	0.00104236
T-bill	0.91169223	0.014654556	62.2122034	4.63098E-92	0.88267222	0.94071225	0.88267222	0.94071225

## APPENDIX P

Retail Repo  
SUMMARY OUTPUT

<i>Regression Statistics</i>	
	0.80487801
Multiple R	7
	0.64782862
R Square	2
Adjusted R Square	0.64484411
	9
	0.00870100
Standard Error	1
Observations	120

ANOVA					
	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>
			0.01643336	217.064140	
Regression	1	0.016433366	6	7	1.64396E-28
Residual	118	0.008933475	7.57074E-05		
Total	119	0.025366841			

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>	<i>Lower 95.0%</i>	<i>Upper 95.0%</i>
	0.01544777		14.4082726		0.01332463	0.01757091	0.01332463	0.01757091
Intercept	2	0.001072146	7	8.98598E-28	1	3	1	3
	0.61817216		14.7330967		0.53508378	0.70126054	0.53508378	0.70126054
T-bill	4	0.04195806	8	1.64396E-28	1	7	1	7

## APPENDIX Q

Borrowed Long Term  
SUMMARY OUTPUT

<i>Regression Statistics</i>	
Multiple R	0.63585561
R Square	0.40431236
Adjusted R Square	0.39695819
Standard Error	0.00689669
Observations	83

### ANOVA

	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>
Regression	1	0.00261496	0.00261496	54.9773054	1.05645E-10
Residual	81	0.003852713	4.75644E-05		
Total	82	0.006467673			

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>	<i>Lower 95.0%</i>	<i>Upper 95.0%</i>
Intercept	0.03449687	0.000891968	38.6750000	5.51711E-54	0.03272213	0.03627160	0.03272213	0.03627160
X Variable 1	0.36481493	0.049201788	7.41466826	1.05645E-10	0.26691881	0.46271106	0.26691881	0.46271106

**APPENDIX R**

Fed Funds Purchased  
SUMMARY OUTPUT

<i>Regression Statistics</i>	
Multiple R	0.97604885
R Square	0.95267136
Adjusted R Square	0.95205671
Standard Error	0.00352425
Observations	79

**ANOVA**

	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>
Regression	1	0.019250561	0.01925056	1549.92219	9.11616E-53
Residual	77	0.000956366	1.24203E-05		
Total	78	0.020206927			

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>	<i>Lower 95.0%</i>	<i>Upper 95.0%</i>
Intercept	0.00040529	0.00047194	0.85879257	0.39312055	0.00053445	0.00134505	0.00053445	0.00134505
T-bill	0.90386213	0.022958697	39.3690512	9.11616E-53	0.85814552	0.94957874	0.85814552	0.94957874



## APPENDIX S

Balance Sheet Account	Correlation Coefficient				
	Total Deposits	Total Liabilities	Total Investments	Total Loans	Six Month T-bill
Ag Loans Fixed	0.903197	0.901321	0.881211	0.892705	0.737729
Ag Loans Variable	0.838566	0.880886	0.763703	0.919690	0.944457
Total Ag Loans	0.894385	0.924428	0.838208	0.973479	0.909995
Real Estate Fixed	0.719748	0.710100	0.675938	0.819274	0.488631
Real Estate Variable	0.943952	0.943839	0.917114	0.889037	0.793290
Total Real Estate	0.917991	0.917375	0.885424	0.947438	0.761799
Consumer	0.892962	0.878271	0.885382	0.875941	0.650325
Commercial	0.804613	0.830574	0.743440	0.805395	0.815058
NIFA	0.689332	0.704491	0.638322	0.770070	0.599562
All Other	0.938054	0.950808	0.880181	0.945901	0.846457
Total Loans	0.946808	0.962967	0.895893	1.000000	0.877727
US Treasury	0.777368	0.811046	0.721356	0.831613	0.832790
US Agency	0.957869	0.947740	0.988794	0.892030	0.736305
Certificates of Deposit	-0.435614	-0.405999	0.306349	-0.355193	-0.364273
Taxable Munis	0.818085	0.820302	-0.058606	0.836805	0.753526
Mortgage Backed	0.693723	0.700056	0.751732	0.646257	0.585419
Corporate Bonds	0.748291	0.787346	0.668145	0.883218	0.762577
Other Securities	0.027322	0.041624	0.041541	0.075595	0.086601
Fed Res Bank Stock	-0.077440	-0.082509	-0.104983	-0.051941	-0.074396
Fed Home Loan Bk	-0.077440	-0.082509	-0.104983	-0.051941	-0.074396
All Taxable Securities	0.953099	0.942167	0.989666	0.890431	0.726649
Tax Free Securities	0.506765	0.485307	0.485450	0.389397	0.341983
Mutual Funds	-0.841791	-0.790158	0.583651	-0.624059	0.115473
Fed Funds Sold	0.503309	0.498315	0.413804	0.462052	0.516900
Total Investments	0.959996	0.951520	1.000000	0.895893	0.755439
Now Accounts	0.929251	0.930235	0.938039	0.905159	0.747688
Savings Acct	0.933521	0.932063	0.921236	0.898568	0.765094
Money Market Act	0.966200	0.955973	0.889713	0.893716	0.817046
CD's < 100,000	0.993073	0.983103	0.970660	0.927755	0.799199
CD's > 100,000	0.973403	0.975229	0.929752	0.930586	0.853806
IRA-CDS UNDER	0.994168	0.992770	0.949548	0.950000	0.885424
IRA-CDS OVER	0.974637	0.972402	0.933636	0.881071	0.870534
Total Certificates	0.994160	0.985485	0.967300	0.929834	0.809394
IRA Accounts	0.956676	0.969522	0.919766	0.966535	0.857747
Total Deposits	1.000000	0.995292	0.959996	0.946808	0.836617
Repurchase/Comm	0.852371	0.888188	0.765923	0.869059	0.985096
Repurchase/Retl	0.983552	0.976420	0.974484	0.924152	0.804878
Borr Funds- ST	0.596123	0.607895	0.530496	0.351341	0.914224
Borr Funds-LT	0.759388	0.761601	0.815518	0.665629	0.635856
Fed Funds Purch	0.765613	0.807783	0.643746	0.784278	0.918870
Total Liabilities	0.995292	1.000000	0.951520	0.962967	0.880053

## APPENDIX T

Scenario Summary				
	Current Values:	Moderately Low Commodity Prices	Very Low Commodity Prices	Moderately Higher Commodity Prices
<b>Changing Cells:</b>				
<b>Ag_Loans_Fixed</b>	4,261,984	8,261,984	12,261,984	2,261,984
<b>Ag_Loans_Variable</b>	5,691,081	10,691,081	15,691,080	3,191,081
<b>Taxable_Securities</b>	24,353,142	15,353,142	6,353,142	28,853,142
<b>Demand_Deposits</b>	4,691,641	2,891,641	2,891,640	5,591,640
<b>Now_Accounts</b>	7,516,319	3,916,319	3,916,319	9,316,318
<b>MMA_Accounts</b>	8,804,333	5,204,333	5,204,333	10,604,333
<b>Certificates_of_Deposit</b>	17,550,211	17,550,211	8,550,210	17,550,210
<b>Result Cells:</b>				
<b>Total_Assets</b>	62,830,541	62,830,541	62,830,540	62,830,541
<b>Total_Capital</b>	8,216,554	8,600,542	9,132,023	8,024,561
<b>Capital_to_Assets</b>	13.08%	15.86%	19.96%	11.95%
<b>Net_Income</b>	555,904	939,891	1,471,372	363,911
<b>Return_on_Equity</b>	6.77%	10.93%	16.11%	4.53%
<b>Return_on_Assets</b>	0.88%	1.73%	3.22%	0.54%

Notes: Current Values column represents values of changing cells at time Scenario Summary Report was created. Changing cells for each scenario are highlighted in gray.

## APPENDIX U

Scenario Summary				
	Current Values:	Low Rate	Up 2% Rate Shock	Up 4% Rate Shock
<b>Changing Cells:</b>				
Ag_Loans_Fixed_Rate	6.88%	5.14%	6.14%	8.14%
Ag_Loans_Variable_Rate	6.41%	5.57%	7.07%	9.07%
Real_Estate_Loans_Rate	6.41%	5.16%	5.56%	6.16%
All_Other_Loans_Rate	6.69%	4.77%	5.77%	7.77%
Taxable_Securities_Rate	3.07%	1.40%	2.90%	4.90%
Tax_Free_Securities_Rate	3.30%	2.88%	3.88%	4.88%
Mutual_Funds_Rate	1.68%	1.76%	3.25%	4.75%
Fed_Funds_Sold_Rate	0.69%	0.22%	2.22%	4.22%
NOW_Accounts_Rate	0.42%	0.02%	2.02%	2.02%
Savings_Accounts_Rate	0.55%	0.98%	2.98%	3.98%
MMA_Accounts_Rate	1.39%	0.21%	2.21%	4.21%
COD_Rate	2.36%	0.40%	2.15%	3.90%
IRA_Accounts_Rate	2.29%	0.29%	2.29%	4.29%
Comm._Repo_Rate	1.59%	0.13%	2.13%	4.13%
Retail_Repo_Rate	2.61%	0.43%	2.18%	3.93%
Borrowed_Short_Term_Rate	0.39%	0.21%	2.21%	4.21%
Borrowed_Long_Term_Rate	3.80%	3.98%	3.00%	4.50%
Fed_Funds_Purchased_Rate	1.73%	0.76%	2.76%	4.76%
<b>Result Cells:</b>				
Total_Assets	62,830,541	62,830,541	62,830,541	62,830,541
Total_Capital	8,216,554	8,055,269	7,796,490	7,937,229
Capital_to_Assets	13.08%	12.85%	12.49%	12.69%
Net_Income	555,904	394,618	135,840	276,578
Return_on_Equity	6.77%	4.90%	1.74%	3.48%
Return_on_Assets	0.88%	0.63%	0.22%	0.44%

Notes: Current Values column represents values of changing cells at time Scenario Summary Report was created. Changing cells for each scenario are highlighted in gray.















0.0000	0.5480	4.306	17.37	54.12	142.71	348.35	208.41	99.13	1.77	162	548.134	1.684	187	4.673	304	1.121	20	18.38	107.60	3.498	0.78	0.741	281	150	7.999	0.844	8.848	7.226	7.999	4.174	3.738	3.520	0.020	0.634	1.036	2.446	4.244	4.244	3.948	3.228	3.374	3.443	384.10	2.041	134	408.284
0.0000	0.5500	4.199	14.42	40.78	110.23	242.87	142.87	71.44	2.89	162	550.000	1.720	172	4.720	304	1.121	20	18.38	107.60	3.498	0.78	0.741	281	150	7.999	0.844	8.848	7.226	7.999	4.174	3.738	3.520	0.020	0.634	1.036	2.446	4.244	4.244	3.948	3.228	3.374	3.443	384.10	2.041	134	408.284
0.0000	0.5520	4.092	11.47	27.32	66.78	155.13	83.28	40.64	4.07	162	552.000	1.756	176	4.756	304	1.121	20	18.38	107.60	3.498	0.78	0.741	281	150	7.999	0.844	8.848	7.226	7.999	4.174	3.738	3.520	0.020	0.634	1.036	2.446	4.244	4.244	3.948	3.228	3.374	3.443	384.10	2.041	134	408.284
0.0000	0.5540	3.985	8.52	14.36	33.86	78.16	51.61	26.96	5.25	162	554.000	1.792	178	4.792	304	1.121	20	18.38	107.60	3.498	0.78	0.741	281	150	7.999	0.844	8.848	7.226	7.999	4.174	3.738	3.520	0.020	0.634	1.036	2.446	4.244	4.244	3.948	3.228	3.374	3.443	384.10	2.041	134	408.284
0.0000	0.5560	3.878	5.57	9.40	19.77	44.16	32.85	17.15	6.44	162	556.000	1.828	180	4.828	304	1.121	20	18.38	107.60	3.498	0.78	0.741	281	150	7.999	0.844	8.848	7.226	7.999	4.174	3.738	3.520	0.020	0.634	1.036	2.446	4.244	4.244	3.948	3.228	3.374	3.443	384.10	2.041	134	408.284
0.0000	0.5580	3.771	2.62	4.24	11.25	20.08	16.04	9.24	7.63	162	558.000	1.864	182	4.864	304	1.121	20	18.38	107.60	3.498	0.78	0.741	281	150	7.999	0.844	8.848	7.226	7.999	4.174	3.738	3.520	0.020	0.634	1.036	2.446	4.244	4.244	3.948	3.228	3.374	3.443	384.10	2.041	134	408.284
0.0000	0.5600	3.664	0.67	0.99	6.10	12.16	8.93	4.35	8.82	162	560.000	1.900	184	4.900	304	1.121	20	18.38	107.60	3.498	0.78	0.741	281	150	7.999	0.844	8.848	7.226	7.999	4.174	3.738	3.520	0.020	0.634	1.036	2.446	4.244	4.244	3.948	3.228	3.374	3.443	384.10	2.041	134	408.284
0.0000	0.5620	3.557	-0.28	-0.47	1.95	7.04	3.02	0.46	10.01	162	562.000	1.936	186	4.936	304	1.121	20	18.38	107.60	3.498	0.78	0.741	281	150	7.999	0.844	8.848	7.226	7.999	4.174	3.738	3.520	0.020	0.634	1.036	2.446	4.244	4.244	3.948	3.228	3.374	3.443	384.10	2.041	134	408.284
0.0000	0.5640	3.450	-1.23	-1.36	2.90	7.98	-0.10	-0.99	11.19	162	564.000	1.972	188	4.972	304	1.121	20	18.38	107.60	3.498	0.78	0.741	281	150	7.999	0.844	8.848	7.226	7.999	4.174	3.738	3.520	0.020	0.634	1.036	2.446	4.244	4.244	3.948	3.228	3.374	3.443	384.10	2.041	134	408.284
0.0000	0.5660	3.343	-2.18	-2.27	3.85	8.92	-0.96	-1.98	12.37	162	566.000	2.008	190	5.008	304	1.121	20	18.38	107.60	3.498	0.78	0.741	281	150	7.999	0.844	8.848	7.226	7.999	4.174	3.738	3.520	0.020	0.634	1.036	2.446	4.244	4.244	3.948	3.228	3.374	3.443	384.10	2.041	134	408.284
0.0000	0.5680	3.236	-3.13	-3.12	4.80	9.86	-1.81	-2.96	13.55	162	568.000	2.044	192	5.044	304	1.121	20	18.38	107.60	3.498	0.78	0.741	281	150	7.999	0.844	8.848	7.226	7.999	4.174	3.738	3.520	0.020	0.634	1.036	2.446	4.244	4.244	3.948	3.228	3.374	3.443	384.10	2.041	134	408.284
0.0000	0.5700	3.129	-4.08	-4.07	5.75	10.80	-2.66	-3.94	14.73	162	570.000	2.080	194	5.080	304	1.121	20	18.38	107.60	3.498	0.78	0.741	281	150	7.999	0.844	8.848	7.226	7.999	4.174	3.738	3.520	0.020	0.634	1.036	2.446	4.244	4.244	3.948	3.228	3.374	3.443	384.10	2.041	134	408.284
0.0000	0.5720	3.022	-5.03	-5.02	6.70	11.74	-3.51	-4.92	15.91	162	572.000	2.116	196	5.116	304	1.121	20	18.38	107.60	3.498	0.78	0.741	281	150	7.999	0.844	8.848	7.226	7.999	4.174	3.738	3.520	0.020	0.634	1.036	2.446	4.244	4.244	3.948	3.228	3.374	3.443	384.10	2.041	134	408.284
0.0000	0.5740	2.915	-5.98	-5.97	7.65	12.68	-4.36	-5.90	17.09	162	574.000	2.152	198	5.152	304	1.121	20	18.38	107.60	3.498	0.78	0.741	281	150	7.999	0.844	8.848	7.226	7.999	4.174	3.738	3.520	0.020	0.634	1.036	2.446	4.244	4.244	3.948	3.228	3.374	3.443	384.10	2.041	134	408.284
0.0000	0.5760	2.808	-6.93	-6.92	8.60	13.62	-5.21	-6.88	18.27	162	576.000	2.188	200	5.188	304	1.121	20	18.38	107.60	3.498	0.78	0.741	281	150	7.999	0.844	8.848	7.226	7.999	4.174	3.738	3.520	0.020	0.634	1.036	2.446	4.244	4.244	3.948	3.228	3.374	3.443	384.10	2.041	134	408.284
0.0000	0.5780	2.701	-7.88	-7.87	9.55	14.56	-6.06	-7.84	19.45	162	578.000	2.224	202	5.224	304	1.121	20	18.38	107.60	3.498	0.78	0.741	281	150	7.999	0.844	8.848	7.226	7.999	4.174	3.738	3.520	0.020	0.634	1.036	2.446	4.244	4.244	3.948	3.228	3.374	3.443	384.10	2.041	134	408.284
0.0000	0.5800	2.594	-8.83	-8.82	10.50	15.50	-6.91	-8.80	20.63	162	580.000	2.260	204	5.260	304	1.121	20	18.38	107.60	3.498	0.78	0.741	281	150	7.999	0.844	8.848	7.226	7.999	4.174	3.738	3.520	0.020	0.634	1.036	2.446	4.244	4.244	3.948	3.228	3.374	3.443	384.10	2.041	134	408.284
0.0000	0.5820	2.487	-9.78	-9.77	11.45	16.44	-7.76	-9.76	21.81	162	582.000	2.296	206	5.296	304	1.121	20	18.38	107.60	3.498	0.78	0.741	281	150	7.999	0.844	8.848	7.226	7.999	4.174	3.738	3.520	0.020	0.634	1.036	2.446	4.244	4.244	3.948	3.228	3.374	3.443	384.10	2.041	134	408.284
0.0000	0.5840	2.380	-10.73	-10.72	12.40	17.38	-8.61	-10.72	22.99	162	584.000	2.332	208	5.332	304	1.121	20	18.38	107.60	3.498	0.78	0.741	281	150	7.999	0.844	8.848	7.226	7.999	4.174	3.738	3.520	0.020	0.634	1.036	2.446	4.244	4.244	3.948	3.228	3.374	3.443	384.10	2.041	134	408.284
0.0000	0.5860	2.273	-11.68	-11.67	13.35	18.32	-9.46	-11.68	24.17	162	586.000	2.368	210	5.368	304	1.121	20	18.38	107.60	3.498	0.78	0.741	281	150	7.999	0.844	8.848	7.226	7.999	4.174	3.738	3.520	0.020	0.634	1.036	2.446	4.244	4.244	3.948	3.228	3.374	3.443	384.10	2.041	134	408.284
0.0000	0.5880	2.166	-12.63	-12.62	14.30	19.26	-10.31	-12.63	25.35	162	588.000	2.404	212	5.404	304	1.121	20	18.38	107.60	3.498	0.78	0.741	281	150	7.999	0.844	8.848	7.226	7.999	4.174	3.738	3.520	0.020	0.634	1.036	2.446	4.244	4.244	3.948	3.228	3.374	3.443	384.10	2.041	134	408.284
0.0000	0.5900	2.059	-13.58	-13.57	15.25	20.20	-11.16	-13.58	26.53	162	590.000	2.440	214	5.440	304	1.121	20	18.38	107.60	3.498	0.78	0.741	281	150	7.999	0.844	8.848	7.226	7.999	4.174	3.738	3.520	0.020	0.634	1.036	2.446	4.244	4.244	3.948	3.228	3.374	3.443	384.10	2.041	134	408.284
0.0000	0.5920	1.952	-14.53	-14.52	16.20	21.14	-12.01	-14.53	27.71	162	592.000	2.476	216	5.476	304	1.121	20	18.38	107.60	3.498	0.78	0.741	281	150	7.999	0.844	8.848	7.226	7.999	4.174	3.738	3.520	0.020	0.634	1.036	2.446	4.244	4.244	3.948	3.228	3.374	3.443	384.10	2.041	134	408.284
0.0000	0.5940	1.845	-15.48	-15.47	17.15	22.08	-12.86	-15.48	28.89	162	594.000	2.512	218	5.512	304	1.121	20	18.38	107.60	3.498	0.78	0.741	281	150	7.999	0.844	8.848	7.226	7.999	4.174	3.738	3.520	0.020	0.634	1.036	2.446	4.244	4.244	3.948	3.228	3.374	3.443	384.10	2.041	134	408.284
0.0000	0.5960	1.738	-16.43	-16.42	18.10	23.02	-13.71	-16.43	30.07	162	596.000	2.548	220	5.548	304	1.121	20	18.38	107.60	3.498	0.78	0.741	281	150	7.999	0.844	8.848	7.226	7.999	4.174	3.738	3.520	0.020	0.634	1.036	2.446	4.244	4.244	3.948	3.228	3.374	3.443	384.10	2.041	134	408.284
0.0000	0.5980	1.631	-17.38	-17.37	19.05	23.96	-14.56	-17.38	31.25	162	598.000	2.584	222	5.584	304	1.121	20	18.38	107.60	3.498	0.78	0.741	281	150	7.999	0.844	8.848	7.226	7.999	4.174	3.738	3.520	0.020	0.634	1.036	2.446	4.244	4.244	3.948	3.228	3.374	3.443	384.10	2.041	134	408.284
0.0000	0.6000	1.524	-18.33	-18.32	20.00	24.90	-15.41	-18.33	32.43	162	600.000	2.620	224	5.620	304	1.121	20	18.38	107.60	3.498	0.78	0.741	281	150	7.999	0.844	8.848																			