FACTORS AFFECTING RURAL BANK PERFORMANCE IN OKLAHOMA

By

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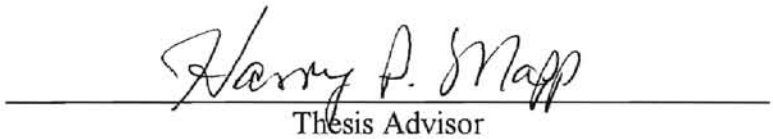

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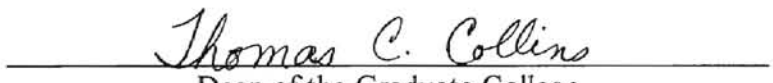

Dean of the Graduate College

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CHAPTER 1

INTRODUCTION

1.1 Simulation Rationale

Commercial banks operate in a very competitive, uncertain, and regulated environment. Bank management must try to balance the uncertain demand for loans with the uncertain supply of deposits. In order to do this, management must appropriately set interest rates charged on loans, interest rates paid on deposits, the amount of advertising, employee salaries, service charges, and other variables that can affect the supply of deposits and the demand for loans. Bank management must also compete with other financial institutions and banks for deposits and loans, while complying with the current government regulations. Further, not all loans that a bank makes will be repaid and therefore, bank management must understand the factors that can increase the chance of loan defaults.

Commercial banks face a serious problem in training new employees and increasing the understanding of employees in different departments within the bank. Employees within a specific department may not understand the impact of their decisions on the overall performance of the bank. Further, employees need to understand the decisions that must be made by other departments within the bank.

Oklahoma Bank Simulation is a computer model developed in the early 1970s to represent the regulatory, competitive, and management environment of commercial banks in a rural Oklahoma county (Fisher, 1973). In the model, each county contains three

competing banks and agriculture is the principal industry. Individuals or teams are given an initial set of statements describing the loan and investment portfolio and financial condition of a bank they will manage for the next two years. Based on the initial financial statements, and conditions expected in the next period, team members make decisions on interest rates to pay on time deposits, interest rates to charge on four types of loans, advertising expenses, loan officer salaries, and service charges. They also decide on the maximum amount of each loan type they wish to make and develop strategies for making taxable and tax exempt investments. These decisions are data for the computer model which generates updated sets of financial statements for the three competing banks in each county being represented in the game. This computer game has been played successfully by hundreds of Oklahoma bankers over the past 20 years in the Oklahoma Bankers Association's Intermediate School of Banking. However, while still a useful learning experience and fun to play, the game has become outdated due to deregulation of interest rates, deregulation of markets (branch banking), changes in deposit and account alternatives and terminology, and the expansion of savings and investment alternatives.

A bank management game is an ideal setting for bank employees to further their understanding of their role and it's effect within the bank. Bank management can gain understanding of the factors that influence the level of bank deposits, loans, and loan defaults. New employees and employees within a specific department can use the bank game to gain understanding of the effects their decisions, as well as decisions made by others in the bank.

1.2 Problem Statement

The primary problems addressed are the identification of key factors which determine the county volume and market share of bank deposits and loans; and developing a new bank management game which is not overly complicated and accurately represents the current competitive and regulatory environment of agricultural banks.

1.3 Objectives

The general objective of this research is to increase the understanding by commercial bank employees of the breadth of activities that take place in different departments within the bank, and how these activities influence profitability. Specific objectives are (1) to determine the key factors influencing an agricultural bank's level of deposits and loans, and (2) to determine the changes needed in the bank simulation model to represent the current decision making environment of an agricultural bank.

1.4 Changes in the Banking Environment

The banking industry has undergone many changes over the past twenty-five years. Changes in regulation, competition, and technology have had a dramatic effect on the banking industry. The first of the regulatory changes followed a period of high and fluctuating interest rates in the late 1970s. "In the wake of the high and volatile interest rates of the 1970s, commercial banks and other depository institutions found themselves at a competitive disadvantage in financial services markets. As market interest rates rose and mutual funds and securities firms began to compete with commercial banks and savings

and loans associations, the flow of funds to depository institutions declined", (Johnson, 1994). Banks were at a "competitive disadvantage" because regulations put ceiling on the interest rates banks could pay on deposits and savings accounts. When market forces (high levels of inflation) pushed interest rates on other investments up, banks were not able to raise their rates enough to compete with other investment opportunities. However, banks no longer face an interest rate ceiling on deposits because of the Depository Institutions Deregulation and Monetary Control Act (DIDMCA). According to Johnson, the most important features of this act may be summarized as follows:

- Uniform reserve requirements for both member and non-member commercial banks were set, virtually eliminating the motivation to withdraw from the Federal Reserve. Also, savings and loans associations, mutual savings banks, and credit unions were subject to uniform reserve requirements.
- The Depository Institutions Deregulation Committee (DIDC) was created to oversee the phase-out of Regulation Q deposits interest rate ceilings over a six-year period.
- All depository institutions were permitted to issue interest-bearing transactions accounts to individuals and nonprofit organizations. Banks and thrifts could offer negotiable order of withdrawal (NOW) accounts. In the case of credit unions, the instrument was the share draft account.
- The deposit insurance limit was raised from $40,000 to $100,000 for all depository institutions.
- Expanded powers of S&Ls included credit cards, commercial real estate loans,

and consumer loans, each up to 20 percent of total assets.

- Mutual savings banks were empowered to make business loans and offer demand accounts to business clients.
- Loan interest rate ceilings were effectively eliminated for mortgage, business, and agricultural loans.

With the implementation of DIDMCA and DIDC, banks were free to set interest rates to attract the necessary level of deposits to meet their loan demand. When the original Oklahoma bank simulation model was developed, banks had a ceiling on interest rates. If other similar investments had interest rates higher than the bank could offer, the bank was unable to raise their rates enough to compete with others in the market.

The Garn-St. Germain Depository Institutions Act of 1982 provided further provisions for commercial banks and their competitors. Spong lists the provisions of the Garn-St. Germain Act as (Spong, 1990):

- Authorization for federal thrift institutions to accept demand deposits from business, corporate, or agricultural customers with which a loan relationship has been established.
- Authorization for federal thrift institutions to invest in a broad range of government securities and to make or participate in commercial and agricultural loans up to 5 percent of a savings and loan association's assets or 7.5 percent of a savings bank's assets (10 percent of assets for either institution after January 1, 1984)
- Directive to the Depository Institutions Deregulation Committee (DDIC) to

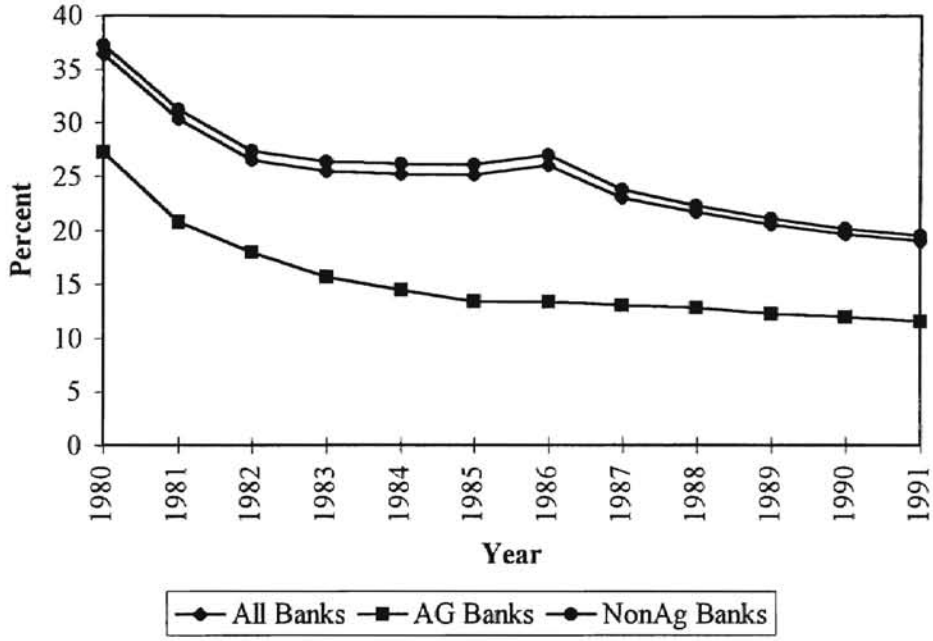
establish within 60 days an account which is "directly equivalent to and competitive with money market mutual funds."

- Elimination of the interest rate deferential between thrift institutions and banks by January 1, 1984.
- Increased lending limits for national banks.
- Authorizations of state-chartered housing lenders to make or purchase alternative mortgages in accordance with the regulations governing their federally chartered counterparts, unless such mortgages are specifically prohibited by subsequent state laws.

Together, the "Monetary Control Act (DIDMCA) and the Garn-St. Germain Act expanded the services many depository institutions can offer and provided for the removal of deposit interest ceilings. Consequently, the two acts eliminate much of the protection many institutions have had and allow for more competition among firms" (Spong, 1990) Banks are now allowed to offer interest bearing checking accounts, such as negotiable orders of withdrawal (NOW) and money market deposits accounts (MMDA), which have given customers a wider variety of accounts from which to choose. With customers allowed to choose among several types of interest-bearing deposits, demand deposits as a percent of total deposits decreased, as shown in Figure 1. The figure reports demand deposits as a percent of total deposits for all bank, Agricultural (AG) banks, and non-agricultural banks. The FDIC identifies agricultural banks as "those having 25 percent or more of total loans concentrated in agriculture. Agricultural loans include those used to finance agricultural production, to purchase farm real estate, or to finance real estate

improvements where farmland is used as security for the loan", (Wallace, 1994).

Figure 1. Demand Deposits to Total Deposits



As Spong indicated, changes in the regulatory environment gave commercial banks more deposit alternatives, as well as more competition. For banks that were accustomed to interest rate ceilings, the change to unrestricted interest rates required substantial adjustment. The ability to raise interest rates allowed banks to adjust to market conditions and attract more deposits that in turn could be loaned out. However, if banks increase interest rates paid on deposits without adjusting interest rates charged on loans, they reduce their interest margin. The interest margin is the "gap between the interest income the bank receives on loans and securities and the cost of its borrowed funds (deposits). It is usually a key determinant of bank profitability. When the interest margin falls, bank stockholders will usually experience a weakening in the bank's bottom line--its net after-tax earnings--and, perhaps, in the dividends they receive", (Rose, 1993).

Increased flexibility in setting interest rates and increased competition, coupled with deregulation made the 1980s a time of challenge for commercial banking. "The 1980s was a decade of dramatic change for depository institutions. Toward the beginning of the decade, geographic and product barriers were significantly reduced, and the deposit side of banks' balance sheets was substantially deregulated. By the end of the decade, the thrift industry had virtually collapsed, and commercial banking was plagued by a wave of failures unprecedented since the Great Depression" (Berger and Udell, 1993). According to Johnson "some of the excesses of the early 1980s legislation are corrected by FIRREA by requiring higher capital levels and more prudent investment policies for thrifts, shoring up federal insurance funds, and limiting the use of brokered deposits", (Johnson, 1994). The major provisions of the FIRREA legislation are described by Johnson as:

- The Federal Home Loan Bank Board and the Federal Savings and Loan Insurance Corporation were abolished. The Office of Thrift Supervision became the chief regulator, and the FDIC took over the insurance function. The FDIC now maintains two funds: the Bank Insurance Fund (BIF) and the Savings Association Insurance Fund (SAIF).
- The Resolution Funding Corporation was created to sell bonds to raise the funds necessary to complete the liquidation of failed savings and loan associations. The Resolution Trust Corporation oversees the liquidation.
- Insurance premiums increased for both S&Ls and commercial banks. FIRREA also gave FDIC the right to increase the rates in either fund, if necessary, to ensure solvency of SAIF and BIF. Premiums may not exceed 32.5 cents per

$100 of deposits or be raised by more than 7.5 cents per year.

- The Community Reinvestment Act of 1977 was amended to require public disclosure of a depository institution's regulatory rating with respect to community reinvestment.
- Any insured depository institution that does not meet minimum capital requirements may not accept brokered deposits.

The banking crisis during the late 1980s put a strain on the FDIC insurance funds, which necessitated the increase in the insurance fee Deposit insurance and other regulations were enacted in 1933. After the regulations were enacted, only 14,500 banks remained, less than half of what had been operating in 1921. "As the insurance system began to prove itself, bank panics and the loss of public confidence became much less of a threat to the banking system. With insurance, all but the largest depositors were assured that they would not suffer a deposit loss even if their bank failed", (Spong, 1990). While the insurance helped stop bank runs by making the public believe their money would still remain even if the bank failed, weaknesses became apparent in the late 1980s. Johnson discusses some of these weakness. "The government guarantee encourages excessive risk taking by managers of financial institutions. The incentive for risk is said to be strong because any failure of risky investments will not hurt depositors; the federal government will assume the deposit liabilities. The converse is that if these risky investments do pay off, the bank and its managers will prosper" (Johnson, 1994). This type of a situation is often referred to as a moral hazard: gaining all of the benefits of the investment, but any costs are passed on to a third party. FIRREA was designed to lessen the moral hazard

problem. Banks that are deemed by the FDIC to be under or only adequately capitalized "cannot offer deposit interest rates significantly above prevailing rates on insured deposits in their normal market area" (Rose, 1993).

Competition has increased in the banking industry. Many states eliminated or reduced restrictions on branching and bank holding company ownership during the 1980s. Local banks must compete with large branch banks (created by eliminating or reducing restrictions), credit unions, and brokerage and finance companies for a customers deposits and loans. The number of services provided by a bank and its competitors has also increased greatly. Banks offer a greater number of deposit alternatives and the number of banks offering credit cards has increased greatly. Many banks have started to offer outside services, such as investment and insurance, to attract new customers and maintain business with current customers.

1.5 Conceptual Framework

The simulation which will be developed from this research will consider a county the market area for the banks. Within each county, three banks compete for deposits and loans in attempting to maximize profits. A generalized profit equation for a single bank, assuming profit maximization is an important goal, can be written as:

(1) $PT = f(LO, IN, DP, TX, OE)$

where PT = bank profit or net income after taxes

LO = income from the loan portfolio

IN = income from the investment portfolio

DP = income and expense from deposits

TX = income taxes paid by the bank

OE = other expenses paid by the bank

Each bank competes with two other banks in a county for both demand deposits and several types of interest bearing deposits. County personal income and county retail sales, as well as the banks' service charges on demand deposits and interest rates paid on interest bearing deposits, impact the volumes of deposits and their allocations among the available deposits coming into the bank. Deposits, sales of investments, and retained earnings provide funds which may be allocated to make new loans and purchase new investments. Each bank may choose to make five types of loans, including one-year agricultural production loans, 10-year agricultural real estate loans, 10-year real estate loans, 2-year commercial loans, and 2-year consumer loans. The amount or volume of each loan type made by a bank depends upon past loan volumes, the interest rate charged by the bank, the amount spent for loan officer salaries, and the amount spent for advertising. A bank's loan volume is also affected by competing banks' interest rates, advertising, and loan officer salaries. So, a bank's income from loans may be represented as:

(1.1) $LO = f(LV_j, LI_j, DPV_k, DPC_k, AV, LS, LV_{2,3})$

where LV_j = the dollar volume of loan type j

LI_j = interest rate charged on loan type j

DPV_k = dollar volume for deposit class k

DPC_k = service charge or interest rate for deposit class k

AV = advertising expense

LS = loan officer salaries

$LV_{2,3}$ = loans made by the two competing banks in the county

Money not loaned out to bank customers is available for several types of investments, including six-month, one-year, and three-year government securities and two classes of tax-exempt municipal bonds. So, a bank's income from investments may be represented as:

(1.2) $IN = f(IV_m, II_m, DP_k)$

where IV_m = the dollar volume of investment class m

II_m = the interest rate earned on investment class m

DP_k = the dollar volume of deposits in class k

Deposits are also affected by the actions and decisions made by competing banks in the county. If the other banks offer higher interest rates on the different interest bearing deposits, spend more for advertising, and pay higher salaries, they will receive a larger market share of deposits. Income and expense from the total of demand and interest bearing deposits may be represented as follows:

(1.3) $DP = f(CPI, CRS, DPI_k, DPE_k, AV, LS, CBD)$

where CPI = county personal income

CRS = county retail sales

DPI_k = deposit income for deposit class k

DPE_k = deposit expense form deposit class k

AV = advertising expense

LS = loan officer salaries

CBD = competing bank decisions/actions

Finally, banks must pay state and federal income taxes. The amount of those taxes is dependent upon income from loans, income from investments (excluding some income from tax-exempt municipal bonds), income and expenses associated with deposits, and other expenses. The tax liability may be represented as:

(1.4) $TX = f(LO, IN, DP, OE)$

where LO = income from the loan portfolio

IN = income from the investment portfolio

DP = income and expense from deposits

OE = other expenses paid by the bank

Income after taxes is available, along with the growth in deposits, as sources of funds for new loans and investments in the next period.

Equations will be developed that determine a bank's level of loans and deposits based on the level of the relevant variables. The market area for the bank simulation is a county containing three competing commercial banks. Each county has a certain level of deposits and loans available to be allocated to each of the competing banks. The county volume of deposits and loans will be estimated using county volume equations. The banks share of the county deposits and loans will be determined using market share equations. The model simulates changes over a six-month period of time, so the equations are estimated using semi-annual data.

1.6 Outline of Thesis

Chapter 2 discusses the data used in the analysis, outlines the estimation methods, and presents the county volume and market share equations. Chapter 3 presents the components of the bank simulation model and discusses which decisions must be made by game participants. Chapter 4 provides a summary of the research.

CHAPTER 2

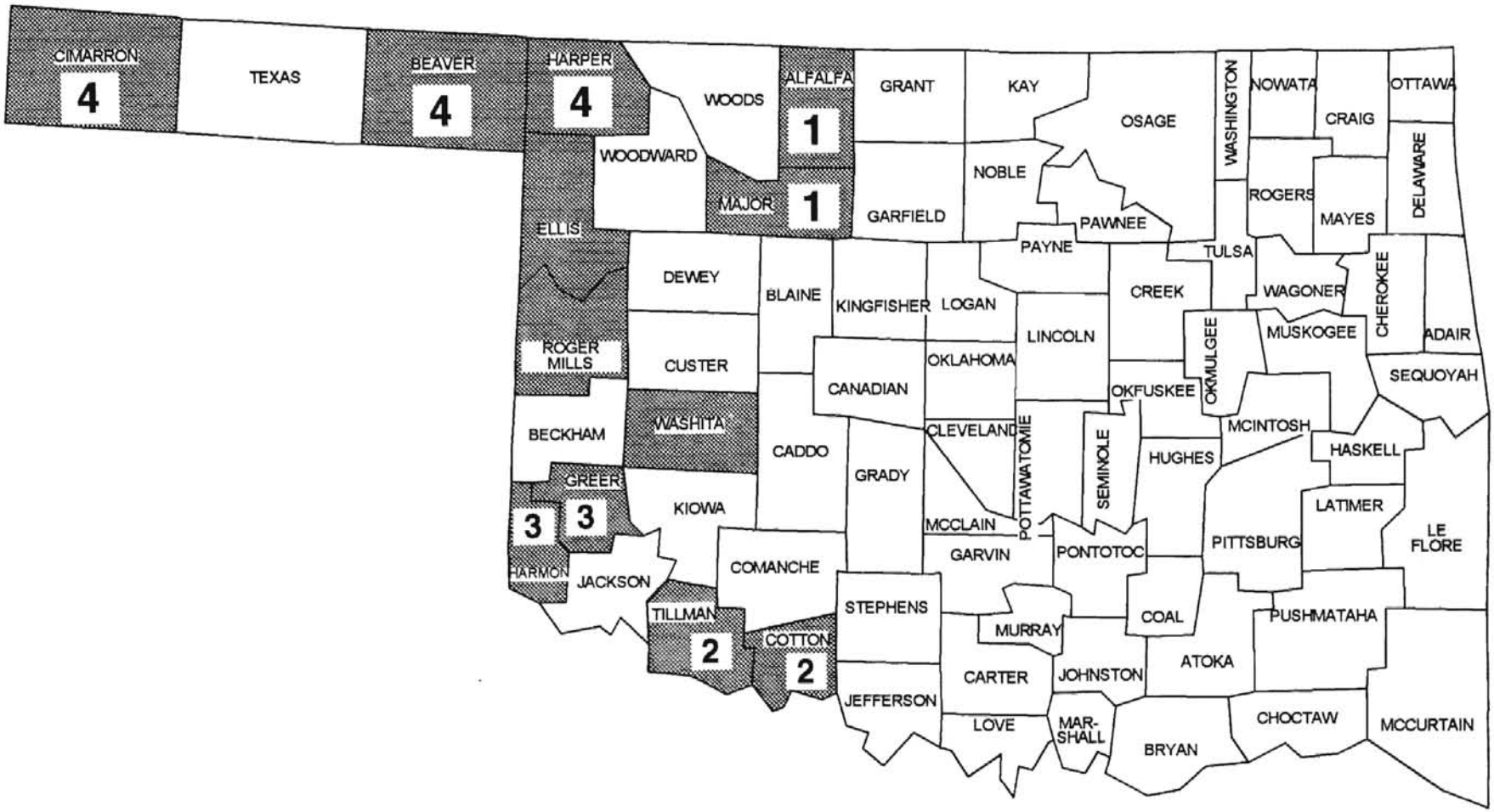
Bank Volume and Market Share of Deposits and Loans

2.1 Data for Estimation

The bank data came from several different sources, including secondary and primary data. Primary data was obtained by a survey (see Appendix A for complete survey) that was sent to each of the banks in the study. The survey provided data that is specific to each bank such as advertising expense, distance to competing banks in county, service charge income, number of loan officers and their average salaries, interest rates charged on loans, and charge-offs on several classes of loans. Much of the secondary data on the banks was obtained from the Federal Deposit Insurance Corporation Consolidated Report of Income (call reports). The call reports provided data on the dollar amount of the various deposit and loan categories, income from deposits and loans by category, and the dollar amount of loans that are greater than 90 days past due and nonaccruing.

Twelve rural Oklahoma counties were identified to be included in the study, and agricultural activity and income were very important in each county. The counties surveyed are identified in Figure 2 by black shading. Federal Deposit Insurance Corporation Consolidated Reports of Income (call reports) were obtained for each bank in the twelve counties, for a total of 32 banks. Also, each bank was mailed a copy of the survey. A follow-up survey was mailed to all of the banks that did not responded to the initial mailing. Phone calls were also made to banks that did not respond to either mailing, and responses were still less than desired. Surveys from 12 of the 32 banks contacted

Figure 2. Banks Included in Study and "County Groups"

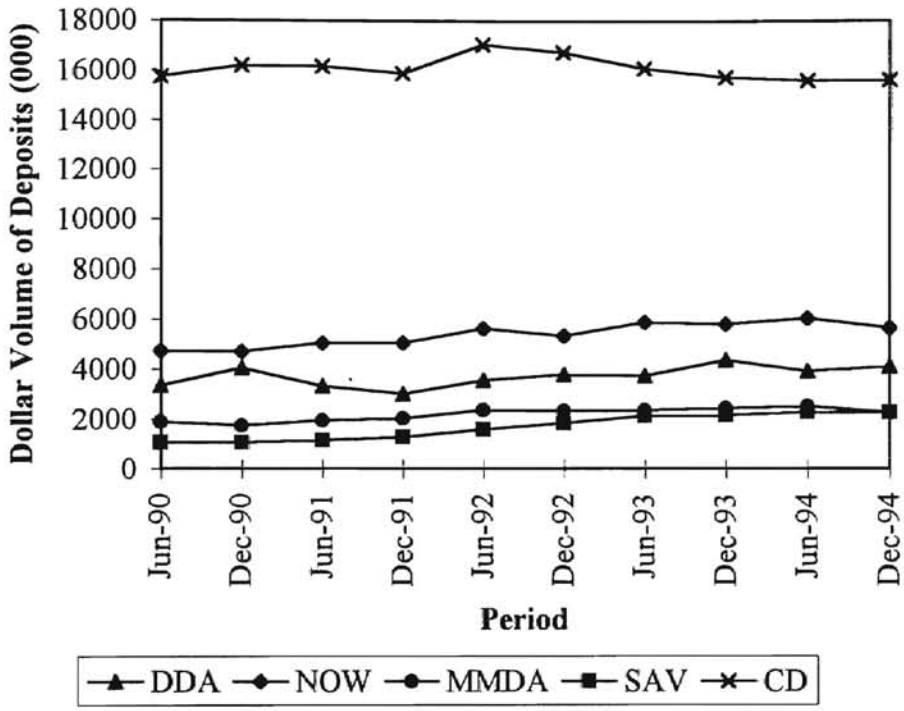


were completed and returned. Since the market share equations require county average data on interest rates, service charge, advertising, salaries, and number of officers, all of the banks in a county were desired. To come up with these averages, counties that were relatively close to each other were made into a "county group" to represent a county. By doing this, 4 county groups were made out of the 12 counties containing a bank which responded to the survey. The county groups are identified in Figure 2 by numbers. Counties labeled with a 1 are in county group 1, counties labeled with a 2 are in county group 2, etc. Counties with no group number did not have any banks responding.

2.2 County Volume Equations - Deposits

The county volume equations will be used to determine the total supply of the various deposit categories available in the county. County volume deposit equations were estimated for demand deposits (DDA), negotiable orders of withdrawal (NOW), money market deposit accounts (MMDA), savings deposits (SAV), and certificates of deposit (CD). The 6-month average levels of the five deposit classes are shown in Figure 3. As the graph shows, deposits where relatively constant or tended to rise during the sample period. The 6-month average levels of deposit interest rates are shown in Figure 4. Interest rates declined significantly over most of the sample period with a slight increase in the last period. Table 1 presents the number of observations, mean, standard deviation, minimum, and maximum of the deposits, interest rates, county personal income, and county retail sales for all bank surveyed.

Figure 3. 6 Month Average of Bank Deposits



A county has a finite amount of money available to be allocated in the various deposit categories. The simulation which will use these equations represents a six-month time period. For this reason, the county volume equations were estimated using semi-annual data. The county volume equations for deposits use the lagged value of the account six months ago, interest rate paid on the account, interest rate offered on a competitive account, county retail sales, county personal income, a time trend variable, and a semi-annual adjustment variable to account for higher levels of deposits in the first or second half of the year. Each of the county volume equations will be presented with a discussion of the variables used. As with Fisher's study, the overall equations significance and the R^2 is very high. The data set combines the banks in each of the twelve counties for each of the ten time periods. This gives 120 total observations, but since a lagged

variable is used in each of the equations only 108 observations are available for the estimation.

Figure 4. 6 Month Average Deposit Interest Rates

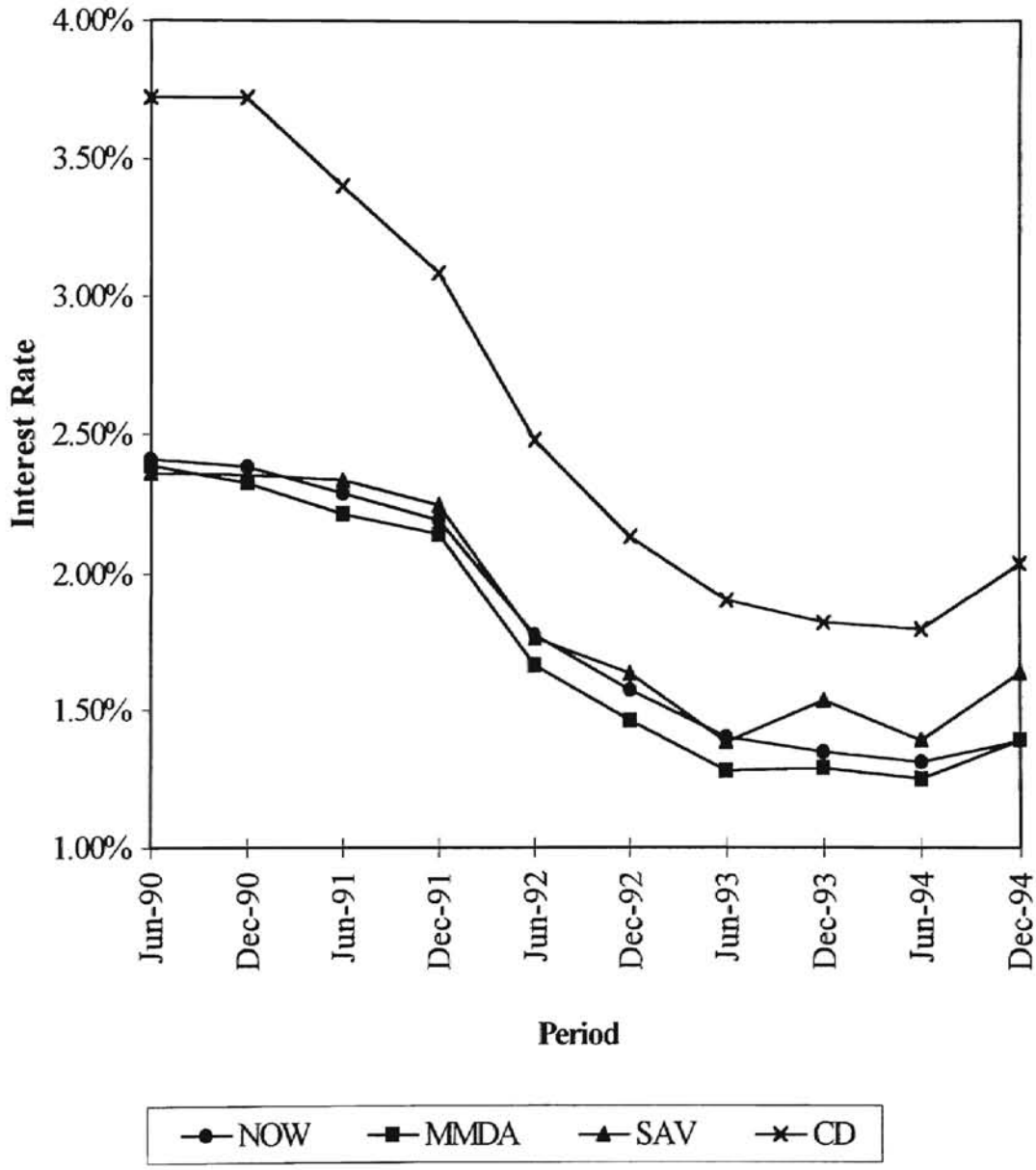


Table 1. Statistical Description of County Deposit Variables.

Variable Name	Obs.	Mean	Std. Dev	Minimum	Maximum
TTLDEP (000)	120	77129	51192	28597	271390
DDA (000)	120	9800	6796	3294	33441
NOW (000)	120	13982	8010	3455	46521
MMDA (000)	120	6133	7185	0	30348
SAV (000)	120	4226	2875	719	11350
CD (000)	120	43316	29928	15494	164870
NOWINT	120	1.75%	.0046	1.09%	2.71%
MMDAINT	120	1.80%	.0076	0	3.94%
SAVINT	120	2.01%	.0049	0.65%	3.22%
CDINT	120	2.48%	.0072	1.53%	4.01%
BONDINT	120	6.39%	.5601	5.42%	7.23%
CPI	120	16388	2962	11789	25539
CRS (000,000)	120	9.7457	11.352	3.50	55.64

2.2.1 Demand Deposits

Equation 2 gives the estimated demand deposit account (DDA) equation. T statistics are presented under the coefficients with 102 degrees of freedom. The POOL command in Shazam (SHAZAM, 1993) was used to account for cross-section heteroskedasticity and time-wise autoregression. DDALAG1 is the county level of demand deposits in the previous time period (6 months ago). NOWINT is the county average interest rate paid on negotiable orders of withdrawal accounts. CPICHANG is county personal income (CPI) in the current period less the CPI in the previous period all divided by the CPI in previous period to give a percentage change in CPI. T is a time trend variable that is 0 in June of 1990 and increases by 1 for each of the following

periods. SEMIADJ is used as a seasonal dummy variable to account for higher or lower levels of demand deposits. SEMIADJ is 0 in the first half of the year, and 1 in the second half of the year.

$$\begin{array}{l} \text{(2) DDA} = 2383.2 + 1.0276\ \text{DDALAG1} - 149{,}490\ \text{NOWINT} \\ \qquad\qquad\quad (1.752) \qquad (67.09) \qquad\qquad (-2.819) \\ \\ + 7188.5\ \text{CPICHANG} - 218.64\ \text{T} + 2124.7\ \text{SEMIADJ} \\ \qquad\qquad (3.367) \qquad\quad (-2.427) \qquad (9.053) \end{array}$$

The equation has an F of 916.676 and an R^2 of .9885. All of the variables are significant at the .05 level of significance and have the expected signs. DDALAG1 has a positive coefficient greater than 1, which would indicate that DDA deposits were increasing over the time period estimated. Also, the T value is much higher than the other variables. This makes sense because DDA deposits wouldn't be expected to vary an extreme amount from what they were in the previous period and should be highly related to their previous level. NOWINT has a negative coefficient as expected. As the interest rate paid on negotiable orders of withdrawal (NOW) increases people would be expected to shift their money into the interest bearing NOW accounts and out of the non-interest bearing DDA accounts. CPICHANG has a positive coefficient as expected. As county personal income increases, DDA deposits would be expected to increase as well. T has a negative coefficient, which would indicate that deposits were decreasing over the sample period. But since DDALAG1 has a positive coefficient greater than 1, which indicates that deposits are increasing over time, T offsets the positive DDALAG1 coefficient. The coefficient on SEMIADJ is positive and indicates that DDA deposits are at higher levels in the second half of the year.

2.2.2 Negotiable Order of Withdrawal

Equation 3 gives the estimated negotiable order of withdrawal (NOW) equation. T statistics are presented under the coefficients with 101 degrees of freedom. The POOL command in Shazam was used to account for cross-section heteroskedasticity and time-wise autoregression. NOWLAG1 is the county level of NOW deposits in the previous time period (6 months ago). MMDALSNOW is the interest rate paid on money market deposit accounts (MMDA) less the interest rate paid on NOW accounts. CPI is county personal income (CPI) in the current period. T is a time trend variable that is 0 in June of 1990 and increases by 1 for each of the following periods. SEMIADJ is used as a seasonal dummy variable to account for higher or lower levels of demand deposits. SEMIADJ is 0 in the first half of the year, and 1 in the second half of the year. COUNTYDUM is a dummy variable used to account for the sale of one of the banks during the sample period.

$$\begin{array}{l} (3)\ \text{NOW} = 5753.5 + .85898\ \text{NOWLAG1} - 30{,}695\ \text{MMDALSNOW} \\ \qquad\qquad\quad (6.646) \qquad (32.35) \qquad\qquad (-1.763) \end{array}$$

$$\begin{array}{l} -0.18284\ \text{CPI} + 50.015\ \text{T} - 1980.6\ \text{SEMIADJ} + 3547.5\ \text{COUNTYDUM} \\ \quad (-4.754) \qquad (.8999) \qquad (-5.732) \qquad\quad (6.646) \end{array}$$

The equation has an F of 979.188 and an R^2 of .9876. All of the variables are significant at the .05 level of significance except the T variable. NOWLAG1 has a positive coefficient as expected. The current level of deposits should be positively related to the previous level of deposits. MMDALSNOW has a negative coefficient as expected. As the interest rate paid on MMDA accounts increased relative to the interest rate paid on NOW accounts customers would be expected to shift out of NOW deposits and into

MMDA deposits. CPI has a negative coefficient, which indicates that as CPI increases customers put less money into NOW accounts. T has a positive coefficient but is not significant. The coefficient on SEMIADJ is negative and indicates that NOW deposits are at higher levels in the first half of the year.

2.2.3 Money Market Deposit Accounts

Equation 4 gives the money market deposit account (MMDA) equation. T statistics are presented under the coefficients with 99 degrees of freedom. MMDALAG1 is the county level of MMDA deposits in the previous time period. MMDAINT is the interest rate paid on MMDA deposits. NOWINT is the interest rate paid on NOW deposits. TTLDEP is the level of total deposits for this time period. CDINT is the interest rate paid on certificates of deposit. CPI is county personal income. T and SEMIADJ are time trend and seasonal dummy variables as discussed earlier.

(4) MMDA = 1788.1 + 0.83894 MMDALAG1 + 14,988 MMDAINT - 62,844 NOWINT
(1.232) (19.40) (.8892) (-1.221)

+ 0.025653 TTLDEP - 27,060 CDINT + .00204 CPI - 182.18 T - 542.47 SEMIADJ
(4.523) (.7375) (.05601) (-2.150) (-2.81)

The equation has an F of 753.139 and an R^2 of .9838. MMDALAG1, TTLDEP, T, and SEMIADJ are all significant at or above the .05 level of significance. The coefficient on MMDALAG1 is positive as would be expected. The current level of deposits should be positively related to the previous level of deposits. MMDA would be approximately 83% of what it was 6 months ago plus the constant of 1,788.1. MMDAINT is positive as expected, but it is not significant at the .10 level of significance. As discussed earlier,

interest rates fell during most of the sample period. The fall in the interest rate, while at the same time deposits remained constant or grew slightly, could explain the insignificant t value. NOWINT and CDINT are negative as expected, but again not significant at the .10 level of significance. TTLDEP is positive as expected. CPI is also positive, which indicates that as customers earn more money they deposit more into MMDA accounts. T is negative, which would indicate that deposits decreased over the sample period. SEMIADJ is also negative, which would indicate that MMDA deposits are higher in the first half of the year.

2.2.4 Savings Deposit Accounts

Equation 5 gives the savings deposit account (SAV) equation. T statistics are presented under the coefficients with 101 degrees of freedom. SAVLAG1 is the county level of SAV deposits in the previous time period. CDLSSAV is the interest rate paid on certificates of deposit (CD) less the interest rate paid on savings deposits. SAVLSMDA is the interest rate paid on SAV deposits less the interest rate paid on MMDA deposits. CRS is county retail sales. T and SEMIADJ are time trend and seasonal dummy variables as discussed earlier.

$$\begin{array}{l} (5)\ \text{SAV} = \underset{(2.936)}{1.086.9} + \underset{(59.81)}{1.0062}\ \text{SAVLAG1} + \underset{(0.8471)}{120.85}\ \text{CDLSSAV} \\ \\ + \underset{(1.885)}{163.84}\ \text{SAVLSMDA} + \underset{(0.7411)}{2.6612}\ \text{CRS} - \underset{(-1.777)}{60.155}\ \text{T} - \underset{(-3.120)}{326.50}\ \text{SEMIADJ} \end{array}$$

The equation has an F of 887.37 and an R^2 of .9886. All variables are significant at or above the .05 level of significance, except CDLSSAV and CRS. The coefficient on

SAVLAG1 is positive as would be expected. CDLSSAV is positive, which indicates that as the difference between CD interest rates and SAV interest rates widens, SAV deposits will increase. The relationship is not significant. SAVLSMDA is also positive as expected. If the interest rate offered on SAV deposits is higher than that offered on MMDA deposits, customers would be expected to put more of their money into savings accounts. CRS is positive, as expected, because an increase in CRS should indicate that consumers have more money to spend and save. T is negative, which would indicate that savings deposits are decreasing over the sample period. But since the SAVLAG1 variable has a coefficient greater than 1, which would indicate that SAV in the current period are greater that SAV in the previous period, the T variable only offsets some of this increase.. SEMIADJ is also negative, which would indicate that savings deposits are higher in the first half of the year.

2.2.5 Certificates of Deposit Accounts

Equation 6 gives the certificates of deposit account (CD) equation. T statistics are presented under the coefficients with 100 degrees of freedom. CDLAG1 is the county level of CD deposits in the previous time period. CDINT is the interest rate paid on CD deposits. BONDINT is the interest rate paid on high grade municipal bonds. CRS is county retail sales. T and SEMIADJ are time trend and seasonal dummy variables, respectively, as discussed earlier.

$$\begin{array}{lll} (6)\ CD = 334.8 + 0.94986\ CDLAG1 + 132{,}280\ CDINT \\ \qquad\qquad\quad (0.12) \qquad (60.00) \qquad\quad (1.819) \end{array}$$

$$\begin{array}{llll} -\ 602.22\ BONDINT + 60.632\ CRS + 245.38\ T - 1012.1\ Month \\ \quad (-1.408) \qquad\quad (1.570) \qquad (1.260) \qquad (-2.437) \end{array}$$

The equation has an F of 2253.945 and an R^2 of .9963. All of the variables are significant at or above the .10 level of significance, except T and the constant. The coefficient on CDLAG1 is positive as would be expected. The current level of deposits should be positively related to the previous level of deposits. CDINT is positive as expected. Higher CD interest rates should attract more deposits. BONDINT is negative as expected. Since this is an alternative investment higher rates should attract deposits, leaving less money in CDs. CRS is positive, as expected, because an increase in CRS should indicate that consumers have more money to spend and save. T is positive, but not significant. SEMIADJ is negative, which would indicate that CD deposits are higher in the first half of the year.

2.3 County Volume Equations - Loans

The county volume loan equations are used to determine the total supply of the various loans in the county. Because the simulation is for 6-month time periods, the county volume loan equations are also estimated using semi-annual data. County volume equations were estimated for agricultural production loans (AGPROD), agricultural real estate loans (AGREL), real estate loans (REAL), commercial loans (COMML), and consumer loans (CONSUM). The 6-month average loan levels are presented in Figure 5. Agricultural production loans showed a definite seasonal trend. The other loan classes were relatively stable, with a slight increase in the second half of the sample period. The 6-month average interest rates charged on the five loan classes are presented in Figure 6. As with deposit interest rates, the loan interest rates decreased substantially during the

sample period. Table 2 contains values for the number of observations, mean, standard deviation, minimum, and maximum of loan, interest rate, and other variable used in the equations.

Figure 5. 6 Month Average Loans Levels

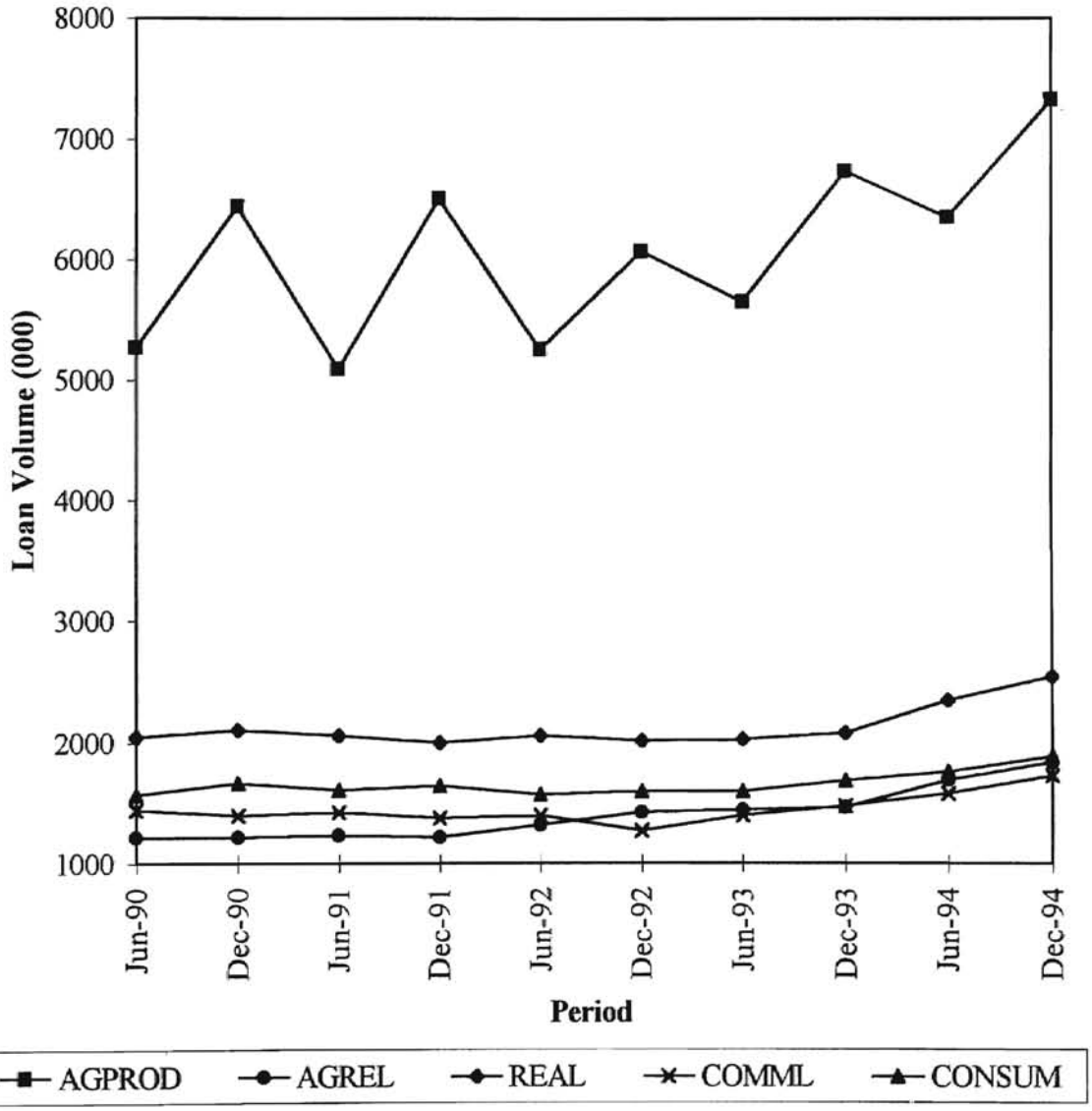
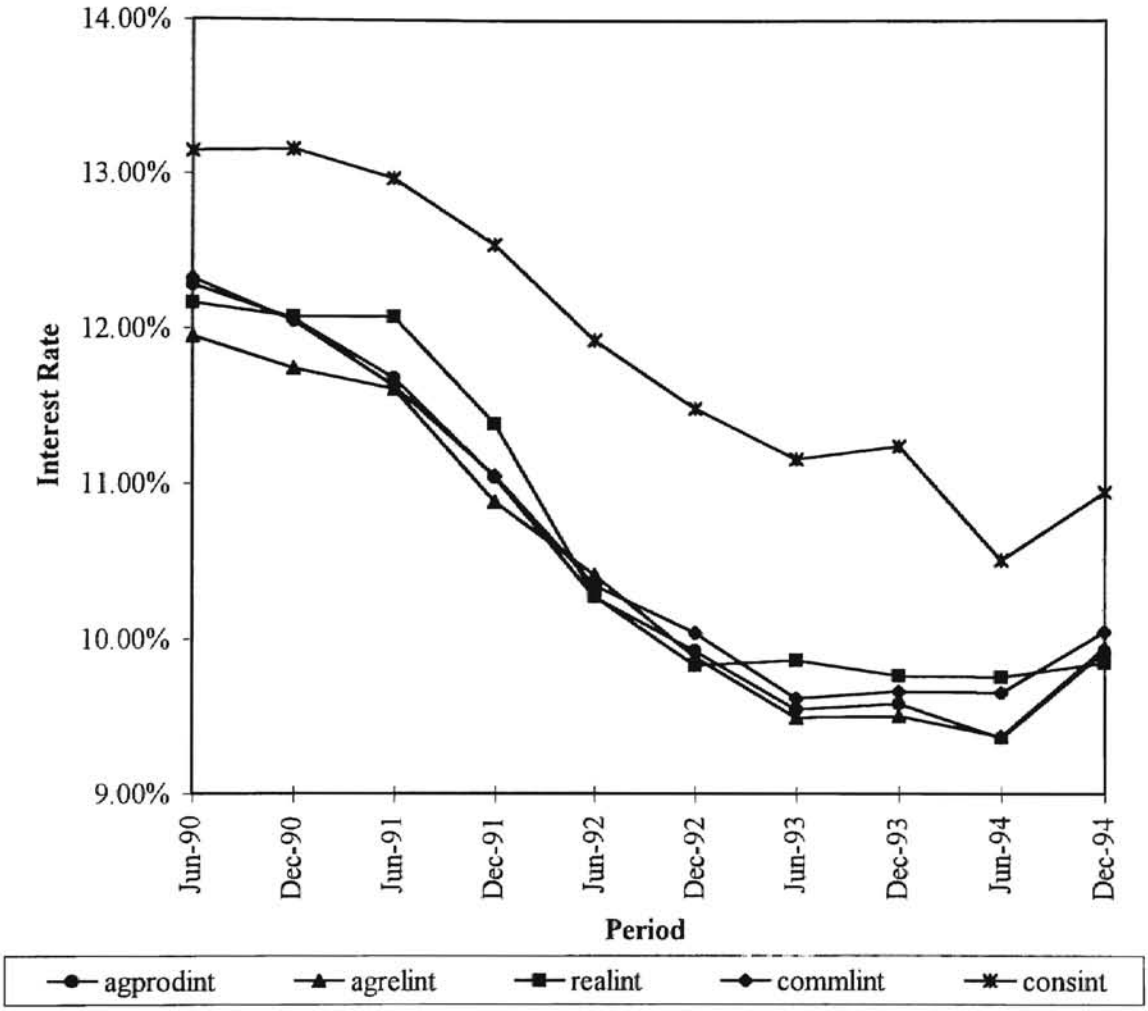


Figure 6. 6 Month Average Loan Interest Rates



The loan equations use the one-period (6 months) lagged level (dollar volume) of the loan class, interest rate charged on the loan, county retail sales, and average loan officer salary. A time trend variable that starts at 0 in June of 1990 and increases by 1 in each of the following periods. A semi-annual adjustment variable is also used to account for higher loan volumes during the first or second half of the year. Other variables specific to the different equations are also used. Each of the county volume equations is presented

with a discussion of the variables used. Again, like the equation estimated by Fisher, the overall equation is very significant and the R^2 is very high.

The data set combines the banks in each of the four county groups (see section 2.1 for a discussion of county groups) for each of the ten time periods. Since the call reports do not provide the interest rates charged on loans, data from the bank surveys were used. A total of 40 observation are identified, but once the lagged variable is removed, only 36 observations are included in the estimation process.

Table 2. Statistical Description of County Loan Variables.

Variable Name	Obs.	Mean	Std. Dev	Minimum	Maximum
AGPROD (000)	40	5859	3305	942	11761
AGREL (000)	40	1379	977	265	4576
REAL (000)	40	2325	1641	893	7457
COMML (000)	40	1484	625	776	3573
CONSUM (000)	40	1618	583	680	3075
AGPROD Int.	40	10.34%	.0105	9.05%	12.37%
AGREL Int.	40	10.16%	.0103	8.44%	12.32%
REAL Int.	40	10.37%	.0121	8.69%	12.59%
COMML Int.	40	10.39%	.0098	9.14%	12.38%
CONSUM Int.	40	11.70%	.0104	9.34%	13.54%
FPI	40	142.89	4.029	136.25	149.17
CRS (000,000)	40	25.253	17.052	12.23	63.73
LAND ($/acre)	40	381.31	60.959	275	453
HOUSCOST	40	155.14	7.555	142.6	166.83
PRODPRIC	40	123.47	1.712	120.88	125.88
INDPROD	40	112.80	3.343	108.93	119.47

2.3.1 Agricultural Production Loans

Equation 7 gives the estimated agricultural production loan (AGPROD) equation. T statistics are presented under the coefficients with 29 degrees of freedom. The POOL command in Shazam was used to account for cross-section heteroskedasticity and time-wise autoregression. AGPRLAG1 is the level of agricultural production loans in the previous period (6 months). COWGTINT is the weighted interest rate charged by banks in the county. It is calculated by taking the sum of the interest rate charged by each bank times the bank's level of AGPROD loans all divided by total AGPROD loan volume in the county. CRS gives the level of county retail sales. SEMIADJ is a dummy variable used to adjust for higher or lower loan volume in the second half of the year. It is 0 for the first half of the year, and 1 for the second half of the year. FPI is the farm price index. As the price farmers receive for a product increases, they generally produce more and often need to borrow more to increase production. AVGSALAR is the average salary paid to the loan officers in the bank.

$$\begin{array}{l} \text{(7)}\ \text{AGPROD} = \underset{(-2.607)}{-13{,}200} + \underset{(4.769)}{0.66014}\ \text{AGPROLG6} - \underset{(-1.295)}{17{,}602}\ \text{COWGTINT} \\ \quad - \underset{(-2.857)}{27.856}\ \text{CRS} + \underset{(9.127)}{1{,}921.3}\ \text{SEMIADJ} + \underset{(2.079)}{69.325}\ \text{FPI} + \underset{(2.49)}{0.17984}\ \text{AVGSALAR} \end{array}$$

The equation has an F of 221.669 and an R^2 of .9810. All of the variables are significant at the .05 significance level, except for COWGTINT. AGPROLG6 has a positive coefficient as expected. The current level of loans should have a positive relationship with the previous level of loans. COWGTINT has the expected negative sign. As interest rates charged on AGPROD loans increases farmers are expected to borrow

less money. The negative coefficient on CRS indicates that as county retail sales increase the level of AGPROD loans would decrease. Since the counties included in the study are agricultural counties, increased retail sales could indicate that farmers have more disposable funds, and would not need to borrow as much. The positive coefficient on SEMIADJ is approximately 33 percent of the average AGPROD level. This indicates that AGPROD loans are considerably higher in the second half of the year. This relationship is expected because of fall planting of wheat and fall purchases of cattle to graze on the wheat. The positive coefficient on FPI indicates that as the prices farmers receive for their products increase the level of AGPROD loans will also increase. AVGSALAR has a positive coefficient, which could indicate that as more loans are made salaries increase.

2.3.2 Agricultural Real Estate Loans

Equation 8 gives the estimated agricultural real estate loan (AGREL) equation. T statistics are presented under the coefficients with 28 degrees of freedom. The POOL command in Shazam was used to account for cross-section heteroskedasticity and time-wise autoregression. AGRELAG6 is the level of AGREL loans one period (6 months) ago. INTCHANG is the average AGREL interest rate in the current period less the AGREL interest rate in the previous period. T is a time trend variable that is 0 in June of 1990 and increases by 1 in each of the following periods. FPI is the farm price index. LAND is the average land value for the county during the current period. WHTFUTPR is the Chicago Board of Trade future price of wheat for the following July.

$$(8)\quad AGREL = \underset{(-2.673)}{-3447.1} + \underset{(26.10)}{1.1717}\ AGRELAG6 - \underset{(-2.367)}{12{,}513}\ INTCHANG$$

$$+ 1.16172\ CRS + 28.799\ T + 1.4665\ LAND + 12.523\ FPI + 235.32\ WHTFUTPR$$
$$(0.9285) \qquad (1.847) \qquad (3.680) \qquad (1.597) \qquad (2.035)$$

The equation has an F of 222.813 and an R^2 of .9847. All of the variables are significant at the .05 significance level, except for FPI and CRS. FPI is significant at the .10 level of significance, however. AGRELAG6 has a positive coefficient as expected. The current level of loans should be a positively related to the previous level of loans. INTCHANG has the expected negative sign. As interest rates charged on AGREL loans increases farmers are expected to borrow less money. The positive coefficient on CRS indicates that as county retail sales increase the level of AGREL loans increases. The positive coefficient on T indicates that AGREL loans are increasing over the time of the sample. LAND has a positive coefficient which indicates that increases in the value of land are accompanied by increases in the level of AGREL. The positive coefficient on FPI reveals that as the prices farmers receive for their products increases, the level of AGREL loans also increases. WHTFUTPR also has a positive sign and reveals that the level of AGREL loans is positively related to an increase in the future's market price of wheat.

2.3.3 Real Estate Loans

Equation 9 gives the estimated real estate loan (REAL) equation. T statistics are presented under the coefficients with 30 degrees of freedom. The POOL command in Shazam was used to account for cross-section heteroskedasticity and time-wise autoregression. REALLAG6 is the level of REAL loans one period ago (6 months). INTPERCH is the percentage change in REAL interest rate. INTPERCH is calculated by taking the interest rate charged on REAL in the current period less the interest rate

charged in the previous period, all divided by the interest rate charged in the previous period. T is a time trend variable that is 0 in June of 1990 and increases by 1 in each of the following periods. LAND is the average land value for the county during the current period. HOUSCOST is the cost of new housing in the current period.

$$\begin{array}{lccc} (9)\ \text{REAL} = -68{,}293 + 0.95796\ \text{REALLAG6} - 1126\ \text{T} \\ \qquad\qquad\quad (-2.285) \qquad (33.49) \qquad\quad (-2.169) \end{array}$$

$$\begin{array}{lccc} + 0.8629\ \text{LAND} + 471.28\ \text{HOUSCOST} - 678.48\ \text{INTPERCH} \\ (1.099) \qquad\quad (2.269) \qquad\quad (-1.30) \end{array}$$

The equation has an F of 229.781 and an R^2 of .9807. All of the variables are significant at the .05 significance level, except for LAND and INTPERCH. INTPERCH is significant at the .10 level of significance, however. REALLAG6 has a positive coefficient as expected. The current level of loans should have a positive relationship with the previous level of loans. INTPERCH has the expected negative sign. As interest rates charged on REAL loans increase, customers are expected to borrow less money. The negative coefficient on T indicates that REAL loans are decreasing over the time of the sample. LAND has a positive coefficient which indicates that as the value of land increases the level of REAL loans also increases. The positive coefficient on HOUSCOST reveals that as the price of building a new house increases the level of REAL loans will also increase. One might argue that the sign should be negative to indicate that the cost of building is low. However, when the demand for housing increases, and real estate loan volumes also increase, the cost of building a new house would also be expected to rise.

2.3.4 Commercial Loans

Equation 10 gives the estimated commercial loan (COMML) equation. T statistics are presented under the coefficients with 28 degrees of freedom. The POOL command in Shazam was used to account for cross-section heteroskedasticity and time-wise autoregression. COMMLAG6 is the level of COMML loans one period ago (6 months). INTCHANG is the average COMML interest rate in the current period less the COMML interest rate in the previous period. T is a time trend variable that is 0 in June of 1990 and increases by 1 in each of the following periods. CRS gives the level of county retail sales. SEMIADJ is a dummy variable used to adjust for higher or lower loan volume in the second half of the year. INDPROD is the industrial production of the major market groups and selected manufactures. It is used to represent the level of production. PRODPRIC is the producer prices received for total finished goods.

(10) COMML = 16,143 + 1.0146 COMMLAG6 - 4471.9 INTCH - 3.9828 CRS
(2.059) (11.83) (-.6513) (-2.11)

+ 108.71 T - 148.48 SEMIADJ + 17.746 INDPROD - 149.36 PRODPRIC
(2.056) (-2.288) (.6432) (-2.579)

The equation has an F of 47.201 and an R^2 of .9700. All of the variables are significant at the .05 significance level, except for INDPROD and INTCH. COMMLAG6 has a positive coefficient as expected. The current level of loans should have a positive relationship with the previous loan level. INTCH has the expected negative sign. As interest rates charged on COMML loans increase, customers are expected to borrow less money. The positive coefficient on T indicates that COMML loans are increasing over the time of the sample. SEMIADJ is negative which signifies that COMML loans are lower in

the second half of the year. CRS has a negative sign which indicates that COMML loans decrease as county retail sales increases. While some what surprising, the sign may indicate that when businesses have more money from sales, they do not need to borrow as much. INDPROD is negative which would indicate that as production increases COMML loans would also increase. PRODPRIC has a negative coefficient which would indicate that as the prices businesses receive for their products increase, they demand fewer COMML loans.

2.3.5 Consumer Loans

Equation 11 gives the estimated consumer loan (CONSUM) equation. T statistics are presented under the coefficients with 29 degrees of freedom. The POOL command in Shazam was used to account for cross-section heteroskedasticity and time-wise autoregression. CONSLAG6 is the level of CONSUM loans one period ago (6 months). INTPERCH is the percentage change in CONSUM interest rate. INTPERCH is calculated by taking the interest rate charged on CONSUM in the current period less the interest rate charged in the previous period, all divided by the interest rate charged in the previous period. T is a time trend variable that is 0 in June of 1990 and increases by 1 in each of the following periods. CRS gives the level of county retail sales. PRODPRIC is the producer prices received for total finished goods.

$$\begin{array}{l} (11)\ \text{CONSUM} = 12{,}506 + 0.90478\ \text{CONSLAG6} - 819.67\ \text{INTPERCH} \\ \qquad\qquad\qquad\quad (5.073) \qquad (6.455) \qquad\qquad (-2.179) \\ \\ \qquad - 3.3964\ \text{CRS} + 91.968\ \text{T} - 102.77\ \text{PRODPRIC} \\ \qquad\quad (-0.8504) \qquad (5.727) \qquad (-5.162) \end{array}$$

The equation has an F of 237.413 and an R^2 of .9971. All of the variables are significant at the .05 significance level, except for CRS. CONSLAG6 has a positive coefficient as expected. The current level of loans should be positively related to the previous loan level. INTPERCH has the expected negative sign. As interest rates charged on CONSUM loans increase, customers are expected to borrow less money. The positive coefficient on T indicates that CONSUM loans are increasing over the time of the sample. CRS has a negative sign which indicates that CONSUM loans decrease as county retail sales increases. PRODPRIC has a negative coefficient indicating that as the prices consumers must pay for their products increase, they demand fewer CONSUM loans.

2.4 Market Share Equations - Deposits

The market share equations are used to determine the share of the market allocated to each bank in the county. Market share equations were estimated for demand deposits (DDA), negotiable orders of withdrawal (NOW), money market deposit accounts (MMDA), savings deposits (SAV), and certificates of deposit (CD). Again, since the simulation is for 6-month periods, semi-annual data are used. Data used in the equations were obtained from the federal reserve call reports and from the survey. The banks included were again grouped in county groups as discussed in section 2.1.

The dependent variable used is the percentage change in market share. This percentage change is calculated by taking the banks market share in the current period, subtracting the market share in the previous period, and dividing by the market share in the pervious period. For example, if the bank now has a 15 percent market share and had

10 percent 6 months ago (1 period) the percentage change in market share would be (.15 - .10)/ .10 = .50 or a 50 percent increase. Equations were also estimated using the current market share as the dependent variable and including the lagged market share as an explanatory variable in the equation. The lagged variable tended to have a high level of significance, but the coefficients and the statistical significance of the other explanatory variables were greatly reduced. These equations did, however, prove to be very significant overall with very high F values and R^2. The equations estimated have an F value and R^2 very similar to those obtained by Fisher. Because the lagged variable tended to drive the equation, the percentage change in market share was used. Variables hypothesized to be important were service charge, advertising, employees salaries, number of competitors, number of loan officers, and interest rate level. Each of the market share equations is presented with a discussion of the explanatory variables. The data set includes the 10 banks that returned completed surveys in the four county groups for each of the ten time periods. A total of 100 observations, were collected, but only 90 are left after the lagged variable is removed.

2.4.1 Demand Deposits

Equation 12 gives the estimated demand deposit market share (MSDDA) equation. T statistics are presented under the coefficients with 85 degrees of freedom. The POOL command in Shazam was used to account for cross-section heteroskedasticity and time-wise autoregression. CHSERVCH is the change in the bank's service charge less the change in the county average service charge. CHADV is the change in the bank's

advertising less the county average advertising. NUMOFFIC is the total number of loan officers employed by the bank during the current period. SALPEREM is the average salary paid to all employees in the bank.

$$\begin{array}{l} (12)\ \text{MSDDA} = -0.0308 - 1.7188\ \text{CHSERVCH} \\ \qquad\qquad\quad (-0.015) \qquad\ (-0.4111) \end{array}$$

$$\begin{array}{l} +\ 1.5796\ \text{CHADV} - 0.6269\ \text{NUMOFFIC} + 0.18409\ \text{SALPEREM} \\ \quad (1.871) \qquad\qquad (-2.104) \qquad\qquad\ (1.881) \end{array}$$

The equation has an F of 3.11 and an R^2 of .1405. All of the variables are significant at the .05 significance level, except for CHSERVCH. CHSERVCH is not significant, but it does have the expected sign. As the service charge levied by a bank increases relative to the county average, customers are expected to shift their money out of the bank and into another bank with lower services charges. CHADV has the expected positive sign. As the bank increases the level of advertising relative to the county average, it is expected to attract more deposits. SALPEREM is also positive as expected. As employees receive more money, they are expected to provide a more "customer friendly" banking environment. This environment is particularly important on demand deposits, were customers do not receive any reward, other than convenience and service, for having their account at a particular bank. NUMOFFIC has a negative sign. More officers would probably indicate that the bank is growing larger. Some customers could associate a larger bank with less service and convenience, and therefore, might move their accounts to a bank they deemed more convenient.

2.4.2 Negotiable Order of Withdrawal

Equation 13 gives the estimated negotiable order of withdrawal market share

(MSNOW) equation. T statistics are presented under the coefficients with 85 degrees of freedom. The POOL command in Shazam was used to account for cross-section heteroskedasticity and time-wise autoregression. CHSERVCH is the change in the banks service charge less the change in the county average service charge. CHADV is the change in the banks advertising less the county average advertising. PERCHSAL is the percentage change in the salary paid to all employees. This percentage change is calculated by taking the salary paid in the current period less the salary paid in the previous period divided by the salary paid in the pervious period. BKLSAVG is the interest rate paid by the bank less the average interest rate paid by the county.

$$\underset{}{(13)\ MSNOW = -0.3891 + 13.485\ CHSERVCH} \\ \underset{(-.0592)\qquad (2.262)}{}$$

$$+ 3.6238\ CHADV + 7.3715\ PERCHSAL + 908.45\ BKLSAVG \\ (2.807)\qquad (3.289)\qquad (2.773)$$

The equation has an F of 10.147 and an R^2 of .3224. All of the variables are significant at the .05 significance level. CHSERVCH has a positive sign. This would seem to be incorrect, unless the customers relate a higher service charge with greater service and increased banking ease. CHADV has the expected positive sign. As the bank increases their level of advertising relative to the county, they are expected to attract more deposits. PERCHSAL is also positive as expected. As employees receive more money, they are expected to provide a more "customer friendly" banking environment. BKLSAVG also has the expected positive sign. When the interest rate the bank is offering on deposits is higher than the county average, customers would be expected to shift their deposits into the bank offering higher interest rates.

2.4.3 Money Market Deposit Account

Equation 14 gives the estimated market share equation for money market deposit accounts (MSMMDA). T statistics are presented under the coefficients with 85 degrees of freedom. The POOL command in Shazam was used to account for cross-section heteroskedasticity and time-wise autoregression. CHSERVCH is the change in the banks service charge less the change in the county average service charge. CHADV is the change in the banks advertising less the county average advertising. PERCHSAL is the percentage change in the salary paid to all employees. This percentage change is calculated by taking the salary paid in the current period less the salary paid in the previous period divided by the salary paid in the pervious period. CHBKLSCO is the percentage change in the banks interest rate less the percentage change in the county average interest rate.

$$\underset{(14)}{\text{MSMMDA}} = \underset{(0.5728)}{0.00527} + \underset{(1.724)}{0.14812}\ \text{CHSERVCH}$$

$$+ \underset{(2.003)}{0.0371}\ \text{CHADV} + \underset{(.8741)}{0.0271}\ \text{PERCHSAL} + \underset{(3.411)}{0.5341}\ \text{CHBKLSCO}$$

The equation has an F of 4.251 and an R^2 of .1652. All of the variables are significant at the .05 significance level, except for PERCHSAL. CHSERVCH has a positive sign. One might expect the opposite sign, unless customers relate a higher service charge with greater service and increased banking ease. CHADV has the expected positive sign. As the bank increases their level of advertising relative to the county average, the bank is expected to attract more deposits. PERCHSAL is also positive as expected. As employees receive more money, they are expected to provide a more

"customer friendly" banking environment. CHBKLSCO also has the expected positive sign. When the interest rate the bank is offering on deposits is higher than the county average, customers are expected to shift their deposits into the bank offering higher interest rates.

2.4.4 Savings Deposit Account

Equation 15 gives the estimated savings deposit account market share (MSSAV) equation. T statistics are presented under the coefficients with 85 degrees of freedom. The POOL command in Shazam was used to account for cross-section heteroskedasticity and time-wise autoregression. CHSERVCH is the change in the banks service charge less the change in the county average service charge. CHADV is the change in the banks advertising less the county average advertising. PERCHSAL is the percentage change in the salary paid to all employees. This percentage change is calculated by taking the salary paid in the current period less the salary paid in the previous period divided by the salary paid in the pervious period. CHBKLSCO is the percentage change in the banks interest rate less the percentage change in the county average interest rate.

$$\underset{(15)}{MSSAV} = \underset{(0.586)}{0.0033} + \underset{(2.320)}{0.13914}\ CHSERVCH$$

$$+ \underset{(0.855)}{0.0114}\ CHADV + \underset{(-1.087)}{0.0227}\ PERCHSAL + \underset{(2.460)}{0.1987}\ CHBKLSCO$$

The equation has an F of 3.757 and an R^2 of .1570. All of the variables are significant at the .05 significance level, except for PERCHSAL and CHADV. CHSERVCH has a positive sign. Again, one might expect the opposite sign, unless the

customers relate a higher service charge with greater service and increased banking ease. CHADV has the expected positive sign. As the bank increases their level of advertising relative to the county average, the bank is expected to attract more deposits. PERCHSAL has a negative sign. Savings deposits require less interaction with the bank staff and there are many non-bank alternatives, such as mutual funds. Thus the salary received by the employees may have little effect on the banks share of savings deposits. CHBKLSCO also has the expected positive sign. When the interest rate the bank is offering on deposits is higher than the county average, customers are expected to shift their deposits into the bank offering higher interest rates.

2.4.5 Certificates of Deposit

Equation 16 gives the estimated certificates of deposit market share (MSCD) equation. T statistics are presented under the coefficients with 87 degrees of freedom. The POOL command in Shazam was used to account for cross-section heteroskedasticity and time-wise autoregression. PERCHSAL is the percentage change in the salary paid to all employees. This percentage change is calculated by taking the salary paid in the current period less the salary paid in the previous period divided by the salary paid in the pervious period. BKLSAVG is the interest rate paid by the bank less the average interest rate paid by the county.

$$\underset{(16)}{\text{MSCD}} = \underset{(1.531)}{0.00459} + \underset{(1.182)}{0.0126}\ \text{PERCHSAL} + \underset{(4.273)}{11.977}\ \text{BKLSAVG}$$

The equation has an F of 9.871 and an R^2 of .1989. PERCHSAL is not significant at the .05 level of significance. It does, however, have the expected sign. As employees are

paid more, they are expected to provide better service to the customers. BKLSAVG is significant at the .005 level of significance and has the expected sign. As the interest rate the bank is offering increases above the county average, the bank is expected to increase market share by attracting deposits from competitors.

2.5 Market Share Equations - Loans

The market share equations are used to determine the share of the market allocated to each bank in the county. Market share equations are estimated for agricultural production (AGPROD), agricultural real estate (AGREL), real estate (REAL), commercial (COMML), and consumer (CONSUM) loans. Again, since the simulation model represents the decision environment for 6-month periods, semi-annual data are used. Data used in the equations were obtained from the federal reserve call reports and from the bank survey. The banks included were again combined in county groups as discussed in section 2.1. The dependent variable used is the percentage change in market share, and is calculated by taking the bank's market share in the current period, subtracting the market share in the previous period, and dividing by the market share in the pervious period. For example, if the bank now has a 15 percent market share and had a 10 percent market share six months ago (1 period) the percentage change would be (.15 - .10)/ .10 = .50 or a 50 percent increase in market share. Equations were also estimated using the current market share as the dependent variable and including the lagged market share variable in the equation. Again, the lagged variable tended be extremely significant, but the coefficients and significance levels of the other explanatory variables were greatly

reduced. These equations did, however, prove to be very significant overall with very high F values and R^2. Because the lagged variable tended to drive the equation, the percentage change in market share was used as the dependent variable. The equations estimated have an F value and R^2 very similar to those obtained by Fisher. Variables hypothesized to be important were advertising, number of banks, loan officer salary, number of loan officers, and interest rate charged on loans. Each of the market share equations is presented with a discussion of the explanatory variables. The data set is comprised of banks that returned completed surveys (a total of 9) in the four county groups for each of the ten time periods. Of the total of 90 observations collected, 81 are left after the lagged variable is removed.

2.5.1 Agricultural Production Loans

Equation 17 gives the estimated agricultural production market share (MSAGPROD) equation. T statistics are presented under the coefficients with 76 degrees of freedom. The POOL command in Shazam was used to account for cross-section heteroskedasticity and time-wise autoregression. CHADV is the change in the banks advertising less the county average advertising. CHNUMOFF is the change in the number of loan officers employed by the bank during the current period, calculated as the number of loan officers in the current period less the number of officers in the previous period. AVGSALAR is the average salary paid to the bank's loan officers. CHBKLSCO is the percentage change in the interest rate charged by the bank less the percentage change in the interest rate charged by the county. For example, assume the bank is charging 12

percent in the current period and charged 13 percent in the previous period, and the county average in the current period is 12.5 and was 13 in the previous period. CHBKLSCO would be equal to ((.12 -.13)/.13) - ((.125 - .13)/.13) = -0.038 or -3.8 percent. The AGPROD market share equation

$$(17)\ \underset{}{\text{MSAGPROD}} = \underset{(-2.206)}{-0.0739} + \underset{(1.438)}{0.0166}\ \text{CHADV}$$

$$- \underset{(-0.1897)}{0.00503}\ \text{CHNUMOFF} + \underset{(2.246)}{0.0000195}\ \text{AVGSALAR} - \underset{(-4.888)}{0.89632}\ \text{CHBKLSCO}$$

has an F of 7.615 and an R^2 of .2866. All of the variables are significant at the .05 significance level, except for CHADV and CHNUMOFF. CHADV is significant, however, at the .10 level. CHADV has the expected positive sign. As the bank increases their level of advertising relative to the county, they are expected to attract more loans. CHNUMOFF has a negative coefficient and is not significant. The banks in the survey did not increase or decrease the number of officers, except for a few times. Because the number of officers were very stable, the variable did not help explain changes in the banks market share. One possible reason for the negative coefficient could be a lag between hiring new loan officers and increased loan volumes. That is, the new officer may not be effective at first in attracting new loan customers, which would increase the banks market share. AVGSALAR has the expected positive coefficient. As officers are paid more, they are expected to work harder at attracting new customers. CHBKLSCO has the expected negative coefficient. As the bank increases interest rates relative to the county, they are expected to attract fewer new loans.

2.5.2 Agricultural Real Estate Loans

Equation 18 gives the estimated agricultural real estate market share (MSAGREL) equation. T statistics are presented under the coefficients with 76 degrees of freedom. The POOL command in Shazam was used to account for cross-section heteroskedasticity and time-wise autoregression. PERCHADV is the percentage change in the banks advertising level, and is calculated as the current level of advertising less the level six months ago divided by the level six months ago. NUMOFF is the total number of officers employed by the bank. AVGSALAR is the average salary paid to the bank's loan officers. BKLSAVG is the bank's interest rate charged on agricultural real estate loans less the county average interest rate. The AGREL market share equation

$$\underset{(-1.89)}{\text{(18) MSAGREL} = -0.0588} + \underset{(1.284)}{0.0141\ \text{PERCHADV}}$$

$$\underset{(-3.797)}{-0.0131\ \text{NUMOFF}} + \underset{(3.712)}{0.00005883\ \text{AVGSALAR}} \underset{(-2.921)}{-2.9759\ \text{BKLSAVG}}$$

has an F of 7.151 and an R^2 of .2798. All of the variables are significant at the .05 significance level, except for PERCHADV. PERCHADV is significant, however, at the .10 level. PERCHADV has the expected positive sign. As the bank increases the level of advertising, it is expected to attract more loans. NUMOFF has a negative coefficient. The banks in the survey did not increase or decrease the number of officers, except for a few times. One possible reason for the negative coefficient could be that when a bank increases the number of officers, the new officers will take a while to learn the new position. That is the new officer may not be effective at first in attracting new loan customers, which would increase the banks market share. AVGSALAR has the expected

positive coefficient. As officers work harder at attracting new customers they will likely be paid more. BKLSAVG has the expected negative coefficient. As the bank increases interest rates relative to the county average, they are expected to attract fewer new loans.

2.5.3 Real Estate Loans

Equation 19 gives the estimated real estate market share (MSREAL) equation. T statistics are presented under the coefficients with 76 degrees of freedom. The POOL command in Shazam was used to account for cross-section heteroskedasticity and time-wise autoregression. CHNUMOFF is the change in the total number of officers employed by the bank. PERCHSAL is the percentage change in the average salary paid to the bank's loan officers. CHDEPSH is the change in the banks market share of all deposits. BKLSAVG is the bank's interest rate charged on agricultural real estate loans less the county average interest rate. The REAL market share equation

$$\begin{array}{l} (19)\ \text{MSREAL} = \underset{(-0.814)}{-0.00608} + \underset{(0.272)}{0.0056}\ \text{CHNUMOFF} \\ \quad + \underset{(0.0730)}{0.00965}\ \text{PERCHSAL} + \underset{(1.922)}{0.5579}\ \text{CHDEPSH} - \underset{(-2.81)}{3.4625}\ \text{BKLSAVG} \end{array}$$

has an F of 2.972 and an R^2 of .1389. CHDEPSH and BKLSAVG are significant at the .05 level of significance. CHNUMOFF has a positive coefficient but is not significant. The banks in the survey did not increase or decrease the number of officers, except for a few times. Because the number of officers were very stable the variable did not help explain changes in the banks market share. PERCHSAL has the expected positive coefficient. As officers work harder at attracting new customers they will likely be paid

more. CHDEPSH has the expected positive coefficient. As the bank attracts more of the county deposits they are expected to establish relationships with the new customers. When the customers need a real estate loan, many of them would probably use a bank with which they are familiar. BKLSAVG has the expected negative coefficient. As the bank increases interest rates relative to the county average, they are expected to attract fewer new loans.

2.5.4 Commercial Loans

Equation 20 gives the estimated commercial loan market share (MSCOMML) equation. T statistics are presented under the coefficients with 76 degrees of freedom. The POOL command in Shazam was used to account for cross-section heteroskedasticity and time-wise autoregression. PERCHADV is the percentage change in the banks advertising level, and is calculated as the current level of advertising less the level 6 months ago all divided by the level six months ago. NUMOFF is the total number of officers employed by the bank. AVGSALAR is the average salary paid to the bank's loan officers. BKLSAVG is the bank's interest rate charged on agricultural real estate loans less the county average interest rate. The COMML market share equation

$$\underset{(-0.870)}{\text{MSCOMML} = -0.038} + \underset{(0.4594)}{0.00586\ \text{PERCHADV}}$$

$$- \underset{(-2.307)}{0.01164\ \text{NUMOFF}} + \underset{(1.908)}{0.000023\ \text{AVGSALAR}} - \underset{(-1.392)}{2.1987\ \text{BKLSAVG}}$$

has an F of 2.226 and an R^2 of .1090. AVGSALAR and NUMOFF are significant at the .05 level of significance. BKLSAVG is significant at the .10 level of significance.

PERCHADV has the expected positive coefficient, but is not significant. NUMOFF has a negative coefficient. The banks in the survey did not increase or decrease the number of officers, except for a few times. One possible reason for the negative coefficient, as indicated earlier, is that the new officer may not be effective at first in attracting new loan customers which would increase the bank's market share. AVGSALAR has the expected positive coefficient. As officers work harder at attracting new customers they will likely be paid more. BKLSAVG has the expected negative coefficient. As the bank increases interest rates relative to the county average, they are expected to attract fewer new loans.

2.5.5 Consumer Loans

Equation 21 gives the estimated consumer loan market share (MSCONSUM) equation. T statistics are presented under the coefficients with 78 degrees of freedom. The POOL command in Shazam was used to account for cross-section heteroskedasticity and time-wise autoregression. CHDEPSH is the change in the bank's market share of all deposits. BKLSAVG is the bank's interest rate charged on agricultural real estate loans less the county average interest rate. The CONSUM market share equation

$$\underset{(21)}{\text{MSCONSUM}} = \underset{(0.8016)}{0.00255} + \underset{(1.975)}{0.30431}\ \text{CHDEPSH} - \underset{(-1.716)}{1.2639}\ \text{BKLSAVG}$$

has an F of 5.257 and an R^2 of .1200. All variables are significant at the .05 level of significance. CHDEPSH has the expected positive coefficient. As the bank attracts more of the county deposits, they are expected to establish relationships with the new customers. When the customers need a loan, many of them would probably check with a

familiar bank. BKLSAVG has the expected negative coefficient. As the bank increases interest rates relative to the county average, they are expected to attract fewer new loans.

CHAPTER 3

BANK SIMULATION

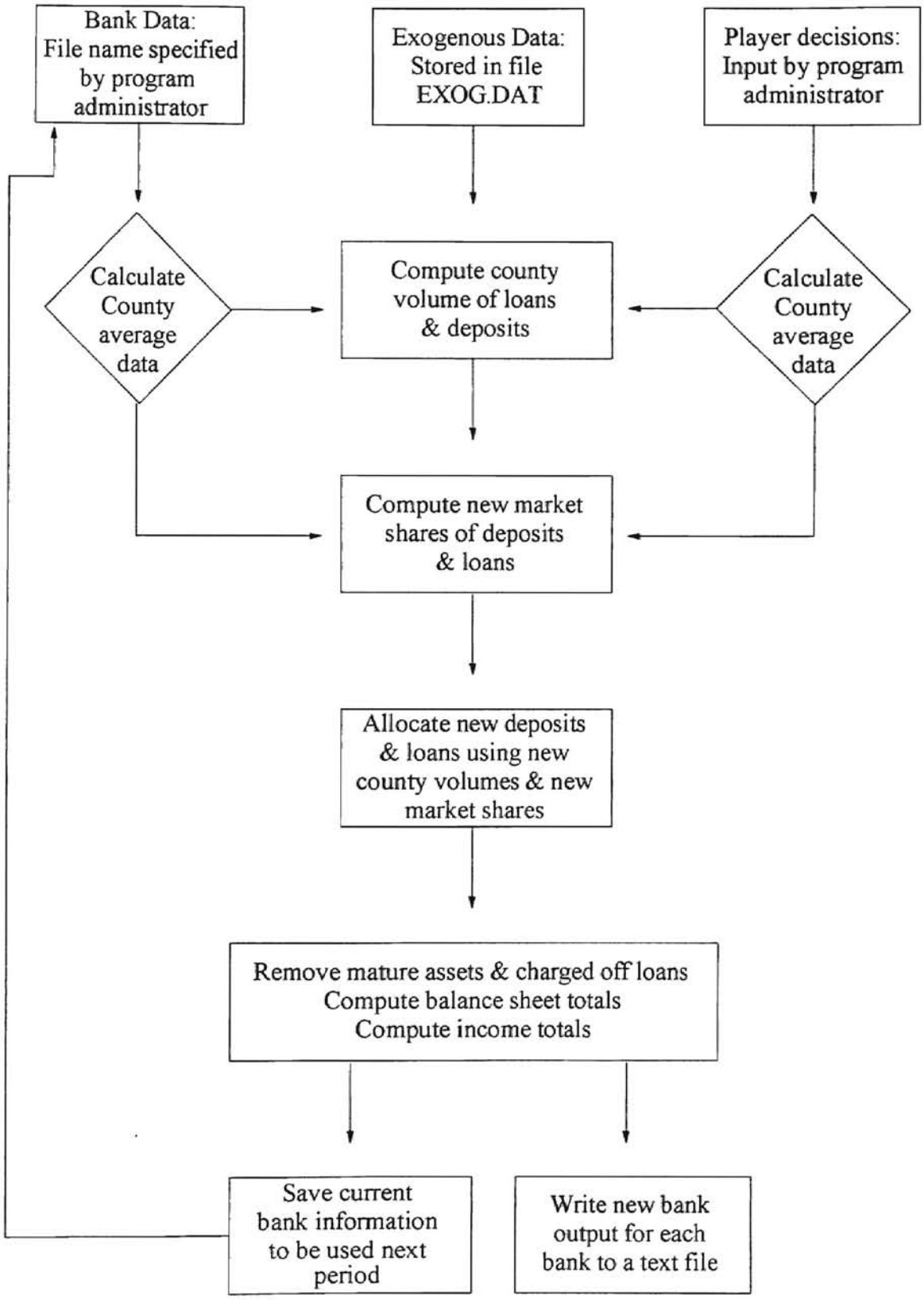
This chapter discusses the components of the bank simulation model, decisions made by participants, output generated by the model, and instructions on how to run the program. Decisions in the model are for six-month periods. The period of play is designated with a .0 or .5 following the year. For example, 1996.0 represents the first six-months of 1996 and 1996.5 represents the second six-months of 1996.

3.1 Components of Oklahoma Bank Simulation

The simulation model is written in the C programming language and is designed to run on IBM compatible micro computers with either Windows 3.x or Windows 95. The simulation is designed to represent the current decision making environment of an agricultural bank in a rural Oklahoma county. Three banks compete for deposits and loans in the county. More than one county is allowed in the simulation, but each county is independent of the other counties. The simulation uses information contained in a history file to generate the beginning balance sheet, income statement, and other bank game output (to be discussed later). Participants playing Oklahoma Bank Simulation make decisions for the next six-month period. Based on output from the previous period (or periods) and information on future economic conditions. The decisions are input into the simulation model, and a new set of output is produced.

Figure 7 shows the general flow of the simulation. To generate a new set of output (a description of how the beginning output is generated is presented next),

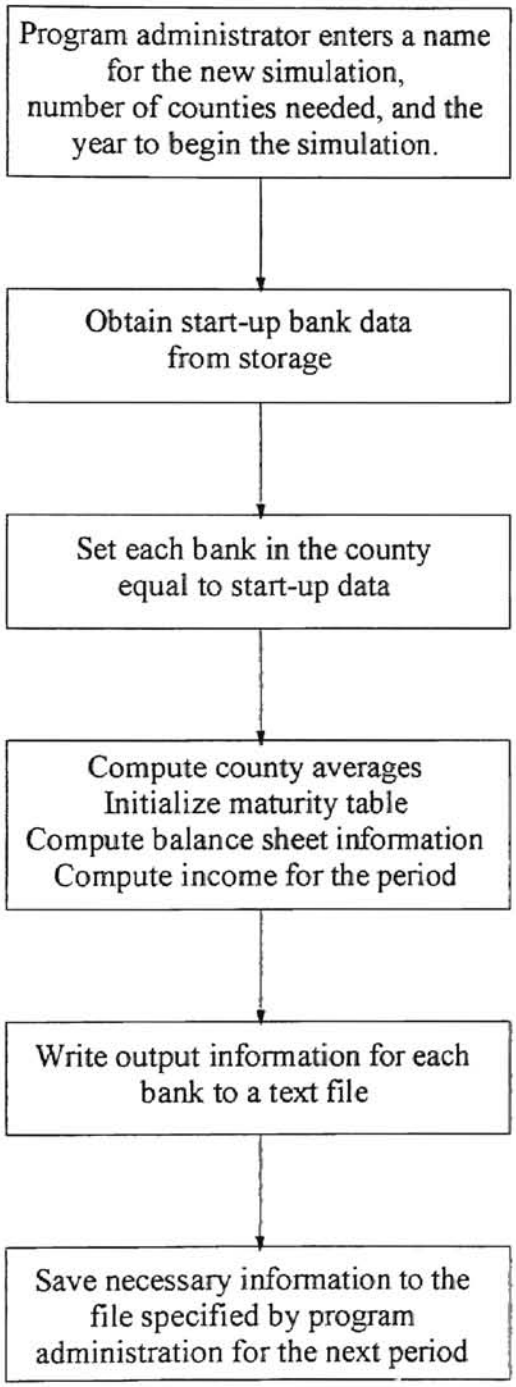
Figure 7. Flow of Model



the program uses information from the previous period a play that is contained in a file designated by the program administrator. Necessary economic data for the period is contained in an exogenous data file EXOG.DAT. The last data needed to generate the new set of output are the player decisions. The program administrator will input the decisions for each bank. Once all necessary data are contained in memory, the program calculates the county average interest rates, service charge, advertising, number of loan officers, loan officer salary, and employee salary. The county average variables, from both the bank data file and the player decisions, and the economic data, are used to determine the new county volumes of deposits and loans. The new market shares for the current period are determined using the county average information. Once the new county volumes and market shares are calculated, the program allocates the new deposits and loans for each bank. The remainder of the program removes mature assets, removes charged-off loans, computes the new balance sheet totals, and computes the income levels and totals. The last step of the program writes the new output for each bank to a text file, and saves the current bank information so that it will be available for the next period.

Figure 8 displays the creation of a new bank simulation. The program administrator would choose to begin a new simulation from the program menu. The program next prompts the program administrator to enter a name for the new simulation, the number of counties needed, and the year to begin the new simulation. The initial simulation information is contained in a history file named EXOG.DAT. The file contains the beginning loan and investment portfolio, beginning level of deposits, beginning cash and due from, beginning capital and surplus, and beginning retained earnings. Every bank

Figure 8. Creating Initial Bank Situation

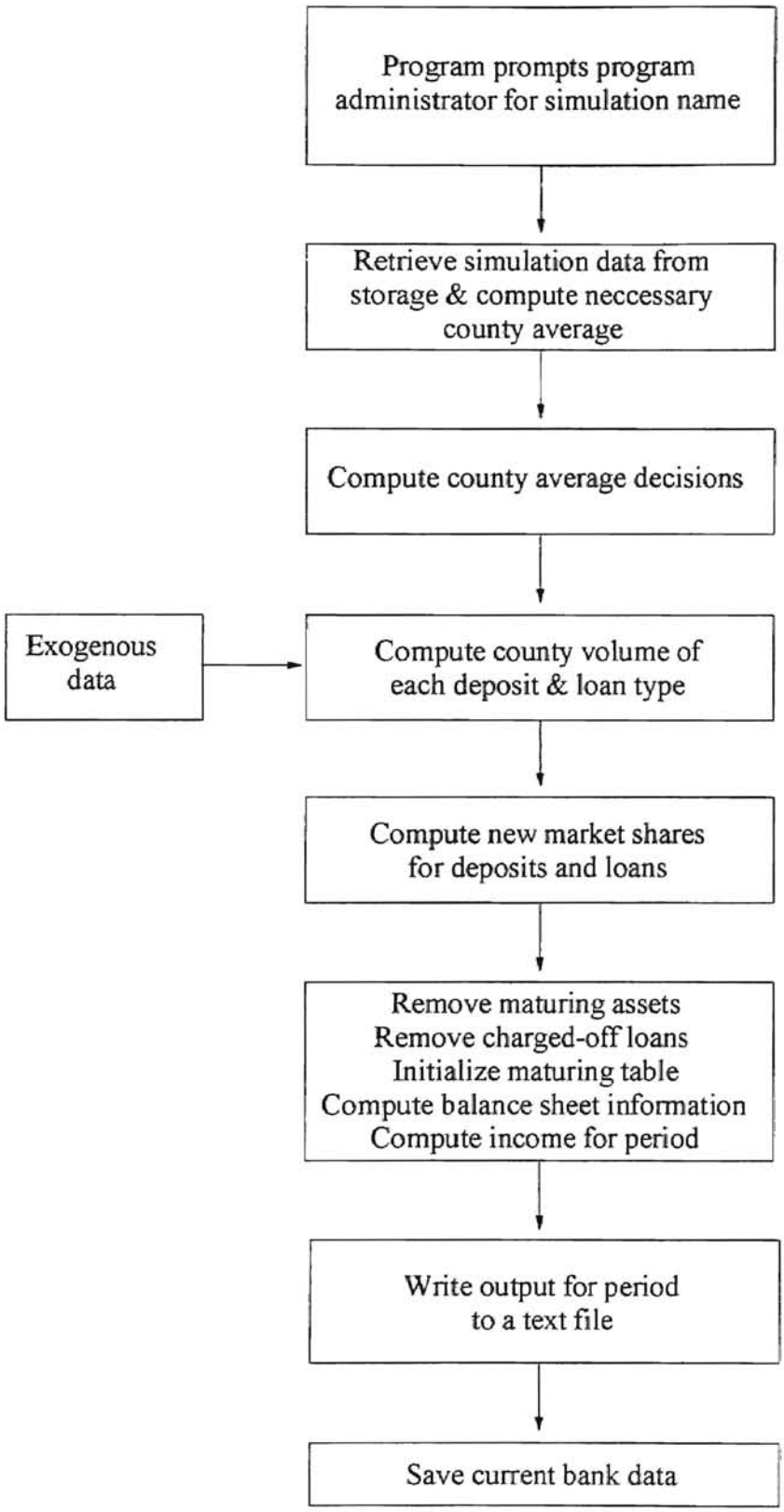


in the county is initialized with the information contained in the history file, and therefore, every bank is identical when the simulation first begins. Once the initial information is obtained for each bank in the county, the program saves the information to a file designated by the program administrator.

Figure 9 provides a graphical view of continuing the bank simulation. The program administrator would choose to continue an existing simulation, enter the file name specified in the beginning period, and enter the player decisions for the current period. The program obtains the previous bank information and the economic data from storage. Once the data have been entered by the program administrator and obtained from storage, county average data is computed. The county volume of deposits and loans and the new market shares of deposits and loans are determined next. Mature assets are removed from each bank's loan and investment portfolio, and charged-off loans are removed from the loan portfolio. The program next determines the investments that are mature for each period. Each bank's new balance sheet and income statement are determined. Finally, the output for the current period is written to a text file and the current set of bank information is stored for the next period of play.

Once the initial period has been generated from the history file (as described above), subsequent periods of play are continued by the program administrator entering the simulation name. The program retrieves the information from the last period of play. The exogenous data needed in the simulation is also obtained from a separate data file. Once all necessary information is obtained from storage, the program computes county average information on interest rates, advertising, service charge, and salaries which are needed later in the program. The program administrator is next prompted to enter the player

Figure 9. Continuing the Simulation



decisions for each bank. The player decisions, which are discussed in detail later, include interest rates to charge on loans, interest rates to pay on deposits, service charge, advertising, number of loan officers, loan officer salary, employee salary, maximum new loans to make, securities to purchase, and securities to sell. The program computes the county average decisions on interest rates, service charge, advertising, number of officers, loan officer salary, and employee salary.

At this point, the program is ready to compute the new county volume of deposits and loans. The county volume equations, which were discussed in the previous chapter, are used to compute the total level of deposits and loans for the current period. These new volumes are based on the player decisions and other economic data that was found to be significant. County average interest rates effect the total county volume of deposits and loan. County per capita income and county retail sales were significant in determining the county volume of deposits. Economic data significant in determining county volume of loans includes the Farm Price Index, county retail sales, average land value, the Futures Price of wheat, cost of new housing index, and the Producer Price Index.

Once the county volume of deposits and loans has been determined, the program next computes the new market shares for each bank. The market share equations, which were discussed in the previous chapter, determine each bank's new market share.

The program next determines the loans and securities that are mature. Agricultural production loans are made for one year, and the full principal amount is paid at the end of one year (2 periods). Agricultural Real Estate and Real Estate loans are made for ten years, and ten percent of the original principal is due each year. Commercial loans have a

two-year term, and fifty percent of the original principal is due each year. Consumer loans also have a two-year term, but twenty-five percent of the original principal amount is repaid after each six-month period. The investment alternatives available in the simulation include six-month government securities, one-year government securities, three-year government securities, two-year municipal bonds, and five-year municipal bonds. Some income from municipals bonds is exempt from state and federal income taxes. Each security matures over the period of time indicated in its name. For example, the six-month government matures after six months (1 period), and the five-year municipal matures after five years (10 periods). Assets are removed from the bank's portfolio of investments as they mature.

Once the mature assets have been removed, the new loans and deposits are allocated to the bank using the new county volume and bank market share information calculated earlier. Participants are allowed to specify the maximum level of new loans they would like to make. If the loan volume they could obtain based on the market share is greater than the maximum they specify, the bank receives the maximum level specified by the participants. If the calculated level is not greater than the specified maximum, the bank receives the level calculated using the county-volume and market-share equations.

Loan charge-offs are also generated each period of play to represent risk associated with each type of loan. Data on loan charge-offs for each loan type were obtained from several rural banks over a five-year period. Average loan charge-offs by loan type were determined from the data. These average charge-offs by loan type are contained in the exogenous data file. Each bank is assessed loan charge-offs based on these averages

multiplied by a number between .5 and 1.5. The charged-off loans are removed from the bank's loan portfolio and, of course, income from those loans is assumed to be lost. Agricultural Real Estate and Real Estate loan charge-offs come from the four most recent six-month periods. For Commercial and Consumer loans, charge-offs come from the four outstanding periods. Agricultural Production loan charge-offs are assessed in the two outstanding periods.

After the new levels are determined and charge-offs assessed, the rest of the simulation is concerned with preparing the results. Each bank's new market share of outstanding loans is calculated by taking the bank's total level of each outstanding loan type divided by the county total for that loan type. The loan market shares for each bank are recalculated each period because of differences in past loan volumes, loan charge-offs, interest rates, advertising, loan officers salaries, and maximum new loan volumes specified by each bank.

Next, the program balances each bank's balance sheet. Cash is used to balance the balance sheet. If the bank has more assets than liabilities and equity, cash is reduced by the amount of the difference. On the other hand, if assets are less than liabilities and equity, cash is increased by the difference. Once assets equal liabilities and equity, the bank's reserve requirement is calculated.. If the bank's cash exceeds the reserve requirement, the difference is invested in the fed fund market. The bank's are only allowed to sell fed funds up to 100% of equity capital. Cash available for fed funds in excess of 100% of equity capital is not invested and, therefore, earns no interest. If cash is less than the reserve requirement, fed funds are purchased to meet the requirement.

Each bank's income on each type of loan and investment is accrued and posted every six-months (1 period). Thus, outstanding loans earn interest every six months based on the outstanding balance. Outstanding securities also earn income every six months based on the outstanding balance. If a bank sells fed funds, the amount of interest received is determined for the six-month period. Service charge income is based on the bank service charge decision (between 0 and 1.0 percent annually) and the total of transaction deposits (checking, Negotiable Order of Withdrawal, and Money Market Deposit Account).

The expense items include interest paid on deposits and interest paid on any fed funds purchased. Each bank's advertising expense is assessed each period. Loan officer salary is calculated using the players' decisions on the number of loan officers times the average loan officer salary. Employee salary is based on each player's employee salary decision times the number of employees employed by the bank, which is set at twenty. Loan losses are included as an expense against income for the six-month period in which they are charged off.

After the income and balance sheet are calculated, the program calculates the remainder of the results. The output is written to a text file which can be printed and distributed for the next period of play. A final step is saving the current period results so that the simulation can continue in the next period.

3.2 Estimation of Investable Funds

Before participants can make decisions concerning loans and investments, the amount of investable funds needs to be estimated. The amount of investable funds can be estimated by completing the Estimation of Investable Funds worksheet shown in figure 10.

The steps for completing the Estimation of Investable Funds follow. An example of the bank output is provided in figure 11. Tables referred to below are in figure 11.

1. The amount of maturing assets should be entered on line 1. This figure is located in the bottom section of Table 3 maturing assets--next four years. The amount available for investment next period is $15,716,232.
2. The amount of cash and due from should be entered on line 2. This amount can be obtained from the Assets shown in Table 1. Cash and due from for the current period is $586,871.
3. On line 3 the anticipated change in total deposits should be entered. The current level of total deposits ($50,160,000) can be obtained from Table 1. The estimated change in total deposits will depend on several factors. First, the decisions for the next period, relative to the county average, on interest rates, service charge, advertising, and employee salary will effect the banks level of deposits. Second, the information in Table 4 of the bank output presents Economic and Statistical Information for the current period and next period that will help estimate growth in deposits. Changes in county per capita income and county retail sales will influence the level of deposits. Further, the county average deposit interest rates are listed for the current period, while these rates are identical for each bank in the output presented, they will differ when the game is being played. The bottom portion of Table 4 presents the expected range of county per capita income and county retail sales for the next period. Finally, the equations used in the simulation were estimated with data from a

period with stable or declining deposits. Therefore, if no changes are made to attract deposits from other banks in the county, the total level of deposits will likely remain stable or even decline slightly.

4. On line 4 the amount of investments that will be sold should be entered. If participants plan to sell $3,000,000 of the current investments, this amount will be available for new investments and loans.
5. On line 5 the amount of fed funds sold during the current period should be entered. The level of fed funds sold can be obtained under Assets in Table 1. Fed funds sold will be added back to cash at the beginning of the next period, and would therefore be available for reinvestment. The current level of fed funds sold is $2,716,407.
6. On line 6 the level of net income for the current six-month period would be entered. This figure can be obtained from Table 2 the Semi-Annual Income Statement. The current period net income was $699,480.50.
7. The reserve requirement for the next period is calculated in section 7. The reserve requirement is based on total transaction deposits. Transaction deposits include DDA deposits, NOW deposits, and MMDA deposits. These levels are given for the current period in Table 1. The reserve requirement is three percent of the first $42.2 million in transaction deposits, and ten percent of transaction deposits over $42.2 million. For the current period, the reserve requirement was 586,871. If participants plan to increase deposits the reserve requirement will also increase.

8. On line 8 the level of fed funds purchased should be entered. Table 1 shows that no fed funds were purchased for the current period.

9. Line 9 is the estimated amount of investable funds. The estimated amount of investable funds will be used when setting the maximum level of new loans and purchasing investments. If new loans and investments exceed investable funds, fed funds will be borrowed to make up the difference. Each bank can borrow up to 100 percent of capital from the fed funds market. If the bank must borrow fed funds above 100 percent of capital the rate charged will be one and one-half times the fed funds rate. If new loans and investments are less than investable funds, the idle cash is invested in fed funds up to 100% of the bank's equity capital.

Figure 10. Estimation of Investable Funds

1. Maturing Assets		$ 15,716,232
2. Plus Cash and Due From	(+)	586,871
3. Plus Anticipated Change in Deposits	(±)	1,000,000
4. Plus Sale (discounting) of Investments	(+)	0
5. Plus Cash Received from Fed Funds	(+)	2,716,407
6. Plus Net Income this Period	(±)	699,480
7. Minus Cash and Reserve Requirement		
3% of Transaction Accounts up to 42.2 Million	(--)	590,000
10% of Transaction Accounts over 42.2 Million	(--)	0
8. Minus Cash Used to Repay Fed Funds	(--)	0
9. Investable Funds Equal	(=)	$ 20,128,990

Figure 11. SIMULATION OUTPUT

OKLAHOMA BANK SIMULATION

Table 1. BALANCE SHEET

COUNTY 1 BANK 1 YEAR 1996.5

ASSETS			LIABILITIES		
Cash and due from		586871	Deposits		
Securities:			DDA deposits	6520800	
Six Month Gov	4000000		NOW deposits	9028800	
One Year Gov	7000000		MMDA deposits	4012800	
Three Year Gov	7000000		Savings deposits	2508000	
Two Year Mun	2000000		CD deposits	28089600	
Five Year Mun	4050000				
Total Investment Securities		24050000	Total deposits		50160000
Federal Funds Sold		2716407	Federal funds purchased		0
Loans:					
Ag Production	11797880		Total Liabilities		50160000
Ag Real Estate	4213660				
Real Estate	6362804		Stockholders' equity capital:		
Commercial	2384418		Capital and Surplus		2000000
Consumer	4415960		Retained earnings		4568000
Total Loans		29174722			
Bank premises and equipment		200000	Total Equity Capital		6568000
Total Assets		56728000	Total Liabilities and Equity		56728000

Capital to Assets	11.58%
Total Loans to Total Deposits	58.16%
Investments to Total Assets	42.40%

Figure 11. SIMULATION OUTPUT (continued)

Table 2. INCOME STATEMENT
COUNTY 1 BANK 1 YEAR 1996.5

INCOME:		DETAIL ON SELECTED ACCOUNTS	
Interest on Loans	1570234.75	INTEREST ON LOANS	1570234.75
Interest on Investments	687850.00	Ag Prod	635883.38
Interest on Fed Funds	81492.21	Ag Real Estate	210007.73
Service Charge	97812.00	Real Estate	318884.16
Total Income	2437389.00	Commercial	126149.95
		Consumer	279309.47
EXPENSES:			
Deposit Expense	847704.06	DEPOSIT EXPENSE	847704.06
Fed Fund Expense	0.00	NOW	135432.00
Advertising	15000.00	MMDA	68217.60
Officer Salary	80000.00	Savings	40128.00
Employee Salary	200000.00	CD	603926.44
Other Expense	300960.00		
Loan Losses	0.00		
Total Expense	1443664.00		
Less Taxes	294244.47		
NET INCOME (this period)	699480.50		
Total Accumulated Income	699480.50		

LOAN CHARGE-OFF INFORMATION

	Dollar Amount	% Charge-off	Historical Range From	To
Ag Production	0	0.000	0%	1.116%
Ag Real Estate	0	0.000	0%	1.515%
Real Estate	0	0.000	0%	2.280%
Commercial	0	0.000	.2%	7.935%
Consumer	0	0.000	.4%	3.375%

Figure 11. SIMULATION OUTPUT (continued)

Table 3. DECISIONS INPUT
COUNTY 1 BANK 1 YEAR 1996.5

Interest Rates	
NOW	3.00%
MMDA	3.40%
SAV	3.20%
CD	4.30%
Ag Prod	11.00%
Ag Real Est	10.40%
Real Estate	10.40%
Commercial	11.00%
Consumer	13.00%

Other Decisions	
Service Charge	0.50%
Advertising Level	15000
Average Officer Sal	40000
Average Employee Sal	20000
Number of Officers	4

Maximum Desired Loans	
Ag Production	10000000
Ag Real Estate	1500000
Real Estate	1500000
Commercial	3000000
Consumer	4000000

Investments Purchased	
Six Month Gov	4000000
One Year Gov	4000000
Three Year Gov	500000
Two Year Mun	500000
Five Year Mun	0

Maturing Assets -- next 4 years

Year	1996.5	1997.0	1997.5	1998.0	1998.5	1999.0	1999.5	2000.0
6 Mo Gov	4000000							
1 Yr Gov	3000000	4000000						
3 Yr Gov	0	2000000	500000	2000000	2000000	500000		
2 Yr Mun	0	1000000	500000	500000				
5 Yr Mun	0	550000	0	1000000	0	1500000	0	500000
AGPROD	5200000	6597880						
AGREL	379804	386316	341498	348010	303192	309704	264886	271398
REAL	568439	597509	513439	532509	455939	470009	395939	410009
COMML	801606	788006	400803	394003				
CONSUM	1766384	1324788	883192	441596				
Total	15716232	17244500	3138932	5216118	2759131	2779713	660825	1181407

Figure 11. SIMULATION OUTPUT (continued)

Table 4. Economic and Statistical Information
COUNTY 1 BANK 1 YEAR 1996.5

CURRENT PERIOD

County Per Capita Income	18000
Retail Sales ($ Millions)	1.25
Average land value	350
Index of new housing costs	156
Farm Price Index	120
Futures Price of wheat	3.00
Average for county banks	
NOW Int.	3.00%
MMDA Int.	3.40%
SAV Int.	3.20%
CD Int.	4.30%
Ag Prod Int.	11.00%
Ag Real Estate Int.	10.40%
Real Estate Int.	10.40%
Commercial Int.	11.00%
Consumer Int.	13.00%
Service Charge	0.50%
Advertising	15000

	Percent Market Share		
	Bank 1	Bank 2	Bank 3
DDA	33.33	33.33	33.33
NOW	33.33	33.33	33.33
MMDA	33.33	33.33	33.33
SAVINGS	33.33	33.33	33.33
CD	33.33	33.33	33.33
AGPROD	33.33	33.33	33.33
AGREL	33.33	33.33	33.33
REAL	33.33	33.33	33.33
COMML	33.33	33.33	33.33
CONSUM	33.33	33.33	33.33

NEXT PERIOD

ACTUAL	
Fed Funds Rate	6.10%
Six Month Gov	6.10%
One Year Gov	6.40%
Three Year Gov	6.80%
Two Year Municipal	4.40%
Five Year Municipal	4.70%

EXPECTED RANGE	FROM	TO
Per Capita Income ($ Mil)	17760	19240
Retail Sales ($ Mil)	1.23	1.36
Average Land Value ($/Acre)	370	410
Index of new housing costs	151	167
Farm Price Index	118	131
Futures Price of wheat ($/bu)	3.09	3.41

Figure 11. SIMULATION OUTPUT (continued)

Table 5. Outstanding Loans and Securities

COUNTY 1 BANK 1 YEAR 1996.5

Year	Ag Real Estate Level	Ag Real Estate Int	Real Estate Level	Real Estate Int	5 Year Mun Level	5 Year Mun Int	3 Year Gov Level	3 Year Gov Int
1987.0	38306	9.50%	55000	9.50%				
1987.5	38306	9.40%	65000	9.35%				
1988.0	76612	9.00%	115000	9.30%				
1988.5	76612	8.80%	125000	9.25%				
1989.0	114918	8.75%	180000	9.20%				
1989.5	114918	8.75%	180000	9.25%				
1990.0	153224	9.00%	235000	9.15%				
1990.5	153224	9.15%	245000	9.10%				
1991.0	190530	9.25%	270000	9.25%				
1991.5	192530	9.25%	284524	9.40%				
1992.0	227836	9.50%	330500	9.65%	0	4.00%		
1992.5	231836	10.00%	343680	10.00%	550000	4.20%		
1993.0	258142	10.25%	395000	10.25%	0	4.20%		
1993.5	278142	10.30%	415000	10.30%	1000000	4.30%		
1994.0	300448	10.30%	455000	10.30%	0	4.40%	0	6.30%
1994.5	312448	10.50%	465000	10.50%	1500000	4.30%	2000000	6.30%
1995.0	340754	10.45%	515000	10.45%	0	4.30%	500000	6.32%
1995.5	348754	10.50%	525000	10.50%	500000	4.40%	2000000	6.35%
1996.0	382060	10.45%	575800	10.45%	500000	4.50%	2000000	6.35%
1996.5	384060	10.40%	588300	10.40%	0	4.20%	500000	6.40%

Year	Commercial Level	Commercial Int	Consumer Level	Consumer Int	Ag Prod Level	Ag Prod Int	2 Year Mun Level	2 Year Mun Int	1 Year Gov Level	1 Year Gov Int
1995.0	400803	10.00%	441596	12.00%			0	4.00%		
1995.5	394003	10.50%	883192	12.50%			1000000	4.35%		
1996.0	801606	10.50%	1324788	12.50%	5200000	10.50%	500000	4.00%	3000000	6.25%
1996.5	788006	11.00%	1766384	13.00%	6597880	11.00%	500000	3.60%	4000000	6.20%

3.3 Participant Decisions

Participants set the interest rate charged on each type of loan, interest rate paid on each type of interest bearing deposit, service charge, advertising rate, number of loan officers, average loan officer salary, and average employee salary. Further, participants specify the maximum amount of new loans they would like to make in the current period for each loan type, and the amount of each type of security to purchase. Participants can also decide to sell any outstanding securities. The decision form is presented in figure 12 with example decisions.

Loan interest rates should be expressed as an annual percentage rate. The rate specified for each loan type is the average rate charged on the new loan of this type to be made in the coming six-month period. Lower average annual interest rates relative to other banks in the county (other things equal), tend to give the bank more of each loan type. However, there is no guarantee that a bank will be able to make as many new loans as desired. For example, a bank may plan to make more ag production loans than the market volume equations will allow. Also, other banks in the county may have competitive interest rates, loan officer salaries, and make other decisions which reduce loan volumes of competing banks.

Deposit interest rates should be expressed as an annual percentage rate. The rate specified for each deposit type is the average rate charged. Higher average annual interest rates, relative to competing banks, will give the bank more of the deposits. No maximum deposit interest rates are specified in the model, but the bank must be able to loan or invest the funds at rates above those paid on deposits in order for the decisions to be profitable.

Figure 12. Decision Form

County # 1 **Bank #** 1 **Period** 1997.0

Loan Interest Rates		**Deposit Interest Rates**	
Ag Production	10.5%	NOW	3.2%
Ag Real Estate	10%	MMDA	3.5%
Real Estate	10.25%	SAV	3.35%
Commercial	11.5%	CD	4.6%
Consumer	13%		

Other Decisions

Service Charge (0 - 1%)	0.35 %
Advertising	18,000
Number of Loan Officers	5
Avg. Officer Salary	43,000
Avg. Employee Salary	22,000

Max New Loans (to make)		**New Investments**	
Ag Production	10,000,000	6 Mo. Gov	0
Ag Real Estate	1,000,000	1 Yr. Gov	0
Real Estate	1,000,000	3 Yr. Gov	4,000,000
Commercial	3,000,000	2 Yr. Mun	0
Consumer	3,000,000	5 Yr. Mun	4,000,000

Investments to Sell

Period	1 yr. Gov	3 yr. Gov	2 yr. Mun	5 yr. Mun

The service charge decision should be expressed as a percent of total transaction deposits (checking, NOW, MMDA). A typical decision would be from 0.0 percent to 1 percent. The service charge decision will be a factor in determining the amount of deposits the bank will acquire.

The advertising decision should be expressed for the six-month period as a dollar amount. Advertising will be a factor in the level of new loans and deposits obtained by the bank in the current period. Advertising above the county average has a positive effect on deposits and loans, but the magnitude of the effect varies for each deposit and loan type.

The number of loan officers employed by the bank should be expressed as a whole number. Changes in the number of officers employed influences the level of new loans obtained, however, the effect differs for each type of loan.

Average loan officer salary should be expressed as an annual dollar amount and half of the total is paid in the next six-month period. Higher salaries reward loan officers for increased productivity. Banks with salaries higher than the county average would be expected to increase loan market share. There is no maximum salary specified for the game. However, if salaries increase more than earnings, net income will be decreased.

Average employee salary should also be expressed as an annual dollar amount and half the total is paid in the next six-month period. Higher employee salaries have a positive effect on the level of deposits. But, as for loan officer salaries, increases in employee salaries must be balanced by increased earnings.

The maximum new loans decision serves as a cap for the current period, and the bank may receive fewer new loans based on market conditions and participant decisions.

Participants can decide to make no new loans of a particular type and would reflect this decision by entering a zero for the loan type. Similarly, participants can take all of a loan type available to their bank by entering a very large number on the decision form. If the new loan amount available to a bank exceeds the maximum new loan amount reflected on the decision form, the bank will receive the amount specified as the maximum entered on the decision form. Interest on each loan type is accrued and posted on the income statement each six-month period. The loans types are described below.

1. Ag Production is a one-year agricultural production loan with one lump sum principal payment at the end of one year (2 periods).
2. Ag Real Estate is a ten-year agricultural real estate loan with ten equal principal payments.
3. Real Estate is a ten-year real estate loan with ten equal principal payments.
4. Commercial is a two-year loan with one-half of the principal repaid at the end of each year.
5. Consumer is a two-year loan with one-fourth of the original principal being repaid each six-month period.

New investments are determined by participants. The amount entered on the decision form will be purchased in the next period of play. Each investment type available is described below.

1. Six-Month Government securities mature after six-months.
2. One-Year Government securities mature after one year and pay interest each six-month period.

3. Three-Year Government securities mature after three-years and pay interest each six-month period.
4. Two-Year Municipal bonds mature after two-years and pay interest each six-month period. Further, some income from two-year municipals is exempt from state and federal income taxes.
5. Five-Year Municipal bonds mature after five-years and pay interest each six-month period. Further, some income from five-year municipals is also tax-exempt.

Finally, participants can decide to sell past investments. When investments are sold they incur a two percent sales charge. Participants should specify the amount of each type to sell and the period in which that investment was purchased. For example, if participants decide to sell 550,000 five year municipal bonds from period 1997.0, they would enter 1997.0 under period and 550,000 under 5 yr. Mun. If no investments are to be sold, the section can be left blank.

3.4 Simulation Output

Each bank decision team will receive five pages of output (figure 11) from the simulation for the beginning period and for each subsequent six-month period. When the simulation first begins, each bank is identical. Participants will be placed in charge of a fifty-six million dollar bank. The output from the simulation includes a balance sheet (Table 1 of figure 11), an income statement and loan charge-off information (Table 2 of figure 11), last periods decision input and maturing assets over the next 4 years (Table 3

of figure 11), economic and statistical information for the current and next period (Table 4 of figure 11), and a detailed description of outstanding loans and securities (Table 5 of figure 11). Participants will use the information contained in the output to make decisions for the following period of play.

Table 1. Balance Sheet

The balance sheet provides a breakdown of the assets, liabilities, and equity of the bank. The first asset entry is cash and due from. This amount includes cash in the bank as well as deposits with other financial institutions. Investments in six-month government securities, one-year government securities, three-year government securities, two-year municipal bonds, five-year municipal bonds, and the total investments in securities is the next item in the asset section. If a bank has cash in excess of the reserve requirement for the current period, it is assumed to sell fed funds up to 100% of equity capital. Cash in excess of total equity and the reserve requirement will not be invested in fed funds and will earn no interest. The next asset item gives a breakdown of total loans in the five loan types. The final asset entry is bank premises and equipment and remains constant over the periods of play.

The liabilities section includes a breakdown of each deposit type. DDA deposits are non-interest bearing checking deposits. NOW deposits are Negotiable Orders of Withdrawal. MMDA deposits are Money Market Deposit Accounts. Savings deposits represents savings deposits with the bank. CD deposits represent Certificates of Deposit. The total level of deposits is also given. The final item in the liabilities section is fed funds purchased. If the bank does not have enough cash to meet the reserve requirement, it is

assumed to purchase fed funds to satisfy the requirement. The bank can borrow fed funds at the current period fed funds rate up to the level of total investment securities. If the bank must borrow fed funds above investment securities, the rate charged will be one and one-half times the fed funds rate. This assumes that the bank could acquire additional funds, but at a higher rate.

The equity section includes capital and surplus, and retained earnings. The capital and surplus entry will not change during the simulation. Retained earnings will increase each period by the amount of net income obtained.

Selected percentages are reported at the bottom of the bank's balance sheet. The capital-to-asset ratio is important to bank examiners and government regulations. In the simulation, if the capital-to-asset ratio falls below five percent, loans will be sold until the capital-to-asset ratio is five percent. The next percentage reported is total loans to total deposits. "The loan-to-deposit (LTD) ratio has traditionally been used to measure asset liquidity", (Wallace, 1994). The final percentage reported is investments to total deposits.

Table 2. Income Statement

The income statement for the previous period is given in table 2 of the bank output. The income statement summarizes all income and expense items on the left side of the table. Since this is a semi-annual income statement, all income and expenses are reported on a six-month basis. Breakdowns of interest earned on each loan type and deposit expense by deposit type are given on the right side of table 2. Loans and investments earn interest each six-month period on the outstanding balances. If the bank has cash in excess of the reserve requirements, interest earned from the sale of fed funds is also reported in

the income portion. Service charge income is based on the service charge decision and the level of transaction deposits (DDA, NOW, MMDA) during the period.

Expenses include deposit expense. This is calculated by taking the average interest rate paid on each deposit type times the level of each deposit type. Fed funds expense is the interest paid on any fed funds borrowed during the period. The bank's expenditure on advertising, loan officers salary, and employees salary are the next three entries and are based on player decisions for the most recent period. Other expense includes FDIC insurance expense, mailing, supplies, depreciation, employee benefits, and any other expense incurred by the bank. The last expense entry is loan losses, which have been explained previously. The dollar amount of loan losses is deducted from the banks income.

Taxes are determined using the corporate income tax rates for 1997 (Table 3). A more detailed discussion of taxes is provided later. The net income for the period is reported for the bank. Finally, the total accumulated income over the periods of play is reported.

Loan charge-off information for each loan type is reported at the bottom of Table 2. It provides the actual dollar amount of charge-offs during the period, charge-offs as a percent of the total loans for that type, and a historical range of loan charge-offs. The historical range should provide participants a feel for which loans are more risky, however, the amount of charge-offs by loan type is a random and unpredictable event for each bank each period.

Table 3. Decision Input

The top portion of table 3 lists the decisions that were made by the bank for the current set of output. The bottom half of table 3 shows the maturing assets for the next four years, and gives a breakdown for each asset type. The first five rows represent investments in securities and the last five rows give the maturing loans. The column headings identify the period in which the assets will mature. Some rows are blank after a few entries because some assets mature in less than four years. For example, the six-month government security fully matures after one period of play. The bottom of the table list the total maturing assets by period. The first number right of total ($15,716,232 in the example output, Figure 11) would be the amount of assets that will mature just prior to next period and would be available for reinvestment.

Table 4. Economic and Statistical Information

The top portion of table 4 provides selected economic and statistical information and the market share of deposits and loans for each bank in the county. The left side of the top portion lists economic information for the current set of output. These economic data are significant in determining deposits and loans for the most recent period of play, and include county per capita income, county retail sales, average land value, index of new housing costs, Farm Price Index, and the Futures Price of wheat. Below this economic information are the average interest rates charged by the county banks during the most recent period of play. This information is important when participants are determining new deposit and loan interest rates. Because the bank is competing with other banks in the county, the rate the bank is offering compared to the other banks in the county is a

factor in determining the new level of deposits and loans. The percent market share information is on the right side of table 4. This allows the bank management team to see how well it is competing in the county deposit and loan market.

The bottom portion of table 4 gives the actual rates that will be received next period on fed funds and the five investment alternatives. The right side gives a projected range of the selected economic information. This portion will also be useful in making decisions for the next period because participants can compare past period actuals to next period projections and try to anticipate future loan and deposit levels.

Table 5. Outstanding Loans and Securities

Table five provides the outstanding loans and investments by period. The corresponding interest rate is displayed next to the outstanding balance. The table is divided into two parts. The top part displays the outstanding balance and interest rates on longer-term investments (ag real estate, real estate, five-year municipals, and three-year government securities). The bottom portion provides a breakdown of the shorter-term investments. The year heading indicates the period during which the loans or securities were made. For example, of the ag real estate loans that were made in 1987.0, $38,306 in principal remains outstanding. These loans have an average interest rate of 9.50%.

3.5 Bank Regulations

Income Taxes

Bank income is taxed using the corporate income tax rates for 1997. In order to establish the appropriate tax, the calculated taxable income each six-months is projected to a yearly basis by simply doubling the six-month taxable income. The first $300,000 in

income from municipal bonds is exempt from taxes and is not included in the calculated taxable income. Any income from municipal bonds over $300,000 is fully taxable. This approach is for simplicity. The actual tax effect would be determined using the alternative minimum tax. Most banks will have taxable income over $335,000 and would face a 34% tax rate. The complete corporate income tax rate schedule for 1997 (1997 Federal Tax Handbook) is presented in table 3.

Table 3. Federal Corporate Income Tax Rates for 1997.

Taxable income over:	But not over:	The Tax is:	Of the amount over:
$ 0	$ 50,000	15%	$ 0
50,000	75,000	$ 7500 + 25%	50,000
75,000	100,000	13,750 + 34%	75,000
100,000	335,000	22,250 + 39%	100,000
335,000	10,000,000	113,900 + 34%	335,000
10,000,000	15,000,000	3,400,000 + 35%	10,000,000
15,000,000	18,333,333	5,150,000 + 38%	15,000,000
18,333,333	------	35%	0

Reserve Requirement and Fed Funds

As was discussed briefly earlier, the bank's cash and reserves must meet or exceed the computed reserve requirement. The reserve requirement used in the simulation is three percent of the first $42.2 million transaction deposits (DDA, NOW, MMDA) and ten percent of transaction deposits over $42.2 million. If the bank has cash in excess of the reserve requirement, the simulation sells fed funds up to the bank's total equity. If the bank's level of cash is greater than the reserve requirement and total equity, then some of

the available cash will not be invested in fed funds and will earn no interest. If the bank does not have enough cash to meet the reserve requirement the simulation will purchase fed funds for the bank. The bank is allowed to borrow at the fed funds rate up to the level of total securities. If more than this amount is needed, the simulation will borrow the needed money at one and one-half times the fed funds rate.

Capital Requirement

The simulation requires that the bank's capital-to-asset ratio be at least five percent. If the ratio falls below five percent, the simulation will sell loans until the ratio reaches five percent.

3.6 Measuring Bank Performance

Many factors can be used to determine overall bank performance. Net income and total accumulated income can be used to determine which bank has been most successful in generating income during the simulation. The bank's return on assets (ROA) and return on equity (ROE) would also measure which banks have been successful in generating income.

A separate performance measure would be loan volumes. Banks willing to make loans at a reasonable rate will generate more loans than a bank charging higher rates. Banks that are willing to make more loans are serving their community by providing its' customers with necessary funding. Also, banks that invest in municipal bonds are also serving their community by providing the county and state with a source of funding.

To determine overall bank performance the above measures could be combined to determine which bank was most successful overall in generating income and serving the

community through making total loans, serving the agricultural borrower, and purchasing municipal bonds.

3.7 Output from Decisions

The decisions from figure 12 for Bank 1, along with decisions from the other two banks, were input into the simulation. The other bank's input decisions were competitive with respect to Bank 1. Figure 13 is the output obtained for Bank 1 using those input decisions. As the output shows, the bank's total assets decreased by about two million dollars. This decrease was caused by total deposits decreasing by a little more than two million dollars. The bank's loans varied with ag real estate and real estate total volumes increasing, and the other three loan types decreasing slightly. On the liabilities side, the bank's savings deposits increased, but the other four deposit types decreased. The bank was forced to borrow $40,189 in the fed funds market to meet the reserve requirement. The total loans to total deposit ratio increased due to the lower level of total deposits.

The income statement (Table 2) shows that net income this period was about $558,000, down about $100,000 from the previous period. No fed funds were sold and, thus, there was no income from the sale of fed funds. Also, Service charge income declined because (1) the bank lost transaction deposits leaving fewer deposits to pay a service charge and (2) the service charge was dropped from .50% to .35%. Deposits expense increased by about $20,000 because the bank paid higher deposit rates. The bank also incurred an expense of about $1,200 for the fed funds that were purchased. Advertising, loan officer salary, and employee salary all increased because the decision for these categories all increased. Other expense was slightly lower due to fewer deposits.

The bank also incurred loan losses of $108,129.94 for the period and income taxes totaled $172,918.42. The bottom of Table 2 gives a breakdown of the loan losses. There were no ag real estate losses during the period, and commercial loans incurred the largest percentage loss.

The top portion of table 3 lists the bank managers' decisions for period 1997.5 . The maturing assets section at the bottom reveals that $17,534,550 in maturing assets will be available next period for new loans and investments.

The economic and statistical information presented in table 4 shows that each of the selected economic variables increased during the period. The bank's interest rate decisions were close to the county averages in most cases. The bank's service charge of 0.35 was well below the county average service charge of 0.47%. This helps explain the banks increase in DDA deposits, which are particularly sensitive to high service charges. The bank's interest rate on NOW deposits was below the county average of 3.30%. This lower rate would help account for the 2.5% loss in the market share of NOW deposits. The other deposit and loan accounts were relatively close to the original 33.33% market share.

The new loans and investments made by the bank can be determined from table 5 and correspond to new loans and investments in period 1997.0. As the table shows, the bank made $976,920 in new ag real estate loans, $661,323 in new real estate loans, $742,186 in new commercial loans, $1,344,866 new consumer loans, and $4,938,132 in new ag production loans. New investments for the period included $4,000,000 in five-year municipal bonds and $4,000,000 in new three-year government securities.

3.8 Program Administrator Instructions

Updating economic data and beginning bank data

The exogenous economic data and beginning bank data are contained in the EXOG.DAT file. The program named CH_EXOG.EXE can be run to change the information contained in EXOG.DAT. When CH_EXOG.EXE is run, the program administrator would chose option 1, "Update the start-up and exogenous data". The program will print the current information contained in EXOG.DAT for each economic variable. The program prompts the program administrator to enter a 1 to change the current data or a 0 to leave the data as is. Once the program administrator finishes with the first variable, the program will print the current information for the next variable. Again, the program allows the program administrator to change the data or leave it as is. The program continues through each variable in the same fashion (displaying current data and allowing changes to be made) until the last variable is reached. Once all changes have been made, the program saves the new decisions so they will be available for the simulation.

The second option in CH_EXOG.EXE is to print the current start-up data. When option 2 is chosen, the data contained in EXOG.DAT is written to the text file EXOG.TXT. This file can be printed or viewed on screen to view the current start-up information.

Running Oklahoma Bank Simulation

The file name of Oklahoma Bank Simulation is OKBKSIM.EXE. When the program is run, there are three options. The first option is to start a new simulation. The

second option is to continue an existing simulation. And the third option is to exit the program.

(1) Starting a New Simulation

When option 1 "start a new simulation" is chosen, the program asks the program administrator to enter a file name for the new simulation. Next, the program asks how many counties are needed. Currently, the maximum number of counties is set at eight. Each county contains three banks, so the maximum number of banks would be twenty-four. The last information needed to begin the simulation is the year. The program administrator is prompted to enter the year that should appear on the first set of output. For example, if the simulation is being played in 1998, the program administrator should enter 1998. The program will print the initial set of output as 1997.5. The program will generate the beginning set of output once the new simulation name, number of counties, and year have been entered. The bank output is written to a text file so that it can be printed and distributed to participants. The names of the output files are COUNTY*.TXT. The * represents the county number. For, example output for county 3 would be contained in COUNTY3.TXT. The output should be printed using a left and right margin of three-quarters of an inch and top and bottom margins of one inch (Different printers may require slightly different margins. If the margins recommended do not work correctly, try making slight adjustment.). The page orientation should be changed to landscape. The program saves the data needed for the next period of play in the file specified by the program administrator.

(2) Continue an Existing Simulation

To continue an existing simulation, the program administrator should choose option (2) "continue an existing simulation". The program asks the program administrator to enter the name of the simulation to continue. The program will retrieve the data contained in the file. The program next asks the program administrator to give the new period a different name. The different name will allow each period's data to remain unchanged, in the event that player decisions were entered incorrectly. If a mistake is found after a period is played, the program administrator can go back to the previous period and rerun using the correct data. Next, the program administrator is asked to begin entering the player decisions. The program administrator is first asked to enter the decision for County 1, Bank 1, then County 1, Bank 2, and so on until the decisions for all of the banks are entered. The program prompts for each decision as they are listed on the input sheets. Loan interest rates are the first set of information entered. Once the loan interest rates are entered, the program will display the rates that were entered and ask if they are correct or if changes need to be made. Once all player decisions have been input and verified, the program will generate the new set of output. Again, the output is contained in text files named COUNTY*.TXT (where * represents the county number). The output should be printed using the same procedures that were used to print the new simulation. The current bank data are saved using the file name specified by the program administrator.

(3) Exit

If option 3 "Exit" is chosen, the program will terminate. No changes are made to any bank information.

Figure 13. OUTPUT FROM EXAMPLE DECISIONS

OKLAHOMA BANK SIMULATION

Table 1. BALANCE SHEET

COUNTY 1 BANK 1 YEAR 1997.0

ASSETS			LIABILITIES		
Cash and due from		521536	Deposits		
Securities:			DDA deposits	6027517	
Six Month Gov	0		NOW deposits	7615157	
One Year Gov	4000000		MMDA deposits	3741887	
Three Year Gov	11000000		Savings deposits	2887326	
Two Year Mun	2000000		CD deposits	27253264	
Five Year Mun	8050000				
Total Investment Securities		25050000	Total deposits		47525151
Federal Funds Sold		0	Federal funds purchased		40189
Loans:					
Ag Production	11502989		Total Liabilities		47565340
Ag Real Estate	4810774				
Real Estate	6454146		Stockholders' equity capital:		
Commercial	2302539		Capital and Surplus		2000000
Consumer	3990836		Retained earnings		5267480
Total Loans		29061284			
Bank premises and equipment		200000	Total Equity Capital		7267480
Total Assets		54832820	Total Liabilities and Equity		54832820

Capital to Assets	13.25%
Total Loans to Total Deposits	61.15%
Investments to Total Assets	45.68%

Figure 13. OUTPUT FROM EXAMPLE DECISIONS (continued)

Table 2. INCOME STATEMENT
COUNTY 1 BANK 1 YEAR 1997.0

INCOME:		DETAIL ON SELECTED ACCOUNTS	
Interest on Loans	1568457.62	INTEREST ON LOANS	1568457.62
Interest on Investments	704100.00	Ag Prod	620319.06
Interest on Fed Funds	0.00	Ag Real Estate	240545.92
Service Charge	60845.96	Real Estate	324987.66
Total Income	2333403.50	Commercial	126508.09
		Consumer	256096.88
EXPENSES:			
Deposit Expense	862513.31	DEPOSIT EXPENSE	862513.31
Fed Fund Expense	1225.76	NOW	121842.52
Advertising	18000.00	MMDA	65483.02
Officer Salary	107500.00	Savings	48362.71
Employee Salary	220000.00	CD	626825.06
Other Expense	285150.91		
Loan Losses	108129.94		
Total Expense	1602519.88		
Less Taxes	172918.42		
NET INCOME (this period)	557965.19		
Total Accumulated Income	1257445.75		

LOAN CHARGE-OFF INFORMATION

	Dollar Amount	% Charge-off	Historical Range From	To
Ag Production	57572	0.500	0%	1.116%
Ag Real Estate	0	0.000	0%	1.515%
Real Estate	2160	0.033	0%	2.280%
Commercial	42970	1.866	.2%	7.935%
Consumer	5428	0.136	.4%	3.375%

Figure 13. OUTPUT FROM EXAMPLE DECISIONS (continued)

Table 3. DECISIONS INPUT
COUNTY 1 BANK 1 YEAR 1997.0

Interest Rates	
NOW	3.20%
MMDA	3.50%
SAV	3.35%
CD	4.60%
Ag Prod	10.50%
Ag Real Est	10.00%
Real Estate	10.25%
Commercial	11.50%
Consumer	13.00%

Other Decisions	
Service Charge	0.35%
Advertising Level	18000
Average Officer Sal	43000
Average Employee Sal	22000
Number of Officers	5

Maximum Desired Loans	
Ag Production	10000000
Ag Real Estate	1000000
Real Estate	1000000
Commercial	3000000
Consumer	3000000

Investments Purchased	
Six Month Gov	0
One Year Gov	0
Three Year Gov	4000000
Two Year Mun	0
Five Year Mun	4000000

Maturing Assets -- next 4 years

Year	1997.0	1997.5	1998.0	1998.5	1999.0	1999.5	2000.0	2000.5
6 Mo Gov	0							
1 Yr Gov	4000000	0						
3 Yr Gov	2000000	500000	2000000	2000000	500000	4000000		
2 Yr Mun	1000000	500000	500000	0				
5 Yr Mun	550000	0	1000000	0	1500000	0	500000	500000
AGPROD	6564857	4938132						
AGREL	386316	439189	348010	400883	309704	362577	271398	324271
REAL	597398	579516	532398	522016	469898	462017	409898	403267
COMML	776776	771896	382774	371093				
CONSUM	1659201	1218206	777212	336216				
Total	17534550	8946939	5540394	3630209	2779603	4824594	1181297	1227538

Figure 13. OUTPUT FROM EXAMPLE DECISIONS (continued)

Table 4. Economic and Statistical Information
COUNTY 1 BANK 1 YEAR 1997.0

CURRENT PERIOD

County Per Capita Income	18500
Retail Sales ($ Millions)	1.30
Average land value	390
Index of new housing costs	159
Farm Price Index	124
Futures Price of wheat	3.25
Average for county banks	
NOW Int.	3.30%
MMDA Int.	3.37%
SAV Int.	3.38%
CD Int.	4.52%
Ag Prod Int.	10.47%
Ag Real Estate Int.	10.23%
Real Estate Int.	10.68%
Commercial Int.	12.00%
Consumer Int.	14.00%
Service Charge	0.47%
Advertising	18000

	Percent Market Share		
	Bank 1	Bank 2	Bank 3
DDA	30.12	27.87	42.01
NOW	32.18	37.16	30.66
MMDA	34.42	31.01	34.57
SAVINGS	33.58	32.95	33.47
CD	33.67	33.07	33.25
AGPROD	33.46	33.03	33.52
AGREL	34.22	34.24	31.54
REAL	33.34	33.22	33.45
COMML	33.59	33.25	33.16
CONSUM	33.38	33.03	33.59

NEXT PERIOD

ACTUAL	
Fed Funds Rate	6.50%
Six Month Gov	6.50%
One Year Gov	6.80%
Three Year Gov	7.00%
Two Year Municipal	4.50%
Five Year Municipal	5.00%

EXPECTED RANGE	FROM	TO
Per Capita Income ($ Mil)	18000	19500
Retail Sales ($ Mil)	1.25	1.39
Average Land Value ($/Acre)	385	425
Index of new housing costs	153	169
Farm Price Index	122	134
Futures Price of wheat ($/bu)	3.28	3.62

Figure 13. OUTPUT FROM EXAMPLE DECISIONS (continued)

Table 5. Outstanding Loans and Securities

COUNTY 1 BANK 1 YEAR 1997.0

Year	Ag Real Estate Level	Ag Real Estate Int	Real Estate Level	Real Estate Int	5 Year Mun Level	5 Year Mun Int	3 Year Gov Level	3 Year Gov Int
1987.5	38306	9.40%	65000	9.35%				
1988.0	38306	9.00%	57500	9.30%				
1988.5	76612	8.80%	125000	9.25%				
1989.0	76611	8.75%	119999	9.20%				
1989.5	114918	8.75%	180000	9.25%				
1990.0	114918	9.00%	176250	9.15%				
1990.5	153224	9.15%	245000	9.10%				
1991.0	152424	9.25%	216000	9.25%				
1991.5	192530	9.25%	284524	9.40%				
1992.0	189863	9.50%	275416	9.65%				
1992.5	231836	10.00%	343680	10.00%	550000	4.20%		
1993.0	221264	10.25%	338571	10.25%	0	4.20%		
1993.5	278142	10.30%	415000	10.30%	1000000	4.30%		
1994.0	262892	10.30%	398125	10.30%	0	4.40%		
1994.5	312448	10.50%	465000	10.50%	1500000	4.30%	2000000	6.30%
1995.0	302892	10.45%	457777	10.45%	0	4.30%	500000	6.32%
1995.5	348754	10.50%	524505	10.50%	500000	4.40%	2000000	6.35%
1996.0	343854	10.45%	517731	10.45%	500000	4.50%	2000000	6.35%
1996.5	384060	10.40%	587745	10.40%	0	4.20%	500000	6.40%
1997.0	976920	10.00%	661323	10.25%	4000000	4.70%	4000000	6.80%

Year	Commercial Level	Commercial Int	Consumer Level	Consumer Int	Ag Prod Level	Ag Prod Int	2 Year Mun Level	2 Year Mun Int	1 Year Gov Level	1 Year Gov Int
1995.5	394003	10.50%	440995	12.50%			1000000	4.35%		
1996.0	400803	10.50%	881989	12.50%			500000	4.00%		
1996.5	765547	11.00%	1322986	13.00%	6564857	11.00%	500000	3.60%	4000000	6.20%
1997.0	742186	11.50%	1344866	13.00%	4938132	10.50%	0	4.40%	0	6.40%

CHAPTER 4

Summary and Conclusion

4.1 Summary

Commercial banks operate in a very competitive, uncertain, and regulated environment. Management of the bank must try to balance the uncertain demand for loans with the uncertain supply of deposits. Further, bank management must compete with other financial institutions and banks for deposits and loans. Commercial banks also face a serious problem in training new employees and increasing the understanding of employees in different departments within the bank. Employees also need to understand the decisions that must be made by other departments within the bank. The purpose of this study was to develop a simulation model that typified rural Oklahoma banks which could be used as a training tool. The specific objectives were: (1) to determine the key factors influencing an agricultural bank's level of deposits and loans, and (2) to determine the changes needed in the bank simulation model to represent the current decision making environment of an agricultural bank.

Many changes have taken place in the banking industry since the original model was developed by Fisher in the early 1970s. Some of the major changes include changes in bank regulation, increased competition, technology, and terminology. Changes in bank regulation include the removal of interest rate ceilings on deposits, allowing banks to make interest-bearing deposits (Negotiable Orders of Withdrawal and Money Market Deposit Account), and the removal of interest rate ceilings on many loans.

Estimation of Equations

Equations were estimated to determine the total county volume of loans and deposits. These equations predict the demand for each loan type and the supply of each deposit type in the county. These county volume equations were estimated using secondary data obtained from the Federal Deposit Insurance Corporation Consolidated Report of Income, primary data obtained from a survey of Oklahoma banks, and economic variables thought to be significant in determining the county volumes. County volume equations were estimated for five deposit types and five loan types. The deposit equations estimated were non-interest bearing checking, negotiable order of withdrawal, money market deposit accounts, savings deposits, and certificates of deposit. The loan equations estimated were agricultural production loans, agricultural real estate loans, real estate loans, commercial loans, and consumer loans. The county volume equations estimated were very significant. Economic data that was significant in determining the new county volumes includes county retail sales, county per capita income, Farm Price Index, average land value per acre, cost of new housing, producer prices, and the Futures Price of wheat.

Another set of equations was estimated to predict the percentage change in market share for each of the loan and deposit accounts. Primary data obtained from a bank survey were used to estimate the market share equations. To estimate the equations, county average data were needed. Due to a low survey response rate, counties that were relatively close together were designated as "county groups". The "county groups" were used to determine the county averages needed. The estimated parameters in the market share equations were not as significant as the county volume equations.

Some of the more significant variables in the market share equations include the change in the bank service charge, change in the bank advertising rate, change in employee salary, and change in loan officer salary. Further, the differences between the bank's interest rates and the county average interest rates were important in the allocation of interest bearing deposit accounts and the loan accounts within a county.

Simulation Model

The simulation model is designed to be used in a gaming context with the three county banks competing for deposits and loans. When the simulation begins, each bank in the county is identical. The information needed to begin the simulation is contained in a start-up data file. Changes can be made to the start-up file to change the condition of the beginning banks, and change the economic data used in the following periods of play. Changes that can be made to the bank include changing the loan and investment portfolio and changing balance sheet items.

Participants make decisions on the interest rates charged on loans, interest rates paid on deposits, service charge, advertising, number of loan officers, and employee and officer salary. Further, participants can specify the maximum level of new loans they would like to make, purchase government securities and municipal bonds, and sell past investments. The model uses the input from the participants and other economic data to determine the county volume of loans and deposits. The new market share for each bank is determined using the input decisions for each bank compared to the county average decisions. Once the new county volumes and market shares have been determined, the remainder of the program updates the bank information. Loan losses are assessed on each

loan category and removed from the loan portfolio. Maturing assets are determined for each period. Assets that have matured are removed from the banks' portfolios. The level of cash and due from is adjusted to a level that balances assets against liabilities and equity capital on the new balance sheet. Government regulations concerning the reserve requirements and the capital to asset ratio are checked to make sure the banks' are in compliance. The model sells fed funds for the bank if cash and due from exceed the reserve requirement, or purchase fed funds if cash and due from is below the reserve requirement. Income from loans and investments is accrued and posted each six-months, and a semi-annual income statement is computed for each bank. Finally, the model writes the new bank information to a text file and saves the bank information needed for the next period of play.

4.2 Conclusion

The estimated county volume equations are statistically significant. The economic data that was determined to be significant in determining the new county volumes would be useful for bankers trying to predict new deposits and loans. While the equations were estimated using data from a period with fairly stable deposit and loan volumes, the economic variables still help predict changes in the county volume of deposits and loans.

The market share equations that were estimated are not as significant as the county volume equations. However, the equations work fairly well in determining new market shares given the competition in the county. If a more complete set of data could be obtained from banks, new market share equations estimated from the data would probably

be more statistically significant. But, the variables that effect the new market shares would probably be the same.

The overall model should be effective in a gaming situation. It will allow participants to better understand many of the decisions that must be made within the bank. Further, it will help participants understand the effect of the decisions on bank profitability. It will also help participants realize the need to maintain some level of liquidity. If participants place most of the bank assets in longer term loans and securities, they will not be able to capture more attractive rates if they become available without incurring a selling cost to liquidate the longer term investments. In addition, discussion among the participants when making decisions should also increase the overall understanding of the operation of a commercial bank.

SELECTED BIBLIOGRAPHY

Avery, Robert B., Patricia E. Beeson, and Mark S Sniderman. "Posted Rates as Signals in Mortgage Lending Markets." Federal Reserve Bank of Cleveland Working Paper. #1949 (1994)

Berger, Allen N. and Udell, Gregory F. *Structural Change in Banking*. Edited by Michael Klausner and Lawrence J White. HomeWood, Illinois: New York University, 1993.

Federal Deposit Insurance Corporation. *Consolidated Report of Income*. June & December reports for 1990 through 1994.

Fisher, Glen D. "The Development of a Management Game for Oklahoma Rural Banks." Unpub. m.s. thesis, Department of Agricultural Economics, Oklahoma State University, December 1973.

Johnson, Hazel J. *Banking Regulation Today*. Chicago, Illinois: Probus Publishing Company, 1994.

Regional Economic Information System. *Personal Income by Major Source and Earnings by Major Industry*. Bureau of Economic Analysis.

Rose, Peter S. *Commercial Bank Management*. 2nd Ed. Homewood, IL: Richard D. Irwin, Inc, 1993.

SHAZAM User's Reference Manual Version 7.0, McGraw-Hill, 1993.

Spong, Kenneth. *BANKING REGULATION Its Purposes, Implementation, and Effects*. 3rd Ed. Division of Bank Supervision and Structure, Federal Reserve Bank of Kansas City, 1990.

Wallace, George K. *Agricultural and Nonagricultural Banking Statistics, 1980-91*. Agriculture and Rural Economy Division, Economic Research Service, U.S. Department of Agriculture. Statistical Bulletin Number 883.

1997 Federal Tax Handbook. Research Institute of America, 1996.

APPENDIX 1

OKLAHOMA BANK SURVEY
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All information is based on the average for the calendar period requested. Please estimate as accurately as possible. This information will become part of a data set which is being used to update the current bank game played in the Oklahoma Bankers Association Intermediate School of Banking.

1. Bank name: _____

   County: _____

2. What is the greatest distance in miles to a competing bank in your county? _____

   What is the least distance in miles to a competing bank in your county? _____

3. Indicate the number of banks, savings and loans, and other financial institutions (Farm Credit System, for example) in your county that competed with your bank for loans and deposits.

Six-Month Period	Average Number of Competitors	Six-Month Period	Average Number of Competitors
Jan. 1 - June 30, 1990		**July 1 - Dec. 31, 1992**	
July 1 - Dec. 31, 1990		**Jan. 1 - June 30, 1993**	
Jan. 1 - June 30, 1991		**July 1 - Dec. 31, 1993**	
July 1 - Dec. 31, 1991		**Jan. 1 - June 30, 1994**	
Jan. 1 - June 30, 1992		**July 1 - Dec. 31, 1994**	

4. In this section report service charge income and other income (overdrafts, excessive withdrawal fees, etc.) earned from total deposits during the requested periods.

Six-Month Period	Service Charge Income ($)	Six-Month Period	Service Charge Income ($)
Jan. 1 - June 30, 1990		**July 1 - Dec. 31, 1992**	
July 1 - Dec. 31, 1990		**Jan. 1 - June 30, 1993**	
Jan. 1 - June 30, 1991		**July 1 - Dec. 31, 1993**	
July 1 - Dec. 31, 1991		**Jan. 1 - June 30, 1994**	
Jan. 1 - June 30, 1992		**July 1 - Dec. 31, 1994**	

5. List your advertising expense for each six-month period.

Six-Month Period	Advertising Expense ($)	Six-Month Period	Advertising Expense ($)
Jan. 1 - June 30, 1990		**July 1 - Dec. 31, 1992**	
July 1 - Dec. 31, 1990		**Jan. 1 - June 30, 1993**	
Jan. 1 - June 30, 1991		**July 1 - Dec. 31, 1993**	
July 1 - Dec. 31, 1991		**Jan. 1 - June 30, 1994**	
Jan. 1 - June 30, 1992		**July 1 - Dec. 31, 1994**	

6. List the number of loan officers or persons responsible for making loans in your bank and circle the average annual salary per loan officer for each period.

Six-Month Period	Number of Loan Officers	Average Salary Range for Loan Officers ($000)
Jan. 1 - June 30, 1990		<20 20-25 25-30 30-35 35-40 40-45 45-50 >50
July 1 - Dec. 31, 1990		<20 20-25 25-30 30-35 35-40 40-45 45-50 >50
Jan. 1 - June 30, 1991		<20 20-25 25-30 30-35 35-40 40-45 45-50 >50
July 1 - Dec. 31, 1991		<20 20-25 25-30 30-35 35-40 40-45 45-50 >50
Jan. 1 - June 30, 1992		<20 20-25 25-30 30-35 35-40 40-45 45-50 >50
July 1 - Dec. 31, 1992		<20 20-25 25-30 30-35 35-40 40-45 45-50 >50
Jan. 1 - June 30, 1993		<20 20-25 25-30 30-35 35-40 40-45 45-50 >50
July 1 - Dec. 31, 1993		<20 20-25 25-30 30-35 35-40 40-45 45-50 >50
Jan. 1 - June 30, 1994		<20 20-25 25-30 30-35 35-40 40-45 45-50 >50
July 1 - Dec. 31, 1994		<20 20-25 25-30 30-35 35-40 40-45 45-50 >50

7. The following section asks for the interest rate charged on different loan types. Since different customers receive different rates, report the average interest rate charged on new or renewal loans on or about June 30 or Dec. 31 for each loan type. Loans to finance agricultural production, loans secured by farmland real estate, commercial and industrial loans, and consumer loans are categorized as reported in your bank's call report. Residential loans are the summed values for these real estate loan categories: 1 - 4 family residential loans, 5+ family residential loans, nonfarm nonresidential properties, and loans for construction & land development as reported in the Federal Reserve call report.

Six-Month Period Ending	Average Interest Rate on Agricultural Production Loans (%)	Average Interest Rate on Farm Real Estate Loans (%)	Average Interest Rate on Commercial and Industrial Loans (%)	Average Interest Rate on Consumer Loans (%)	Average Interest Rate on Residential Real Estate Loans (%)
June 30, 1990					
Dec. 31, 1990					
June 30, 1991					
Dec. 31, 1991					
June 30, 1992					
Dec. 31, 1992					
June 30, 1993					
Dec. 31, 1993					
June 30, 1994					
Dec. 31, 1994					

8. In this section list the dollar amount of charge-offs for agricultural real estate loans, agricultural production & other loans to farmers, and commercial & industrial loans.

Six-Month Period	Agricultural Farmland Loans	Agricultural Production & other Loans to Farmers	Commercial & Industrial Loans
Jan. 1 - June 30, 1990			
July 1 - Dec. 31, 1990			
Jan. 1 - June 30, 1991			
July 1 - Dec. 31, 1991			
Jan. 1 - June 30, 1992			
July 1 - Dec. 31, 1992			
Jan. 1 - June 30, 1993			
July 1 - Dec. 31, 1993			
Jan. 1 - June 30, 1994			
July 1 - Dec. 31, 1994			

If you have questions about the requested data please call Chris Petermann at (405) 744-6702.

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