DETERMINATION OF A COMPUTER SIMULATION CREDIT SCORING MODEL

by

Shari Jeanette Allen

Agricultural Economics Department

Submitted in Partial Fulfillment of the Requirements of the
University Undergraduate Fellows Program

1982-1983

Approved by:

John B. Penson, Jr.
(Faculty Advisor)

April 1983

ABSTRACT

Determination of a Computer Simulation Scoring Model (April 1983)

Shari Jeanette Allen, Senior Student, Texas A&M University

Faculty Advisor, Dr. John B. Penson, Jr.

The nature of the problem of safely investing bank's loanable funds is examined. A possible means of solving some of the difficulties, credit scoring, is proposed with the objectives it shall meet. Credit scoring literature and loan evaluation techniques are reviewed to understand what has been accomplished, and the strengths or weaknesses of previous models. The characteristics which are found desirable are incorporated into the programmed model. Case examples illustrate the properties and use of the model. Such a loan evaluation system has a great potential for expansion of service in other areas of lending.

Keywords

credit scoring, lending policy, programming, determinant analysis, risk, investment, capital budgeting, discounting, net present value, objective, and subjective short-run model.

DEDICATION

I wish to dedicate this paper to those I love. Their strength gives me strength.

ACKNOWLEDGEMENTS

I am sincerely grateful to Dr. John B. Penson, Jr., advisor for my undergraduate fellows project. His devotion of time, guidance, and encouragement played an integral part in the successful development of this paper.

My appreciation is also expressed to Dr. Penson's secretary, Linda Conti, for her contributions to this effort.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER I

INTRODUCTION

The primary question addressed in this study is the factors to be considered when designing a credit scoring model.[1] Within the lending industry, dollars from depositors are invested, through loans, money markets, and other investment opportunities, to earn a yield which will meet expenses and give a profit. These deposits represent liabilities to a lender much as accounts payable to a business; they are due on demand. Therefore, due to the highly liquid nature of demand deposits and, to a lesser extent, time or savings deposits, it is clearly in the lender's best interest to invest these monies where a satisfactory and safe return will be realized. My focus for this paper will be the commercial (particularly agricultural) loan by a bank, and how the desirability of that loan may be identified through a loan evaluation system.

To help insure the favorable performance of the invested funds, the lender must make some assessment of the potential borrower. Financial data and personal characteristics are evaluated and the loan process begins. Without a systemized analysis, the time such a review takes, particularly for business loans, may be longer than desired. A portion of the lender's time is spent processing the financial data to determine the strengths and weaknesses of the borrower. If a weak borrower is found through this process, the time is well spent. Yet consider the loan request from an obviously strong borrower. Is it necessary to perform as

---

[1] This paper follows the style of the *American Journal of Agricultural Economics.*

complete a loan review as in the former case?

Another problem rises from the personal judgment of the loan officer. Certainly an experienced officer has some understanding of how to correctly interpret the repayment risk of a loan request. Yet perhaps bank policy suggests not making every available loan in light of other factors, external to the borrower, which must be considered. A loan evaluation system can then help the bank directors communicate their policy decisions to the individual lending officer.

The level of investigation of a given loan request must also be examined. Several financial tools, such as capital budgeting, cash flow feasibility, and others, exist for the analysis of an investment. Some lenders, however, do not employ these tools in their review process. Many borrowers, particularly within traditional family based agriculture, do not know of these techniques. A loan system incorporating these tools would aid in the interpretation of a loan's feasibility for both the borrower and lender.

My objective for this study then is to develop a loan evaluation model which will meet these needs:

1. reduce amount of time spent analyzing definitely good loans and permit a deeper study of the weaker requests,
2. open a channel whereby the decisions of the directing board can be made known to the individual loan officer,
3. improve the sophistication of loan request analysis, and
4. improve quality of information about a business to both the borrower and lender.

CHAPTER II

LITERATURE REVIEW

Before designing the actual model, credit scoring literature and evaluation techniques were reviewed to determine where previous models had succeeded or failed, and also what the informational needs of the lender would be. Numerous models exist and may be grouped in two general categories: objectively-estimated models and subjectively-estimated models. Furthermore, some models are designed primarily for consumer loan requests while others are designed for business loans.

Subjectively-Estimated Models

The traditional method of evaluating loan requests has been judgmental, based on the lender's experience. Rules of thumb have been used to determine the worthiness of a loan request, and through history this method has proven satisfactory. A difficulty with this system arises, however, during periods of heavy volume. Individual lender attention is limited so time needed for thorough investigation of a weaker borrower may not be available. Administrative control over lending policy may also be impaired because of the lack of an effective communication of bank policy between directors and credit analysts.

A loan evaluation model may be designed, however, to utilize the lender's experience and to improve communication. The variables analyzed and the weights assigned to them would be established, with final approval by management. An example of a subjective estimation of a variable may be as simple as follows:

CHARACTER RATING	SCORE
Poor	1
Fair	2
Average	3
Good	4
Excellent	5

Financial variables may also be included in this type of analysis, where the variable values are measured in numerical terms.

As with any control system, the subjectively- estimated loan evaluation model should be continually inspected to insure that it is performing as desired. The increase or decrease of bad loans within the portfolio should be identified as to the cause. If it is determined that a basic factor in the model has changed among the borrowing clientele, this factor should be adjusted. Furthermore, if the performance of the model warrants, it should be entirely re-evaluated and restructured.

Objectively-Estimated Models

Consumer Loans

A typical consumer loan system analyzes characteristics of the borrower such as customer stability, employment stability, credit history, and amount of outstanding debt to obtaoin some measure of the risk involved. Under the Equal Credit Opportunity Act, a loan cannot be refused on the basis of race, sex, or marital status. Some of the factors which may be used to indicate the borrower's ranking within these categories include home ownership status, telephone in home, income, length of current employment, credit information from credit bureaus, and amount of downpayment. Each factor is then statistically weighted, the data is

applied, and the credit score results. If the score is sufficiently high, the loan request is approved. However, if the score is lower than some cutoff mark, additional investigation must be done, or the request may be denied altogether.

A relatively simple example of a consumer loan evaluation model is presented in Figure 1. The reader places his or her characteristics within the model, sums the score, and if it is over a minimum, acceptance is almost guaranteed. Otherwise, the company will look at the application more closely. This example also serves to indicate that credit scoring systems are not limited to financial institutions only, but that they may be utilized by anyone who extends credit.

A more sophisticated consumer loan evaluation system has been implemented at Indiana National Bank. In 1971, a Credit Analysis Model (CAM) was installed primarily to examine consumer loans. The CAM was developed after extensive study of previous research, with special attention being given to identified shortcomings of earlier models. This model differs somewhat in that it does allow for subjective estimation and human judgment. The CAM has three analysis stages; after each of which an acceptance decision may be made. The first stage includes the statistical score on the submitted variables, the second stage requires a secondary set of loan risk variables which are independent of the first set, and the final stage analyzes a credit report on the borrower. With effective quality control of input data and design of the CAM, this system has achieved some acceptance by the lending officer; the first step in instituting a loan evaluation system.

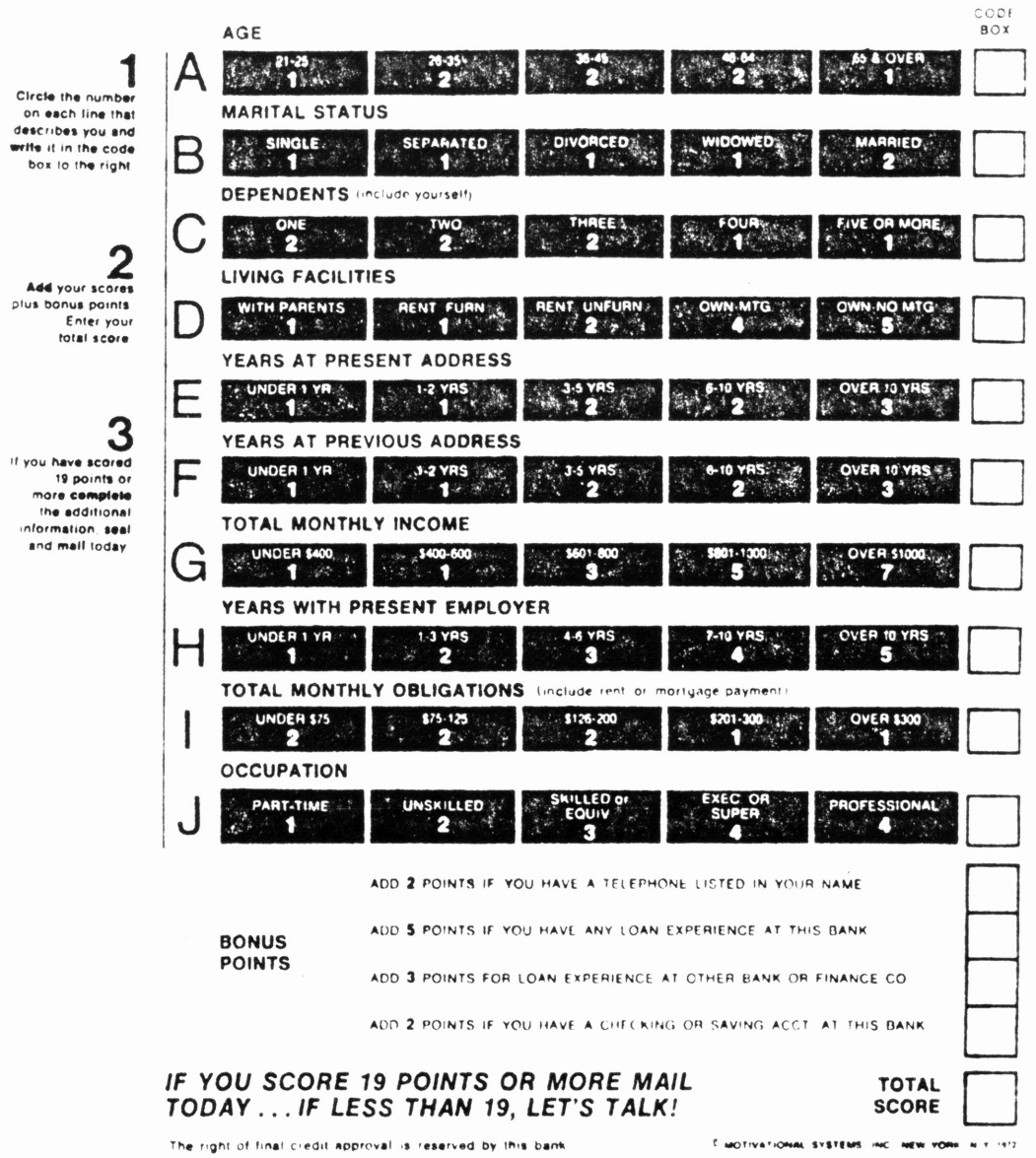

Figure 1. Example of a model

Business Loans

A loan evaluation model designed for business loans requires a greater degree of sophistication. This is so because the typical commercial borrower is not as easily defined as the typical consumer borrower. Some of the difficulty arises because of a lack of standardization among businesses which impairs the ability to determine the optimal predictive factors of loan risk in a statistically significant study. Variations in size, operating procedures, and other characteristics further serve to diversify the group. In addition, up to date financial data may not be readily available, especially from small borrowers.

Several studies have been done to identify predictive factors for loan risk. Among the first of these was the Beaver study in 1966. He determined that a random selection of variables would not improve predictive capability. In 1968, Evert utilized Dunn and Bradstreet reports and found the best individual predictors were nonratio variables. Two ratios were discovered which improved the accuracy of the prediction. The function Evert developed correctly classed a valid sample of businesses as to continued operation or failure 82 percent of the time. A study by Blum in 1969 resulted in a twelve-ratio variable function which predicted with 93-95 percent accuracy the failure rate within one year. After examining the results of these studies and through research of his own, Robert O. Edmister in 1971 stated that the accuracy of a credit scoring function increased with the additional consideration of independent variables not previously included in the model.

An objectively-estimated credit scoring model which has earned a degree of respect is the Zeta Score, developed by Wood, Struthers, and

Winthrop, an investment banking and stock brokerage firm. This model utilizes seven financial ratio variables to provide an indication of a borrower's rating as a credit risk. The weights are determined through a statistical determinant analysis based upon a sample from bankrupt and nonbankrupt firms. Zeta's predictions are very good, with one year forecasts of bankuptcy being 93 percent accurate. Five year predictions still maintain a 77 percent accuracy. The Zeta score is therefore helping many credit analysts evaluate potential customers.

However, several drawbacks of the Zeta Score in relation to the model of this paper should be examined. First, the specific investment is not analyzed. Only the firm as a whole is diagnosed. Only after the investment opportunity has been undertaken and incorporated into the firm does its impact come under inspection. A second drawback for the purposes of this research is that Zeta does not apply to financial, real estate, utility, or railroad companies. This is because such a diversity of firms is treated that comparable data for each and every group cannot be made. To alleviate these shortcomings, the agriculture lender should structure his credit scoring model to meet the particular circumstances and characteristics of his clientele.

A second business-oriented objective credit scoring model has been developed by the Federal Intermediate Credit Bank (FICB) in conjunction with the Agricultural Economics Department at the University of Missouri. The weights again are determined by discriminant analysis to fit to Production Credit Associations of that district. Little additional information is required for the system. Loan requests may be automatically submitted for manual examination to certain flags of the input data. If the

final credit score is above the cutoff mark of 100, the request may be granted. Otherwise, further manual examination is required.

The primary intent of the FICB/University of Missouri model is to *decrease the examination time* for good loans. Other possible benefits cited are that examination costs will be reduced and that index information will be available for the PCAs to supplement their credit administration. Yet, as with the Zeta Score, the PCA model does not examine the inherent feasibility of a given investment opportunity. Also, a lender from another area will require those factors and weights which are reflective of his clientele.

Investment Analysis

Within agriculture, the presence of alternative investments and high cost of funds requires that some research be done to find those opportunities which yield the greatest return at an acceptable risk level. To accomplish this task, several capital budgeting techniques may be used to indicate the best investment. The first of these is the payback method. The annual revenue flows after costs and taxes have been deducted are added to find the number of years the project takes to pay for itself. This method is simple to use, yet it does not account for the timing of the returns, nor the returns after the cost has been repaid.

Another capital budgeting tool is the internal rate of return method. This method seeks that interest rate which equates the present value of the cash inflows to the cost of the outflows. The results are satisfactory in most cases, and the deficiencies of the payback method are filled. Yet a possibility of multiple solutions to the internal rate

of return exist if not all net cash revenue flows are positive.

The net present value, or NPV, method of analyzing an investment opportunity discounts the projected net cash income to the present. After subtracting the initial cost outlay for the project, a decision may be made. If the resulting NPV is positive, the project is acceptable as a return is generated over and above costs and interest. An NPV of zero leaves the decision as neutral, while if the NPV is negative, the investment should not be undertaken as it would actually generate a loss.

The NPV method does account for income received over the entire economic life of the investment and the timing of that income. It is also incapable of producing multiple solutions. Because the NPV provides an effective means of ranking investments and does not contain the deficiencies of either the payback or internal rate of return methods, it is desirable for inclusion in an investment analysis.

CHAPTER III

THE STRUCTURE OF THE MODEL

Characteristics of Model

From the preceding review of the use of credit scoring and loan investment analysis, desirable characteristics of the model to be developed are found. The first of these is that the evaluation system must be flexible to accommodate the wide variations among lenders and their respective customer bases. Agriculture is a diverse industry; its members range from small part time or hobby farmers to large farm corporations. Each of these groups has its own peculiar needs and characteristics to be met. Agriculture lenders also vary greatly. The importance of agriculture in the loan portfolio and the lender's attitude toward risk are just two factors which must be considered in the design of a scoring model.

In addition to flexibility, the model should be coded into a computer language for use in the bank's system. This element is necessary as the financial world is moving at a faster and more highly automated pace. Electronic Funds Transfer (EFT) is increasing, homebanking is being introduced, and machine tellers are becoming commonplace. The reasons for these trends are speed coupled with accuracy and efficiency, each of which may be obtained through use of computers.

A third requirement of the model is that it be capable of analyzing not only the borrower's financial condition, but the feasibility of an investment opportunity as well. Performing each type of analysis in

applicable situations would improve the lender's information about the safety of extending credit to a particular borrower. This improved information would aid the loan officer to direct the borrower as to the steps he can take to make financial progress.

Ratio Analysis

In keeping within the constraints of this project, the depth of a loan request analysis is not extensive, nor is the accuracy of the predictive variables proven. Instead, the main goal of this research is to develop an analysis tool for lenders. This tool may serve as a pattern for the implementation of a credit scoring system suited to each lender's particular needs. For the purposes of illustration, the ratios chosen for the financial analysis were selected from the four divisions of financial ratios. They are listed in Table 1. The variables were chosen from different groups to analyze different facets of the business and prevent undue overlapping. A fifth variable, management ability, was chosen to reflect a personal characteristic of the borrower.

According to the value of each variable entered, an arbitrary value is assigned to it. For example, if a borrower's current ratio were a 2.00 and the highest category was a 1.20, the arbitrary value assigned would be the highest, a five. To reflect the importance of each variable, the arbitrary values are multiplied by weights. The products are then summed, resulting in the credit score. This score is then compared to a desired cutoff score, and a decision to accept or analyze further may be made.

Table 1: Variable Values for Case Examples

Division	Purpose	Ratio Used	Source
Liquidity	show ability to generate sufficient cash to meet financial commitments as they become due without disrupting operations	Current Ratio (current assets/ current liabilities)	Balance Sheet
Solvency	illustrate relationship between claims on the business and total assets or owner's equity	Net Capital (total assets/ total liabilities)	Balance Sheet
Profitability	determine rate of return on investment	Rate of Return on Capital (total returns to equity capital invested in the farm business/ farm business net worth	Income Statement
Efficiency	show degree to which a farm operator can achieve desired results without waste	Gross Ratio (total expenses/ gross farm income)	Income Statement

Investment Analysis

The portion of the program which analyzes the worth of an investment utilizes the net present value concept discussed in Chapter II. The steps of computing the NPV are simply programmed into Fortran. Various interest rates and differing economic lives are allowed so as to fit any investment opportunity.

Order of Solution

A flowchart of the model presented in Figure 2 illustrates how each form of analysis is fitted in the program. The necessary information is entered at the "input values" box. Due to the requirements of programming, the amount of the loan request is entered first, primarily for reference purposes in the data output. The letter Z is also assigned a value by the user. This letter instructs the computer as to which operations are to be performed. If Z=1, only the financial analysis is performed. If Z=2, the net present value process only is done. And, if Z=3, both operations are executed. Each branch of the program ends with a data report of the results of the analysis.

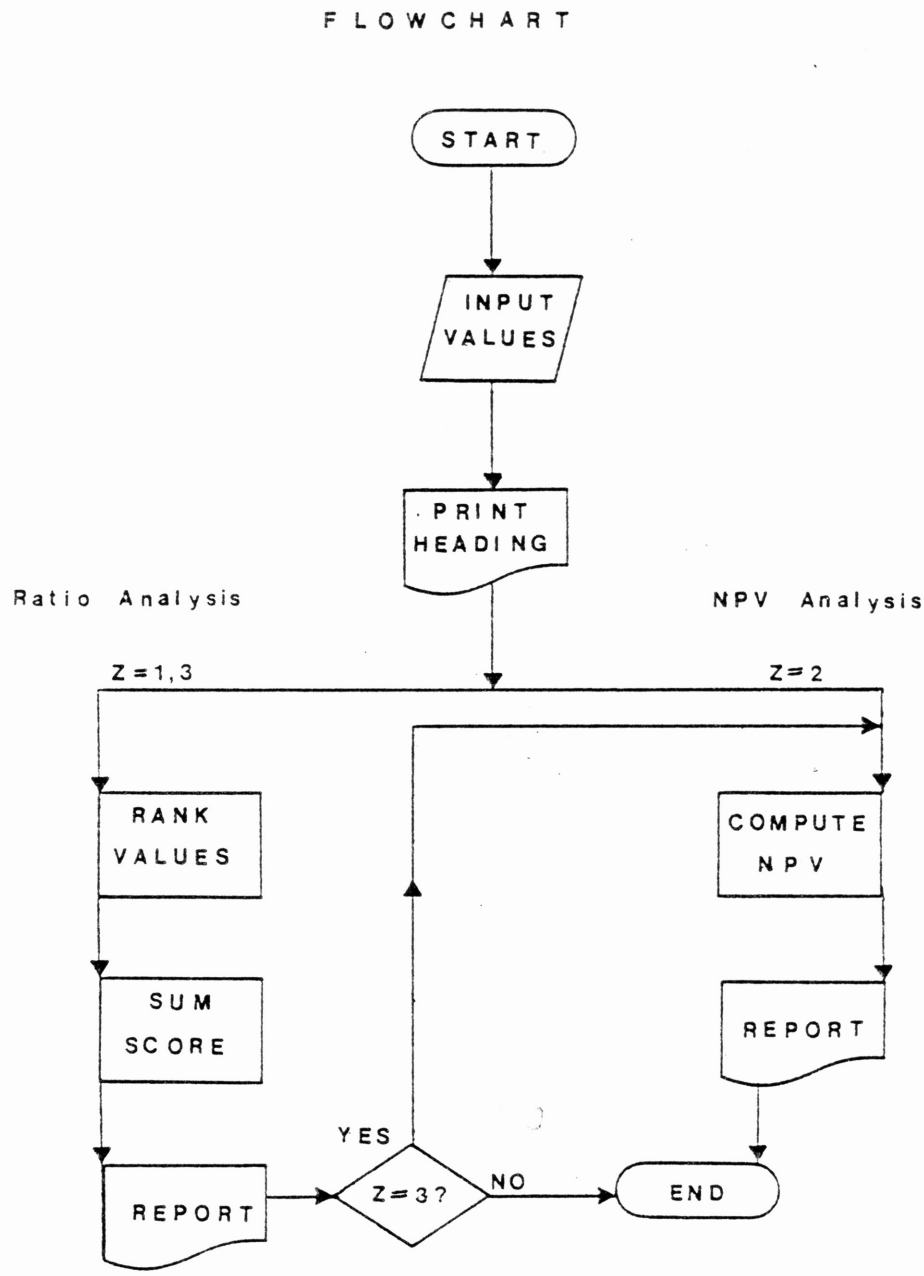

Figure 2. Flowchart of model

CHAPTER IV

A CASE STUDY

The previous discussions have described the loan evaluation model, yet an actual run of a sample case through the model will more clearly illustrate its properties. In constructing two cases for analysis, it is desirable to show an acceptable and an unacceptable request. Therefore, Borrower 1 has the acceptable request while Borrower 2 is highly questionable. Listed in Table 2 are the respective values for the previously selected variables for Borrower 1 and Borrower 2. As the computer processes the data and analyzes the values in relation to what were designated as risk levels for each variable, the arbitrary values are assigned accordingly. The weights are then multiplied by the arbitrary value to yield a weighted value. These are then summed to give the credit score. Table 3 will prove helpful in visualizing this process. The difference between the credit score of 4.60 for Borrower 1 and 2.40 for Borrower 2 serve as an indication of the relative positions of the two. Yet the scores alone cannot determine what the loan officer's answer will be.

A determination by the lender of what is the minimum acceptable score in accordance with his risk level must be done. Within this example, the minimum credit score was set at 2.50. Now a comparison may be made which will indicate the course of action for the loan request. The 4.60 score of Borrower 1 clearly classifies this loan as acceptable. Yet Borrower 2's score of 2.40 is 0.10 *below* the 2.50 minimum. This should indicate to the lender that the loan is highly questionable and should be either analyzed more deeply or denied altogether. The foregoing study

Table 2: Ratio and Variable Analysis Process for Case Examples

VARIABLE	BORROWER 1		BORROWER 2	
	Current	Prior	Current	Prior
Current Ratio	1.860	1.700	0.530	0.758
Net Capital Ratio	1.200	1.200	0.755	0.960
RoR on Capital	1.000	0.900	0.300	0.330
Gross Ratio	2.000	2.000	0.450	0.570
Management	5	4	2	2

Table 3: Investment Analysis (NPV method) for Case Examples

	Rank	Weight*		Weighted Value
BORROWER 1				
Current Ratio	5	.2		1.00
Net Capital Ratio	3	.2		0.60
RoR on Capital	5	.2		1.00
Gross Ratio	5	.2		1.00
Management	5	.2		1.00
			SCORE =	4.60
BORROWER 2				
Current Ratio	2	.2		0.40
Net Capital Ratio	2	.2		0.40
RoR on Capital	3	.2		0.60
Gross Ratio	3	.2		0.60
Management	2	.2		0.40
			SCORE =	2.40

*Weights arbitrarily equal.

exemplifies the ratio analysis portion of the program. To illustrate the present value process, the following investment opportunity has been presented to Borrower 1. He may purchase 30 beef cows today for $750 each, or $22,500. After five years, he plans to sell them for $450 each, or $13,500. Anticipating a 90 percent calf crop, 27 calves will be raised to 600 pounds and then sold each of the five years. Borrower 1 estimates his appropriate discount factors as 7 percent or the first three years, and 8 percent for the remaining two years. Table 4 outlines this information and computes the net present value of the project. The project therefore today is worth $14,746.98 after all costs have been met. If Borrower 1 has no other investment opportunities, or other projects do not yield as highly as this beef cow plan, this investment may undertaken.

Table 4: Case Example - Net Present Value Calculation

Year	Proforma Income[3]	Interest Factor[4]	Discounted Income
1	6700.00	0.9346	6261.68
2	6700.00	0.8734	5852.04
3	7600.00	0.8163	6203.87
4	7600.00	0.7558	5744.32
5	5340.00	0.6998	3737.17
Present Value of Income			27,799.08
Plus Present Worth of Sale Price			9447.90
			37,246.98
Less Cost			22,500.00
			14,746.98

[3] Income over and above costs

[4] Interest Factor = $1/(1 + r_1)$ X $1/(1 + r_2)$ ... X ... $1/(1 + r_n)$

CHAPTER V

SUMMARY AND CONCLUSIONS

This paper has attempted to show that a systemized loan evaluation can be beneficial for the lender as well as the borrower. The model which has been presented serves as a pattern for an actual system, which may be installed by a lender. Various critical points were not determined. These include the variables which should be included in the analysis process, the weights to be assigned, determination of a cutoff score, and other details. As has been stated previously in this work and will be emphasized again, each lender faces his own specific situation, and these components of a loan analysis system must suit that situation.

To aid the lender in establishing these criteria, a study may be performed to indicate the standards. The CAM at Indiana, and the FICB/University of Missouri model may serve as examples for the course such a study should take. Because of the flexibility of the model, subjectively determined variables and values may also be used. For either the objective or subjective model, continuous monitoring of the model's performance must be done.

In conclusion, it must be stated that a well-designed and implemented computerized credit scoring model will in the future be viewed as a important asset of the lender. Current problems which oppose the institution of such a model stem from an incomplete understanding of the systems function. It does not seek the loan officer's job; it does complement his abilities. The system does not change bank customers into mere numbers on paper; it increases the quality of information about that bor-

rower. Finally, the time conserved from repeated analyses may be channeled into obtaining a deeper understanding of the weaker borrower's situation. The improved efficiency and quality of the loan review process afforded by a computerized credit scoring model will therefore insure its place as an integral tool at the lender's disposal.

REFERENCES

American Institute of Banking. *Agricultural Finance.* U.S.A.: The American Bankers Association, 1969.

Bank Administration Institute and the Robert Morris Associates. *Customer Profitability Analysis.* U.S., 1972.

Churchill, Gilbert A., et. al. "Developing a Credit Scoring System." *The Credit World.* April (1977):6-10.

Edmister, Robert O. "Financial Ratios and Credit Scoring for Small Business Loans." *The Journal of Commercial Bank Lending.* 54(1971):10-23.

Federal Intermediate Credit Bank of St. Louis. internal correspondence. September 11, 1981.

Haldeman, Robert G. "Zeta: A New Scoring System." working paper. Wood, Struthers, and Winthrop, 1978.

Hettenhouse, George W., and Jack R. Wentworth. "Credit Analysis Model - A New Look for Credit Scoring." *The Journal of Commercial Bank Lending.* 54(1971):26-32.

Jessup, Paul T. *Modern Bank Management - A Casebook.* St. Paul, Minnesota: West Publishing Co., 1978.

Orgler, Yair E. *Analytical Methods in Loan Evaluation.* Lexington, Massachusetts: Lexington Books, 1975.

Penson, John B., Jr., and David A. Lins. *Agricultural Finance: An Introduction to Macro and Micro Concepts.* Englewood Cliffs, N.J.: Prentice-Hall, Inc. 1980.

Penson, John B., Jr., Danny A. Klinefelter, and David A. Lins. us Farm Investment and Financial Analysis. Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1982.

Prochnow, Herbert V., ed. *Bank Credit.* San Francisco: Harper and Row Publishers, 1981.

APPENDIX A

PROGRAM LISTING

```
    //$OPTIONS
 1        DIMENSION ACCT(8),LACCT(8),VALUE(8),WT(8),WTVAR(8),PTFAVG(8)
         *,RATIO(8),NORM(8,4)
 2        DIMENSION DATA(40),PFI(40),CINT(40),CIF(40)
 3        REAL ACCT,LACCT,WT,WTVAR,SCORE,RATIO,MNSCOR,PTFAVG,NORM
 4        REAL PFI,PV,TPV,FNPV,CIF,C,TV,TIF,AMT,NTV
 5        INTEGER VALUE,J,Z
 6        INTEGER Y,X,I
    C
    C *** INPUT VALUES ***
    C
 7        READ(1,2) AMT,Z
 8      2 FORMAT(1F12.0,5X,I2)
 9        READ(1,4)(ACCT(J),J=1,6)
10      4 FORMAT(6F10.0)
11        READ(1,4)(LACCT(J),J=1,6)
12        READ(1,5)Y,C,TV
13      5 FORMAT(I2,2F11.0)
14        DO 222 I=1,Y
15    222 READ(1,6)CINT(I),PFI(I)
16      6 FORMAT(F6.0,4X,F11.0)
17        DO 223 I=1,3
18    223 WRITE(6,224) CINT(I),PFI(I)
19    224 FORMAT(F6.3,4X,F11.2)
20        DO 225 J=1,5
21    225 READ(1,12)(NORM(J,K),K=1,4)
22     12 FORMAT(4F5.0)
23        DO 226 J=1,5
24    226 WRITE(6,227) (NORM(J,K),K=1,4)
25    227 FORMAT(5X,4F5.2)
    C
    C *** PRINT HEADING ***
    C
26        WRITE(6,7)
27      7 FORMAT('1','************************************************',/)
28        WRITE(6,8)
29      8 FORMAT(32X,'LOAN EVALUATION REPORT')
30        WRITE(6,9) ACCT(6),AMT
31      9 FORMAT(//5X,'BORROWER NUMBER....',F11.2/5X,'AMOUNT OF LOAN.....
         *',F10.2/)
32        WRITE(6,10)
33     10 FORMAT(/'------------------------------------------------',/)
34        IF(Z.EQ.3) GO TO 1000
35        IF(Z.EQ.2) GO TO 2000
36   1000 READ(1,11)(DATA(J),J=1,6)
37     11 FORMAT(6F8.0)
    C
    C *** RATIO ANALYSIS PROCESS ***
    C
38        WT(1)=DATA(1)
39        WT(2)=DATA(2)
40        WT(3)=DATA(3)
41        WT(4)=DATA(4)
42        WT(5)=DATA(5)
43        MNSCOR=DATA(6)
    C
44        READ (1,13)(PTFAVG(J),J=1,5)
45     13 FORMAT(5F10.0)
    C
```

```
      C *** PLACE VARIABLE AND FIND WEIGHTED VALUE ***
      C
   46       DO 14 J=1,5
   47       RATIO(J)=ACCT(J)/LACCT(J)
   48       IF(ACCT(J).LE.NORM(J,1)) VALUE(J)=1
   49       IF(ACCT(J).GT.NORM(J,1).AND.ACCT(J).LE.NORM(J,2)) VALUE(J)=2
   50       IF(ACCT(J).GT.NORM(J,2).AND.ACCT(J).LE.NORM(J,3)) VALUE(J)=3
   51       IF(ACCT(J).GT.NORM(J,3).AND.ACCT(J).LE.NORM(J,4)) VALUE(J)=4
   52       IF(ACCT(J).GT.NORM(J,4)) VALUE(J)=5
   53       WTVAR(J)=WT(J)*VALUE(J)
   54    14 CONTINUE
      C
      C *** CALCULATE SCORE ***
      C
   55       SCORE=0.0
      C
   56       DO 15 J=1,5
   57       SCORE=WTVAR(J)+SCORE
   58    15 CONTINUE
      C
      C *** RATIO ANALYSIS REPORT ***
      C
   59       WRITE(6,16)
   60    16 FORMAT(//5X,'RATIO ANALYSIS REPORT:'/)
   61       WRITE(6,17)
   62    17 FORMAT(6X,'VARIABLE',7X,'VALUE',3X,'LAST VALUE',2X,'PORT. AVE.',
           *3X,'WEIGHT',4X,'PERFORMANCE')
   63       J=1
   64  8888 IF(J.EQ.1) GO TO 8881
   65       IF(J.EQ.2) GO TO 8882
   66       IF(J.EQ.3) GO TO 8883
   67       IF(J.EQ.4) GO TO 8884
   68       IF(J.EQ.5) GO TO 8885
      C
   69  8881 WRITE(6,2221) ACCT(J),LACCT(J),PTFAVG(J),WT(J),RATIO(J)
   70  2221 FORMAT(/2X,'CURRENT RATIO',5X,F6.3,4X,F6.3,6X,F6.3,6X,
           *F5.3,10X,F5.3)
   71       GO TO 8886
   72  8882 WRITE(6,2222) ACCT(J),LACCT(J),PTFAVG(J),WT(J),RATIO(J)
   73  2222 FORMAT(/2X,'NET CAP. RATIO',4X,F6.3,4X,F6.3,6X,F6.3,6X,
           *F5.3,10X,F5.3)
   74       GO TO 8886
   75  8883 WRITE(6,2223) ACCT(J),LACCT(J),PTFAVG(J),WT(J),RATIO(J)
   76  2223 FORMAT(/2X,'ROR ON CAPITAL',4X,F6.3,4X,F6.3,6X,F6.3,6X,
           *F5.3,10X,F5.3)
   77       GO TO 8886
   78  8884 WRITE(6,2224) ACCT(J),LACCT(J),PTFAVG(J),WT(J),RATIO(J)
   79  2224 FORMAT(/2X,'GROSS RATIO',7X,F6.3,4X,F6.3,6X,F6.3,6X,
           *F5.3,10X,F5.3)
   80       GO TO 8886
   81  8885 WRITE(6,2225) ACCT(J),LACCT(J),PTFAVG(J),WT(J),RATIO(J)
   82  2225 FORMAT(/2X,'MANAGEMENT',8X,F6.3,4X,F6.3,6X,F6.3,6X,
           *F5.3,10X,F5.3)
   83       GO TO 8886
   84  8886 CONTINUE
   85       J=J+1
   86       IF (J.LE.5) GO TO 8888
   87       CONTINUE
      C
   88       WRITE(6,21) SCORE,MNSCOR
```

```
89       21 FORMAT(//4X,'SCORE OF THIS REPORT:',F7.3/12X,'DESIRED SCORE',
           *F7.3)
90          WRITE(6,10)
91          IF(Z.EQ.3) GO TO 1050
92          GO TO 3000
93     1050 WRITE(6,22)
94       22 FORMAT('1','------------------------------------------------',/)
         C
         C *** NET PRESENT VALUE CALCULATION ***
         C
95     2000 TPV=0.0
96          TIF=1.0
97          DO 23 X=1,Y
98          CIF(X)=1/(1+CINT(X))
99          TIF=TIF*CIF(X)
100         PV=PFI(X)*TIF
         C
         C *** NET PRESENT VALUE REPORT ***
         C
101         IF(X.GT.1) GO TO 8889
102         WRITE(6,24)
103      24 FORMAT(//5X,'NET PRESENT VALUE REPORT'//)
104         CONTINUE
105         WRITE(6,27)C,TV
106      27 FORMAT(/3X,'EQUITY.............$',F9.2,/3X,
           *'SALE PRICE.........$',F9.2)
107         WRITE(6,25)
108      25 FORMAT(//7X,'YEAR',4X,'PRO-FORMA INCOME',3X,'INTEREST FACTOR'
           *,3X,'DISCOUNTED INCOME'/)
109    8889 WRITE(6,29) X,PFI(X),TIF,PV
110      29 FORMAT(/8X,I2,7X,F11.2,10X,F11.4,10X,F11.2)
111    8890 TPV=TPV+PV
112      23 CONTINUE
113         NTV=TV*TIF
114         WRITE(6,30)TPV
115      30 FORMAT(//6X,'PRESENT VALUE OF INCOME....$',F11.2)
116         FNPV=TPV-C+(NTV)
117         WRITE(6,31)NTV
118      31 FORMAT(//6X,'PRESENT WORTH OF SALE PRICE....$',F11.2)
119         WRITE(6,34)FNPV
120      34 FORMAT(//6X,'NET PRESENT VALUE....$',F11.2)
121         WRITE(6,22)
122    3000 CONTINUE
123         RETURN
124         END

         //$DATA
```

APPENDIX B

COMPUTER RESULTS FOR CASES

****

LOAN EVALUATION REPORT

BORROWER NUMBER.... 1.00
AMOUNT OF LOAN..... 10000.00

RATIO ANALYSIS REPORT:

VARIABLE	VALUE	LAST VALUE	PORT. AVE.	WEIGHT	PERFORMANCE
CURRENT RATIO	1.860	1.700	1.040	0.200	1.094
NET CAP. RATIO	1.200	1.200	0.760	0.200	1.000
ROR ON CAPITAL	1.000	0.900	1.230	0.200	1.111
GROSS RATIO	2.000	2.000	0.800	0.200	1.000
MANAGEMENT	5.000	4.000	3.000	0.200	1.250

SCORE OF THIS REPORT: 4.600
DESIRED SCORE 2.500

****

LOAN EVALUATION REPORT

BORROWER NUMBER.... 2.00
AMOUNT OF LOAN..... 10000.00

RATIO ANALYSIS REPORT:

VARIABLE	VALUE	LAST VALUE	PORT. AVE.	WEIGHT	PERFORMANCE
CURRENT RATIO	0.530	0.758	1.040	0.200	0.699
NET CAP. RATIO	0.755	0.960	0.760	0.200	0.786
ROR ON CAPITAL	0.300	0.330	1.230	0.200	0.909
GROSS RATIO	0.450	0.570	0.800	0.200	0.789
MANAGEMENT	2.000	2.000	3.000	0.200	1.000

SCORE OF THIS REPORT: 2.400
DESIRED SCORE 2.500

NET PRESENT VALUE REPORT

EQUITY.....$ 22500.00
SALE PRICE.....$ 13500.00

YEAR	PRO-FORMA INCOME	INTEREST FACTOR	DISCOUNTED INCOME
1	6700.00	0.9346	6261.68
2	6700.00	0.8734	5852.04
3	7600.00	0.8163	6203.87
4	7600.00	0.7558	5744.32
5	5340.00	0.6998	3737.17

PRESENT VALUE OF INCOME....$ 27799.08

PRESENT WORTH OF SALE PRICE....$ 9447.90

NET PRESENT VALUE....$ 14746.98

VITA

Shari Jeanette Allen was born in Rantoul, Illinois on August 15, 1961, to Lonnie and Patricia Allen. She graduated as validictorian from S. H. Rider High School, Wichita Falls, Texas in 1979. She is currently pursuing a Bachelor of Science degree in Agricultural Economics at Texas A&M University, with an expected completion date of May, 1983.

Her permanent address is:

Shari J. Allen

5306 Rivera Drive

Wichita Falls, Texas 76310

The typist for this project was Mrs. Linda Conti.