Staff Papers Series

Staff Paper P90-42 June 1990

ANALYSIS OF LOAN SETTLEMENTS AND RESTRUCTURED LOAN PERFORMANCE

by

Glenn Pederson
Ananth Rao
Michael Boehlje

Department of Agricultural and Applied Economics

University of Minnesota
Institute of Agriculture, Forestry and Home Economics
St. Paul, Minnesota 55108

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Executive Summary

The Farm Credit Banks of St. Paul (FCB), like many other Farm Credit District banks, experienced a significant deterioration in loan quality during 1983-86. Unrestructured, nonaccrual loan volume stood at $1.328 billion in the St. Paul District by the end of 1986. The St. Paul FCB developed its strategy for managing the nonaccrual loan problem during the latter part of 1986. Rapid restructuring of nonaccrual loans (Phase I) was to be a major element of the overall plan to stop the deterioration of bank equity capital and ensure bank survival.

The Phase I project was implemented during the first quarter of 1987, to aggressively deal with nonaccruing loans and acquired property. The project was to be accomplished through a number of alternatives for debt restructuring. These included; accepting cash settlements, restructuring loans for viability by writing down principal and/or accrued interest, reamortizing loan payments over a longer term, restructuring loans for work-out, accepting deeds-in-lieu-of-foreclosure, and litigation. The Phase I project was continued as Phase II, which was implemented during the remainder of 1987.

Two of the key issues of restructuring are how to decide which farm loans should be restructured and how to evaluate the uncertain future performance of loans that are restructured for viability. The problem of the FCB consists of choosing which settlement alternative is most appropriate in each case and negotiating that resolution. A primary measure of the success of restructuring is the improvement in ability of the restructured business to overcome future cash flow difficulties. Therefore, it is important to consider the various factors which influence the financial performance of the farming operation during the post-restructure period. Randomness in the problem mainly derives from uncertainty about movements in land prices, fluctuations in product prices, and variability in the borrower's cash flow stream.

While previous studies have analyzed the problem of financing new and accruing borrowers, this study extended the probabilistic model to categorizing loan settlements and analyzing the performance of restructured, nonaccrual borrowers. The analysis focuses on identifying determinants

of the debt resolution/restructure decision, identifying determinants of post-restructure performance and estimating the probability that restructured loans would perform or not perform.

Stratified random sampling was done on St. Paul Federal Land Bank borrower credit files in southern Minnesota. Available information was collected from individual credit files of borrowers by Bank employees for 2-3 years prior to debt resolution and, in the case of restructured loans, for one year following the restructure date. Individual case data were collected from a total of 185 borrower files. Three general categories of variables were identified for analysis; financial, nonfinancial, and restructure variables.

The analysis revealed that nonfinancial variables (cooperativeness and management ability of the borrower) were major determinants of the FCB decision whether or not to restructure a nonaccrual loan. If the borrower was cooperative in the process of debt resolution and was judged to have average or higher level of management ability, there was a higher probability that the debt would be restructured. In addition, if the FCB expected a higher (smaller negative or larger positive) value from the resolution, there was a higher probability that the borrower's debt would be restructured. Borrower financial variables (e.g., the financial leverage ratio and the current ratio) did not play significant roles as determinants of the FCB's decision to restructure or not restructure a nonaccrual loan.

The analysis of post-restructure performance indicated that loans had a higher probability of not performing if the post-restructure interest rate was higher, the level of borrower gross cash farm income was lower (than in the pre-restructure period), and the debt structure of the farm business (after restructuring) indicated that the farm had relatively greater fixed assets than term liabilities and a higher financial leverage position. Significance of the interest rate, farm income, and financial structure variables in the model indicated that restructured loans remained highly sensitive to factors which determine the debt repayment burden and the repayment ability of the restructured farm operations. In relative terms, the nonperformance of restructured loans is found to be somewhat more sensitive to financial structure and farm income variables than it is to level of interest rates. These results suggest factors which the Farm Credit Banks and other agricultural lenders might want

to consider when restructuring farm loans to achieve a desired level of performance on restructured loans.

The main limitations of this study are the small sample size and only one year of post-restructure performance data. The estimated model may not be capturing some of the other potential determinants of long term performance. This becomes an issue as the restructured loan agreements mature and interest rates are increased by the FCB to levels that are consistent with rates on other accruing loans. Moreover, these restructured farm operations will be subjected to future changes in financial and income conditions in agriculture.

ACKNOWLEDGEMENTS

This project report was prepared with financial and technical support provided by the U.S. Department of Agriculture, Economic Research Service through a Federal grant to the University of Minnesota (USDA - 58 - 3AEN - 8 - 00046) and additional funding provided by the Farm Credit Banks of St. Paul.

Valuable assistance in data collection was provided by the Southern Minnesota Farm Credit Service Centers and by FCB-St. Paul Bank staff. Valuable comments on an earlier draft of this report were also provided by FCB-St. Paul staff.

ANALYSIS OF LOAN SETTLEMENTS AND RESTRUCTURED LOAN PERFORMANCE

Important lessons were learned from the farm financial crisis of the 1980's. These lessons include the critical importance of identifying changes in economic conditions early, interpreting their strategic importance for farmers and their financial institutions, and developing appropriate, timely responses. During this period segments of agriculture were shown to be vulnerable to interest rate variability due to relatively high levels of borrowed capital and relatively low rates of return on assets. As a result, farm asset values plummeted and cash flows proved inadequate to meet loan commitments.

Creditors were thrust into the role of absorbing unexpectedly massive loan losses. These losses derived from missed interest and principal payments and from lower collateral values (which frequently were below principal balances when loans were liquidated). These losses were shared by borrowers in default, borrowers who were current in their financial obligations, farm lenders, and the taxpaying public. Increasingly, lenders were willing to maintain their exposure for creditworthy farm customers, but were not enthusiastic about taking on new credit risks.

Some farm financial institutions and a number of credit analysts recognized that in the face of severe and widespread economic difficulty, the early restructuring of debt may be an appropriate strategy (Pederson et al., Boehlje et al.). Rescheduling principal payments over a longer term, reducing interest rates, and forgiving principal and/or accrued interest may be preferable to the debtor, the lender, and society. The alternative is to insist that debt obligations be paid in full and allow the losses to continue escalating until that is accomplished or until bankruptcy or repossession occurs.

The objective of this paper is to explore two aspects of the identified debt restructuring problems. We identify and analyze 1) the determinants of farm loan restructuring decisions, and 2) the post-restructure performance of loans at the Farm Credit Bank of St. Paul (FCB). The analysis focuses on Federal Land Bank nonaccrual loans which were part of an aggressive restructuring activity in the FCB during 1987. This paper provides an empirical analysis of selective debt restructuring as one credit policy response to widespread loan default. The results may have

implications for similar dilemmas at credit institutions in developing countries and/or the U.S. savings and loan industry.

Background

The Farm Credit Banks of St. Paul (FCB), like many other Farm Credit District banks, experienced a significant deterioration in loan quality during 1983-86. Unrestructured, nonaccrual loan volume stood at $1.328 billion in the St. Paul District by the end of 1986. That represented about 16.9 percent of gross loan volume. Federal Land Bank loans accounted for 84.7 percent of the total nonaccruing loan volume at the FCB and Federal Land Bank Associations. In addition FLB delinquencies were reported to be 6.1 percent of loan volume on December 31, 1986. Uncertainty about farm real estate values, the continuing deterioration of loan collateral values, and the build-up of acquired property inventories through deedback and foreclosure further compounded the FCBs problems. The Bank was also projecting that it would be forced to continue moving a large number of loans to nonaccrual status during 1987.

The St. Paul FCB developed its strategy for managing the nonaccrual loan problem during the latter part of 1986. The emphasis of the recovery plan was to negotiate loan restructuring arrangements that would maximize the economic benefits to the Bank while attempting to minimize the overall credit risk and legal exposure. Rapid restructuring of nonaccrual loans (Phase I) was to be a major element of the overall plan to stop the deterioration of bank equity capital and ensure bank survival.

The Phase I project was implemented during the first quarter of 1987, to aggressively deal with nonaccruing loans and acquired property. The project was to be accomplished through a number of alternatives for debt restructuring. These included; putting loans improperly classified as nonaccrual back into accrual status, accepting cash settlements, restructuring loans for viability by writing down principal and/or accrued interest, reamortizing loan payments over a longer term, restructuring loans for work-out, accepting deeds-in-lieu-of-foreclosure, and litigation. The Phase I project was continued as Phase II, which was implemented during the remainder of 1987.

By mid-August 1987, the total unrestructured, nonaccrual loan volume had been reduced sharply by over $637 million through the restructuring of over 4,000 loans. By the end of 1987, unrestructured loan volume was 56 percent below the level in December, 1986, and Federal Land Bank loan delinquencies had fallen to 10.7 percent of gross loan volume and 3.9 percent of loan volume excluding unrestructured, nonaccrual loans. Mid-August, 1987, the Federal Land Bank indicated that preliminary agreements had been reached on 4,218 loans. The breakdown of these agreements was; 930 cash settlements, 829 restructured for workout (i.e., orderly collection), 1380 restructured for viability, 808 deed acceptances, and 271 loans in litigation.[1/] Final settlements had been achieved on just over 80 percent of the total preliminary agreements. About 72 percent of the agreements on loans restructured for viability had progressed to a final settlement.

One of the key issues of restructuring (such as the Phase I and Phase II activities of the FCB) is the uncertain future performance of loans that are restructured for viability. The FCB defines viable farm units as those which generate sufficient income on an annual basis to pay all operating, family living and interest expenses and maintain capital replacement. A viable unit generally has a good net worth position. Fundamental questions of restructuring action include; will such restructured loans remain viable, and what are the implications for financial performance of the associations? Early estimates by internal auditors of the St. Paul FCB and by special credit personnel within the Bank indicated that widely disparate opinions were held concerning the percentage of loans restructured for viability which were expected to perform. With these vastly different views concerning the long-term viability of restructured farm operations, the questions for analysis are: What internal and external factors are important to consider when restructuring a problem loan? Can probabilities of success be determined? What are the major determinants of restructured loan performance?

Analysis of the determinants of restructured loan performance at the microeconomic level is important for several reasons. First, the viability of a restructured loan is critical to the survivability of those farming operations that have participated in the loan restructuring program. Second, performance of restructured loans in the aggregate is critical to the earnings and short-run financial viability of the credit institution. Third, identification and quantification of the factors that lead to

successful loan restructuring would be useful in guiding future negotiations involved in loan restructuring. Success of restructuring is not measured solely in terms of obtaining an agreement between borrower and lender on a restructuring proposal. Success of restructuring is measured in terms of the improved ability of the restructured business to overcome future cash flow difficulties. Therefore, it is important to consider the various factors which influence the financial performance of the farming operation during the post-restructure period.

Theoretical Background

No economic or financial theory has been advanced to analyze the firm in financial distress (Marais et al.). However, the existing theory of firm reorganization in bankruptcy applies to the distress situation and the legal/financial condition of the firm. The process of reorganization is designed to enable the firm to continue in existence and maintain whatever goodwill it still possesses, rather than to liquidate its assets to meet the demands of creditors. The economic justification for reorganization is that the going concern is expected to be worth more than the value of the individual assets if sold separately. The primary tasks of the reorganization process from the debtor's perspective are to relieve the burden of liabilities and to realign the capital structure so that financial problems are not likely to recur (Altman).

From the creditor's perspective expected utility maximization provides a framework for analyzing alternative actions for managing the financial distress condition. The emphasis on utility maximization is due to its extensive use in the development of models of decision analysis and predictive models of human behavior. The decision maker for any choice problem can be treated as either a single individual or, more abstractly, as a family, a firm or a public agency. The choice problem is best characterized as the selection of a preferred action for a finite set of discrete actions with various attributes. Probabilistic choice theory specifies the probability with which an individual will select any feasible alternative. It provides a potentially powerful framework for analyzing discrete choice situations.

Two alternative interpretations of probabilistic choice theory are the constant utility approach and the random utility approach. The constant utility approach hypothesizes that the utility of alternatives is constant and that the choice probabilities are functions which are parameterized by those utilities. The random utility approach formulated by Manski hypothesizes that utilities are random. He identifies four distinct sources of randomness; unobserved attributes, unobserved taste variables, measurement error and imperfect information.

The random utility approach is more consistent with accepted consumer theory. According to this approach the decision maker always selects the alternative with the highest utility. Since the utilities are not known with certainty, the probability of choosing alternative i is equal to the probability that the utility of the ith alternative (U_{in}) is greater than, or equal to, utility of all other alternatives in the choice set. More formally,

$$\Pr(i|C_n) = \Pr[U_{in} \geq U_{jn}], \text{ for all } j \in C_n \qquad (1)$$

where C is the choice set and n is the number of decisionmakers. One can operationally derive choice probabilities by assuming a joint probability distribution for the set of random utilities $\{U_{in}, i \in C_n\}$. In general the random utility of an alternative can be expressed as a sum of observable (systematic) and unobservable (random) components of the total utilities.

$$\begin{aligned} U_{in} &= V(Z_{in}, S_{in}) + \varepsilon(Z_{in}, S_{in}) \\ &= V_{in} + \varepsilon_{in}. \end{aligned}$$

Following consumer theory, Z is a vector of attributes, S denotes taste variations, and ε is the error term associated with S and Z. Expression (1) can then be written as

$$\Pr_n(i) = \Pr[V_{in} + \varepsilon_{in} \geq V_{jn} + \varepsilon_{jn}] \text{ for all } j \in C_n \qquad (2)$$

where $Pr_n(i) = Pr(i|C_n)$. The right side of (2) can be rewritten as

$$Pr\,[\varepsilon_{jn} \leq V_{in} - V_{jn} + \varepsilon_{in}] \text{ for all } j \in C_n,\ j \neq i.$$

Any particular multinomial choice model can be derived from Equation (2), given specific assumptions on the joint distribution of the disturbances. The most insightful way to express $Pr_n(i)$ is to reduce the multinomial choice problem to a binary one. To do this, we create a "composite" alternative out of all the alternatives in C_n (other than i), and use the utility of the "best" alternative in the composite to represent the entire composite. If U_{in} exceeds the utility of the composite alternative, then i is chosen.

$$Pr_n(i) = Pr\,[V_{in} + \varepsilon_{in} \geq \text{Max}\,(V_{jn} + \varepsilon_{jn})] \text{ for } j \in C_n,\ j \neq i \qquad (3)$$

To utilize Equation (3), we must derive the distribution of utility of the composite alternative from the underlying distribution of the disturbances. This derivation is "feasible" with the Multinomial Logit (MNL) model. The MNL is expressed as[2/]

$$Pr_n(i) = \frac{e^{V_{in}}}{\sum_j e^{V_{jn}}} \qquad \text{for} \quad j \in C_n. \qquad (4)$$

Equation (4) reduces to a binary logit expression when the number of choices is limited to two.

The foregoing theoretical framework provides a foundation for analyzing loan settlement and restructure performance problems. Attributes of the borrower (the arguments of the function, V, in the above equations) might include financial and nonfinancial measures. For example, the financial variables may include indicators of solvency, liquidity, debt structure, profitability, and operating efficiency. Nonfinancial variables might include age and education of the operator, farm

size characteristics, how long a farmer has been borrowing from the Federal Land Bank, how long the loan is past due, etc.

The problem of the decisionmaker (in this case the FCB) in each case consists of choosing an action from a set of debt resolution alternatives which include; restructuring of assets and liabilities, cash settlement, acceptance of deedback of assets, litigation and combinations of these categories of resolution. The decision rule for the FCB is to choose the alternative in each case which minimizes the expected loss of revenue from resolution when compared to the foreclosure alternative. Randomness in the problem (denoted by ε_i in the above equations) mainly derives from uncertainty about movements in land prices, fluctuations in product prices, and variability in the borrower's cash flow stream.

Methods of Analysis

Gessner et al. have analyzed the theoretical and empirical aspects of estimating models with binary dependent variables. They observe that each of the classification techniques (e.g., linear discriminant analysis (LDA), binary probit, ordinary least squares (OLS), and quadratic discriminant analysis) has a set of underlying assumptions that must not be violated by the data. To use LDA the researcher must assume that the predictor variables are distributed multivariate normal and the distributions of predictors across groups differ only by a shift in means (i.e., they have identical variance-covariance matrices). Violations of these conditions result in less efficient parameter estimates in the case of LDA. The maximum likelihood estimates that are obtained either through binary probit or binary logit models are consistent even if these conditions do not prevail (Maddala). Although there are no multi-variate distributional assumptions for the predictors underlying logit and probit analysis, strict error term distributional assumptions underlie both techniques. The logit model requires the assumption of a skewed Weibull or Gumbel distribution of the error term, as compared to the symmetric normal distribution for probit and OLS. Due to the closed form structure, logit is preferred to probit for analytical convenience.

Several recent studies have focussed on the problem of classifying borrowers as good or poor risks (Lufburrow et al.; Pederson and Duncan; Fiske, et al.; Mortensen et al.; Miller and LaDue; Chikkara). Lufburrow et al. and Pederson and Duncan used Probit and discriminant analysis, respectively, in their research. Fiske et al. employed logistic regression to model factors influencing currentness of debt payment among Ohio farmers. Mortensen et al. and Miller and LaDue used logistic regression to predict probability of loan default of farmers in North Dakota and New York, respectively. Chikkara reviewed non-parametric classification techniques as alternatives to these parametric techniques.

While previous studies have analyzed the problem of financing new and accruing borrowers, this study extends the probabilistic model to categorizing loan settlements and analyzing the performance of restructured, nonaccrual borrowers. The analysis focuses on identifying determinants of the restructure decision, identifying determinants of post-restructure performance and estimating the probability a restructured loan would perform or not perform.

Estimation of Settlement Probabilities

Three resolution alternatives were identified. The cash-out, deedback, and combination resolution alternatives were combined into a single "not restructured" category. These outcomes signify the termination of the financial relationship between the borrower and the FLB. The "restructured" category includes loan settlements where the financial relationship between the borrower and the lender continues. If these alternatives are not appropriate, the loan falls into the foreclosure/litigation category. Thus, the decision process of those personnel involved in FCB special credit is modelled as a choice among the three mutually exclusive alternatives.

We define P_1, P_2 and P_3 to be the probabilities associated with the not restructured (NR), restructured (R) and litigation (L) categories, respectively. We can express these probabilities in binary form. Let $P_1 / (P_1 + P_3) = F(\beta^T_1 x)$ where F denotes a cumulative distribution function for random utility (from Equation 1) and T is the transpose. Similarly, $P_2 / (P_2 + P_3) = F(\beta^T_2 x)$. These imply

$$P_j / P_3 = \frac{F(\beta^T_j x)}{1-F(\beta^T_j x)} = G(\beta^T_j x) \quad \text{for } j = 1,2. \tag{5}$$

Because $\sum_{j=1}^{2} P_j / P_3 = (1-P_3) / P_3 = (1/P_3) - 1$, we have

$$P_3 = [1 + \sum_{j=1}^{2} G(\beta^T_j x)]^{-1}. \tag{6}$$

From Equation (5)

$$P_j = G(\beta^T_j x) / [1 + G(\beta^T_j x)] \tag{7}$$

where G is also a cumulative distribution function. From the logistic model, we have $G(\beta^T_j x) = \exp(\beta^T_j x)$. Equations (6) and (7) can then be written as

$$P_j = \exp(\beta^T_j x) / [1 + \sum_{j=1}^{2} \exp(\beta^T_j x)] \qquad \text{for } j = 1,2 \tag{8}$$

and

$$P_3 = 1 / [1 + \sum_{j=1}^{2} \exp(\beta^T_j x)] \qquad \text{for } j = 1,2. \tag{9}$$

The resulting variable is simply the natural logarithm of the odds of (NR/L) and (R/L).

The litigation/foreclosure category is specified as the base for model estimation. The criteria for choosing the most appropriate model are the Pseudo-R^2 statistic, the log-likelihood ratio, the Chi-square statistic, asymptotic-t values, and correct prediction percentages.

Estimation of Nonperformance Probabilities

In binomial logit analysis, we assume that there is an underlying response variable Y_i^* defined by the regression relationship

$$Y_i^* = \beta^T X_i + u_i \tag{10}$$

where X_i are the independent variables, u is the error term, and β is the vector of coefficients. In practice, Y_i^* is unobservable. We observe the dummy variable Y, defined by

$$\begin{aligned} Y &= 1 \text{ if the restructured loan is not performing (i.e., if } Y_i^* > 0) \\ &= 0 \text{ if the restructured loan is performing (i.e., if } Y_i^* \leq 0). \end{aligned} \tag{11}$$

In this formulation $\beta^T X_i$ is $E(Y_i^* | X_i)$.

From Equations (10) and (11) we get

$$\begin{aligned} \text{Prob } (Y_i = 1) &= P_1 \\ &= \text{Prob } (u_i > -\beta^T X_i) \\ &= 1 - F(-\beta^T X_i) \end{aligned} \tag{12}$$

where F is the cumulative distribution for u. In this case the observed values of Y are the realizations of a binomial process with probabilities given by Equation (12), which vary from trial to trial (depending on the X_i). Hence, the likelihood function is

$$L = \prod_{y_i=0} F(-\beta^T X_i) \prod_{y_i=1} [1 - F(\beta^T X_i)]. \tag{13}$$

Since the cumulative distribution of u_i is assumed to be logistic, we have

$$F(-\beta^T X_i) = \frac{\exp(-\beta^T X_i)}{1 + \exp(-\beta^T X_i)} = 1/(1 + \exp(\beta^T X_i).$$

Therefore,

$$1 - F(-\beta^T X_i) = P_1$$
$$= \exp(\beta^T X_i) \; / \; [1 + \exp(\beta^T X_i). \qquad (14)$$

In this case, there is a closed form expression for F (because it does not involve explicit integrals) and we can compute P_1. By rearranging Equation (14) we get

$$\text{Ln}\,[P_1 / (1 - P_1)] = \exp(\beta^T X_i). \qquad (15)$$

The dependent variable in this regression equation is simply the logarithm of the odds that the restructured loan will not perform. A restructured loan is not performing if the borrower failed to make interest and/or scheduled principal payments under the terms of the restructure arrangement.

Data Description

Stratified random sampling was done on St. Paul Federal Land Bank borrower credit files in southern Minnesota. Sampling was based on loan size (borrower's business view principal, BVP) in December, 1986. The size groups were identified as: tier I - borrowers with BVP less than $100,000; tier II - borrowers with BVP greater than $100,000 and less than $200,000; and tier III - borrowers with BVP greater than $200,000. The proportion of borrowers by size of loan and category of resolution was considered while selecting the sample size in each of the categories.

Farm Credit Bank employees and persons contracted to the Bank collected information from individual credit files of borrowers for 2-3 years prior to debt resolution and in the case of restructuring for one year following the restructure date. Individual case data were collected from a total of 185 borrower files. Three general categories of variables were identified for analysis; financial, nonfinancial, and restructure variables. Summary statistics for these variables are reported in Table 1, based on 87 borrower cases. Complete information on all the variables was available in only 87 of the total 185 cases collected.

Financial Variables

The primary financial variables which were derived from credit file data include; the debt/asset ratio (DA), the rate of return on farm assets (ROA), the financial leverage ratio (FLR), the current ratio (CR), the debt service coverage ratio (DSCR), the gross ratio (GROSR), the debt structure index (DSI), and nonfarm income (NFI). Additional variables included the amount of term debt owed to lenders other than the FLB (OTD) and the amount of gross cash farm income (GCFI).

The rate of return on farm assets was computed as the net cash farm income plus interest paid all divided by total farm assets. The resulting ratios for 1984-86 are measures of historical farm profitability. These individual year ratios were combined into a geometric mean ROAGM for each farm. The sample mean of ROAGM is .11 and the estimated standard deviation is .07. The distribution of ROAGM is skewed to the right with the maximum average return being .40 and the minimum return being zero. Half the farms in the sample had mean rates of return exceeding .10, as reflected by the median statistic. Thus, when net cash farm income and interest payments are summed, profitability of these sample farm operations is reasonably good. Therefore, the major concern about debt repayment ability becomes the size of the debt burden is and the average interest rate on that debt.

The financial leverage ratio (FLR) is defined as the return on farm equity (ROE) divided by the return on farm assets (ROA). The FLR signals potential financial problems by indicating when debt capital is not being used effectively (Penson). If debt capital is used effectively, the return to

Table 1. Descriptive Statistics of Selected Variables in the Loan Settlement Analysis

Variable	Mean	Standard Deviation	Median	Interquartile Range 25th Percentile	Interquartile Range 75th Percentile	Minimum	Maximum
Financial:							
ROAGM	.11	.07	.10	.06	.15	.00	.40
FLR	-.48	15.45	.31	-1.45	2.05	-98.90	84.37
DA a/	1.09	1.26	1.11	1.00	1.39	.39	10.76
CR a/	2.06	5.03	1.16	.40	1.53	.01	36.02
DSI a/	.99	.20	.98	.90	1.06	.29	1.83
DSCR	.49	1.06	.34	.02	.66	-1.07	5.89
GROSR	1.01	.50	.91	.81	1.06	.47	4.62
NFI ($)	10,597.	12,035.	7,386.	1,600.	14,662.	0.	58,740.
OTD ($)	251,915.	246,468.	169,800.	83,505.	379,600.	1,290.	1,426,102.
GCFIGM ($)	140,767	122,481	103,815	51,730.	185,844.	2,549.	549,682.
Restructure:							
PENR a/	2.20	1.49	1.60	1.32	2.46	.62	7.45
RES ($000)	-88.	114.	-87.	-151.	-39.	-460.	336.
BVP ($000)	147.	102.	121.	74.	178.	7.	644.
Nonfinancial:							
AGE (yrs)	48.80	9.97	47.	42.	57.	27.	74.
ACRES (acres)	342.	314.	254.	160.	361.	40.	2,089.
RELAT (mo.)	68.04	35.41	64.	47.	80.	24.	299.
DUE (mo.)	16.39	9.83	14.	9.	24.	0.	42.

a/ These balance sheet measures reflect values of assets at the end of 1986.

farm assets will be greater than the cost of debt. In that case ROE will be greater than ROA, and the financial leverage ratio will be greater than one. However, if debt capital is not used effectively, its interest costs will exceed its returns and the leverage ratio will be less than one. Computationally,

$$FLR = \frac{ROE}{ROA} = \frac{\text{(Net cash farm income/Net worth)}}{\text{(Net cash farm income + Interest paid)/Total farm assets}}.$$

FLR is expressed as the geometric mean of the 1984-1987 measures. The mean FLR is -.48, which is both significantly lower than one and negative. The median FLR is .31 which indicates the ratio above (or below) which 50 percent of the farms fall. Many farms with nonaccruing loans at the Federal Land Bank were clearly experiencing profitability problems and were not in a position to productively use additional debt. On the contrary, debt reduction was seriously required for the average nonaccrual borrower. The interquartile range of the FLR variable is -1.45 to 2.05, which means that 25 percent of the farmers had financial leverage ratios less than -1.45 (and 25 percent of the farms were above 2.05). An inspection of the sample revealed that 60 percent of the farms had FLRs less than 1.0.

The leverage indicator, debt/asset ratio, is computed as

$$DA = \frac{\text{Total farm liabilities}}{\text{Total farm assets}}.$$

The DA variable is expressed using the end of 1986 values for assets and liabilities. As one might expect, the mean DA ratio is quite high (at 1.09) and has a large standard deviation (1.26). The mean ratio indicates that on average nonaccrual farm borrowers were insolvent. The sample statistics indicate that the DA ratio has a highly positively skewed distribution. According to the 25th percentile statistic, about one-fourth of the sample farm borrowers were in debt positions less than 100 percent of total assets. The DA measure generally suggests that due to the erosion of asset

values prior to the end of 1986, the leverage positions of these nonaccrual borrowers was excessive at the time loan settlements were being negotiated.

The debt service coverage ratio (DSCR) is a measure of repayment ability and shows the farmer's ability to meet debt servicing obligations. The higher the ratio above one, the more secure is the ability to service debt. A DSCR significantly, and persistently, less than one indicates the need for restructuring debt in order to decrease current obligations. The debt service coverage ratio is computed as

$$\text{DSCR} = \frac{\text{(Net cash farm income + Total interest payments + Land rent)}}{\text{(Total interest paid + Principal on FLB debt + Land rent)}}.$$

Since only FLB principal payments are included in the denominator of the DSCR measure, the resulting estimates will overstate the true DSCR whenever non-FLB principal payments compromise a proportion of the total annual principal obligation. Non-FLB principal payment information was not available in borrower credit files.

DSCR is expressed as the geometric mean of the 1984-1987 measures. The estimated sample mean DSCR is .49 with a standard deviation of 1.06. This mean DSCR is indicative that on average farmers with nonaccrual loans were unable to service their existing debt and repayment capacity was lacking. The interquartile range statistics for the DSCR variable are .02 to .66. A review of the individual data indicated that about 20 percent of the borrowers had DSCRs above 1.0. While this suggests that these farmers did have adequate debt repayment capacity but were not making their loan payments, it was not possible to determine what percentage would continue to show adequate repayment capacity after including non-FLB principal payments in the ratio. A dilemma which the FCB faced in southern Minnesota during 1986-87 was that new loans had not been previously cross-collateralized with older, more highly-collateralized loans. As a consequence, some borrowers found an advantage from stopping payment on new loans and continuing to pay on other, older loans. This situation may apply in some of the sample cases under analysis.

The current ratio (CR) is a short-term liquidity measure. The CR measure is computed as

$$CR = \frac{\text{Total current farm assets}}{\text{Total current farm liabilities}}.$$

The CR variable is also expressed as an end of 1986 value. The mean CR of the sample is estimated to be 2.06 with a large standard deviation of 5.03. The median CR is 1.16 and the interquartile range is from .40 to 1.53. These ratio statistics suggest that on average farmers had adequate balance sheet liquidity to meet short term obligations. However, the sample statistics indicate this is a highly skewed distribution. Over 50 percent of the farmers had current positions less than 1.16 and many were in illiquid positions at the time loan settlements were being negotiated.

The gross ratio (GROSR) is a measure of overall efficiency of the farm operation. The GROSR measure is computed as

$$GROSR = \frac{\text{Annual total cash operating expenses}}{\text{Annual gross cash farm income}}.$$

The GROSR variable is expressed as the geometric mean of the 1984-87 ratios. The mean GROSR for 1984-87 is 1.01 which could be interpreted to mean that on average these nonaccrual farmers were not running efficient operations. Since the mean gross ratio is so close to one, the typical profitability is more correctly measured by the median. The median statistic (.91) provides an indication that over 50 percent of the farmers were generating positive profits. The interquartile range and maximum statistics reflect that at least 25 percent of the farming operations were not profitable (with gross ratios above 1.00) and some were experiencing large losses on operations (with gross ratios as high as 4.62).

The debt structure index (DSI) is a measure of the relationship between term liabilities and term assets (Mazzocco). Computationally, the DSI is

$$DSI = \frac{\text{(Total liabilities - Current liabilities)}}{\text{Total liabilities}} \Big/ \frac{\text{(Total assets - Current assets)}}{\text{Total assets}}.$$

The DSI is an indicator of potential future liquidity problems arising from the timing of liability maturities and rates at which noncurrent assets contribute to cash flow. To illustrate, consider two firms each with a DSI of one and identical values of total assets. Assume, firm A has a DA ratio of 0.3, while firm B has a DA ratio of 0.9. If all other factors are equal, firm B will require annually three times more cash than firm A to reduce term debt. Firm B's likelihood of experiencing liquidity problems is magnified by its financial leverage. Therefore, it is more important for firm B to maintain (or increase) its DSI position to properly manage liquidity.[3/]

The mean DSI variable is expressed using balance sheet values from the end of 1986. The sample mean DSI is quite high (.99) and has a sizeable standard deviation (.20). A DSI value less than 1.0 reveals proportionately greater fixed assets than term liabilities and implies that a significant proportion of these borrowers could experience future liquidity problems. Interestingly, the DSI ratio varies from a minimum of 0.29 to a maximum of 1.83. The median statistic shows that over 50 percent of the borrowers had a DSI below .98 and that there was a need to consider adjustments of long term indebtedness at the time loan settlements and debt restructuring were being considered.

The non-FLB debt variable (OTD) has a sample mean of $251,915 and a median of $169,800. These debts include outstanding liabilities to commercial banks, farm input supplies, individuals, and other creditors. The distribution of OTD is quite skewed and ranges from a minimum of $1,290 to a maximum of $1,426,102.

The gross cash farm income variable (GCFIGM) is computed as the geometric mean of the farm's annual gross cash farm income during 1984-87. The sample mean of GCFIGM is estimated to be $140,767. This measure of farm earnings also has a positively skewed distribution as reflected

by the median ($103,815) and the minimum ($2,549) and maximum ($549,682) statistics. Clearly, the range of farm sizes is quite great.

Restructure Variables

Restructure variables include the collateral position of the nonaccrual loan (PENR), the resolution value associated with the expected loss or gain from restructuring (RES), and the pre-restructure business view principal of the borrower's loan (BVP).

The penetration ratio (PENR) measures the relationship between the outstanding amount of FLB debt and accrued interest divided by the net realizable value (NRV) of the assets held by the FLB as collateral. To the extent there is an excess of asset value this ratio will be less than 1.0 and serves as an indicator of the margin of lender safety in case a borrower defaults. The penetration ratio is computed as

$$\text{PENR} = \frac{\text{FLB debt (excluding FLB stock)}}{\text{NRV of FLB land, bldg., mach. \& equip.}}.$$

The PENR variable is expressed using end of 1986 balance sheet and appraisal report values. The sample mean penetration ratio is estimated to be 2.20. This indicates that the average nonaccrual FLB loan was inadequately collateralized (based on the value of assets reported in borrower credit files). The interquartile range of PENR was from 1.32 to 2.46. This suggests that most FLB loans were highly penetrated. One of the major reasons cited by the FLB for loan restructuring was the overpenetration of loans in the portfolio.

The resolution value (RES) is a benefit (cost) measure of loan settlement alternatives. The variable is derived by applying the formula in use at FLB branches during the nonaccrual loan resolution "blitz". Branch loan officers used this approach to conduct individual restructure analyses and estimate the future gains (losses) if loans were restructured. The RES measure is computed in three steps for alternatives other than foreclosure/litigation. First, the value of the resolution is computed as the sum of the present loan balance plus interest accrued, real estate taxes, and interest

accrued on prior liens. Second, the collateral (or settlement) offered is defined as the maximum of the established "bottom line" amount or the net realizable value of FLB collateral. Third, the computed future gain or loss (i.e., RES) is the difference between the step 2 value and the value in step 1.

These steps are illustrated in Table 2 for three different case settlement situations. Accrued interest (Col. 2), accrued real estate taxes (Col. 3), and interest accrued on prior liens other than FLB debt (Col. 4) are the additional expenses that would be incurred if the loan were foreclosed. These anticipated expenses are incorporated to bring the cash-out, deedback, and restructure alternatives to the same point in time as the foreclosure option (which is assumed to take 2 years to final settlement).

For example, under the cash-out alternative the present investment (business view principal plus previously accrued interest) of a case drawn at random is $165,100 (Col. 1). The interest which would accrue to the loan over the next 2 years ($30,709) is added to the projected accrual of real estate taxes ($8,500) and the estimated future interest accruing on prior liens ($61,398) - both over the next 2 years. The future value of the cash-out resolution (2 years hence) is the sum of $265,757 (Col. 5). This is the step 1 value. One of the cash-out comparison values is the FLBs "bottom line" ($158,250 in Col. 6). The "bottom line" is the minimum amount the Bank would accept when it compares the present investment with the value of collateral assets (given real estate market conditions at the time of settlement). To be consistent with the FLBs special credit procedure during Phase I, the bottom line was defined as 75 percent of the appraised value of the assets on what were considered nonviable accounts. The other cash-out comparison value is the net realizable value of FLB collateral ($170,420) which would be realized if the property were acquired and then sold (Col. 7). The step 2 value is the maximum of the bottom line (Col. 6) and NRV of FLB collateral (Col. 7). The RES value is the difference between the values in Col. 8 (step 2) and Col. 5 (step 1). The loss to the FLB from accepting the cash-out settlement is $95,337 (Col. 9). This is the RES value of this particular case, and it represents 58 percent of the FLBs present investment in the loan.[4/]

Table 2. Computation of Future Gain/Loss (RES) Values for Three Settlement Alternatives

Settlement Alternative	Present Investment [a/]	Accrued Interest [b/]	Accrued Real Estate Taxes [c/]	Accrued Interest on Prior Liens [d/]	Computed Value of Resolution (Step 1) (1+2+3+4)	FLBs Bottom Line [e/]	NRV of FLB Collateral	Collateral or Settlement Offered (Step 2) (maximum of 6 or 7)	Computed Future Gain (Loss) (RES) [f/] (Step 3) (Col 8 - 5)	RES as Percent of Present Investment (Col 9/Col 1)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Cash-out	$165,100	$30,709	$8,500	$61,398	$265,757	$158,250	$170,420	$170,420	($95,337)	58
Deedback	94,712	17,616	6,150	32,580	151,058	47,450	79,150	79,150	(71,908)	76
Restructure	326,219	52,195	10,200	37,206	425,820	326,219	381,207	381,207	(44,613)	14

a/ The present investment equals principal plus previously accrued interest.

b/ Accrued interest equals the product (post-restructure interest rate * present investment * 2 years). Discussion with Bank officials indicated that it would normally take 2 years for a final settlement if a loan was foreclosed.

c/ Accrued real estate taxes on the land for 2 years.

d/ Interest accrual for 2 years on prior liens other than FLB debt.

e/ The FLBs "bottom line" position is defined as the smaller of 75 percent of the appraised value of FLB collateral or the value of the present investment.

f/ A positive number indicates the gain derived from the resolution alternative over the value which would be realized through foreclosure.

Comparable losses are calculated for the deedback illustration and the restructure illustration in Table 2. The corresponding percentage losses for the deedback and restructure alternatives are 76 percent and 14 percent, respectively. These illustrated losses are not comparable across alternatives because they represent different loan situations. Since these are isolated case examples, the relative sizes of these losses should not be interpreted as being representative of the amounts achieved by the FLBs under each loan settlement strategy.

The average resolution reported in Table 1 is estimated to be -$88,000. This indicates that the FLB conceded that amount of debt to the average nonaccrual borrower as part of the settlement agreement when compared to the foreclosure alternative. The range of RES was quite large from an FLB concession of $460,000 to a net gain of $336,000. In over 75 percent of the cases the computed FLB loss was more than $39,000 when compared to the foreclosure alternative. In 25 percent of the cases the FLBs resolution value was calculated to be a loss of $39,000 or less, or a gain (as indicated by the interquartile range statistics). It is important to note that if the FLB had foreclosed on these loans additional transactions costs would have been incurred (fees and selling expenses). These added costs were not included in the RES measure.

The business view principal (BVP) of borrower debt in the sample has an estimated mean value of $147,000 and a range from $7,000 to $644,000. Over 50 percent of the farmers had BVPs below $121,000, while another 25 percent had BVPs above $178,000. This suggests that the typical nonaccrual loan was relatively large and that a large variation in loan sizes existed in the nonaccrual portfolios of the two FLB associations which were analyzed.

Nonfinancial Variables

Nonfinancial variables include the borrower's age (AGE), total acres owned prior to debt resolution (ACRES), how long the borrower had been banking with the FLB (RELAT), how long the loan had been in nonaccrual status (DUE), cooperativeness of the borrower (COOP), and management ability (MGMT) of the borrower.

The average age of borrowers in the sample was slightly over 48 years. The youngest nonaccrual borrower was 27 years of age and the oldest borrower was 74 years old. The range of borrower ages suggests that problems with debt repayment existed for younger and older borrowers. These farmers had been borrowing from the FLB for an average of 68 months (or just over 5½ years) prior to the date of loan settlement. The longest term borrower in the sample had been borrowing from the FLB for 299 months (about 25 years).

Average farm size was estimated to be 342 acres, but farm size varied considerably. The range of farm size was from 40 to 2,089 acres. It appears that the average-sized farm in the sample was typical of farming operations in that area of the state. However, large commercial farms and small farming operations were also in default. The average length of time these loans were in default was just over 16 months, but the range statistics indicate that while some loans were not past due, about 50 percent were past due 9 to 23 months while others (about 25 percent) had not been performing for between 24 and 42 months.

Cooperativeness (COOP) is a binary dummy variable equalling one (if the borrower was judged by the FLBA loan officer to be cooperative in seeking a compromise) or zero (otherwise). In each case the loan officer had made several notes and observations in the credit file on the borrower's attitude toward restructure efforts. These observations were carefully evaluated while collecting borrower information. These notes and observations formed the main basis for determining if the particular borrower was cooperative or not. The summary statistics indicate that 75 percent of the total sample borrowers were cooperative in the loan settlement efforts.

Management (MGMT) is an ordinal dummy variable which indicates the FLB's assessment of the borrower's business management abilities. The variable equals zero (if the management ability of the farm operator is considered poor), one (if management is average), or two (if management is good). Loan officers had also written notes and observations in the credit files on the borrower's management ability. These observations formed the basis for categorizing borrowers by the degree of management ability. Sample statistics indicate that management ability was considered good in only 9 percent of the total cases, average in 68 percent of the cases and poor in 23 percent of the cases.

Analysis of Loan Settlements

Why were some loans restructured for viability, while others were resolved through cash settlement, deedback of property, or litigation? This question is addressed with the use of multinomial logit analysis. LIMDEP software is used for model estimation. A total of 185 loan cases were used for the analysis.

Multi-collinearity among the variables was checked using the method of singular value decomposition (Belsley, Kuh, and Welsch).[5/] GAUSS software was used for singular value decomposition. The procedure revealed that there was collinearity between

DUE, AGE, COOP, and MGMT;

NFI and REGION;

OTD, RELAT, DA, DSI, and PENR;

CR and DSI; and

GROSR, REGION, AGE, and COOP variables.

The collinear variables; REGION, ACRES, DUE, OTD, CR, PENR, and GROSR were dropped from the analysis.

Although loan size information was collected, it was determined through preliminary correlations analysis that size of loan based on business view principal would not be a significant predictor of loan settlement outcomes. Therefore, all borrower cases were pooled for a single analysis.

Results of Loan Settlement Analysis

Estimated parameters for alternative L are normalized to zero for the purpose of identification. Variables such as AGE, NFI, RELAT, DA, DSI, and GCFI were found to be statistically insignificant and they were dropped from the analysis. The estimated coefficients are to be cautiously interpreted as they are the probabilities (log odd ratios) of the restructured (R) and not restructured (NR) alternatives relative to the foreclosure/litigation (L) alternative.

Results in Table 3 suggest that nonfinancial variables were major determinants in the loan settlement process relative to the foreclosure/litigation alternative. Nonfinancial variables such as cooperativeness of the borrower and managerial ability of the borrower were highly significant predictors of loan settlements.

Cooperativeness (COOP) has a positive sign in both equations. However, the magnitude of the coefficient is higher with alternative R (3.8152) than with alternative NR (2.5754). It was not possible to test whether these two coefficients are significantly different from one another. The COOP coefficient in the estimated R equation also has slightly higher significance than in the NR equation. The large coefficient for COOP in the R equation implies that the odds of restructuring the loan were higher if the borrower was cooperative with the FLB during the loan settlement process. This indicates that there was a greater chance of restructuring the borrower rather than using litigation.

Results for the MGMT variable are quite similar to those for the cooperativeness variable. A similar interpretation applies to the MGMT coefficient, even though the magnitudes of the coefficients are lower. The slightly larger coefficient on MGMT in the R equation (1.20728) compared to that in the NR equation (1.03626) implies higher odds of restructuring. That is, the debts of farmers who were considered to be better managers were more likely to be restructured than they were to be settled through a cash-out or deedback.

Size of debt resolution (RES) is the measure used to determine the gain (loss) associated with each settlement alternative. The coefficients are both positive in sign, but the coefficient is more significant in the R equation than the NR equation. If the expected resolution values were higher (less negative), the odds of restructuring were also higher relative to litigation. This presumably occurred since there were gains to the FLB from restructuring rather than litigating the debt. The magnitude of the RES coefficient is slightly higher in the R equation (.43308) than in the NR equation (.30187) which indicates a higher probability of restructuring rather than cash-out or deedback.

Table 3. Loan Settlement Model Results with Litigation as the Base

Variable	Alternative NR			Alternative R		
	Estimated Coefficient	T Statistic	Significance Level	Estimated Coefficient	T Statistic	Significance Level
Constant	-.15981	-.29	.7737	-1.01400	-1.52	.1284
COOP	2.57541	3.40	.0007	3.81520	4.75	.0000
MGMT	1.03626	1.95	.0517	1.20728	2.17	.0297
RES[a/]	.30187	1.71	.0873	.43308	2.09	.0371
DA	.00155	2.15	.0319	.00073	.99	.3229
ROAGM	-.00129	-1.89	.0589	-.00027	-.36	.7172

Log likelihood ratio	=	70.177
Chi-squared (8) significance level	=	.35206 E-13
Pseudo-R^2	=	.21

a/ Units of RES are expressed in $100,000.

The coefficients on the debt/asset ratio carry positive signs in both equations. However, the coefficient in the R equation is not significantly different from zero. The significant positive coefficient in the NR equation suggests that there was a greater likelihood of not restructuring loans of farmers with relatively high debt loads at the time of loan settlement rather than going through foreclosure and litigation. Thus, these loans more frequently ended in a cash-out or deedback.

The coefficients on the rate of return on assets have negative signs in the estimated equations. This was a somewhat unexpected result. Once again, the coefficient on ROAGM was significantly different from zero in the NR equation, but was not significant in the R equation. The negative relationship in the NR equation indicates that borrowers with histories of more profitable farming operations were more likely to be not restructured. If the FLB were restructuring farms for future profitability (and repayment ability) these farms would seem to have been reasonably good candidates. The negative coefficient raises some other plausible explanations. First, these farms may have been profitable prior to the loan settlement date, but they may have been experiencing cash flow and liquidity problems as well, which could have impaired future repayment ability (even in a restructured operation). A second alternative explanation is that these farmers were good candidates for restructuring but were either not cooperative with FLB restructuring efforts, or they preferred to deedback the land to the FLB because of the high cost of continuing to service the debt, or a cash-out was the farmer's preferred choice (due to the implied forgiveness of debt).

The estimated equations correctly predicted 52 percent of the loans under the litigation alternative, 41 percent of the loans under the nonrestructure alternative, and 81 percent of the loans under the restructure alternative. Total correct prediction of loan settlements was 60 percent of the 169 nonaccrual loans in the data set.

A 10 percent proportional sample was drawn randomly as the holdout sample before estimating the model. The model was validated using this holdout sample. Parameter estimates performed well in the holdout sample with the total correct prediction of 68 percent. As a result, the model may be used to calculate the probability that a nonaccrual loan will be resolved through restructuring or through the nonrestructuring alternative, rather than resorting to the litigation alternative.

Interpretation of the results is expanded by analyzing changes in the probabilities of alternative loan settlement outcomes relative to the litigation alternative for different combinations of cooperativeness and management ability of the borrower while holding RES and FLR at their mean values. These probabilities are presented in Table 4. When the borrower was considered cooperative in negotiating a loan settlement and was evaluated to have average management ability, the probability the loan would be restructured was estimated to be 59.9 percent. This compares to a 22.6 percent chance the loan would be restructured if the borrower was not cooperative with the FLB during negotiations. The corresponding percentages increase slightly to 64.5 percent and 30.9 percent, respectively, when management is considered to be good. At the other extreme a nonaccrual loan to a noncooperative borrower with average management ability would have a 27.2 percent chance of ending in a foreclosure/litigation action. The probability of foreclosure for a noncooperative borrower with poor management ability rises sharply to 52.6 percent.

Interestingly, of the probabilities in the NR column indicate that cooperative borrowers with good management ability were not restructured 34.9 percent of the time. This suggests that the borrower may have voluntarily terminated the loan through a deedback and/or cash-out alternative. This compares with 41.2 percent among those with poor management ability. It should also be noted that the probability of not being restructured decreased from 57.9 percent to 34.4 percent as management ability deteriorated from good to poor among noncooperative borrowers. The corresponding probability of foreclosure increased even more dramatically from 11.1 percent to 52.6 percent. The relatively wide range of probabilities of not restructuring, relative to the litigation alternative among noncooperative borrowers, suggests a broader range of factors than those in the model were influencing outcomes in the noncooperative, nonrestructured group.

A similar analysis can be undertaken for different values of the resolution variable. Assuming the borrower is cooperative, management ability is average, and the farm business has an average financial leverage ratio, we raised the RES value from its mean of -$88,000 to $50,000. The probability that the loan would be foreclosed is 0.9 percent, not restructured is 35.1 percent, and restructured is 63.9 percent with this higher RES value. This indicates that a slight reduction would occur in the probabilities of foreclosure (from 1.6 to 0.9 percent) and no restructure (from 38.5 to

Table 4. Probabilities of Alternative Loan Settlements for Alternative Levels of Management and Borrower Cooperation

Borrower	Borrower's Level of Management	Probability the Nonaccrual Loan Would Be		
		Foreclosed	Not Restructured	Restructured
		(probabilities as percents)		
Cooperative				
	Good	0.5	34.9	64.5
	Average	1.6	38.5	59.9
	Poor	4.8	41.2	53.9
Not Cooperative				
	Good	11.1	57.9	30.9
	Average	27.2	50.2	22.6
	Poor	52.6	34.4	13.0

35.1 percent) with a significant increase in RES. There is a corresponding slight increase in the probability the loan would be restructured (from 59.9 to 63.9 percent).

Analysis of Restructured Loan Nonperformance

The second objective of the research involves identification and evaluation of factors which explain post-restructure performance of loans restructured for viability. The research question is: What factors explain why some restructured loans did not perform in the year following restructure? Binomial logit is used to analyze the problem.

Data

A total of 85 restructured cases remained after deleting the observations under the cash-out, deedback and litigation categories. However, only 43 cases had complete information. Since parameter estimates were found to be sensitive to missing values, only the 43 complete cases were used in the analysis. When the gross cash farm income (GCFI) variable was included, 19 observations were missing. The mean value of GCFI from the remaining 24 observations was used to replace the missing values. This is not expected to introduce any statistical bias into the estimation, since the mean values are the best guess for the missing values.

Several of the financial variables reported in Table 5 were expressed in index form. The ROA, DA, CR, and DSI measures were computed as the 1988 value divided by the corresponding geometric mean for 1984-87. This index measure approach was used to capture the influence of changes in these financial variables from the pre-restructure (base) period to the post-restructure period on the likelihood of post-restructure performance. Therefore, index values greater than 1.0 indicate an increase in the measure during 1988. For example, the mean ROA index is 1.01, which suggests that restructured farms were slightly more profitable on average than they had been during the pre-restructure years. The mean DA index value is .95, which implies a slight average reduction in the relative debt load of restructured operators.

Table 5. Descriptive Statistics of Selected Variables in the Post-Restructure Performance Analysis

Variable	Mean	Standard Deviation	Median	Interquartile Range		Minimum	Maximum
				25th Percentile	75th Percentile		
Financial:							
ROA (index)	1.01	.19	1.01	1.01	1.01	.48	1.88
DA (index)	.95	.56	1.09	.83	1.34	.27	1.92
CR (index)	.93	1.24	.98	.36	2.44	.03	36.02
DSI (index)	1.04	.22	.99	.93	1.08	.69	1.78
OTD (index)	.99	.33	.97	.86	1.11	.05	1.89
GCFI (index)	1.046	.27	1.05	1.0	1.1	.22	1.78
Restructure:							
PENR (index)	1.24	.64	.85	.70	.93	.39	1.37
INT (%)	9.18	1.10	9.	8.	9.76	8.00	12.75
BVP ($000)	151.	118.	121.	81.	181.	7.	644.
Nonfinancial:							
AGE (yrs)	49.11	7.79	48.	44.	56.	28.	66.
RELAT (mo.)	66.56	25.21	63.	47.	87.	23.	119.
DUE (mo.)	12.49	8.34	12.	6.	16.	0.	49.
LAND	1.14	.19	1.13	1.	1.21	.77	1.82

The exception to this index computation is the penetration ratio. The post-restructure PENR in Table 5 is computed as the penetration ratio in 1988 divided by the penetration ratio in 1987. The resulting mean PENR is 1.24 for the sample farms which suggests that these FLB loans were more severely under-collateralized in the post-restructure period. This is not the case. The PENR distribution is highly positively skewed, and the resulting mean is biased upwards by a few large PENR values. A better measure of the post-restructure average PENR is the median statistic which is .85. This indicates that post-restructure loans tended to be adequately collateralized even though many FLB loans were structured at greater than appraised value.

Additional variables were considered as part of the post-restructure performance analysis. Other term debt (OTD) of the borrower is computed as a ratio of 1988 total farm liabilities (minus FLB debt) relative to the 1987 amount. OTD measures the extent of increase or decrease in the borrower's term loan obligation in the post-restructure period to creditors other than FLB. A ratio above 1 indicates that borrowers have increased their debt obligation to external creditors and reduced their obligation to the FLB. The reduction could be due to debt write-offs achieved during reorganization. The mean value of OTD was estimated to be only slightly under 1. This indicates that there was not much change in the average borrower's debt obligation to other lenders. However, about 25 percent of the sample borrowers had OTD ratios exceeding 1.11 which indicates that they had increased their non-FLB liabilities. Another 25 percent of the borrowers had OTD ratios below .86, indicating that they had reduced their other liabilities.

Gross cash farm income (GCFI) is included as a proxy variable to capture the effect of changes in economic and other environmental conditions on farm financial performance during the post-restructure period. While GCFI is an annual measure, the variable reported in Table 5 is expressed as the ratio of the 1988 (post-restructure) cash income to the geometric mean of the 1984-87 cash income series. The reported mean GCFI index is 1.046. This indicates that there was a slight increase in the level of cash incomes during 1988 for the average restructured farm operation. This index may indicate a greater capacity to repay debt in the post-restructure period. The range of the GCFI measure was quite large from a minimum of .22 to a maximum value 1.78. According to the interquartile range statistic, about 25 percent of the restructured farms experienced a drop in

gross cash income from farming during 1988, since the index for those farms was less than 1.0. In some cases these were farmers with fewer acres of farmland and a reduced resource base following the restructure action.

Net cash farm income was computed as an alternative measure to GCFI. However, net cash farm income had negative values in many cases and when it was included in the model it was not a significant predictor of performance. The net cash farm income variable also caused the signs of other key variables to change due to collinearity problems. Therefore, net cash farm income was dropped from the model and replaced by GCFI.

The post-restructure interest rate (INT) is the contractual interest rate charged by FLB after restructuring the loan. The average interest rate on restructured loans in the sample was 9.18 percent. These post-restructure interest rates ranged from 8 to 12.75 percent. The restructure rate was typically set as a 3-year fixed rate. At the end of the fixed-rate contract the interest rate is to be renegotiated with the FLB. Consequently, loans which were restructured in early 1987 were due for an interest rate review/adjustment beginning in early 1990.

One additional measure (LAND) was added to the list of nonfinancial variables. LAND is measured as the ratio of appraised value of FLB land in 1988 relative to 1987. LAND was included in the specification to reflect changes in land market conditions during the post-restructure period. A LAND ratio below 1 indicates a decrease in the value of real estate assets during the post-restructure period relative to the pre-restructure period. Similarly, a ratio above 1 indicates an increase in relative value. These ratios could be explained by changes in land prices, changes in the amount of land owned, or a combination of these factors. Some farmers may have reduced their owned land base as part of the restructure settlement. It is considered unlikely that the restructured farmers purchased additional land during the post-restructure period. This suggests a LAND ratio less than 1 due to adjustments in the quantity of land. Alternatively, if the quantity of owned land remained quite stable among the sample farms, changes in the LAND ratio would be predominantly due to land price adjustments. Land price increases could be due to either actual increases in the market price of farmland during the post-restructure period, or due to adjustments in the carrying

value of farm real estate on farmers' balance sheets. This latter possibility would arise if land had been undervalued prior to restructuring.

The mean land ratio was estimated to be 1.14 (an average increase during the post-restructure period) with a standard deviation of 0.19. The interquartile range statistics indicate that about 75 percent of the sample farms had LAND ratios above 1. Since 25 percent of the case farms had computed land ratios exceeding 1.21 and land values in southern Minnesota improved about 16-17 percent during 1987-88 (Schwab and Raup) a case can be made that these were largely actual market price increases. The maximum LAND ratio (1.86) suggests that significant undervaluation had occurred in selected cases prior to restructuring. Thus, by including LAND in the model specification it is possible to identify the role which improvements in land prices played in post-restructure performance.

Multicollinearity among the variables was checked using GAUSS and the singular value decomposition method. The procedure revealed the following multicollinearity pattern:

AGE with the INTERCEPT term;

DUE with the INTERCEPT and COOP;

MGMT with COOP and BVP;

NFI with the INTERCEPT, DA, and DSCR;

INT with the INTERCEPT and COOP;

FLR with the INTERCEPT, COOP, and DSCR;

GROSR with the INTERCEPT, DA, and DSCR; and

DSI with the INTERCEPT.

All collinear variables were sequentially dropped from the analysis. Those variables include AGE, DUE, MGMT, NFI, FLR, GROSR, and the INTERCEPT.

Results of Loan Nonperformance Analysis

Estimated parameters of the restructured-performing (RP) equation are normalized to zero for the purpose of interpretation. Care should be taken in interpreting the restructured-nonperforming (RNP) model coefficients, since they are the probabilities (log odd ratio) the

restructured loan would not perform relative to the outcome that the loan would perform. Results presented in Table 6 indicate the variables which were found to be significant in explaining why restructured loans did not perform. Contrary to earlier loan settlement analysis, nonfinancial variables were not significant and were excluded from the final model. As expected, the post-restructure interest rate (INT) was significant and has a positive sign. The higher the interest rate, the higher are the odds that the restructured loan would not perform (relative to the performing outcome). The coefficient of the INT variable is statistically significant at the 1.4 percent level.

The debt structure index variable (DSI) carries the expected negative sign and the coefficient is significant at the 12 percent level. The DSI variable focuses attention on long term financial structure. DSI values less than 1 reveal proportionately greater fixed assets than term liabilities. A low DSI suggests a potential liquidity problem if assets were generating cash flow at a slower rate than required by the loan maturity. Conversely, a DSI value greater than one may indicate excess liquidity if assets are converting to cash at a faster pace than that demanded by the maturity structure of liabilities. Other liquidity measures such as the current ratio and the debt service coverage ratio were evaluated. However, when those variables were included they were not found to be significant and they created significance problems for other variables in the model. Thus, while other liquidity indicators were considered, only DSI was retained in the model. Recall, the DSI is also inversely related to the debt/asset ratio. Therefore, a lower DSI value suggests a higher leverage position and an inverse relationship between the debt structure index and the odds that the restructured loan would not perform.

As expected, the gross cash farm income (GCFI) index has a negative sign in the model. The higher the level of gross cash farm income in the post-restructure period, the lower are the odds of not performing or default on the loan. Since GCFI is a measure of farm earnings conditions and a potential indicator of changes in repayment capacity, the improvement in the gross cash farm income situation of restructured borrowers was an important factor in explaining post-restructure performance. The coefficient of GCFI variable is significant at the 7.1 percent level.

Table 6. Restructured Loan Nonperformance Model Results with RP as the Base

Variable	Estimated Coefficient	T Statistic	Significance Level
INT	1.09358	2.44	0.0147
DSI	-6.66611	-1.54	0.1248
GCFI	-4.85365	-1.80	0.0716

Log likelihood ratio	=	15.498
Chi-squared significance level (3)	=	.00043
Pseudo-R^2	=	.41

A total of 36 cases was used to estimate the equation in Table 6 (of which 28 cases were performing loans and 8 were nonperforming loans). When applied to the data set, the estimated equation correctly classifies 89 percent of restructured loans in the restructured performing loan (RP) category. The model also correctly identifies 63 percent of the nonperforming restructured loans (RNP). Total correct classification of restructured loans is 83 percent. When the borderline cases are considered as correctly classified, the model's correct prediction improves to 93 percent in the RP category and 88 percent in the RNP category. Total correct classification improves to 92 percent.

The model was validated using the 15 percent holdout sample (7 cases). Parameter estimates performed reasonably well in the holdout sample with a correct prediction of 80 percent for performing loans and 100 percent for nonperforming loans. The total correct classification was 86 percent.

The model was also evaluated by computing the probabilities of nonperformance at the mean values of the variables. The probability that the average restructured loan would not perform was estimated to be 12 percent. This is slightly higher than the 5-10 percent range of nonperformance anticipated by FCB credit personnel.

The responsiveness of restructured loan performance to different levels of the explanatory variables is summarized in Figures 1 through 3. In Figure 1 the post-restructure interest rate (INT) is varied as the DSI and GCFI variables are held at their mean values. The estimated cumulative probability that a restructured loan would not perform with an interest rate of 10.20 percent (one standard deviation above the mean) increases from 12 percent to over 29 percent.

The effect of an improvement in farm income on loan performance is illustrated by varying GCFI while holding INT and DSI at their mean values. The cumulative probability that a restructured loan would not perform as a function of GCFI is shown in Figure 2. With a GCFI ratio one standard deviation below its mean, the probability that the restructured loan would not perform increases from 12 percent to over 31 percent. Similarly, by varying the DSI variable over the relevant range the probability of a restructured loan not performing is shown in Figure 3. With a DSI one standard deviation below its mean, the probability that a restructured loan would not

FIGURE 1. EFFECT OF POST-RESTRUCTURE INTEREST RATE ON LOAN NONPERFORMANCE

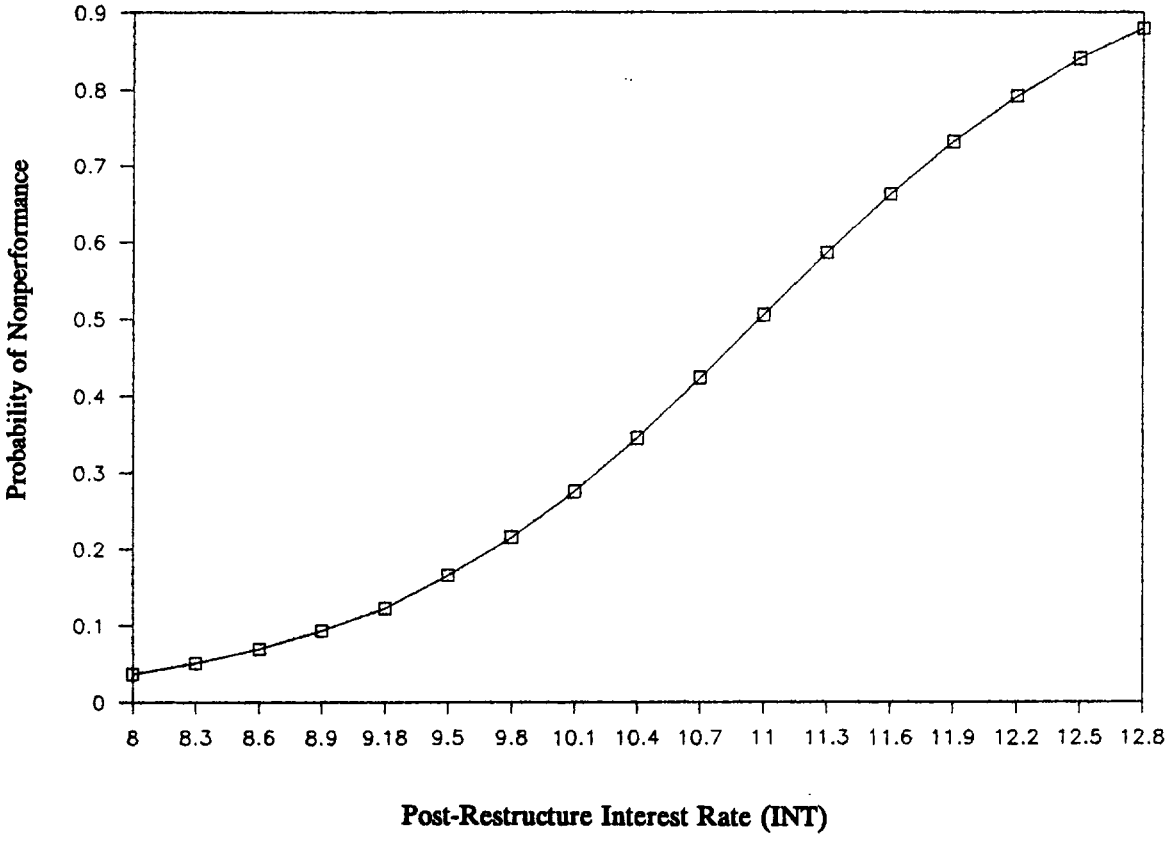


FIGURE 2. EFFECT OF GROSS CASH FARM INCOME ON LOAN NONPERFORMANCE

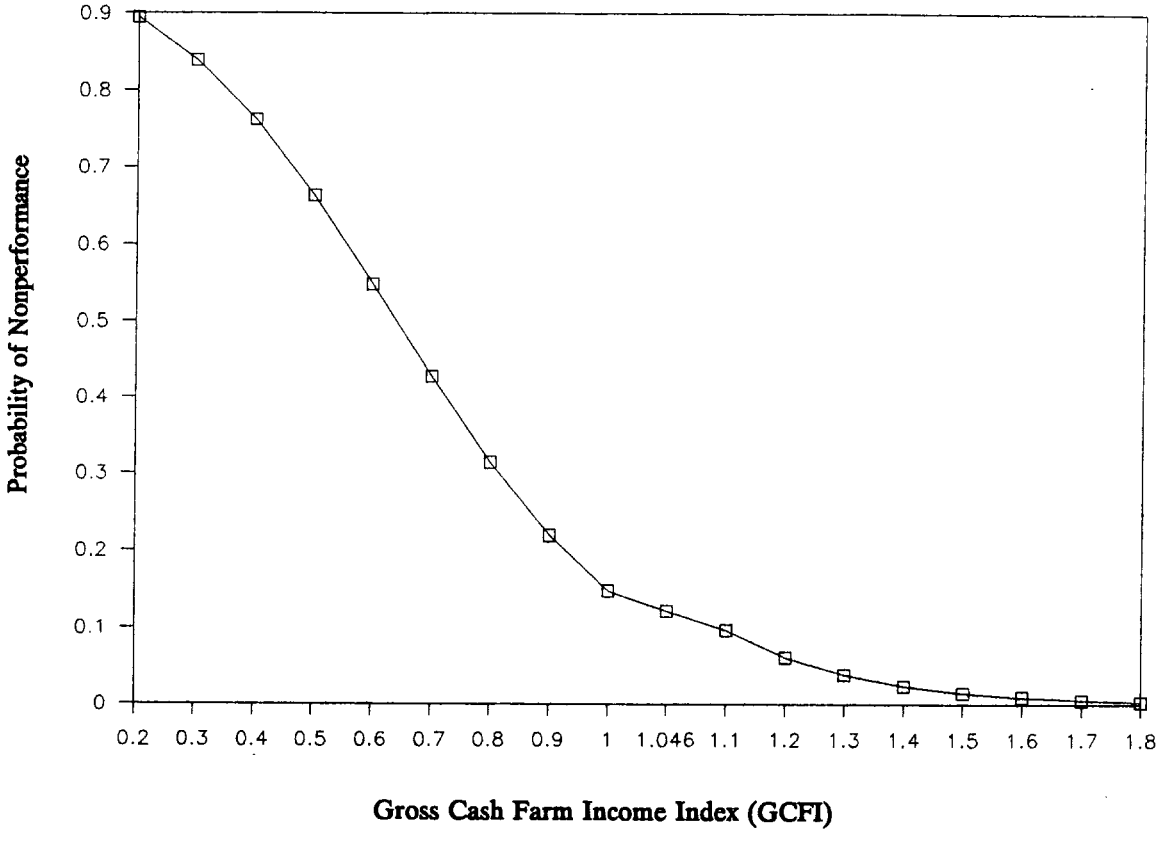
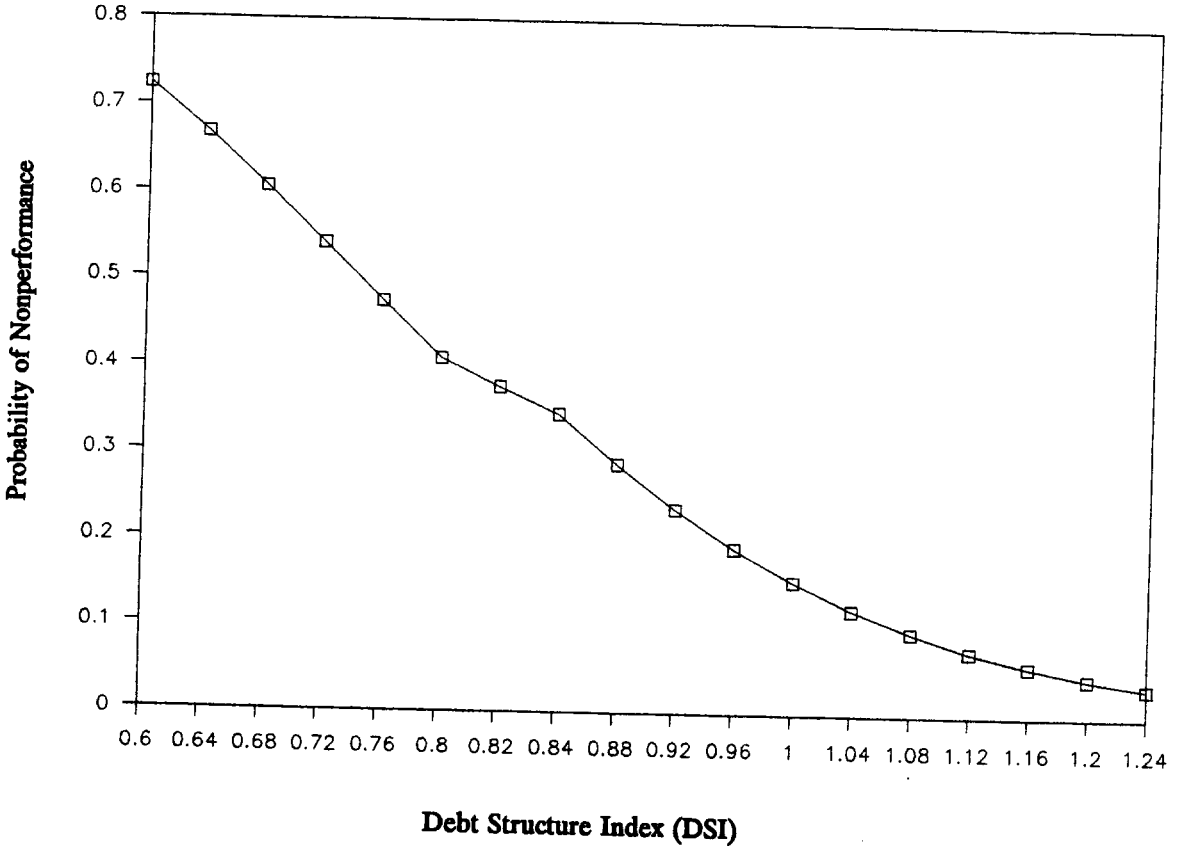


FIGURE 3. EFFECT OF DEBT STRUCTURE ON LOAN NONPERFORMANCE



perform increases from 12 percent to over 41 percent. These results indicate that nonperformance of restructured loans is highly sensitive to farm income and the financial structure and leverage of the farm business during the post-restructure period. In relative terms, the nonperformance of restructured loans is found to be more sensitive to financial structure and leverage in the post-restructure period than it is to the gross cash farm income variable or the level of the interest rate on the loan.

Summary, Conclusions, and Limitations

This study used multinomial logit methods to analyze the probability that a nonaccrual farm borrower would settle a debt problem through each of three debt resolution alternatives (foreclosure/litigation, cash-out or deedback, and restructure). Further, a binomial logit analysis was developed to estimate the probability that a restructured loan would not perform during the post-restructure period.

The analysis revealed that nonfinancial variables (cooperativeness and management ability of the borrower) were major determinants of the FCB decision whether or not a nonaccrual loan should be restructured. If the borrower was cooperative in the process of debt resolution and was judged to have average or higher level of management ability, there was higher probability that the debt would be restructured. In addition, if the FCB expected a higher (smaller negative or larger positive) value from the resolution, there was a higher probability that the borrower's debt would be restructured. Borrower financial variables were not found to be consistently significant determinants of the outcome of a nonaccrual loan settlement. Higher farm leverage positions prior to resolution tended to result in either a cash-out or deedback of property instead of a foreclosure. However, the farmer's financial leverage position did not predict a restructure outcome when compared to the foreclosure/litigation alternative. Similarly, a higher average rate of return on farm assets during years preceding the date of loan settlement predicts a higher probability of not restructuring the loan. That result was unexpected and could be due to several factors unique to the individual cases under analysis (e.g., borrower preferences and other unspecified variables). The rate of return was not a significant predictor of the restructure outcomes in the sample.

The analysis of post-restructure performance indicated that loans had a higher probability of not performing if the post-restructure interest rate was higher, the level of borrower gross cash farm income was lower (in the post-restructure period), and the debt structure index was lower. Significance of the interest rate, cash farm income and debt structure (financial structure and leverage) variables in the model indicated that restructured loans remained highly sensitive to factors which determine the debt repayment burden and the repayment ability of the restructured farm operations. These results suggest factors which the Farm Credit Banks and other agricultural lenders might want to consider when restructuring farm loans to achieve a desired level of performance on restructured loans.

The main limitations of this study are the small sample size and only one year of post-restructure performance data. As a result, while the maximum likelihood estimates obtained from the small sample are quite efficient, the holdout sample is quite small for model validation. Additionally, only one year of information limits the analysis of determinants of post-restructure performance. The estimated model may not be capturing some of the other potential determinants of long term performance. This is particularly important as the restructured loan interest rates are increased by the FCB to levels that are consistent with rates on other accruing loans and as financial and income conditions in agriculture change. A final limitation is the degree of subjectivity used to measure the cooperativeness and managerial ability of the borrower. Subjective assessment based on the written comments of the loan officer was judged to be the only means available for quantifying these borrower characteristics.

FOOTNOTES

1/ Program results were obtained through personal communication with FCB credit personnel in St. Paul.

2/ Equation (4) defines a proper probability mass function, since

$$0 \leq \Pr_n(i) \leq 1, \quad \text{for all } i \in C_n.$$

and

$$\Sigma \Pr_n(i) = 1, \quad \text{for all } i \in C_n$$

It is assumed that $U_{ni} = V_{ni} + \varepsilon_{ni}$ for all $i \in C_n$ and that all the disturbances (ε_{in}) are a) identically and independently distributed (IID), and b) Gumbel-distributed with the same scale parameter and a constant zero location parameter. The IID assumption represents an important restriction. It requires all the disturbances to have the same scale parameter. Although the choice of scale parameter is arbitrary (since it simply sets the scale of utilities), the fact that each disturbance has the same scale value implies that the variances of the random components of the utilities are equal. Gumbel-distribution of error can be defended as an approximation to the normal density (Ben-Akiva and Lerman). It is used for analytical convenience.

3/ The ratio of term liabilities (TL) to fixed assets (FA) is the product of the DA ratio and the debt structure index (i.e., TL/FA = DA * DSI). Both the overall leverage position of the borrower and the relative maturities of asset and liabilities are captured in the DSI ratio (Barry et al.).

4/ This RES value illustrates an important constraint under which the FLB operated in Minnesota. If the value of the assets received through foreclosure was not sufficient to repay the FLB, there was little opportunity to get a deficiency judgement against the debtor. Therefore, a cash-out was the FLBs best available strategy in some cases.

5/ SVD is a procedure for diagnosing the presence of multi-collinearity between the independent variables. The procedure uses two criterion; a) a singular value with a high condition index (30 or above) associated with b) a high variable decomposition proportion (0.5 or above) for two or more estimated regression coefficients. These two criterion jointly indicated which variables are exhibiting near dependency. Those variables are dropped from the analysis.

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