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The Profitability of Agricultural Lending Relationships

By

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Executive Summary

The profitability of agricultural loan relationships was studied using individual relationship data on 1001 borrowers from six lenders with strong agricultural lending reputations. Data were collected for a random sample of borrowers stratified by size and level of risk.

Data were collected from three sources. Data on all loans and services used for one full year for each relationship were obtained from the lenders' electronic and manual files. In addition, the loan officer for each relationship completed a questionnaire and each lender provided institutional specific data.

Annual profit, defined as the return to fixed costs and overhead, was determined for each relationship. This included a detailed estimate of all personnel costs attributable to each relationship. Customer lifetime value, estimated as the present value of the expected income stream over 10 years, was simulated for relationships taking into consideration expected movements through size and risk levels as well as business stage.

Relationships of all sizes were profitable. Significant economies of size lower the costs of serving large relationships resulting in large profits per relationship although the competitive market passes part of the potential gain on to the farmer in the form of lower rates. Small loans have higher personnel costs, but the rates charged on these loans are high enough to more than offset the higher servicing costs.

The interest rates charged medium risk borrowers were sufficiently higher than the rates charged low risk borrowers that medium-risk relationships showed greater profits in the long run (customer lifetime value) as well as on an annual basis. The rate difference more than covered the higher personnel costs and the chance of write-offs.

The business stage that was most profitable per relationship was growth. Growing farms had high loan volumes that were only partially offset by lower returns per dollar of loan due to reduced interest rates. Beginning farmers had low loan volumes and high personnel costs making them among the least profitable on an annual basis. However, on a longer run basis, these farms are very likely to go through growth stages, making their profitability similar to stable farms.

Non-loan services *per se* add a small amount to relationship profitability. They also reduce personnel costs by a modest amount. The strong correlation between number of non-loan services and loan volume is a major contributor to the higher profits with more non-loan services. However, the number of non-loan services appears to expand relationship longevity. Relationship longevity reduces personnel costs modestly. The major factor making long-term relationships more profitable is that the average interest rate that is charged is higher. Farmers with long-term relationships appear to be less interest rate sensitive.

Mid-sized relationships tend to have lower write-offs than either small or large loans. This appears to result from a higher effective level of scrutiny or a willingness of other lenders, including FSA, to assist these borrowers. Personal stage and age have a life cycle relationship to loan volume, but little effect on profit per dollar of loan. Farm type has little effect on profitability except that the predominant type in the region (dairy in this case) has a modestly higher profit.

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By

Eddy LaDue, Brent Gloy and Charles Cuykendall¹

U. S. farmers use over \$200 billion of debt in the operation of their businesses, making credit one of the most important inputs in the U.S. food system. Adequate supplies of low cost credit to U.S. farmers are dependent upon lenders being able to make profitable agricultural loans and lenders operating to deliver this credit in an efficient manner. The objectives of the research reported in this publication are to assess the profitability of different types of agricultural lending relationships and to identify factors influencing the level of costs and returns associated with various types of loans.

The Data

Data were gathered from six agricultural lending institutions. These institutions represented both commercial banks and Farm Credit associations. All of the lenders have substantial agricultural loan portfolios and dedicate significant resources to lending to agricultural customers. The data were gathered by Cornell research associates who visited branches of the institutions. While at the institutions, the researchers worked closely with lender personnel to identify agricultural lending relationships and collect the relevant data.

Sampling Procedure

Each lender's loan portfolio was stratified by risk and outstanding loan balance. Sampling according to these criteria was used to insure that sufficient variation was achieved with respect to both factors. This approach insured that one would sample enough high risk or large loans to make an accurate assessment of their profitability.

Relationships, not individual loans, were sampled. A loan relationship was defined to include all the loans and people associated with a single business. For a partnership, all the loans to the people in the families included in the partnership were included in the relationship. For instance, a home loan to a son who is part of the farm business was included in the relationship. A farm loan to a son who is operating a separate business was excluded, even if the father in the selected relationship co-signed on the note. The use of relationships rather than loans was designed to avoid treating a farm with one \$500,000 loan differently than a farm with five \$100,000 loans. Further, many of the lender costs are incurred for a relationship, not for individual loans, and allocating them to individual loans becomes arbitrary.

Size strata definitions are based on the outstanding loan volume plus unused commitments on lines of credit at the time the sample was selected. Risk criteria are based on the lenders risk rating system.

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Size (loan volume) strata definitions:

Small: Less than \$100,000

Mid-size: \$100,000 to \$400,000

Large: Over \$400,000

New loans: Relationships established within the last 12 months

Risk strata definitions:

Low risk: borrowers that are rated superior, strong or excellent, satisfactory and adequate or watch.

Medium risk: borrowers with loan classified as OAEM (Other Assets Especially Mentioned) as well as substandard and doubtful loans that are still accruing interest.

High risk: all non-accrual loans (which may be included in substandard or doubtful categories) and all loans placed in the loss category.

The three risk categories and four size categories result in 12 possible strata. However, since no lender makes new high-risk loans, there were 11 strata for which borrowers were selected.

Selection procedure:

For each lender, all loan relationships were sorted into the risk and size categories listed above. Then the sample was drawn from the customers listed in each category. To draw the sample from each list, the total number of customers in the risk/size cell was divided by the number of customers to be selected (10 per branch or 30 per institution). The result was the sample interval. For example, if there are 60 customers in a branch in the risk/size category, dividing 60 by 10 results in an interval of 6. Thus, every 6th customer was selected.

To select the first customer, a random number from 1 to the sample interval was selected. In our example, a number from 1 to 6 was randomly selected. The method recommended was to place the numbers 1 through 6 on small pieces of paper in a hat and blindly select one of the pieces. If the number 4 was drawn, the first customer to be in the sample was the fourth customer on the list. Then every 6th customer (from the number 4 customer) was selected to be included in the sample.

To maintain confidentiality, each selected borrower was given a “Cornell number.” A list of the corresponding lender numbers and Cornell numbers was prepared for the lender and was left with the lender. Cornell did not keep a copy. This process

allowed follow up for missing or questionable data, but means that Cornell has no way to identify the individual borrowers in the sample.

Data Collection

Data were collected using three questionnaires, the File Data Form, the Loan Officer Questionnaire, and the Institution Level Data Questionnaire (Appendix A). Line-by-line directions for completion of the File Data Form and Loan Officer Questionnaire were prepared to insure conformity in the data collected and to assist loan officers in understanding the questions asked.²

Research associates completed the File Data Form by gathering data from lender files. Often much of the loan data were maintained on computer files. In those cases a computer terminal in the lender's offices was made available to the research associate. A loan officer trained the associate in use of the system and provided back-up assistance in obtaining the information needed. Data not in the computer files were obtained from the individual paper files maintained for each borrower. Data were collected on each loan in the relationship.

The loan officer in charge of each sampled relationship completed a Loan Officer Questionnaire for the relationship. For each loan officer with sampled relationships, a research associate explained the questionnaire and directions, usually while completing one relationship questionnaire. Then the loan officer completed Loan Officer Questionnaires for each of his/her sampled borrowers.

The Institution Level Data Questionnaire was completed by senior management of the institution. For commercial banks, sometimes this was the head of the agricultural lending department.

Completed questionnaires were entered in electronic files and the data for each relationship subjected to a thorough series of consistency checks contained in a diagnostic routine. Each item flagged by the diagnostics routine was investigated. First, electronic data were compared to the questionnaire to see if the data were entered correctly. If the questionable data were entered correctly, the lender was contacted to obtain the correct values or an explanation of the data.

Sample Characteristics

A total of 1087 relationships were selected for the sample. Of those 86 were excluded from the analysis due to the lack of a loan officer questionnaire or because the average daily balance was under \$300 or over \$20 million. A loan officer questionnaire was unobtainable in some cases because the loan officer had recently changed and the current loan officer was unable to provide the data needed. In some cases the loan officer had not met the farm managers. If the prior loan officer was no longer with the institution, it was not possible to accurately complete the questionnaire. Only about a

² Directions for completion of questionnaires are available from the authors.

half dozen relationships were excluded on the basis of loan volume. The number of relationships included in the analysis was 1001.

The stratified sampling procedure resulted in much higher sampling rates for high risk and large loans than for small and low risk loans (Table 1). The high sampling rates were necessary to obtain a large enough sample in the more sparsely populated categories. The high risk categories had the smallest numbers of relationships and the intent was to sample all mid-sized and large high risk loans. However, data for many of these relationships were unavailable, frequently because the file was at the attorney's office, in court or otherwise unavailable.

Table 1. Sample Size and Sampling Rate

Size and Risk Level	No. in Sample	Sampling Rate %^a
Under \$100,000		
Low risk	142	3.0
Medium risk	109	17.9
High risk	57	44.5
\$100,000 to \$400,000		
Low risk	139	6.5
Medium risk	113	28.5
High risk	24	61.5
Over \$400,000		
Low risk	142	23.5
Medium risk	95	73.6
High risk	07	53.8
New loans		
Low risk	148	15.5
Medium risk	25	53.2
All Borrowers	1001	10.2

^a Percent of all borrowers in the sampled portfolios in that strata that are included in the sample. Includes only branches sampled.

The average daily loan balance was calculated for each borrower. The overall average loan balance outstanding for the year was \$127,513 (Table 2). The average balance ranged from \$38,259 to \$41,079 in the small loan categories, \$153,444 to \$174,566 in the mid-sized loan categories, and \$710,876 to \$921,779 in the large loan categories.³ The predominance of small loans in the portfolios results in average values for small and mid-sized loans that are considerably less than the midpoints on their ranges. That is the midpoint between \$100,000 and \$400,000 is \$250,000, but the average loan size for mid-sized loans is only \$157,000.

³ These are weighted means. Whenever a mean is presented that combines observations from more than one of the 11 strata, the number is a weighted mean with weights for each observation based on the number of relationships in its strata as found in the portfolios from which the samples were drawn.

Medium risk loans tend to be larger than low risk loans. Loan size itself may be a contributor to risk. Also, more aggressive farmers will tend to be more highly leveraged resulting in a higher chance of moving into a higher risk category if things do not go well with the business.

Table 2. Average Annual Loan Balance by Size and Risk

Size and Risk	Dollars^a
Under \$100,000	
Low risk	38,259
Medium risk	41,079
High risk	39,091
\$100,000 to \$400,000	
Low risk	153,444
Medium risk	174,566
High risk	158,509
Over \$400,000	
Low risk	710,876
Medium risk	921,779
High risk	736,480
New loans	
Low risk	79,115
Medium risk	129,775
All (Average)	127,513

^a Includes actual loan balances outstanding. Unused commitments are excluded.

Interest Rates and Margins

The interest rate margin is the difference between the interest charged to farmers and the cost of the funds used to make the loan. The interest rate margin is a major factor influencing the profitability of a lending relationship.

Cost of Funds

Each lender provided their estimated cost of funds for the 12-month period for which data were collected on their loan relationships. Lender information systems, which provided much of the individual loan data, were generally maintained for the last 12 months, rather than for a calendar year basis. Data could be collected from only one lender at a time, and the collection took several weeks at each institution. This caused the 12-month period for which data were collected to vary from institution to institution, with an eight month lag from the first to the last institution. Thus, data on the cost of funds and rates charged involve more than a single calendar year. In other words, the data used in this report consider profitability on an annual basis, but the annual term considered varies slightly across lenders. The data were made comparable by subtracting the cost of funds for the period corresponding to each institutions data. Inherent in these comparisons is the assumption that the interest rate margin earned by the lender is

relatively constant from month to month. In other words, if the lender's cost of funds falls, the interest rates paid by farmers also fall.

For cooperatives, any patronage dividend received from the funding source (Farm Credit Banks) was subtracted from the reported cost of funds. These dividends are received on the basis of the amount of funds borrowed. They represent an offset to the interest paid on funds borrowed.

For purposes of comparison, the cost of funds for each institution was estimated over a comparable period.⁴ To put the cost of funds data on a comparable basis, the average relationship between the 30-day CD rate and the cost of funds for each institution was used to adjust the cost of funds to same 12-month period (Table 3). The rate paid by each Farm Credit institution was adjusted for the patronage dividend received from the Farm Credit bank that supplied their credit. The rates reported by commercial banks represented the average interest paid on funds and did not include an allocated cost for tellers, accounting and facilities for collecting those funds.

The average cost of capital for the six institutions was 4.05 percent. The study was conducted during a period of declining interest rates as the average cost of funds fell from 5.86% to 2.43%.

Table 3. Estimated Average Cost of Funds

Month	Percent^a
January	5.86
February	5.48
March	5.18
April	4.85
May	4.38
June	4.11
July	3.88
August	3.59
September	3.31
October	2.95
November	2.62
December	2.43
Average	4.05

^a Cost of capital estimated for some months for some lenders using the 30 day CD rate as the mover. Net of patronage dividends received by Farm Credit Associations from their funding source.

⁴ The profitability estimates in the remainder of the study were developed using the data for the actual one-year period for which data were collected for individual each lender.

Interest Rates Received

The interest rate charged to each borrower was calculated based upon the average daily balance and the interest earned on the loan. Interest rates charged decline as the size of relationship increases and increase as risk increases (Table 4). In comparing low risk relationships, mid-sized borrowers paid 40 basis points⁵ less than small borrowers while large relationships paid 120 basis points less. Similarly, at the medium risk level, mid-sized borrowers paid 90 basis points less than small borrowers and large borrowers paid 140 basis points less.

Table 4. Average Interest Rate Earned^a by Size and Risk, Portfolio Average⁶

Size and Risk	Percent
Under \$100,000	
Low risk	7.7
Medium risk	8.8
High risk	9.3
\$100,000 to \$400,000	
Low risk	7.3
Medium risk	7.9
High risk	8.5
Over \$400,000	
Low risk	6.5
Medium risk	7.4
High risk	7.3
New loans	
Low risk	6.6
Medium risk	7.4
All (Average)	7.1

^a Interest rates at different institutions were for a different sequence of months.

The data presented in Table 4 represent the average interest rate earned on loans during the 12 month period for which data were collected. Data on the interest rate stated on each loan were not collected. Since interest rates were changing during the period that data were collected, calculating interest rate margin from the rates would have involved collecting several interest rates on each loan and a use of a complex weighting scheme to

⁵ A basis point is 1/100 of a percent. Thus, a quarter of a percent is 25 basis points and 0.4 percent is 40 basis points.

⁶ Averages are reported as portfolio or borrower averages. Portfolio average = average dollar value divided by average ADB. Borrower average = average of each individual borrower's dollars/ADB

Example:

Borrower 1: \$150 cost, \$1000 ADB, = 15 %

Borrower 2: \$200 cost, \$4000 ADB, = 5 %

Portfolio average = $(150+200)/(1000+4000) = 7\%$

Borrower average = $(15 + 5) / 2 = 10\%$

calculate the average rate. Instead, the actual interest earned on the loan was collected. The total interest earned by each loan was then divided by the average daily balance to obtain the interest rate earned.⁷

Given the method used to calculate rates, the average rate earned by high risk loans is not representative of the rates charged. Many of these loans were in nonaccrual status, some of which earned no interest during the entire year. As a result the calculated interest rate will be below the actual stated rates on these loans.

The interest rate premium for risk can be calculated by subtracting the average for a lower risk category from a higher risk category. The interest rate premium charged for medium risk over low risk loans varied considerably by relationship size. The highest premium of 110 basis points occurred with small loans where medium risk loans earned 8.8 percent and low risk loans earned 7.7 percent. The risk premium in the large loan category was nearly as large, 90 basis points, while mid-sized relationships had the lowest risk premium of only 60 basis points. The risk premium in the new loan category was 80 basis points.

Interest Rate Margins

The difference between the interest rate charged and the cost of funds is the interest rate margin, which is the gross income from lending the money. For fixed rate loans, the margin is the difference between the rate charged and the rate on funds obtained for and/or assigned to the loan and was generally not the same as the cost of funds reported by the institution. For variable rate loans the interest rate margin is the difference between the cost of funds and the rate received. Monthly costs of funds were obtained in order to allow calculation of the appropriate cost of funds for loans that were outstanding for less than the full year.

The average interest rate margin for the entire sample was 3.3 percent (Table 5). This includes the margin on fixed as well as variable rate loans, and also includes many loans that were not open an entire year. In addition, the cost of funds data in Table 3 are for the same 12-month period for all lenders and the margin data reported in Table 5 were collected for 12 consecutive months (the immediate 12 months prior to the month we collected data for each individual institution) out of a 20 month period from November 2000 through June of 2002. . Thus, a subtraction of the average cost of funds from the average interest rate does not necessarily exactly equal the average margin.

Margins declined rapidly as relationship size increased. For instance, the margin on low risk loans declined by 70 basis points when size increased from small to mid-size loans and fell another 50 basis points when size increased from mid-sized to large. The decline attributed to size is even stronger in the medium risk categories. Here, margins dropped by 110 and 70 basis points with the move from small to mid-sized and mid-sized to large loans.

⁷ For additional details on the procedure used to calculate interest rate margin please see the section "Calculating Relationship Profitability".

The risk premium lenders charged for medium over low risk loans also declined rapidly as relationship size increased. For small loans the premium for medium risk over low risk was 90 basis points. In the mid-size category the premium was 50 basis points and by the time the large category was reached the risk premium had declined to 30 basis points. To the extent that the margins reflect the risk of loss, it appears that lenders perceive a higher risk of loss with small loans or that the loss with large loans will not be proportionately as large as losses in the smaller size categories. It is also likely that these differences reflect the belief that servicing costs decline as size increases.

Table 5. Net Interest Rate Margin by Size and Risk, Portfolio Average^a

Size and Risk	Percent
Under \$100,000	
Low risk	4.0
Medium risk	4.9
High risk	4.8
\$100,000 to \$400,000	
Low risk	3.3
Medium risk	3.8
High risk	5.1
Over \$400,000	
Low risk	2.8
Medium risk	3.1
High risk	3.0
New loans	
Low risk	3.1
Medium risk	3.2
All (Average)	3.3

^a Interest rate charged minus cost of funds

Although the average new loan relationship loan volume was smaller than the average mid-sized loan (see Table 2), the margin earned on new loans was smaller than the margin earned on existing mid-sized loans and slightly larger than the margin earned on existing large loans. This could be the result of strong competition for new loans, a perception that new loans were lower risk than the average rating (because they had just been made), or that the new loans had just been priced and some existing loans may not have been re-priced as judiciously in a declining interest rate environment.

Personnel Costs

Personnel costs are second only to interest costs in determining loan profitability. Data on personnel time and mileage were obtained from the loan officer questionnaire. Each loan officer was asked to estimate the hours spent and miles driven in connection with each sampled loan during the past year. While this information is based on recall, it is assumed that those over estimating will be offset by those underestimating.

Loan officer time includes hours spent by the loan officer on this account during the 12-month period. It includes time driving to and visiting the farm, time on the phone relative to this relationship, time working in the office, and time spent at the County Clerk's office or other locations collecting information relative to this business.

Credit analyst time includes time the credit analyst spent on this account during the 12-month period. This would include time collecting data, preparing analyses and spreadsheets and discussing the loan with the loan officer.

Accounting time includes accounting staff time attributable to this account during the 12-month period. This includes setting up accounts for new loans when they are made, entering disbursements and payments when they occur, providing status information when requested and preparing annual status and tax reports.

Direct supervisor time reflects time spent on this loan by the loan officer's supervisor(s). This includes the branch managers, credit supervisors, and others who could become directly involved in borrower relationship decisions. Senior management not directly involved in the borrower relationship or loan decision except possibly through actions of the credit committee was excluded. That part of a supervisor's time that was not spent directly on loan decisions was also excluded.

New relationship time reflects the time expended by the loan officer in attempting to obtain this account within the past two years. This includes time visiting the farm or talking on the phone. New relationship costs also include the vehicle costs of travel to the farm during the prior two years.

Attorney costs include the amounts paid for attorney fees for work related to this relationship during the 12 month period. Any fees that are passed through to the borrower, so that they are not a net cost to the lender, were excluded.

Vehicle distance was calculated from the number of visits made to this farm during the 12 month period and the average total distance traveled to make an average visit to the farm. In cases where the farm was visited in conjunction with visits to other farms, mileage for these visits was calculated as a share of the common mileage plus the extra miles to get to this specific farm (i.e. an officer traveling 60 miles to and from the area to visit 3 farms and an 8 added miles to get to and from this specific farm would record 28 miles for each of these visits).

Credit committee reflects the time spent by credit committee members on this relationship. Data were obtained on the number of times requests for this relationship went to credit committee within the 12 month period. The time spent was estimated assuming that the credit committee had six members and that they spent an average on one hour reading the file and acting upon the loan.

On average 13 percent of the loans went to loan committee. Whether a loan goes to loan committee is a function of the size of the loan and the policies of the lender. Generally, only large loans go to loan committee. Some lenders require a high proportion of loans to go to loan committee while others give loan officers and supervisors higher lending authorities and few loans must go to loan committee. Taking a loan to loan committee, of course, influences loan officer and, often, analyst time.

The average total personnel time spent per relationship was 10.8 hours (Table 6). The loan officer spent about 6.32 hours and credit analysts, accountants and the direct supervisors spent about half that much time.

Table 6. Direct Personnel Time and Cost Per Relationship

Personnel Type	Hours	Cost (Basis Points)^a
Loan officer	6.32	16.4
Credit analyst	1.42	2.2
Accounting	1.38	2.2
Direct supervisor	0.49	1.9
New relationship	0.38	1.3
Attorney costs	^b	0.7
Vehicle costs	^b	2.3
Credit committee	<u>0.81</u>	<u>4.1</u>
Total	10.80	31.1

^a Portfolio average.

^b Not applicable

Data on the cost per hour and mile were obtained as part of the Institutional Level Data Questionnaire. The average of the costs reported by the institutions are shown in Table 7. When calculating customer profitability the value for the applicable institution was used. The value reported by the institution is an average of the institution. For instance, loan officer salaries vary within each institution, but the average value for the institution is used in this study.

Table 7. Direct Personnel Cost Per Hour or Mile

Cost Type	Dollars
Loan officer	33.84
Credit analyst	20.28
Accounting	21.94
Direct supervisor	48.97
Credit committee	410.60
Vehicle cost per mi.	0.39

The use of averages may result in some size bias in loan officer costs in that in some cases large loans are handled by more experienced, more highly paid, loan officers. This would result in an underestimation in the costs of large loans and some overestimation of costs for small loans. However, this bias is expected to be small because most of the loans for most of the lenders were assigned on a geographic basis.

Personnel costs include costs for all people who could be directly ascribed to a loan relationship. They include costs for loan officers (time and travel), supervisors, credit analysts, credit committee, accounting and attorney. They also include similar costs incurred to obtain new relationships.

Loan office time represented over half of the personnel cost for an average loan (Table 6). Although small in comparison to loan officer time, credit committee time was the second most costly item.

New relationship cost represents the additional costs of contacting and selling a customer on borrowing from this lender. These costs are in addition to the normal costs of servicing the loans in the year the relationship started, and occurred in the two years prior to the year for which data were collected. The costs included are only those incurred for loans in the portfolio. It does not include the cold calls and public relations activities with potential customers who do not borrow from the lender.

Loan Fee Income

Loan fees are used for two basic purposes. First, they allow the lender to better align the loan income stream with the timing of lender costs. This is accomplished by moving some of the loan income up to the time the loan is made, which is when a high proportion of the lender expenses occur. Secondly, loan fees are a method of increasing the income on the loan without charging a higher rate.

Some fees are just passed from the farmer through the lender to the charging entity. For example, mortgage recording fees and some guarantee fees may be collected by the lender, but are just passed through to the county or guarantor. Data on these fees were not collected. Data were collected only on fees that could influence the profitability of a loan relationship.

Average fees charged amounted to 15 basis points (15/100 of a percent) on the total portfolio (Table 8). Larger fees were charged on larger continuing loans, but those larger fees did not consistently represent a higher charge per dollar of loan.

The highest fees were charged to new relationships, which is when the opportunities for charging fees are most numerous. The weighted average of all fees for new relationships (both low and medium risk) was \$877 or 101 basis points per dollar of loan. Fees represented a significant part of income from these borrowers.

Table 8. Loan Fees Received by Size and Risk^a

Size and Risk	Dollars per Relationship	Basis Points per Dollar of Loan
Under \$100,000		
Low risk	25	07
Medium risk	55	13
High risk	10	03
\$100,000 to \$400,000		
Low risk	144	09
Medium risk	103	06
High risk	292	28
Over \$400,000		
Low risk	576	08
Medium risk	924	10
High risk	07	00
New relationships		
Low risk	891	113
Medium risk	792	61
All (Average)	189	15

^a Includes: origination, appraisal, construction, credit check, etc.

Loan Write-Off Costs

A major factor influencing the profitability of any loan portfolio is the level of write-off's sustained. Data on the write-off's sustained during the past two years were collected on all loans. The data for the two years were summed and then divided by two to obtain average write-offs for a single year period.

Write-off costs averaged 13 basis points per dollar of loan volume (Table 9). This represents a modest cost and is slightly less than the national average net charge offs of 17 basis points by agricultural banks during 1997-2001.⁸

Table 9. Loan Write Offs Per Dollar of Loan by Size , Portfolio Average^a

Relationship Size	Dollars Per Relationship	Basis Points Per Dollar of Loan
Under \$100,000	70	18
\$100,000 to \$400,000	62	04
Over \$400,000	1,456	20
New relationships	00	00
All (Average)	166	13

^a Average dollars divided by average ADB

⁸ Agricultural Finance Databook, Board of Governors of the Federal Reserve System, Federal Reserve Statistical Release E.15

The low level of write-offs with mid-sized relationships (\$100,000 to \$400,000) is pervasive among lenders in the study. While this appears to be an odd result, there are several factors that justify the finding. Many lenders are skeptical of the profitability of small and certainly would not take one over from another lender if there appeared to be significant risk involved. At the other end of the scale, relatively few lenders are interested in taking on a risky large loan. The large losses that could result make such loans very low priority or off limits.

On the other hand, mid-sized loans likely present a more palatable risk-return trade-off. Mid-sized loans are perceived to be profitable and if they go bad the losses will be manageable. The relationship is small enough that the loan officer usually has a good grasp of the business and can make sure that the collateral paperwork is properly filed. Also, these borrowers are frequently priority borrowers for the Farm Service Agency, which will often provide loans or guarantees in an effort to turn around this type of borrower. In summary, mid-sized loans often have lower losses due to better lender servicing and better collateral control.

Calculating Relationship Profitability

There are a number of cost and revenue items involved in the profitability of any lending relationship. To determine the profitability of relationships, data were collected on each of the cost items that could be directly tied to a lending relationship. This implies that the profitability values obtained represent the returns to overhead costs and administration, which includes the return to physical facilities, general overhead, administrative costs and supervisory costs (excluding loan officer supervisor and credit committee costs that relate to specific lending relationships).

The individual income (Table 10) and expense (Table 11) items and the way they are calculated are discussed below.

Net interest income is the interest earned on the loan minus the cost of funds appropriate for that loan. Interest earned is the total dollars of interest earned by the loan during the year. This is the interest that accrued on the loan regardless of whether it was received in that year or not. The cost of funds for fixed rate loans was the cost assigned to that particular loan when it was made. These loans were often match funded or assigned to particular funding sources, which established the rate to be assigned.

Each lender provided a monthly list of the cost of funds for the institution (see Institution Level Data Questionnaire, Appendix A). The cost of funds for each variable rate loan was the average of the rates provided by that institution for the months for which the loan was outstanding. The cost of funds for a loan outstanding for the entire year was the average of the 12 monthly values. If a loan were outstanding only the last three months of the year, the cost of funds would be the average of the monthly rates for those three months. Interest income and the cost of funds for the proportion of any loan that is sold, is excluded from net interest income. This includes guaranteed loans and other loans that have been sold. The income from these loans is included under servicing

fee income. For the average relationship, interest pass through of \$146.16 on guaranteed loans sold and \$138.56 on other loans sold is excluded from income.

For the six loan portfolios studied, the average relationship earned net interest income of \$3,886.71 or 304.8 basis points per dollar loaned (Table 10). This amounts to 90 percent of total income for the average relationship.

Table 10. Average Portfolio Income Per Relationship^a

Item	Dollars per Relationship	Basis Points per Dollar of Loan
Net interest income ^b	3,886.71	304.8
Loan fee income	189.45	14.9
Loan servicing fee income	85.08	6.7
Value of stock (@4.75 %)	62.63	4.9
Interest assistance income	<u>23.71</u>	<u>1.8</u>
Loan income	4,247.58	333.1
Net tax preparation fees	17.37	1.4
Net record keeping fees	4.68	0.4
Net consulting fees	0.37	0.0
Net lease service fees	38.00	3.0
Net other service fees	1.76	0.1
Net deposit income	<u>12.82</u>	<u>1.0</u>
Net non-loan service income ^c	75.00	5.9
Total Income	4,322.58	339.0

^a Average daily balance for the year of \$127,513

^b Excludes interest pass through of \$146.16 on guaranteed loans sold and \$138.56 on other loans sold.

^c No lender had appraisal, trust, brokerage or insurance fee income on sampled farms.

Loan fee income represents fees charged for such items as loan origination, appraisal, construction loan fee and credit checks. These fees are kept by the lender and contribute to the profitability of the relationship. Fees that are passed through from the farmer to other entities, and not kept by the lender, are excluded.

Loan servicing fee income is income received for servicing loans that have been sold. In the case of sold loans, the lender does not have funds invested in the loan, but services the loan and receives a fee for that service. In some cases, the lender collects the interest and passes through only part of the amount collected. The difference between the amount received and the amount remitted to the loan buyer is counted as a loan servicing fee.

For the portfolios in the study, loan servicing fee income average \$85.08 per relationship, which amounted to 6.7 basis points per dollar of funds actually loaned.

Value of stock is the savings achieved by the lender because the borrower invests capital in the lender, which can be used to fund part of the loan. Only Farm Credit Associations have this kind of stock. The farmer is required to buy stock in the cooperative in order to qualify to borrow money.

This value could be set at the cost of funds for the lender, because the lender does not need to borrow the funds provided by the borrower. However, the way stock works is that the lender lends the farmer the money for the stock and the stock represents investment in the cooperative for which the farmer receives no monetary reward (interest or dividends). Thus, the value of the stock to the lender is the interest received on the stock loan, for which no money need be advanced.

The stock requirement plans of the Farm Credit Associations involved varied widely. In some cases, the stock was not necessarily tied to a specific loan or loans. Thus, data on stock balances were obtained, but no attempt was made to tie that stock to a specific loan. The stock was valued at 4.75 percent of the face value.

Interest assistance income is interest received from the Farm Service Agency, the New York State Linked Deposit program or other agencies as a subsidy or partial payment of interest. Borrowers qualifying for these programs pay a lower than market rate on their loan and the difference between what the farmer pays and the market rate is paid to the lender by FSA or another agency. For these loans, the farmer pays part of the interest and the rest is paid in the form of an interest assistance payment.

Net non-loan service income is the net income received for non-loan services provided by the lender. The services provided varied considerably by lender. The primary services provided by commercial banks were checking and various other deposit accounts. Farm Credit Associations often offered other services such as tax preparation, record keeping, consulting and appraisal. Leasing services were provided by both types of lenders.

The lenders were asked to estimate the net income rate generally achieved for deposit accounts and other non-loan services. The net income rate each service was then multiplied by the total fee income for that service to obtain the net income.

Net non-loan service income averaged \$75 per relationship and 5.9 basis points per dollar loaned for all relationships.

Total income is the sum of the income received for loans, net of funding costs, and for non-loan services. Total relationship income averaged \$4,323 per relationship and 339 basis points (3.39 percent) per dollar of loan volume.

Total loan personnel costs include all personnel costs directly attributable to the loan relationship. As discussed under personnel costs above, the personnel time came from the Loan Officer Questionnaire and the rates per hour and mile came from the Institutional Level Data Questionnaire. Personnel costs averaged \$396 per relationship or 31 basis points per dollar loaned (Table 11).

Table 11. Average Portfolio Expenses Per Relationship

Item	Dollars Per Relationship	Basis Points per Dollar of Loan
Loan officer	210.29	16.4
Loan officer vehicle	28.96	2.3
Credit analysts	27.71	2.2
Accounting time	27.82	2.2
Loan officer supervisor	24.26	1.9
Credit committee	52.06	4.1
New relationship	16.28	1.3
Attorney fees & court	8.77	0.7
Total loan personnel	396.15	31.1
Patronage dividend:		
Cash	431.11	33.8
Revolving certificates ^a	237.08	18.6
Total patronage	668.19	52.4
Total personnel and patronage costs	1,064.34	83.5
Loan write-off costs	166.11	13.0
Total costs	1,230.45	96.5

^a Discounted at 8 percent for five years.

Patronage dividend costs represent the amounts paid in cash to the borrower, or committed to be paid by the issuance of revolving certificates, during the 12-month period. The revolving certificates had five-year maturities and were discounted back to the year of the data to reflect the present value of the delayed payment. An 8 percent discount rate was used as an estimate of the likely average interest rate on loans over the future five-year period.

Patronage dividends are included as an expense because they are paid to the borrower and represent an alternate way to lower the effective interest rate paid. They are paid on the basis of loan volume, not ownership in the cooperative. The cooperative could have chosen to lower interest rates and pay no patronage dividend. While they can be viewed as allocation of profits rather than a cost, the fact that they are paid to customers, not owners, makes treating them as a cost most appropriate. It is recognized that a cooperative could add the patronage dividends back in to determine the profitability of the organization at the market rates charged.

Patronage dividends were a significant cost item. Average costs were \$668.19 per relationship and 52.4 basis points per dollar of loan. This is particularly important since half of the institutions surveyed were commercial banks with no patronage dividends.

Loan write-off costs were discussed above. They averaged \$166 per relationship and 13 basis points per dollar of loan.

Total costs include all relationship costs except for interest costs and the costs of providing non-loan services averaged \$1,230 per relationship and 96.5 basis points per dollar of loans.

Loan underwriting and servicing income represents the net income, before loan write-off costs, from the lending activities associated with the relationship. It is determined by subtracting personnel and patronage costs from total loan income (net of interest costs). For the average relationship in the portfolios studied this income category was \$4,247 per relationship and 333 basis points (3.33 percent) per dollar loaned (Table 12).

Total relationship profitability represents the net income generated by the relationship as a contribution to general overhead, fixed costs and profit. It includes income from lending and from non-loan financial services and is net of write-off costs.

Clearly agricultural loans are profitable. The average relationship generated profitability of \$3,092 per relationship or 243 basis points (2.43 percent) per dollar loaned. This represents a major contribution to overhead and fixed costs for the firms involved. Well operated financial institutions should be able to keep fixed costs and overhead to less than 2.43 percent of loan volume.

Table 12. Average Portfolio Net Income Per Relationship by Management Function

Item	Dollars per Relationship	Basis Points per Dollar of Loan
Loan underwriting and servicing:		
Income ^a	4,247	333.1
Expense ^b	1,064	83.5
Net income	3,183	249.6
Net non-loan service income ^c	75	5.9
Loan write-off costs	166	13.0
Total relationship profitability	3,092	242.5

^a Includes net interest income, fees, loan servicing income and stock value (saved interest cost).

^b Includes loan servicing costs and patronage dividends.

^c Includes net income from tax preparation, record keeping, consulting, leasing services, deposit accounts and other services.

Relationship Profitability

Although agricultural loans are profitable, some relationships are undoubtedly more profitable than others. To do the best job of establishing loan policies and underwriting standards, lenders need to know which factors are related to profitability and how they are related. In the analysis that follows a number of factors that are believed to be related to loan profitability are investigated.

Relationship Size

Loan size has long been known to be an important factor in lending profitability. It is an important variable in the interest rate tier structure used by many lenders. There are substantial fixed costs in lending, which result in a declining cost per dollar of loan volume with increased loan size. Also, obtaining additional loan volume is often perceived to be more easily accomplished by making one large loan as opposed to several smaller loans. These factors lead some lenders to the conclusion that it is difficult to profitably extend credit to smaller borrowers. This conclusion can also be compounded by using measures of performance, such as loan volume per loan officer or employee, which inherently assume that larger loans are the profitable loans.

The perception that it is more difficult to obtain loan volume with small loans appears to result from a higher level of competition or an assumption of limited loan officer time (not cost), rather than the existence of potential customer. Farms with sales of under \$250,000 borrow 55 percent of total farm debt.⁹

Although there is concern about the profitability of smaller loans, the vast majority of the loan relationships in lender portfolios are quite small. Over half of the relationships maintained by these lenders had loan volumes of less than \$100,000. These borrowers represented 17 percent of the total loan volume (Table 13). In contrast borrowers with over \$400,000 in loan volume made up only 8 percent of the borrowers but represented 45 percent of the loan volume. New relationships represented only 6 percent of loan volume.

Table 13. Percent of Borrowers and Loan Volume by Size

Relationship Size	Percent of Relationships	Percent of Loan Volume
Under \$100,000	56	17
\$100,000 to \$400,000	26	32
Over \$400,000	08	45
New relationships	10	06
All	100	100

Some lenders have developed streamlined procedures for handling small loans. They have designed loan policy, loan officer procedure, as well data collection and

⁹ 2003 USDA Farm Costs and Returns Survey (FCRS)/Agricultural Resource Management Survey (ARMS). Special sort prepared by Robert Hoppe.

analysis requirements, which are different for small loans than for large ones. Often this involves strong reliance on a credit score, non-farm income or collateral.

Time requirements per relationship were considerably less for small loans than larger ones (Table 14). Small loans required about half as much time as mid-sized loans and about a quarter the time of large loans. However, small loans required much more time per dollar of loan volume, about twice as much as mid-sized loans and about four times as much as large loans. New relationships require the most time of the loan officer and of other lender staff.

Table 14. Time Requirements for Loan Relationships by Loan Size

Relationship Size	Loan Officer Hours		Total Lender Hours	
	Per Relationship	Per \$1,000 of Loan	Per Relationship	Per \$1,000 of Loan
Less than \$100,000	3.60	.093	6.09	.158
\$100,000 to \$400,000	7.71	.049	12.99	.083
Over \$400,000	18.81	.025	31.67	.042
New relationships	8.48	.104	15.64	.192
All relationships	6.32	.050	10.80	.085

The personnel item that increases most rapidly with relationship size is credit committee time (Table 15). Size is often the primary factor in determining which loans go to loan committee. Most, but not all, costs designed to obtain new loans is related to new relationships. Supervisor costs also increase more rapidly than loan officer time as loan size increases. Many small loans can be made within the lender's loan authority and the supervisor does not need to be involved.

Table 15. Hours Used per Loan Relationship by Relationship Size

Relationship Size	Loan Officer	Credit Analyst	Accounting	Supervisor	New Loans	Credit Committee	Total Lender
Less than \$100,000	3.60	0.86	1.14	0.20	0.05	0.23	6.08
\$100,000 to \$400,000	7.71	1.72	1.39	0.75	0.11	1.31	12.99
Over \$400,000	18.81	3.77	3.12	1.84	0.23	3.90	31.67
New relationships	8.48	1.96	1.35	0.45	2.98	0.42	15.64
All	6.32	1.42	1.38	0.49	0.38	0.81	10.80

Although loan officers spend more time on larger loans, there is still considerable variability in the time spent for each size of loan (Table 16). Over half of the small loans and about one third of all loans use less than four hours of loan officer time. On the other

hand, a few of those small loans required a substantial amount of time, over 16 hours. Large loans required an average of 19 hours but a few were handled in less than four hours.

Table 16. Percent of Farms by Size and Loan Officer Time

Loan Officer Time (hours)	Size of Relationship				All Farms
	Under \$100,000	\$100,000 to \$400,000	Over \$400,000	New relationships	
<4	55	29	06	32	32
4 to 7	21	24	15	25	21
8 to 11	12	17	18	19	16
12 to 15	06	14	17	10	12
16 or more	06	16	44	14	19

Personnel costs per relationship increase sharply with increases in relationship size (Table 17). Larger relationships often have more entities, often involving a combination of proprietorships, partnerships, LLC's and corporations, and more loans. Also, with the larger loan volume, the loan officer wants to do a thorough analysis of the firm's data and the risks involved with the relationship, and must take the loan to loan committee more frequently. All of these characteristics lead to more time being spent with the relationship.

Table 17. Personnel Costs by Size ^a

Relationship Size		Dollars per Relationship	Basis Points per Dollar of Loan
Range	Average (\$)		
Under \$100,000	38,588	203	53
\$100,000 to \$400,000	156,784	506	32
Over \$400,000	747,792	1,217	16
New relationships	81,496	572	70
All relationships	127,513	396	31

^a Includes All (Average) loan officer, officer vehicle, credit analyst, accounting, supervisor, credit committee, attorney fees and new relationship costs. Excludes write-offs.

Although costs increase with relationship size, there are significant efficiencies in serving larger borrowers. On a per-dollar-of-loan basis, small loans are the most costly to serve. They cost about 20 basis points more than mid-sized loans and about 40 basis points more than large loans.

However, the 120 basis point higher interest rates charged for small loans, over large loans (Table 18), more than covers the added personnel costs. Even if the recall method used to obtain the loan office time data reported in this study resulted in a significant underestimate of the time required, the higher rates more than cover the added personnel costs of small loans. Thus, the sometimes-heard statement that "you cannot

charge a high enough rate to cover the higher cost of making small loans” appears to be wrong.

Table 18. Average Interest Rate Earned^a by Size, Portfolio Average

Relationship Size	Percent
Under \$100,000	7.9
\$100,000 to \$400,000	7.4
Over \$400,000	6.7
New relationships	6.7
All (Average)	7.1

a Total interest income divided by average daily balance.

The highest cost borrowers to serve are new relationships. The loan officer has to take time to get to know a new borrower and understand their business. A detailed analysis of the business is usually conducted to be sure that the new business will be good business. The entire loan file needs to be established. All loans are new loans. Collateral appraisals need to be conducted. All these efforts result in the cost of a new loan being nearly twice as costly as a similar sized established loan.

All sizes of loans are profitable (Table 19). Even small loans make a contribution to fixed costs and overhead. However, profit per relationship increases sharply with relationship size. Large relationships earn many times as much as small ones.

Table 19. Relationship Profitability by Size

Farm Size	Underwriting & Servicing Income	Net Non-Loan Income	Write-offs	Total Profitability^a
	-----Dollars per Relationship-----			
Under \$100,000	1,191	22	-70	1,143
\$100,000 to \$400,000	3,732	49	-62	3,719
Over \$400,000	16,712	588	-1,456	15,844
New relationships	2,702	50	00	2,752
All (Average)	3,183	75	-166	3,092

^a Return to overhead costs and administration (physical facilities, general overhead, and administrative and supervisory costs excluding directly attributable loan officer supervisor and credit committee costs).

On a per dollar of loan basis small loans are most profitable (Table 20). In general, the higher rates charged more than offset the higher personnel costs associated with serving smaller borrowers. Net earnings for small loans were about 40 basis points per dollar of loan higher than larger loans.

New loan relationships are more profitable than existing loans. This results from fees charged on a number of the functions conducted for new loans (application fees, credit checks, appraisals) and the absence of losses. It could be argued that some of the

fees should be allocated over the life of the loan. However, for this analysis they were counted in the year received. Some lenders use fees as an important part of their pricing structure. Others charge few fees.

Table 20. Relationship Profitability Per Dollar of Loan by Size

Farm Size	Underwriting & Servicing Income	Net Non-loan Income	Write-offs	Total Profitability ^a
	-----Basis Points-----			
Under \$100,000	254	22	-18	258
\$100,000 to \$400,000	218	05	-05	218
Over \$400,000	224	09	-16	217
New relationships	332	16	00	348
All (Average)	251	16	-13	254

^a Return to overhead costs and administration (physical facilities, general overhead, and administrative and supervisory costs excluding directly attributable loan officer supervisor and credit committee costs).

These results have implications for lenders. If a lender is unable to hire added loan officers to expand loan volume, the lender can generate the most profit by focusing on large loans. Large loans make more efficient use of personnel time. On the other hand, if the lender has limited funds, those funds could be most efficiently allocated to small loans. Small loans have the highest return per dollar of loan volume. If the lender can obtain more funds and more loan officers, they will maximize the bottom line by designing policies to serve and obtain the business of all sizes of relationships.

Risk Level

Most new loans are rated as low risk at the time they are made. A few medium risk loans are viewed as “good-bets” by the lender and are made in spite of the higher risk. However, most medium risk loans result from good loan situations that have experienced bad luck, poor management, divorce, unusual weather, disease problems, or other negative business factors. In a few cases these problems are sufficiently severe that the relationship becomes a non-accrual or loss loan, placing it in the high risk category.

Low risk borrowers make up most of the loan portfolio of agricultural lenders (Table 21). Less than 2 percent of the borrowers and loan volume are represented by high risk relationships.

Table 21. Percent of Borrowers and Loan Volume by Risk

Loan Size	% of Relationships	% of Loan Volume
Low risk	86	81
Medium risk	12	17
High risk	02	02
All relationships	100	100

Medium risk relationships require more personnel time than low risk relationships (Table 22). As risk increases, the loan officer spends more time analyzing records,

monitoring collateral and staying in touch with the borrower(s). However, these loans tend to be larger. Some of them likely are medium risk because of the higher leverage level of the business. The higher balances of these relationships result in about the same time per dollar of loan as low risk loans. It appears that medium risk loans are not treated significantly differently than low risk loans. The increased time spent on medium risk relationships is accounted for by the larger loan volume of the accounts.

Table 22. Loan Relationship Time Requirements by Risk Level

Loan Size	Loan Officer Hours		Total Lender Hours	
	Per Relationship	Per \$1,000 of Loan	Per Relationship	Per \$1,000 of Loan
Low risk	5.76	.048	10.03	.084
Medium risk	9.64	.052	15.49	.084
High risk	10.91	.095	16.42	.142
All relationships	6.32	.050	10.80	.085

High risk loans result in by far the highest time requirements both per relationship and per dollar of loan. The added time required for monitoring the loan, double checking loan documentation, dealing with legal issues and handling the added paperwork results in more time being spent by everyone connected with the loan. In addition attorney and court costs are incurred.

Supervisor time increases most rapidly with increased risk (Table 23). Since the potential for loss is great with high risk loans, the supervisor and the loan officer are both spending considerable time with such borrowers. Not surprisingly, little time is spent on new loans for high risk borrowers. Also, since many of these relationships do not involve new loans, credit committee time is also much reduced. Credit analyst time is also small because many of these businesses are not providing new operating and financial data and advancing additional money is usually not being considered.

Table 23. Hours Used per Loan Relationship by Risk Level

Loan Size	Loan Officer	Credit Analyst	Accounting	Supervisor	New Loans	Credit Committee	Total Lender
Low risk	5.76	1.41	1.35	0.35	.39	0.77	10.03
Medium risk	9.64	1.69	1.56	1.09	.36	1.16	15.49
High risk	10.91	0.12	1.42	3.48	.03	0.46	16.42
All	6.32	1.42	1.38	0.49	.38	0.81	10.80

The affect of the risk level on the time requirements of a relationship translate directly into personnel costs (Table 24). Costs per dollar of loan are similar for low and medium risk loans, but costs are more than double that for high risk loans. Since the time requirements are less than twice as high for high risk loans compared to low risk, but the costs are nearly triple, it is clear that high risk loans require more time from more highly paid personnel. More loan officer, supervisor and credit committee time are required. On

the other hand once a business goes into bankruptcy or litigation, the loan officer may have no contact with the borrower for long periods of time. This leads to high variability in personnel costs for high-risk loans.

Table 24. Personnel Costs by Risk, Portfolio Average ^a

Risk Level	Average Daily Balance (\$)	Dollars per Relationship	Basis Points per Dollar of Loan
Low	119,678	357	30
Medium	185,680	595	32
High	115,332	956	83
All relationships	127,513	393	31

^a Includes All (Average) loan officer, officer vehicle, credit analyst, accounting, supervisor, credit committee, attorney fees and new relationship costs. Excludes write-offs.

Higher risk loans are charged higher interest rates to cover the higher costs and the greater possibility of write-offs sometime during the life of the loan (Table 25). The magnitude of the increase in moving from low to medium risk is 70 basis points. The rates earned on high-risk loans are higher, but again caution should be used as some of the loans are not accruing, which makes the rates appear lower than they would actually earn if still accruing. The predominance of low risk loans makes the average rate close to the low risk rate.

Table 25. Average Interest Rate Earned^a by Risk Level

Risk Level	Percent
Low risk	7.0
Medium risk	7.7
High risk	8.1
All (Average)	7.1

^a Total interest income divided by average daily balance.

As one would expect, the higher interest rates charged medium risk borrowers results in higher short run profitability (Table 26). As long as the medium risk borrower does not move to high risk, that borrower is more profitable to the lender than a low risk borrower. This higher profitability is necessary because of the need to cover the losses that will result if the borrower becomes non-accrual or write-off's are incurred. The adequacy of this risk premium is discussed later in the customer lifetime value section of this publication.

Average losses for high risk borrowers of over \$8,000 per year more than offset the higher rates they are charged and result in significant losses for such borrowers. Net income from servicing and underwriting of high risk loans is less than for medium risk borrowers because some of the interest is not received, loan volumes are lower and costs are higher.

**Table 26. Relationship Profitability by Risk Level
Portfolio Average**

Risk Level	Underwriting & Servicing Income	Net Non-loan Income	Write-offs	Total Profitability^a
	-----Dollars per Relationship-----			
Low	2,950	78	-17	3,011
Medium	4,880	65	00	4,945
High	3,044	14	-8,274	-5,216
All (Average)	3,183	75	-166	3,092

^a Return to overhead costs and administration (physical facilities, general overhead, and administrative and supervisory costs excluding directly attributable loan officer supervisor and credit committee costs).

When considered per dollar of loan similar results occur, medium risk loans are more profitable and high-risk loans are very unprofitable (Table 27). Income per dollar of loan is similar for high and low risk relationships with the higher interest rates on high-risk loans offsetting the higher underwriting and servicing costs. However, high losses on high-risk relationships make them very unprofitable.

**Table 27. Relationship Profitability Per Dollar of Loan by Risk Level
Portfolio Average**

Risk Level	Underwriting & Servicing Income	Net Non-loan Income	Write-offs	Total Profitability^a
	-----Basis Points-----			
Low	246	7	-01	252
Medium	263	3	00	266
High	264	1	-717	-452
All (Average)	249	6	-13	242

^a Return to overhead costs and administration (physical facilities, general overhead, and administrative and supervisory costs excluding directly attributable loan officer supervisor and credit committee costs).

Size and Risk Level

Size and risk level frequently interact in their affect on time requirements and profitability. The added time spent on medium risk loans in comparison to low risk loans of the same size is much higher for small loans than large loans (Table 28). In fact, medium risk large loans have nearly the same time requirement per dollar of loan as low risk large loans. It appears that the analysis and detail required to monitor and service a large loan is about the same regardless of risk. In each case a complete financial and business analysis must be done, collateral must be closely monitored and the borrower is afforded a high level of service. Alternately, low risk small loans are made quickly with a minimum of analysis and monitoring of collateral. But, when the risk on a small loan increases or when a new medium risk small loan is being considered, a much higher level of attention is given to the relationship. More of the analysis used on larger loans is conducted in these situations. This higher level of attention results in higher personnel time requirements.

Table 28. Loan Relationship Time Requirements by Size and Risk Level

Loan Size	Loan Officer Hours		Total Lender Hours	
	Per Relationship	Per \$1,000 of Loan	Per Relationship	Per \$1,000 of Loan
Under \$100,000				
Low risk	3.25	.085	5.63	.147
Medium risk	5.13	.125	8.46	.199
High risk	9.37	.240	11.86	.303
\$100,000 to \$400,000				
Low risk	6.98	.045	11.93	.078
Medium risk	11.13	.064	17.19	.098
High risk	12.97	.082	28.47	.180
Over \$400,000				
Low risk	17.45	.025	30.19	.042
Medium risk	25.08	.027	39.28	.043
High risk	19.86	.027	25.07	.034
New relationships				
Low risk	8.26	.104	15.09	.191
Medium risk	12.92	.100	26.84	.207
All (Average)	6.32	.050	10.80	.085

The differences in time requirements by size and risk translate directly into personnel costs (Table 29). A large borrower with medium risk has about the same cost per dollar of loan as one with low risk, but a small borrower with medium risk has much higher personnel costs than one with low risk.

Table 29. Loan Personnel Cost by Size and Risk^a

Size and Risk	Dollars per Relationship	Basis Points per Dollar of Loan
Under \$100,000		
Low risk	183	48
Medium risk	287	70
High risk	542	139
\$100,000 to \$400,000		
Low risk	433	28
Medium risk	721	41
High risk	2,296	145
Over \$400,000		
Low risk	1,154	16
Medium risk	1,532	17
High risk	1,019	14
New relationships		
Low risk	533	67
Medium risk	953	73
All (Average)	396	31

^a Cost includes: loan officer time, officer vehicle, credit analyst, accounting, supervisor, credit committee, new relationships and attorney charges. Write-offs are excluded.

The higher level of profitability of medium risk loans compared to low risk loans is maintained for all loan sizes (Table 30). In the short run the higher interest rates and only modestly higher costs lead to greater profitability.

Table 30. Relationship Profitability by Size and Risk Level

Farm Size and Risk Level	Underwriting & Servicing Income	Net Non-loan Income	Write-offs	Total Profitability ^a
	----- Dollars per Relationship -----			
Under \$100,000				
Low risk	1,153	23	-30	1,146
Medium risk	1,508	19	00	1,527
High risk	1,103	13	-1,910	-794
\$100,000 to \$400,000				
Low risk	3,570	49	00	3,619
Medium risk	4,427	56	00	4,483
High risk	5,541	08	-4,076	1,473
Over \$400,000				
Low risk	15,484	655	00	16,139
Medium risk	22,670	330	00	23,000
High risk	14,660	34	-83,526	-68,832
New loans				
Low risk	2,663	51	00	2,714
Medium risk	3,495	17	00	3,512
All (Average)	3,183	75	-166	3,092

^a Return to overhead costs and administration (physical facilities, general overhead, and administrative and supervisory costs excluding directly attributable loan officer supervisor and credit committee costs).

The level of losses that can be experienced by large high-risk loans is substantial, with write-offs averaging over \$80,000 per year swamping the modest \$15,000 underwriting and servicing income.

In spite of the higher personnel costs for medium risk small loans, the short run profitability gain from these loans is higher per dollar of loan than the other sizes (Table 31). These loans are about 70 basis points more profitable than low risk loans while the larger size medium risk loans are only about 20 basis points more profitable than low risk. This increased return must also compensate the lender for the increased likelihood that the loan will move to high risk.

Counter to the experience with existing loans, medium risk new loans are less profitable per dollar of loan than low risk loans.

Table 31. Relationship Profitability Per Dollar of Loan by Size and Risk Portfolio Average^a

Farm Size and Risk Level	Underwriting & Servicing Income	Net Non-loan Income	Write-offs	Total Profitability ^b
	----- Basis Points -----			
Under \$100,000				
Low risk	302	6	-08	300
Medium risk	367	5	00	372
High risk	282	3	-488	-203
\$100,000 to \$400,000				
Low risk	233	3	00	236
Medium risk	254	3	00	257
High risk	350	0	-257	93
Over \$400,000				
Low risk	218	9	00	227
Medium risk	246	4	00	250
High risk	199	0	-1134	-935
New loans				
Low risk	337	6	00	343
Medium risk	270	1	00	271
All (Average)	250	6	-13	243

^a Average dollars divided by average ADB.

^b Return to overhead costs and administration (physical facilities, general overhead, and administrative and supervisory costs excluding directly attributable loan officer supervisor and credit committee costs)

Farm Type

Farm type could influence relationship profitability in a number of ways. Typical farms of some types may generally be larger or smaller than other types. This will normally influence the average outstanding loan balances that operators maintain. The character of the collateral and the type of loan may result in more monitoring. For example, an operating loan to a bedding plant operation using the growing inventory of plants as collateral may require a high level of monitoring and the loan needs to be re-written each year. Alternately, a mortgage loan on land for a crop farm may last many years and require little monitoring. An unusual farm type for the region may require more loan officer time because (s)he has less experience with that farm type.

The predominant farm type in the northeast United States where the lenders participating in this study were located is dairy. Dairy represented 46 percent of the loans and 57 percent of the loan volume (Table 32). Annual crop farms, including grain and vegetable farms, were the second most prevalent with 20 percent of farms and 17 percent of loan volume. Other animal operations included beef, sheep, swine and poultry. Permanent plantings included fruit farms and some timber operations. The green industry included greenhouse, nursery and sod operations.

Table 32. Number of Farms and Loan Volume by Farm Type

Farm Type	Number	Percent of Farms	Percent of Loan Volume
Dairy	462	46	57
Annual crops	196	20	17
Other animal production	118	12	09
Permanent plantings	67	07	06
Green industry	55	05	04
Others	103	10	07
All	1001	100	100

Dairy farms maintained the largest average balances (Table 33). Dairy farms tend to be more capital intensive with larger building and animal investments than other farm types, which results in a greater need for capital, and thus, more debt capital. Other animal farms in the Northeast have a greater tendency to be part time businesses and consequently have lower loan balances.

Table 33. Average Daily Balance by Farm Type

Farm Type	Dollars
Dairy	159,980
Annual crops	111,445
Other animal production	92,347
Permanent plantings	110,574
Green industry	112,171
Others	86,165
All	127,513

The lowest interest rates earned occurred on dairy and annual crop loans (Table 34). These are the predominant farm types in the region and usually have a considerable portion of their loans in long-term mortgage loans that are often made at lower rates. Other animal and green industry borrowers paid the highest rates. Other animal loans tend to be to smaller producers and often represent loans to minor enterprises for the region. Minor enterprises for a region frequently pay higher rates because loan officers must spend more time per borrower staying up to speed with that industry and minor enterprises are often higher risk because they are not as adapted to the region as major enterprises. Green industry borrowers generally have a higher proportion of their loan volume in short term loans that often command higher interest rates than mortgage loans.

Table 34. Average Interest Rate Earned^a by Farm Type, Portfolio Average

Business Stage	All Lenders
Dairy	7.0
Annual crops	6.9
Other animal production	7.7
Permanent plantings	7.1
Green industry	7.7
Others	7.2
All	7.1

^a Total interest income divided by average daily balance.

Loan officer time per dollar of loan was lowest for dairy farms, likely due to the high average loan volume and the predominance of this type in the region (Table 35). Other animal operations also had low time requirements, at least in part because these farms tended to be part time farms with real estate collateral and non-farm income for repayment. The highest time requirements were experienced by permanent planting operations. Both loan officer and credit analyst time were considerably higher for these businesses. The reason for this is unclear, though the apple industry, which represents a majority of permanent planting farms, was experiencing severe stress at the time of the study. This may have resulted in higher time requirements for these loans. Except for the permanent planting farms, the personnel costs per dollar of loan varied modestly between farm types (Table 36).

Table 35. Loan Relationship Time Requirements by Farm Type

Loan Size	Loan Officer Hours		Total Lender Hours	
	Per Relationship	Per \$1,000 of Loan	Per Relationship	Per \$1,000 of Loan
Dairy	7.43	.046	13.04	.082
Annual crops	5.29	.047	9.33	.084
Other animal production	4.29	.046	7.07	.077
Permanent plantings	8.69	.079	15.04	.136
Green industry	6.51	.058	9.03	.081
Others	4.89	.056	7.85	.091
All	6.32	.050	10.80	.085

Table 36. Personnel Costs by Farm Type ^a

Farm Type	Dollars per Relationship	Basis Points Per Dollar of Loan
Dairy	477	30
Annual crops	348	31
Other animal production	237	26
Permanent plantings	484	44
Green industry	393	35
Others	311	36
All (Average)	396	31

^a Includes loan officer, officer vehicle, credit analyst, accounting, supervisor, credit committee, new relationship costs and attorney fees.

The amount of profit generated by the relationship varied modestly by farm type (Table 37). Dairy farms had the highest total relationship profit, largely because of a larger loan volume. Permanent planting businesses had the lowest profit, due in large part to high write-offs, likely related to the high level of stress being experienced by that industry at the time of the survey.

**Table 37. Relationship Profitability by Farm Type
Dollars per Relationship, Borrower Average**

Farm Type	Under-writing & Servicing Income	Net Non-loan Income	Write-offs	Total Profitability	Total w/ Average Write-offs^a
Dairy	4,248	70	-94	4,224	4,152
Annual crops	2,698	84	-118	2,664	2,616
Other animal production	2,149	21	-26	2,144	2,004
Permanent plantings	2,692	88	-1,506	1,274	2,614
Green industry	2,454	298	00	2,752	2,586
Others	1,690	10	-120	1,580	1,534
All (Average)	3,183	75	-166	3,092	3,092

^a With write-off estimated at average write-off per dollar of average daily balance for all relationships, multiplied by average daily balance.

Whether the high level of write-offs experienced by the permanent planting sector is a true indication of the profit of that sector is open to question. The sample for this study was drawn based on relationship size and risk level. The sample was not drawn by farm type. Since the sample was random, the data should be representative and, thus, provide an appropriate representation of farm types. However, write-offs occurred very infrequently in the sample because the lenders had very few of them in total. When they occurred they were often large and had a significant impact on the results. It could be that the write-offs that occurred were the result of other factors, such as divorce or death, that were totally unrelated to farm type, and that taking the sample in a different year would have resulted in a totally different write-off experience. It is also possible that the year in which the study was conducted found one type of enterprise at the bottom of its natural profit cycle. This study cannot capture the low point of the profit cycles for each farm type. For that reason, average profit by farm type is also calculated using average the write-off experience (last column on Table 37). In that case there is little difference in the relationship profit on non-dairy farms.

On a per dollar of loan basis the difference in profitability by farm type is modest (Table 38). Dairy farms are most profitable, but by only 12 to 35 basis points. The green industry is the second most profitable in spite of slightly higher loan personnel costs. Part of this profitability results from a much higher level of use of non-loan services. Non-loans service income for the green industry was many times higher than for other industries.

Table 38. Relationship Profitability by Farm Type, Basis Points Per Dollar of Loan, Portfolio Average^a

Farm Type	Underwriting & Servicing Income	Net Non-loan Income	Write-offs	Total Profitability	Total w/ Average Write-offs^b
Dairy	266	04	-06	264	257
Annual crops	242	07	-10	239	236
Other animal production	233	02	-03	232	222
Permanent plantings	243	08	-136	115	238
Green industry	219	26	00	245	245
Others	196	01	-14	183	184
All (Average)	250	06	-13	243	243

^a Average dollars divided by average ADB.

^b Includes average write-offs for all borrowers.

Business Stage

Because farm businesses are generally individual proprietorships or partnerships, they tend to go through a series of stages, sometimes referred to as the business life cycle. A beginning farmer often starts with a modest size farm with little equity. As the farm succeeds it often goes through a series of growth periods each followed by a period of stability. After expanding to an acceptable size, the business will remain at a stable size for a number of years until the operators allow the business to decline as they move towards retirement or they transfer it to another generation.

Loan officers were asked to indicate the current stage the farm business. The definitions of the stages are shown below.

Beginning farming: A business that has been recently established. This would include a person who just started farming on a full or part time basis or recently switched from a part time to an approximately full time farm. A person in this stage is still dealing with the issues and problems of getting established.

Expansion stage: This is a business that is in the expansion phase. Expansion of the business is a part of the plan of the operator(s). They may have expanded within the last few years or are planning to expand within the next few years. They may be operating in a manner that results in gradual expansion of the business.

Major growth: A business that is currently expanding. Either an expansion took place within the last year or two, or the business is increasing size this year. The assumption is that more services would be required during this period.

Stable business: This is a business in which the operator has achieved the maximum size that (s)he desires or believes to be achievable. While modest growth or decline in the size of the business may take place over time, it is not the intent of the management to

increase (or decrease) the size of the business. This would include businesses that have reached the maximum size that is achievable with the personal or physical resources available.

Transferring business: A business that is in the process of being transferred to the next generation. This should only include the period during which the business is actually being transferred. It does not include the period when a son, daughter or other person joins the business and works as an employee – even if some people hope or expect that the business will be transferred. It also does not include the period when the business has been transferred to the younger generation, but dad and/or mom are still around and involved in the business. When the younger generation becomes the primary decision-maker and a high proportion of the operating assets are transferred, the business is assumed to have been transferred.

Declining (or disinvesting) business: A business that is declining in either size or aggressiveness of the manager. The manager may be reducing the size by renting less land or hiring out functions to avoid having to deal with them. The business may be stagnating or atrophying. The operator may be just hanging on until retirement or sale of the farm.

Not in Business: a relationship with loans outstanding but that is not currently in business. This may represent businesses that are in bankruptcy where the business is no longer in operation but the assets have not been sold or for other reasons the loan has not been paid off. This also includes rural home loans or real estate loans where there are agricultural assets, but there is no farm business.

About half of the businesses were in the stable stage (Table 39). Growth and major growth farms made up only 18 percent of farms but 41 percent of loan volume. On the other hand beginning, declining and not-in-business farms made up a considerably smaller proportion of loan volume than they did farm numbers.

Table 39. Number of Farms by Business Stage

Business Stage	Number of Farms	Percent of Farms	Percent of Loan Volume
Beginning	47	05	02
Growth	145	14	29
Major growth	36	04	12
Stable	475	47	41
Transferring	48	05	04
Declining	142	14	08
Not in business	107	11	04
All	1,000 ^a	100	100

^a One farm business stage unknown.

Not surprisingly, growth, and particularly major growth farms had by far the largest loan volumes (Table 40). These farms are making significant capital investments in their businesses and a high proportion of such investments are made with borrowed funds. Beginning and declining farms had small loan volumes. This represents businesses that are just starting up that are frequently small and farms that are winding down and frequently have paid off most of their loans.

Table 40. Average Daily Balance by Business Stage

Business Stage	Dollars
Beginning	63,085
Growth	256,782
Major growth	405,812
Stable	117,864
Transferring	120,141
Declining	79,585
Not in business	54,736
All	127,513

The growth and major growth farms were charged lower interest rates than other borrowers (Table 41). These borrowers had larger loan volumes, which would qualify them for lower rates in some lenders' tier structure of interest rates. In addition, these borrowers may obtain lower rates because they are more likely to shop for lower rates based on the large investment and the fact that they are making a major change in their business. Such a process leads farmers to finding the lowest rates available and can result in lenders bidding for loan business.

Table 41. Average Interest Rate Earned^a by Business Stage, Portfolio Average

Business Stage	Percent
Beginning	7.4
Growth	6.7
Major growth	6.8
Stable	7.3
Transferring	7.1
Declining	7.8
Not in business	7.1
Average	7.1

^a Total interest income divided by average daily balance.

Beginning and declining farms paid highest rates. Beginning farms paid only slightly more than stable farms. Declining farms paid 50 basis point higher rates than stable farms, likely the result of lower loan volumes and a less competitive nature of the business management.

Growth and, particularly, major growth farms require the most loan officer and total lender time (Table 42). Major growth farms use more of nearly everyone at the bank's time (Table 43). The major growth farms frequently require projection of cash flows to assess financial feasibility and new loans need to be established and old ones rewritten. Major funding is often being considered which results in more use of loan supervisors and credit committees. New loan relationships require more loan officer, credit analyst and accounting time but use little supervisor or credit committee time.

Table 42. Time Used per Loan Relationship by Business Stage

Business Stage	Loan Officer Hours		Total Lender Hours	
	Per Relationship	Per \$1,000 of Loan	Per Relationship	Per \$1,000 of Loan
Beginning	8.03	.127	15.26	.242
Growth	11.57	.045	19.47	.076
Major growth	23.27	.057	36.26	.089
Stable	5.04	.043	8.94	.076
Transferring	6.10	.051	11.68	.097
Declining	5.73	.072	8.34	.105
Not in business	3.47	.063	5.59	.102
All	6.32	.050	10.80	.085

Table 43. Hours Used per Loan Relationship by Business Stage

Business Stage	Loan Officer	Credit Analyst	Accounting	Supervisor	New Relationships	Credit Committee	Total Lender
Beginning	8.03	2.32	2.02	0.60	1.80	0.50	15.26
Growth	11.57	2.58	1.74	0.81	0.78	1.98	19.47
Major growth	23.27	3.67	2.81	2.16	0.69	3.66	36.26
Stable	5.04	1.34	1.28	0.32	0.31	0.65	8.94
Transferring	6.10	1.75	1.73	0.56	0.09	1.45	11.68
Declining	5.73	0.64	1.10	0.55	0.01	0.30	8.34
Not in business	3.47	0.26	1.02	0.63	0.11	0.10	5.59
All	6.32	1.42	1.38	0.49	0.38	0.81	10.80

Personnel costs by stage correspond closely to the hours required (Table 44). Costs per dollar of loan are quite similar for the different stages except for beginning farmers. Their costs were about double that of the other stages. Loan officers usually spend more time with beginning farmers, evaluating their proposals, providing financial guidance and establishing their loan packages. For other personnel, the analyst's spread sheet must be developed and accounting must establish all new loans and files.

Table 44. Personnel Costs by Business Stage, Portfolio Average^a

Business Stage	Dollars per Relationship	Basis Points Per Dollar of Loan
Beginning	518	82
Growth	734	29
Major growth	1,417	35
Stable	313	27
Transferring	423	35
Declining	324	41
Not in business	250	46
All (Average)	396	31

^a Includes loan officer, officer vehicle, credit analyst, accounting, supervisor, credit committee, new loan (relationship) costs and attorney fees.

Relationship profitability per stage is closely related to loan volume. Growth and major growth farms, which had the highest loan volumes, had clearly higher relationship profitability than farms at other stages (Table 45). Income from the higher loan volume more than offset the higher personnel costs.

**Table 45. Relationship Profitability by Business Stage
Dollars per Relationship, Borrower Average**

Business Stage	Underwriting & Servicing Income	Net Non-loan Income	Write-offs	Total Profitability	Total w/ Average Write-offs^a
Beginning	2,048	14	00	2,062	1,896
Growth	5,848	170	00	6,018	5,852
Major growth	7,463	81	00	7,544	7,378
Stable	3,016	88	-24	3,080	2,938
Transferring	4,076	17	-307	3,786	3,927
Declining	2,340	20	-907	1,453	2,194
Not in business	1,013	04	-350	667	851
All (Average)	3,183	75	-166	3,092	3,092

^a With write-off estimated at average write-off per dollar of average daily balance for all relationships, multiplied by average daily balance.

For farms still in business, beginning farms were the least profitable per relationship. These businesses had low loan volumes and high personnel costs.

On a dollar of loan basis, beginning and transferring farms had the highest profitability (Table 46). The transferring farms were charged the highest interest rates and had only modest personnel costs. The beginning farms had high interest rates but those high returns were partially offset by higher personnel costs.

**Table 46. Relationship Profitability by Business Stage
Basis Points Per Dollar of Loan , Portfolio Average**

Business Stage	Underwriting & Servicing Income	Net Non-loan Income	Write-offs	Total Profitability	Total w/ Average Write-offs^a
Beginning	325	02	00	327	314
Growth	228	06	00	234	221
Major growth	184	02	00	186	173
Stable	256	07	-02	261	250
Transferring	339	02	-26	315	328
Declining	294	03	-114	183	284
Not in business	185	01	-64	122	173
All(Average)	250	06	-13	243	243

^a Includes average write-offs for all borrowers

Lowest profitability per dollar was found on major growth farms, which were charged nearly the lowest interest rates and personnel costs were near average due to the large loan volume. Below average profitability was also found on growth farms, again due largely to lower interest rates charged.

Personal Stage

Farm operators tend to go through a series of stages, frequently referred to as the life cycle stages. These stages can influence the business through the vigor and attentiveness of the operator, the level of withdrawals, the labor and support contribution of family members and the time requirements of family commitments. The stage of the business often moves along with personal stage so that loan volume is also related to personnel stage.

The loan officers were asked to identify the personal stage of the operators of each business. For the analysis that follows the personal stage used is the personal stage of the primary operator. The definitions of the stages are shown below.

Single: The operator is not married and there is no “significant other” who could be expected to be involved in the goals, objectives and operation of the business, or may influence the amount withdrawn from the business or the amount of non-farm income contributed to the business. This stage also includes divorced people where the divorce is long enough ago that it no longer influences the operation or withdrawals of the business.

Married without children: There is a spouse or “significant other” who could be involved in the decision-making for the business and influences the amount withdrawn from the business or contributed to the business from non-farm sources.

Young children: This includes families with secondary school age or younger children. The children represent a commitment of time and resources.

College-age children: Operators with college age children (ages approximately 18 to 25) who could influence the withdrawal demands on the business. Withdrawals could be used to go to college, start some other business or support the children’s other activities.

Silver years: The children, if any, are past college age but the operator is still a full-fledged member of the labor and management team for the business.

Retirement: The operator is retired or partially retired. (S)he may be actively involved in the business but less than full time or limited in the activities that are conducted. Operator is not the primary operator.

Farms with young or college age children made up over 50 percent of the loan relationships. Loan relationships with young children made up the largest proportion of borrowers and loan volume (Table 47). The group including those in their silver years follows this segment closely. The youngest and oldest borrowers made up a higher percentage of farms than loan volume.

Table 47. Number of Farms and Loan Volume by Personal Stage

Personal Stage	Number^a	Percent of Farms	Percent of Loan Volume
Single	108	11	06
Married w/o children	77	08	06
Young children	320	32	34
College-age children	190	19	20
Silver years	248	25	31
Retirement	44	05	03
Total	987	100	100

^a Personal stage was not provided for 14 farms.

Loan volume per farm tends to follow the expected life cycle pattern. Loan volumes tend to increase with more advanced personal stages until the silver years are reached and then decline (Table 48).

Table 48. Average Daily Balance by Personal Stage

Personal Stage	Dollars
Single	75,221
Married w/o children	89,569
Young children	132,901
College-age children	135,033
Silver years	160,073
Retirement	89,430
All	127,513

Families with children pay higher rates than those without (Table 49). Operators of child rearing age are likely at the more aggressive stages in their lives, and thus, operate expanding, higher risk businesses.

Table 49. Average Interest Rate Earned^a by Personal Stage, Portfolio Average

Personal Stage	Percent
Single	6.8
Married w/o children	7.3
Young children	7.2
College-age children	7.4
Silver years	6.7
Retirement	6.9
All	7.1

^a Total interest income divided by average daily balance.

Time spent on loan relationships also tend to follow a life cycle pattern (Table 50). However, time per relationship and per dollar peak with those with college-age children. Although those in their silver years have the largest loan balances, less time is spent with them and they are charged lower rates. One would expect that the silver years borrowers would have high equity in their businesses and that in many cases the loan officer would have several years experience dealing with this operator. Both of these factors could lead to expenditure of less time and lower rates.

Table 50. Time Used per Loan Relationship by Personal Stage

Personal Stage	Loan Officer Hours		Total Lender Hours	
	Per Relationship	Per \$1,000 of Loan	Per Relationship	Per \$1,000 of Loan
Single	4.61	.061	7.54	.100
Married w/o children	4.75	.053	8.16	.091
Young children	7.46	.056	12.86	.097
College-age children	8.80	.065	14.15	.105
Silver years	5.02	.031	8.64	.054
Retirement	4.50	.050	10.40	.116
All	6.32	.050	10.80	.085

Total personnel cost per dollar of loan is quite similar for most personal stages except those in their silver years (Table 51). Silver years borrowers have about half the cost per dollar of loan experienced by other relationships. The increasing cost with advancing stages up through college-age children appears to be largely a function of loan volumes.

Table 51. Personnel Costs by Personal Stage, Portfolio Average^a

Personal Stage	Dollars per Relationship	Basis Points Per Dollar of Loan
Single	290	39
Married w/o children	301	34
Young children	484	36
College-age children	500	37
Silver years	315	20
Retirement	361	40
All (Average)	396	31

^a Includes loan officer, officer vehicle, credit analyst, accounting, supervisor, credit committee, new loan (relationship) and attorney fees.

Profit per relationship is significantly lower for single operators and those without children (Table 52). This results at least in part from the lower loan volumes of these operators. Profit levels for operators with young children through their silver years are relatively constant. Silver years operators and those with young children use more non-loan services.

**Table 52. Relationship Profitability by Personal Stage
Dollars per Relationship, Borrower Average**

Personal Stage	Underwriting & Servicing Income	Net Non-loan Income	Write-offs	Total Profitability	Total w/ Average Write-offs^a
Single	1,930	62	-71	1,921	1,826
Married w/o children	1,999	23	-03	2,019	1,856
Young children	3,446	98	-54	3,490	3,378
College-age children	3,429	39	-108	3,360	3,302
Silver years	3,637	108	-399	3,346	3,559
Retirement	2,855	05	-365	2,495	2,694
All (Average)	3,183	75	-166	3,092	3,092

^a With write-off estimated at average write-off per dollar of average daily balance for all relationships, multiplied by average daily balance.

On a per dollar of loan basis farms in retirement were the most profitable for the lender (Table 53). This appears to result from a marginally higher interest rate margin than other stages, in spite of only average interest rates paid, and strong loan fee income, more than offsetting the higher personnel costs. Silver years farms have the lowest interest rate margin and lowest loan fees paid per dollar of loan. This more than offsets their lower personnel costs and is consistent with their low interest rates and the fact that most will not be taking out new loans or conducting other activities that will trigger loan fee income.

Table 53. Relationship Profitability Per Dollar of Loan by Personal Stage, Portfolio Average

Personal Stage	Underwriting & Servicing Income	Net Non-loan Income	Write-offs	Total Profitability	Total w/ average Write-offs^a
Single	2.57	.08	-.09	2.56	2.52
Married w/o children	2.23	.03	.00	2.26	2.13
Young children	2.59	.08	-.04	2.63	2.54
College-age children	2.54	.03	-.08	2.49	2.44
Silver years	2.27	.07	-.25	2.09	2.21
Retirement	3.19	.01	-.41	2.79	3.07
All (Average)	2.50	.06	-.13	2.43	2.43

^a Includes average write-offs for all borrowers.

Operator Age

Agricultural public policy supports assistance for young, beginning and small farm operators. Beginning farmers are generally assumed to be young, though that is not the case in all instances. For individual proprietorships where the spouse is not an integral part of the business, operator age is clearly defined. For these businesses, analysis on the basis of age is straightforward. However, many businesses have more than one operator, either a spouse who is an integral part of the business or parents, siblings or other family or non-family members. For this study, a spouse or “significant other” whose only activities were to keep the books, run errands, and fill in during emergencies was not listed as an operator. A spouse or “significant other” who is a part of the management team and operates as the herdsman or has other significant responsibilities is included as a partner.

For multi-operator businesses, analysis requires determination of which operator’s age to use. Alternatives include age of the primary operator, average age of all operators or the age of the youngest operator. Specification of the primary operator is open to question and often results in the Agricultural Census definition where the primary operator is the one filling out the questionnaire. For father/child partnerships there is usually some point in time when neither is the primary operator. To avoid those issues the analysis by age that follows is based on the youngest operator. For husband/wife partnerships, this will usually mean the youngest operator is the female spouse, but typically the difference between the ages of the spouses is small. For father/child or mother/child partnerships, this specification defines the age as the age of the child. For sibling partnerships, the age is that of the youngest sibling, but the age is usually quite representative of the age all partners.

For individual proprietorships, one expects the business to expand while the operator is young, reach a point where business size and activity peaks and remains stable for a number of years, and then decline as the operator moves towards retirement. Husband/wife and sibling partnerships would be expected to follow the same pattern.

However, businesses that bring in a younger partner, often with the intent to transfer the business to them in time, will usually avoid the decline phase and move directly from the growth or stable stages to more growth. In these cases, it is the age of the youngest operator, rather than the older operator, that determines the character of the business.

Farms where the youngest operator was between 40 and 49 years of age were the most prevalent in the lender portfolios (Table 54). They represented nearly one third of the total portfolio. Ten percent of the farms had at least one operator who was less than 30 years of age. These farms borrowed nine percent of total loan volume. The increasing number of farmers in the 40-49 years group may be the result of structural change in agriculture. With increasing size of businesses there are fewer younger operators and new businesses starting up, resulting in fewer young operators. At the other end of the age spectrum, the older operators are more likely to operate small businesses, which are exiting from agriculture at a higher rate.

Table 54. Number of Farms by Age of Youngest Operator

Age of Youngest Operator	Number of Farms^a	Percent of Farms	Percent of Loan Volume
Under 30	99	10	09
30 - 39	236	24	28
40 - 49	281	29	34
50 - 59	220	23	21
60 or more	133	14	08
All	969	100	100

^a Operator age was not provided for 32 businesses.

The increasing loan balances per relationship through the 40-49 year age group and then a decline show the life cycle pattern of borrowing as operators became older (Table 55).

Table 55. Average Daily Balance by Age of Youngest Operator

Age of Youngest Operator	Dollars
Under 30	108,596
30 - 39	147,948
40 - 49	152,528
50 - 59	119,786
60 or more	76,766
All	127,513

Time requirements per loan relationship follow the same life cycle pattern with maximum time use occurring at 40-49 years of age (Table 56). However, cost per dollar of loan showed no real trend or pattern. It appears that time requirements are not really related to operator age. Total personal costs show the same relationships as time requirements, a life cycle trend in costs per relationship, but little relationship per dollar of loan (Table 57).

Table 56. Loan Relationship Time Requirements by Age of Youngest Operator

Age of Youngest Operator	Loan Officer Hours		Total Lender Hours	
	Per Relationship	Per \$1,000 of Loan	Per Relationship	Per \$1,000 of Loan
Under 30	5.90	.054	10.20	.094
30 - 39	6.74	.046	11.89	.080
40 - 49	8.39	.055	13.53	.089
50 - 59	5.02	.042	8.79	.073
60 or more	4.43	.058	8.06	.105
All	6.32	.050	10.80	.085

Table 57. Personnel Costs by Age of Youngest Operator

Age of Youngest Operator	Dollars per Relationship	Basis Points Per Dollar of Loan
Under 30	379	35
30 - 39	448	30
40 - 49	503	33
50 - 59	316	26
60 or more	263	34
All (Average)	396	31

Profit per relationship also shows the life cycle pattern with largest profit at 40-49 years (Table 58). Loan write-offs followed a similar pattern but peaked in the next older (50-59 years) age group, likely a function of the larger loan volumes in the 40-49 year group and the normal delay between the time a relationship experiencing reverses and actual date of write-off. Net non-loan income peaked at 30-39 years indicating that this group is likely actively expanding and using services as part of the management function.

**Table 58. Relationship Profitability by Age of Youngest Operator
Dollars per Relationship, Borrower Average**

Age of Youngest Operator	Underwriting & Servicing Income	Net Non-loan Income	Write-offs	Total Profitability	Total w/ Average Write-offs ^a
Under 30	2,615	69	-25	2,659	2,518
30 - 39	3,556	105	-47	3,614	3,535
40 - 49	3,831	71	-92	3,809	3,735
50 - 59	2,968	87	-477	2,578	2,889
60 or more	2,243	25	-164	2,104	2,102
All (Average)	3,183	75	-166	3,092	3,092

^a With write-off estimated at average write-off per dollar of average daily balance for all relationships, multiplied by average daily balance.

Profitability per dollar of loan appears to be unrelated to operator age except that the oldest group, 60 or over, appears to be slightly more profitable (Table 59). This may be the result of a modestly higher interest rate margin. Younger operators, that show

lower profitability per relationship, have about the same profitability per dollar of loan as loans to older operators. There appears to be little reason for lenders to avoid younger operators on the theory that they are less profitable to serve.

**Table 59. Relationship Profitability by Age of Youngest Operator
Basis Points Per Dollar of Loan, Portfolio Average**

Age of Youngest Operator	Underwriting & Servicing Income	Net Non-loan Income	Write-offs	Total Profitability	Total w/ Average Write-offs^a
Under 30	241	6	-02	245	234
30 - 39	240	7	-03	244	234
40 - 49	251	5	-06	250	243
50 - 59	248	7	-40	215	242
60 or more	292	3	-21	274	282
All (Average)	250	6	-13	243	243

^a Includes average write-offs for all borrowers.

Length of Customer Relationship

It is generally believed that longer-term relationships are more profitable relationships. Long term customers are well known by the loan officer, so less time is required to learn about the customer and monitoring can be limited to those aspects of the business or those customers that the lender knows need monitoring. Customers know the lender and the loan officer's expectations, so that less time is required in keeping the customer informed. Long time customers are viewed as more loyal, and thus, possibly less interest rate sensitive (more profitable).

For this study, relationship length refers to the number of years that this entity has been a customer of this lender. The entity refers to the same group of people. If the father of a current father-son partnership was a borrower for 20 years before the partnership was formed and the current partnership has been in operation for 5 years, the relationship length is 25 years. If the borrower changed from a partnership to a limited liability corporation during the relationship period, such a change was ignored.

Nearly half of the borrowers in this study had been customers for less than five years (Table 60). Only 20 percent had been customers for more than 12 years.

Table 60 . Number of Farms by Length of Customer Relationship

Length of Relationship (years)	Number	Percent
<5	427	43
5-8	213	21
9-12	160	16
13-16	70	07
17 or more	131	13
All (Average)	1001	100

Average daily balances increase with the length of the relationship up to 9-12 years and then start to decline as those with longer relationships tend to be paying loans off faster than they are taking out new ones (Table 61).

Table 61. Average Daily Balance by Length of Customer Relationship

Length of Relationship (Years)	Dollars
Less than 5	105,475
5-8	143,403
9-12	173,258
13-16	162,491
17 or more	108,809
All (Average)	127,513

Interest rates tended to decline as relationship length increased up the 9-12 year relationships (Table 62), after which they tended to increase. This is at least partly due to changes in loan volume. Lower rates are charged on larger loans. However, rates were considerably higher for relationships over 12 years with the highest rates charged to those who had been customers 17 or more years. This difference is not due to loan volume since relationships of less than five years had very similar average balances but were charged 28 basis points less than those with 13-16 year relationships. Also, those with over 17 year relationships paid about 50 basis points higher rates than those with 5-12 year relationships with about the same balances. Clearly lenders were able to charge higher rates to borrowers with longer term relationships.

Table 62. Average Interest Rate Earned^a by Length of Customer Relationship Portfolio Average

Length of Relationship (Years)	Percent
<5	7.14
5-8	6.98
9-12	6.92
13-16	7.42
17 or more	7.53

^a Total interest income divided by average daily balance.

Loan officer and total lender time spent per relationships were not closely related to the length of customer relationships (Table 63). On the other hand, time per dollar of loan volume was consistent with changes in balances with time declining as relationships lengthened to 9-12 years and then declining.

Table 63. Time Used per Loan Relationship by Length of Customer Relationship

Length of Relationship (Years)	Loan Officer Hours		Total Lender Hours	
	Per Relationship	Per \$1,000 of Loan	Per Relationship	Per \$1,000 of Loan
<5	6.44	.061	10.43	.099
5-8	6.82	.048	12.18	.085
9-12	5.99	.035	10.85	.063
13-16	6.53	.040	10.94	.067
17 or more	5.33	.049	9.51	.087

Total personnel costs peak for 5-8 year relationships and then decline (Table 64). Lowest costs per dollar of loan occur at 13-16 year relationships. Although dollars per relationship are lower for longer term relationships (17 or more years) loan volume drops even more sharply. Short-term relationships, which, of course, include new relationships are the most costly to serve.

Table 64. Personnel Costs by Length of Relationship^a

Length of Relationship (Years)	Dollars per Relationship	Basis Points Per Dollar of Loan
<5	380	36
5-8	460	32
9-12	432	25
13-16	370	23
17 or more	317	29
All (Average)	396	31

^a Includes loan officer, officer vehicle, credit analyst, accounting, supervisor, credit committee, new relationship costs, and attorney fees.

Profit per relationship increased with length to 13-16 year relationships (Table 65). Although loan volume is already dropping by that time, it is still quite high, only a little below the peak, and the interest rate paid is higher than with shorter-term relationships. In addition personnel costs decline to that point. Although the 17 or more year relationships pay even higher rates, their loan volume is considerably lower and personnel cost per dollar of loan are higher.

**Table 65. Relationship Profitability by Length of Customer Relationship
Dollars per Relationship, Borrower Average**

Length of Relationship (years)	Underwriting & Servicing Income	Net Non-loan Income	Write-offs	Total Profitability	Total w/ Average Write-offs ^a
< 5	2,504	84	-12	2,576	2,422
5-8	3,345	113	-237	3,221	3,292
9-12	4,005	48	-50	4,003	3,887
13-16	4,794	28	-1,383	3,439	4,656
17 or more	3,452	32	-77	3,407	3,318
All (Average)	3,183	75	-166	3,092	3,092

^a With write-off estimated at average write-off per dollar of average daily balance for all relationships, multiplied by average daily balance.

Non-loan services income is higher for newer borrowers with peak income for 5-8 year relationships. These newer borrowers are expanding their businesses and are more likely to be younger borrowers who view use of services as a normal part of their management.

Profitability per dollar of loan with average write-offs is higher for relationships over 12 years than for shorter term relationships (Table 66). These longer term borrowers tend to pay higher interest rates which more than offset modest differences in personnel costs and income from non-loan services.

Table 66. Relationship Profitability, Basis Points Per Dollar of Loan by Length of Customer Relationship, Portfolio Average

Length of Relationship (years)	Underwriting & Servicing Income	Net Non-loan Income	Write-offs	Total Profitability	Total w/ Average Write-offs^a
<5	237	8	-01	224	232
5-8	233	8	-16	225	228
9-12	231	3	-03	231	221
13-16	295	2	-85	212	284
17 or more	317	3	-07	313	307
All (Average)	250	6	-13	243	243

^a Includes average write-offs for all borrowers.

Number of Non-Loan Services

A basic principle of finance is that increasing the number of the lender's services that a customer uses increases profitability. A customer using more services is more likely to remain with the institution rather than switch to the competition because the cost of switching all those services could be high. This may allow charging higher rates or fees with low risk of losing the customer. Also, if all services are with one institution, the borrower is less likely to be subjected to advertisements and personal appeals from other lenders.

Non-loan services included checking accounts, savings accounts, certificates of deposit, tax preparation, record keeping, appraisal, leasing, consulting, and some other services such as safe deposit boxes, tax planning, IRA accounts, money market accounts and payroll (Table 67). Checking and saving accounts, as well as tax preparation and record keeping were the most used services. Trust services, insurance, brokerage services were used by none of the relationships studied. Data on the total income received by the lender for each service were collected. In general commercial bank borrowers used primarily deposit services and Farm Credit System borrowers used other services such as tax preparation, record keeping or consulting.

Table 67. Frequency of Use of Non-Loan Services

Non-Loan Service	Percent
Checking account	30
Savings account	12
Tax preparation	09
Record keeping	06
Consulting	03
Appraisal	02
Certificates of deposit	02
Leases	01
Other	06
None	29

To estimate the direct contribution of these services to profitability, lenders were asked to indicate their costs per dollar of income for each of these services, from which the net income rate for each service was determined. Only two or three lenders offered most of the individual services, so the net income rates are not reported here. The net income rates were multiplied by the gross income received for each service by each individual relationship to determine the contribution to profitability provided by any service.

Over half of the borrowers used no non-loan services (Table 68). A large portion these relationships were Farm Credit System borrowers because they do not offer deposit services and many of the other services are short term in duration rather than continuing services. Only five percent of the borrowers used three or more services.

Table 68. Number of Farms by Number of Services Provided

Number of Non-Loan Services	Number	Percent
0	542	54
1	259	26
2	147	15
3 or more	<u>53</u>	<u>05</u>
Total	1001	100

The number of non-loan services used is closely related to loan volume (Table 69). People who use more non-loan services generally have larger loan balances. Larger businesses have a need for a wider array of services and some services only become feasible for larger businesses. Also, since some services are only used intermittently for particular situations, a larger business which is likely to face any situation more frequently is apt to be using more services in any year.

Table 69. Average Daily Balance by Number of Non-loan Services Provided

Number of Non-Loan Services	Dollars
0	99,150
1	141,922
2	162,011
3 or more	249,019
All (Average)	127,513

Interest rates are not related to the number of services except that those with the most services (3 or more) were charged lower rates (Table 70). This may be related to the higher loan volume and it may be that borrowers who use a number of services are viewed as lower risk, and thus, are charged a lower rate.

Table 70. Average Interest Rate Earned^a by Number of Non-loan Services

Number of Non-Loan Services	Percent
0	7.7
1	7.9
2	7.8
3 or more	7.5
All (Average)	7.8

^a Total interest income divided by average daily balance.

The relationship between number of non-loan services and personnel costs appears to be weak. Time used per relationship tends to increase as the number of non-loan services increase, with a leveling off of time for those with three or more services (Table 71). However, most of that change appears to be the result of changes in loan volume. Hours spent per dollar of loan increase only very slightly as more non-loan services are added until reaching a peak at two services and then declining for those with three or more services. Personnel costs showed a similar trend with costs per dollar of loan relatively constant for zero to two services and then declining for those with three or more services (Table 72).

Table 71. Time Used per Relationship by Number of Non-Loan Services

Number of Non-Loan Services	Loan Officer Hours		Total Lender Hours	
	Per Relationship	Per \$1,000 of Loan	Per Relationship	Per \$1,000 of Loan
0	5.00	.050	7.80	.079
1	7.40	.052	13.58	.096
2	8.73	.054	15.70	.097
3 or more	7.70	.031	14.12	.057

Table 72. Personnel Costs by Number of Non-Loan Services^a

Number of Non-Loan Services	Dollars per Relationship	Basis Points Per Dollar of Loan
0	308	31
1	481	34
2	528	33
3 or more	516	21
All (Average)	396	31

^a Includes loan officer, officer vehicle, credit analyst, accounting, supervisor, credit committee, new relationship costs, and attorney fees.

Profit per relationship increases as the number of non-loan services increases (Table 73). On average adding a service adds about \$1,750 to relationship profitability. Part of this is undoubtedly due to the increasing loan volume, but part is also due to rising net non-loan income and declining write-offs.

Table 73. Relationship Profitability by Number of Services, Dollars per Relationship, Borrower Average

Number of Services	Underwriting & Servicing Income	Net Non-loan Income	Write-offs	Total Profitability	Total w/ average Write-offs^a
0	1,733	00	-283	1,450	1,567
1	4,332	157	-44	4,445	4,323
2	5,272	85	-06	5,351	5,191
3 or more	6,552	436	00	6,988	6,822
All (Average)	3,183	75	-166	3,092	3,092

^a With write-off estimated at average write-off per dollar of average daily balance for all relationships, multiplied by average daily balance.

Net non-loan income increases erratically as number of non-loan services increase. The level of net income obtained from non-loan services varies considerably between services. Some services are offered at near cost as a way of providing customer value. The data for this study were collected during a period of low and declining interest rates. This made deposit accounts less profitable than they might be in other time periods. Some actually had negative profitability. The existence of services with little or no profit contributes to the erratic profitability trend with a higher number of services.

Write-offs consistently declined with rising numbers of non-loan services. There are several possible explanations for this result. Many of the services are designed to improve the management of the business. Examples include consulting and record keeping. Farms using these services may be less likely to default. Secondly, farms with financial problems may be less likely to be able to afford non-loan services. Finally, relationships in default may cancel all non-loan services because of their financial position.

Although the relationships between number of services and write-offs held on a dollar of loan basis as well as relationship basis, total profitability per dollar of loan increased up to two services and then declined (Table 74). Loan volume increased more rapidly than profitability for those with three or more services. Also, those with three or more services were charged lower interest rates than those with fewer. It may be that those with three or more services are viewed as better managers or as more loyal customers that should be rewarded with lower rates.

Table 74. Relationship Profitability Per Dollar of Loan by Number of Non-Loan Services, Portfolio Average^a

Number of Services	Underwriting & Servicing Income	Net Non-loan Income	Write-offs	Total Profitability	Total w/ average Write-offs ^b
	-----Basis Points-----				
0	175	00	-29	146	162
1	305	11	-03	313	303
2	325	05	00	330	317
3 or more	263	18	00	281	268
All (Average)	249	06	-13	242	242

^a Average dollars divided by average ADB.

^b Includes average write-offs for all borrowers.

There is a definite relationship between number of non-loan services and length of relationship (Table 75). More services add to longevity. Although adding one non-loan service appears not to improve longevity for small borrowers, it improves longevity for larger borrowers. Adding the second or more services adds to longevity for all size groups. The second and third services add about three years each to relationship length.

Table 75. Length of Customer Relationship by Size and Number of Non-Loan Services

Number of Non-Loan Services	Size of Relationship			All Farms ^a
	Under \$100,000	\$100,000 to \$400,000	Over \$400,000	
-----Years-----				
0	8.9	7.5	7.9	7.6
1	7.5	9.5	9.6	7.5
2	10.3	12.0	10.1	10.3
3 or more	14.0	14.4	15.0	13.6
All (Average)	9.3	9.4	9.7	8.0

^a Includes new relationships which are excluded from size categories.

Establishing New Relationships

One of the costs of establishing new relationships is the time and energy spent on cold calls and other contacts designed to encourage potential customers to do business with the lender. To estimate these costs, loan officers were asked to indicate their efforts during the two prior years. They provided information on the number of visits, time

spent per visit, miles traveled and time spent in phone contact. These costs were included in the profitability calculations. The physical data on these efforts are presented in Table 76.

**Table 76. New Relationship Development Resource Use and Costs
In Two Years Prior to Year of Relationship Establishment**

Item	Relationship Size	
	Less than \$100,000	\$100,000 or More
Number of visits to farm	0.89	1.64
Hours spent visiting farm	1.80	2.90
Phone hours	0.73	1.60
Total Hours	2.53	4.50
Miles traveled	47	121
New relationship cost	\$103	\$207
Average loan balance	\$29,838	\$255,012
Percent of new all borrowers	76	24
Percent of borrowers visited	46	57
Percent of borrowers phoned	47	67

As expected, more effort was expended on larger borrowers (\$100,000 or more) than small ones (less than \$100,000). About half of the small borrowers and two-thirds of the large borrowers were contacted, either by a visit to the farm or by phone, in the two years prior to becoming a borrower of this lender. The average number of visits per farm indicates that small borrowers that were visited received an average of nearly two visits while large borrowers received about three visits. Total loan officer time spent was about 2.5 hours for small loans and 4.5 hours for larger loans.

It should be remembered that these costs only include costs for those borrowers who ultimately became borrowers. Lenders undoubtedly spent similar amounts of time on other borrowers who did not develop relationships with the lender. The true cost of new relationship development would need to factor in the yield of new relationships per potential borrower contacted.

Customer Lifetime Value

To this point the study has considered the annual profitability of a borrower. In order to understand the long-term profitability of a borrower it is important to consider how annual profitability is likely to change over time. Perhaps the most obvious example of the importance of this analysis is provided by the case of borrowers in different risk categories. A medium risk borrower has a much higher likelihood of becoming a non-accrual or loss borrower and incurring write-off costs than a low risk borrower. As a result, they are charged higher rates than low risk borrowers. Assessing the desirability of a medium risk borrower based on only one year of profits overestimates the longer term value of that customer compared to a low risk borrower. In order to accurately estimate the long-term value of the customer, it is necessary to consider both the one-

period returns and the likelihood that the borrower will transition to more or less favorable risk categories.

Similarly, a beginning farmer may provide only modest profitability for the lender, but considering the likelihood that this borrower will become a growth or major growth borrower could result in a much higher level of long-run profitability than a currently stable borrower who is quite profitable, but is more likely to deteriorate than improve over time. As these examples indicate, the long run profitability of a borrower may be quite different from the short run or one year profitability.

In an effort to provide a better measure of the long-run profitability of borrowers, customer lifetime value was estimated. Two separate lifetime value models were considered, a size/risk model and a business stage model. Essentially, these models calculate the profitability generated over a several year period when a borrower starts in a particular size/risk or business stage. The model allows borrowers to move into different stages over time. These movements are based on the likelihood that the borrower will remain in the current size/risk or business stage or transition to another size/risk or business stage during each year. In order to develop the models it was necessary to develop transition matrices that indicate the probability that a borrower in one size/risk category or business stage will transition to another size/risk category or business stage in later years. These transition matrices were then used to estimate the profitability of borrowers in each stage and risk category.

Lifetime Values by Business Stage

Three sets of data were used to develop the business stage transition matrices. The first data set contains information on customer retention rates by business stage. The lenders provided estimates of these retention rates. The median reported value for each stage was used in the analysis (Table 77). These data indicate the likelihood that a borrower in each business stage will continue to borrow from the same lender. For instance, lenders indicated that on an annual basis 96.2% of stable borrowers remained in the portfolio and 3.8% left the portfolio. The borrowers could leave for a variety of reasons ranging from normal repayment of the loans, the borrower's dissatisfaction with the lender, or the lender's dissatisfaction with the borrower.

Table 77. Retention and Exit Rates by Business Stage

Business Stage	Retention Rate (Percent)	Exit Rate (Percent)
Beginning	95.0	5.0
Growth	96.2	3.8
Major growth	99.2	0.8
Stable	96.2	3.8
Transferring	94.4	5.6
Declining	85.9	14.1
Not in business	50.0	50.0

The second critical data set is the distribution of the number of years that borrowers remain in a business stage. The number of years that each borrower had spent in his current stage was collected from loan officers. These data provide a snapshot of the length of time that borrowers spend in each of the business stages. The data on distribution by stage is presented in Table 78. For instance, 14.66 percent of the borrowers in the growth stage had been in the growth stage for three years.

Table 78. Distribution of Relationships by Period in Stage

Years in Stage	Stage					
	Beginning	Growth	Major Growth	Stable	Transferring	Declining
	----- Percent ^a -----					
1	49.34	29.32	66.19	7.98	15.25	23.63
2	15.16	34.75	22.35	18.70	36.98	24.19
3	32.66	14.66	3.05	11.10	21.66	14.78
4	1.42	8.09	3.86	5.20	15.63	7.50
5	1.42	4.32	3.86	24.73	7.61	16.86
6	0.00	1.19	0.00	1.11	0.00	1.95
7	0.00	0.47	0.68	1.49	0.34	0.12
8	0.00	1.30	0.00	0.77	0.89	1.83
9	0.00	0.00	0.00	0.33	1.17	0.00
10	0.00	3.69	0.00	15.54	0.47	8.24
11 or more	0.00	2.20	0.00	13.06	0.00	0.91

^a Totals may not add to 100.00 due to rounding.

Although these data indicate the period of time borrowers have been with the lender at one point in time, they can also be interpreted as the distribution of time that borrowers stay with the lender. That is, viewing these data as a snapshot of the flow of borrowers through time implies that 29.32 percent of growth borrowers stay in the growth stage for only one year and another 34.75 percent of the original growth borrowers will exit the stage after two years. These data allow one to determine the likelihood that borrowers will transition from the various stages after a given amount of time.

The final step in the process is to determine the stage to which the borrowers transfer (if they do not exit). The third set of data indicates which stage the borrowers move into from each stage. The data for this table (Table 79) come from information requested on the current and prior stage of each relationship. Considering stable borrowers, 33.18% transitioned to growth, 4.9% to major growth, 17.35% to transferring, 39.75% to declining and 4.83% to not in business.

Table 79. Distribution of Movement Between Business Stages

Stage moving from:	Stage moving to:						
	Begin-ning	Growth	Major Growth	Stable	Trans-ferring	Declin-ing	Not in Business
	----- Percent of Borrowers Moving ^a -----						
Beginning	0	14.87	1.00	83.86	0.00	0.17	0.10
Growth	0	0.00	2.82	93.31	0.74	2.65	0.49
Major growth	0	24.36	0.00	47.68	24.51	2.37	1.07
Stable	0	33.18	4.90	0.00	17.35	39.75	4.83
Transferring	0	3.71	0.00	34.38	0.00	61.91	0.00
Declining	0	0.00	0.00	17.10	1.31	0.00	81.59

^a Totals may not add to 100.00 due to rounding.

The final transition matrices are developed from these three sets of data (Tables 77, 78 and 79). The matrices indicate the probability that a borrower in one stage will transition to another stage. The matrices are dependent upon the amount of time that the borrower has spent in the current stage. For example, the transition matrix in Table 80 shows the probability that borrowers will move to other stages after spending one year in each of the current stages (rows).

The first row of Table 80 is developed in the following manner. The chance that a beginning borrower will exit is indicated by the retention table (Table 77). Five percent of beginning borrowers will exit, leaving 95 percent to remain as beginning farmers or transfer to a different stage. The proportion of borrowers who will transition from the beginning stage to another stage after one year is found in Table 78. Since 49.34 percent of the beginning borrowers will remain in that stage only one year, 50.66 percent of the borrowers will remain as beginning borrowers in year two. However, we must also consider the 5% exit rate for beginning borrowers when determining the proportion of borrowers that will remain in the beginning stage after one year. Thus, 50.66 percent (the total of beginning borrowers that remain beginning for more than one year) of the remaining 95 percent, or 48.13 percent of the original borrowers will remain as beginning farmers. Similarly, 49.34 percent (the percent of beginning borrowers that transition away from beginning after one year) of the 95 percent, or 46.87 percent will move on to other stages.

The 46.87 percent will be distributed among the other stages based on the rates of movement between stages from Table 79. Thus, 14.87 percent of the 46.87 percent, or 6.97 will move to growth. One percent of the 46.87 percent, or 0.47 percent, will move to major growth and 83.86 percent of 46.87 percent, or 39.31 percent, will move to stable. This process is then repeated for borrowers who begin in the other business stages.

Table 80. Distribution of Borrowers in Next Year After Being in Current Stage for One Year

Moving from (Current Stage)	Moving to (Next Year Stage)							
	Begin- ning	Growth	Major Growth	Stable	Trans- ferring	Declin- ing	Not in Business	Not a Customer
	----- Percent of Borrowers ^a -----							
Beginning	48.13	6.97	0.47	39.31	0.00	0.08	0.05	5.00
Growth	0.00	67.99	0.80	26.32	0.21	0.76	0.14	3.80
Major growth	0.00	15.99	33.54	31.31	16.09	1.56	0.70	0.80
Stable	0.00	2.55	0.38	88.52	1.33	3.05	0.37	3.80
Transferring	0.00	0.53	0.00	4.95	80.00	8.91	0.00	5.60
Declining	0.00	0.00	0.00	3.47	0.27	65.60	16.56	14.10
Not in business	0.00	0.00	0.00	0.00	0.00	0.00	50.00	50.00

^a Totals may not add to 100.00 due to rounding.

Since the movement of a borrower from one stage to the next depends on how long the borrower has been in the current stage, several of these matrices were developed. For instance, a borrower that has remained stable for several years may be more likely to enter the declining or transferring stage than a borrower that has only just entered the stable business stage.

The matrix for borrowers who have been in their current stage for two years is developed in the same manner using the same data sets. The only difference is that after one year in the stage, the proportion of borrowers that stay in the stage or move to the next stage is based on the number of farms remaining in the stage at the end of the prior year, rather than all of the farms originally in that stage.

To illustrate this point, again consider the case of beginning farms. Here, 15.16 percent of the original beginning farmers will leave after two years. However, only 50.66 percent of the original beginning farmers stayed for more than one year. This means that 29.92 percent of the beginning farmers that remained for one year will transition to another stage at the end of year two. This percentage is calculated by dividing the percent of the total beginning farmers that leave after two years (15.16%) by the percent of farmers that remain for one year (50.66).

This means that 70.08% (100% - 29.92%) of the remaining beginning borrowers will remain in the beginning stage for another year. These probabilities are then adjusted by the exit rate so that 66.58% of the borrowers remain in beginning for a third year (70.08%*95%), and 28.42% (29.92%*95%) will transition to another stage.

The probability that a borrower will move to a different stage must then be distributed amongst the various stages by multiplying them by the values in Table 79. In the case of beginning farmers, 4.23% (28.42%*14.87%) move to growth, 0.28% move to major growth (28.42% x 1%), 23.83 percent (28.42% x 83.86%) move to stable, 0.05% (28.42% x 0.17%) move to decline, and 0.03% (28.42% x 0.10%) move to not in business (Table 81).

**Table 81. Distribution of Borrowers in Next Year
After Being in Current Stage for Two Years**

Moving from (Current Stage)	Moving to (Next Year Stage)							
	Begin- ning	Growth	Major Growth	Stable	Trans- ferring	Declin- ing	Not in Business	Not a Customer
	----- Percent of Borrowers ^a -----							
Beginning	66.58	4.23	0.28	23.83	0.00	0.05	0.03	5.00
Growth	0.00	48.90	1.33	44.14	0.35	1.25	0.23	3.80
Major growth	0.00	15.98	33.60	31.28	16.08	1.55	0.70	0.80
Stable	0.00	6.49	0.96	76.65	3.39	7.77	0.94	3.80
Transferring	0.00	1.53	0.00	14.16	53.21	25.50	0.00	5.60
Declining	0.00	0.00	0.00	4.65	0.36	58.69	22.20	14.10
Not in business	0.00	0.00	0.00	0.00	0.00	0.00	50.00	50.00

^a Totals may not add to 100.00 due to rounding.

Similar transition matrices were developed for borrowers that had been in each stage for one to ten years (see Appendix B for other matrices). For some stages no borrowers remained in that stage for as long as 10 years. For example, no beginning farmers remained beginning for over 5 years and no farm stayed in major growth for more than 7 years.

The transition matrices conditioned on the number of years in the previous stage (Tables 80 and 81) are critical components of the lifetime value simulation¹⁰. Table 80 is a transition matrix for borrowers who have been in their current stage one year. Thus, a person who had been a beginning farmer one year has a 48 percent chance of being a beginning farmer the next year, a 7 percent chance of being in growth, a less than 1 percent chance of being in each major growth, a 39 percent chance of being stable and a five percent chance of exiting farming or moving to a different lender. Considering a beginning farmer who has remained in the beginning stage for two years, the probability of remaining in beginning is 67 percent (Table 81).

These matrices were used to simulate how a borrower's business stage might change over a 10-year period. This is done by assigning a borrower to an initial stage and subsequent stages based on the probabilities described in the probability transition matrices. The process begins with the assignment of the borrower to a business stage. The probabilities in Table 80 are then used to construct a cumulative probability distribution for this type of borrower.

Consider a beginning farmer. Based on the probabilities in Table 80 a borrower that starts in beginning has a 48.13% chance of staying in the beginning stage, a 6.97% chance of moving to growth, and so on. This probability distribution function is used to create a cumulative probability distribution function. Then, a random number is drawn from a uniform distribution between 0 and 1. This value is then compared to the

¹⁰ Transition matrices were also calculated and utilized for borrowers that spent more than two years in a stage. These matrices are reported in Appendix B.

cumulative probability distribution to determine the borrower's stage in period 2. The important calculations for the beginning farmer example are shown in Table 82. For instance, if the random number is 0.48, then the farmer remains in the beginning stage for another year.

Table 82. Example Year One Beginning Farmer Cumulative Distribution and Transitions Stages

Random Number Value	Farm Stage in Year 2
0 to 0.4813	Remain beginning farmer in year 2
0.4813 to 0.5510 (0.4813 + 0.0697)	Growth in year 2
0.5510 to 0.557 (0.5510 + 0.0047)	Major growth in year 2
0.5557 to 0.9488 (0.5557 + 0.39.31)	Stable in year 2
0.9488 to 0.9496 (0.9488 + 0.008)	Decline in year 2
0.9496 to 0.9501 (0.9496 + 0.0005)	Not in business in year 2
0.9501 to 1.00 (0.9501 + 0.0500) ^a	Exit, no longer a borrower of this lender

^a Totals do not add exactly to 1.00 due to rounding.

At the end of the year the process repeats itself. If the farmer has entered a new stage then the probabilities in Table 80 are used to make the new assignment. If the borrower has remained in the current stage then the cumulative probability distribution consistent with the number of years that the borrower has remained in the stage is used to make the assignment.

As an example, consider a beginning borrower that transitioned to growth after year one because the random number was between 0.4813 and 0.5510. At the end of year two this borrower has been in growth for one year, so the probability cutoffs are again determined from Table 80, except that the row of probabilities corresponding to growth is used to make the assignment. In this case the cumulative probability distribution would be as shown in Table 83.

Table 83. Example Year One Growth Farm Cumulative Distribution and Transitions Stages

Random Number Value	Stage in Year 3
Zero to 0.6277	Remain in growth for year 3
0.6277 to 0.6371	Move to major growth in year 3
0.6371 to 0.9490	Move to stable in year 3
0.9490 to 0.9515	Move to transfer in year 3
0.9515 to 0.9604	Move to decline in year 3
0.9604 to 0.9620	Move out of business in year 3
0.9620 to 1.00	Exit this lender in year 3

If the random number chosen for year 2 were 0.40, the farmer would stay in growth in year 3. In this case the probability cutoffs at the end of year 3 would be determined from the two year matrix, Table 81, because (s)he would have been in growth for two years.

In order to obtain the farmer's stage in each year, this process is continued to take the borrower through 10 years of transitions. Very few farmers will remain in the same stage for 10 years, so the ten-year matrix shown in Appendix B is rarely used.

Once a borrower's stage is determined for any year, the net income (profitability) for that year is selected from a distribution of the incomes observed in the sample data. This was accomplished by developing a cumulative distribution of the profitability levels observed in the data. While possible to use the mean and standard deviation and base incomes on the mean and a random number of standard deviations, the data are not necessarily consistent with the normal distribution.

Since the sample was stratified, the data were weighted to develop the distribution. For example, assume our sample included five growth farms with the characteristics shown in Table 84.

Table 84. Example Growth Farm Profitability Data

Observation	Sampling Weight	Profitability (Net Income)(\$)	Distribution Weight
1	0.06	3,000	0.273
2	0.06	3,500	0.273
3	0.04	2,000	0.182
4	0.04	4,000	0.182
5	0.02	1,000	0.091
Total	0.22		1.001 ^a

^a Total does not add to 1.00 due to rounding.

The sampling weights for each observation denote the proportion of the population that the observation represents. This takes into consideration the proportion of the population that is represented by this type of borrower and the sampling percentage rate.

The distribution weight is the proportion of the total sample of borrowers included in this group of borrowers (borrowers in the growth stage). The distribution weight for observation 1 is $0.06/0.22 = 0.273$.

The empirical cumulative distribution is then calculated as shown in Table 85 with observations arrayed from low to high profitability. A random number is drawn from 0 to 1 to determine the income for the year for the growth borrower described above. If the number drawn is .50, the income is \$3,000.

Table 85. Example Growth Farm Cumulative Profitability Distribution

Income (\$)	Percentage	Cumulative Distribution	Distribution Range
1,000	0.091	0.091	0.000 to 0.091
2,000	0.182	0.273	0.091 to 0.273
3,000	0.273	0.546	0.273 to 0.546
3,500	0.273	0.819	0.546 to 0.819
4,000	0.182	1.000	0.819 to 1.000

This process establishes the income for each year in the eleven-year period. The borrower is assumed to be in the initial stage for one year with the first transition taking place at the end of the first year. The borrower goes through ten transitions. The eleven years of income are converted to a present value by discounting by the firm's opportunity cost of capital. Since the objective is to determine the value of borrowers to lenders, the lender's opportunity cost of capital was used as the discount rate. The rate that lenders pay for funds to lend thus represents their opportunity cost.

Since the opportunity cost of capital is being used to value streams of income received over the next ten years, the appropriate rate should reflect the estimated rate over that period. Future rates are, of course, unknown. However, if we accept that future rates may be similar to past rates, historical rates may be a reasonable approximation of future rates. A high proportion of the funds borrowed by The Farm Credit System and commercial banks are short term funds whose rates are closely related to Treasury Bill rates. For this reason, the rates paid by the lenders in 2001 were indexed by the average Treasury Bill rate for the last ten year period. In 2001 the average cost of capital for the lenders in the study was 4.05 percent and the three-month Treasury Bill rate was 3.40 percent. Thus, lender cost was 65 basis points above the Treasury Bill rate. The average three-month Treasury Bill rate for the 10 years ending in 2001 was 4.49 percent. Based on a premium of 65 basis points over Treasury Bills, the ten-year average cost of capital was estimated at 5.14 percent. This rate was used to discount the ten-year stream of income for each simulated borrower.

The result of one iteration of the simulation is a series of 11 business stages and returns levels. This process is repeated 10,000 times to obtain an average result for that type of borrower. The average of the 10,000 simulations for borrowers starting in each stage provides an estimate of the average performance that the lender could expect when they establish a relationship with a borrower in a particular stage.

Results of Analysis by Stage

As borrowers starting in any stage move through time, their normal progression from stage to stage determines their profitability for the lender. The transitions through the stages can be illustrated by the case of beginning farmers and major growth borrowers. Table 86 shows how borrowers that started in the beginning stage transitioned over ten years. Beginning farmers tend to move to other stages within five

years. As they move from beginning, some move to growth or major growth and a larger proportion move to stable. After ten years of transitions nearly half of the borrowers have exited.

Table 86. Transition Through Time for Borrowers Starting as Beginning Farmers

Business Stage	Year										
	Start	1	2	3	4	5	6	7	8	9	10
	----- Percent of Borrowers ^a -----										
Beginning	100.0	48.1	31.9	2.6	0.2	0.0	0.0	0.0	0.0	0.0	0.0
Growth	0.0	7.0	7.8	11.1	10.0	8.9	7.5	6.7	6.7	5.7	5.1
Major growth	0.0	0.5	2.4	1.7	0.8	0.8	0.9	0.9	0.7	0.7	0.6
Stable	0.0	39.3	47.2	65.0	61.4	54.3	48.8	43.9	38.9	35.9	32.5
Transferring	0.0	0.0	1.3	2.9	3.8	4.1	4.3	4.0	3.8	3.5	3.1
Declining	0.0	0.1	2.0	4.8	6.8	9.2	9.7	9.8	9.4	8.6	8.5
Not in business	0.0	0.1	0.0	0.7	1.7	2.7	3.7	3.8	4.3	4.3	3.9
Exit	0.0	5.0	7.3	11.2	15.3	20.0	25.3	30.9	36.2	41.5	46.5
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

^a Data presented are rounded.

Only a third of major growth farms remain in that stage for more than one year (Table 87). Many move to stable and a number either go to growth or transferring. By the end of ten years of transitions a majority of those remaining with the lender are in the stable stage and about half are no longer borrowing funds from this lender.

Table 87. Transition Through Time for Borrowers Starting in the Major Growth Stage

Business Stage	Year										
	Start	1	2	3	4	5	6	7	8	9	10
	----- Percent of Borrowers ^a -----										
Beginning	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Growth	0.0	16.0	16.9	12.5	9.8	8.4	7.3	6.2	5.7	5.0	4.3
Major growth	100.0	33.5	16.7	12.6	9.6	7.2	5.7	4.6	3.6	2.9	2.4
Stable	0.0	31.3	41.0	42.7	43.5	41.7	39.1	36.3	33.3	30.8	28.0
Transferring	0.0	16.1	10.0	9.2	7.1	6.2	5.2	4.5	4.1	3.7	3.2
Declining	0.0	1.6	9.4	10.7	11.3	11.0	10.6	10.0	9.4	8.5	7.9
Not in business	0.0	0.7	0.3	1.9	3.2	4.1	4.6	4.7	4.8	4.4	4.3
Exit	0.0	0.8	5.8	10.5	15.5	21.5	27.4	33.6	39.2	44.8	49.9
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

^a Data presented are rounded.

The present value of the 11 years of income provides an indication of the lifetime value of the customer (Table 88). These values represent the discounted profits that could be expected from a borrower that had just entered the stage. The customers who are the most profitable are those who have just entered one of the growth stages when they start with the lender. These borrowers were the most profitable on a one year basis (Table 45) and tend to have higher loan volumes than the other stages. A borrower who

is in one of these stages at the time of their first loan is sure to go through this high profit, high loan volume period.

Table 88. Customer Lifetime Values by Business Stage^a

Stage	Mean CLV^b	Standard Deviation	% Less than Zero
Beginning farmer	\$19,394	\$18,726	2.03
Growth stage	26,526	27,915	2.08
Major growth stage	28,613	25,114	2.83
Stable	19,612	19,732	1.61
Transferring	17,080	14,986	0.51
Declining	8,008	11,266	6.05

^a Present value of eleven years of income

^b Customer Lifetime Value

The third most profitable business stage is a stable borrower. These borrowers tend to have strong loan volume, pay higher interest rates than growth borrowers and many of them will go through a profitable growth stage at some point during the 11 year period.

The least profitable stage is declining. These farms provided relatively low returns on a one-year basis (Table 45) so the percent of situations with negative income to the lender is much higher than the other stages (Table 88). Declining farms move to either of the growth stages only infrequently (Table 89) and a high proportion of them exit the lender during a 10 year period.

Table 89. Percent of Time Borrowers Spent in Each Stage by Initial Stage^a

Business Stage	Initial Stage^b					
	Beginning	Growth	Major Growth	Stable	Transferring	Declining
	----- Percent of Borrowers -----					
Beginning	16.6	0.0	0.0	0.0	0.0	0.0
Growth	6.9	25.9	8.4	5.4	2.2	0.5
Major growth	0.9	0.8	18.1	0.8	0.5	0.5
Stable	42.5	40.0	33.4	53.1	15.6	4.5
Transferring	2.8	2.7	6.3	3.1	25.0	0.5
Declining	6.3	6.4	8.2	8.0	13.5	24.7
Not in business	2.3	2.5	3.0	3.0	4.6	7.9
Exit	21.7	21.7	22.6	26.4	38.6	61.3
Total	100.0	100.0	100.0	100.0	100.0	100.0

^a Assuming that borrowers start with the lender at the time they enter the stage.

^b Data presented are rounded.

Transferring farms are somewhat less profitable than stable borrowers. Transferring borrowers have a higher chance of going into a declining stage or exiting and spend only short periods of time in either of the growth stages.

The long run performance of beginning borrowers shows a sharp contrast to their short run one-year profitability. Beginning borrowers had the lowest one-year profitability of all business stages (Table 45). However, over the eleven-year period their profitability was essentially similar to that of stable borrowers (Table 88). Over the eleven years, these borrowers spend somewhat more time in one of the growth stages and are less likely to go into decline or exit the lender.

Clearly, beginning borrowers represent good business for a lender. Although they are not very profitable in their initial period as a beginning borrower, over the long run they are just as profitable as a stable borrower who looks much more profitable in the short run.

Lifetime Values by Risk and Size

Customer lifetime values were estimated for the size and risk categories used for stratification of the sample. Like the stage analysis, size/risk analysis also used three sources of information. First, the retention rates for the size/risk classes were estimated by the lenders (Table 90). Lenders were asked to supply a five-year retention rate for borrowers in each of the nine size/risk categories. For borrowers in the 6 low and medium risk categories, the information was used to estimate an annual retention rate. Many of the lenders estimated that all of the borrowers in the high-risk categories would exit by the end of the five-year period. Thus, the retention rate was zero for the five-year period. This makes it impossible to estimate an annual rate over the five-year period using the same procedure that was used for low and medium risk borrowers. However, most of the lenders provided data on how long each of the high-risk borrowers of five years ago had remained a borrower before exiting. These data and some professional judgment were used to estimate retention rates for the high-risk categories.

Table 90. Retention and Exit Rates by Size and Risk

Size and Risk Level	Retention Rate (Percent)^a	Exit Rate (Percent)
Small size, low risk	95.6	4.4
Small size, medium risk	94.6	5.4
Small size, high risk ^b	40.0	60.0
Mid-size, low risk	98.0	2.0
Mid-size, medium risk	96.8	3.2
Mid-size, high risk ^b	45.0	55.0
Large size, low risk	98.8	1.2
Large size, medium risk	95.4	4.6
Large size, high risk ^b	50.0	50.0

a Median of values provided by lenders.

b Estimated from values provided by lenders. Data supplied were five-year retentions, many of which were zero, with some added data on when borrowers actually exited the lender.

The second piece of information used in the size/risk simulation was the lender risk rating for each borrower for the last four years. Although each lender utilizes their own risk rating system, it was possible to map each lenders rating system into three risk categories. Changes in risk levels were calculated from these categories.

The third piece of information was the loan volume change experienced by each borrower over the last five years. In order to calculate loan volume in earlier years, the loan volume change was calculated and divided by five. Then, the average daily balance for the survey year was modified for each succeeding prior year by the annual change. For example, if the loan volume had increased by \$50,000 over the last 5 years and the average daily balance in the survey year was \$150,000, the loan volume for the prior year was estimated at \$140,000, the second prior year was \$130,000 and so forth. These data were used to estimate a borrower's loan volume for each of the last four years, which correspond to the dates of the risk rating data for each borrower.

By combining the risk rating data and the loan volume for each year, four observations on loan volume and risk level data were developed for each borrower. Thus, each farm could have three possible changes in their size/risk category. These three years of change data were used to develop the probabilities of changing to another size/risk category from any given category. Next, the data were combined with the exit rate data to determine the probabilities that a farm will move to each strata or exit in that year (Table 91). For example, 88.03 percent of small, low risk borrowers remained small, low risk borrowers in the next year. However, the data do not account for the exit rate, which was 4.4 percent in this stratum. Thus, after considering exit, the probability of a borrower in the small, low risk strata staying in that strata for the next year is calculated by multiplying 88.03 percent by (1-0.044), which equals 84.16 percent.

Table 91. Distribution of Borrowers in Next Year After Being in Current Strata^a

Moving from (current strata) Strata Size/Risk	Moving to: (Next Year Strata)									
	1	2	3	4	5	6	7	8	9	Exit
	----- Percent -----									
1 Small, low	84.16	0.87	0.26	9.77	0.15	0.00	0.38	0.01	0.00	4.40
2 Small, medium	1.03	83.02	0.36	0.29	9.73	0.00	0.00	0.17	0.00	5.40
3 Small, high	6.80	1.06	31.26	0.00	0.00	0.76	0.00	0.00	0.12	60.00
4 Mid, low	5.62	0.13	0.00	81.01	1.95	0.15	8.86	0.28	0.00	2.00
5 Mid, medium	0.00	3.75	0.00	6.55	78.66	0.00	0.62	7.22	0.00	3.20
6 Mid, high	0.00	0.00	2.92	6.27	1.40	34.41	0.00	0.00	0.00	55.00
7 Large, low	0.00	0.00	0.00	1.43	0.00	0.00	94.36	2.83	0.18	1.20
8 Large, medium	0.00	0.00	0.00	0.00	2.42	0.00	0.00	92.21	0.77	4.60
9 Large, high	0.00	0.00	0.00	0.00	0.00	0.00	5.05	0.00	44.95	50.00

^a Based on four years of data, three data switch observations per relationship. Data for five institutions were used because historical risk data were not available for one institution. Observations were weighted based on relationships for the five institutions.

Next, the probability distribution of borrowers was converted to a cumulative distribution (Table 92). When simulating size/risk changes, the borrower's current strata determines which row of the cumulative distribution is evaluated. For example, a small, low risk borrower uses row 1. A random number from zero to one is drawn and its value determines the strata to which the borrower moves. In our example, if the number 0.85 is drawn, the borrower moves to strata 2 (small, medium risk). In the next year, row two of

Table 92 is used, since the borrower has moved to strata 2 (small, medium risk). This process is then repeated for ten transitions of a single borrower.

Table 92. Cumulative Distribution of Borrowers in Next Year After Being in Current Strata

Moving from (current strata) Strata Size/Risk	Moving to: (Next Year Strata)									
	1	2	3	4	5	6	7	8	9	Exit
1 Small, low	.8416	.8503	.8528	.9506	.9521	.9521	.9559	.9560	.9560	1.0000
2 Small, medium	.0103	.8405	.8441	.8470	.9443	.9443	.9443	.9460	.9460	1.0000
3 Small, high	.0680	.0786	.3912	.3912	.3912	.3988	.3988	.3988	.4000	1.0000
4 Mid, low	.0563	.0575	.0575	.8676	.8871	.8886	.9772	.9800	.9800	1.0000
5 Mid, medium	.0000	.0375	.0375	.1030	.8896	.8896	.8958	.9680	.9680	1.0000
6 Mid, high	.0000	.0000	.0292	.0918	.1059	.4500	.4500	.4500	.4500	1.0000
7 Large, low	.0000	.0000	.0000	.0143	.0143	.0143	.9580	.9862	.9880	1.0000
8 Large, medium	.0000	.0000	.0000	.0000	.0241	.0241	.0241	.9463	.9540	1.0000
9 Large, high	.0000	.0000	.0000	.0000	.0000	.0000	.0506	.0506	.5000	1.0000

The income of the borrower in each year is determined by the empirical cumulative distribution of incomes for farms of that stratum in the sample. The same procedure as described for Tables 84 and 85 was used to develop a cumulative income distribution. The profitability of all sample farms in the small, low risk strata was used to determine the distribution of incomes for that strata. The average profitability of each stratum is presented in Table 30.

In each year, once the borrower's stratum is selected, the income for that year is determined by drawing a random number between 0 and 1, and using it to determine the income from the cumulative distribution.

To determine the expected result for borrowers in each size/risk strata an individual borrower was moved through 10 annual transitions (10 years) a total of 10,000 times. The average of those 10,000 simulations is reported as the result.

Changes in Size/Risk over Time

Small, low risk borrowers tended to expand but remain low risk (Table 93). Only 25 percent of these borrowers were still small, low risk borrowers after 10 years. About 20 percent expanded to mid-sized (\$100,000 to \$400,000) low risk and about 15 percent expanded to large low risk farms (over \$400,000). A total of 8.6 percent moved to a medium risk category while only 0.3 percent ended up as high risk or loss borrowers. About 31 percent of these borrowers were no longer borrowing from the same lender at the end of the 10-year period. These borrowers either, paid off their loans, moved to another lender, or left farming.

**Table 93. Transition Through Time
for Borrowers Starting as Small, Low Risk Farmers**

Size and Risk	Year										
	Start	1	2	3	4	5	6	7	8	9	10
	----- Percent of Borrowers ^a -----										
Small, low	100.0	84.2	71.4	61.2	52.6	45.5	39.5	34.5	30.7	27.7	24.8
Small, medium	0.0	0.9	1.5	2.0	2.3	2.4	2.5	2.5	2.4	2.4	2.5
Small, high	0.0	0.3	0.3	0.1	0.2	0.2	0.1	0.1	0.2	0.1	0.2
Mid, low	0.0	9.8	16.2	20.0	22.5	23.8	24.1	24.1	22.7	21.5	20.4
Mid, medium	0.0	0.2	0.6	1.0	1.4	1.8	2.4	2.6	3.0	3.1	3.2
Mid, high	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.1	0.0
Large, low	0.0	0.4	1.4	3.1	5.0	6.9	8.7	10.4	12.3	13.7	14.8
Large, medium	0.0	0.0	0.0	0.2	0.4	0.6	0.9	1.3	1.9	2.4	2.9
Large, high	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1
Exit	0.0	4.4	8.5	12.4	15.7	18.8	21.7	24.5	26.7	28.9	31.2

^a Totals may not add to 100.0 due to rounding.

Consistent with their lower exit rate (Table 90), mid-sized, low risk borrowers were less likely to exit the lender, with only about 21 percent leaving by the end of the 10-year period (Table 94). Sixty-five percent of these borrowers remained low risk. About 14 percent reduced their loan volume to less than \$100,000. However, over 40 percent increased their loan volume over the \$400,000 level, clearly indicating that as a group average loan volume increased.

**Table 94. Transition Through Time
for Borrowers Starting as Mid-Sized, Low Risk Farmers**

Size and Risk	Year										
	Start	1	2	3	4	5	6	7	8	9	10
	----- Percent of Borrowers ^a -----										
Small, low	0.0	5.6	9.5	12.0	12.9	13.6	13.5	13.1	12.7	12.5	11.6
Small, medium	0.0	0.1	0.3	0.6	0.9	1.0	1.3	1.4	1.4	1.5	1.7
Small, high	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1
Mid, low	100.0	81.0	66.2	54.9	46.5	39.3	33.6	29.6	25.9	22.8	20.8
Mid, medium	0.0	2.0	3.1	3.8	4.0	4.0	4.2	4.2	4.1	3.9	3.6
Mid, high	0.0	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0
Large, low	0.0	8.9	15.6	20.6	24.4	27.5	29.8	30.9	32.0	32.6	32.6
Large, medium	0.0	0.3	0.9	1.7	2.7	3.6	4.4	5.2	6.3	7.2	8.0
Large, high	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.2	0.2	0.2	0.2
Exit	0.0	2.0	4.1	6.4	8.5	10.7	13.0	15.2	17.3	19.3	21.3

^a Totals may not add to 100.0 due to rounding.

Of the three size groups studied, the large low risk borrowers were the least likely to leave the lender. Only 16 percent of these borrowers paid off their loan or moved to another lender during the 10-year period (Table 95). However, 18 percent moved into a higher risk category. This movement appears to be unique to the large farms. Much lower percentages of the smaller farms moved into the medium risk category. Large farms tend to be managed by operators who are willing to take more risk. Frequently they became large farms by taking more risk. Further, farm size as used in this study refers to relationship total loan volume. Farms with large loan balances are more likely

to use greater leverage and thus, in higher risk situations. Any unfortunate event, such as disease, low yields, divorce or injury can set off a chain of events that will result in the farm moving into a higher risk situation.

**Table 95. Transition Through Time
for Borrowers Starting as Large, Low Risk Farmers**

Size and Risk	Year										
	Start	1	2	3	4	5	6	7	8	9	10
	----- Percent of Borrowers ^a -----										
Small, low	0.0	0.0	0.1	0.2	0.4	0.5	0.7	0.9	1.0	1.1	1.2
Small, medium	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.2	0.3
Small, high	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mid, low	0.0	1.4	2.5	3.4	3.9	4.4	4.6	5.1	5.4	5.6	5.6
Mid, medium	0.0	0.0	0.1	0.2	0.4	0.5	0.8	1.0	1.2	1.4	1.6
Mid, high	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Large, low	100.0	94.4	89.2	84.5	80.1	76.0	72.3	68.4	65.0	61.8	58.8
Large, medium	0.0	2.8	5.2	7.3	9.2	10.7	12.2	13.5	14.6	15.2	15.9
Large, high	0.0	0.2	0.3	0.1	0.2	0.3	0.4	0.5	0.3	0.4	0.5
Exit	0.0	1.2	2.6	4.4	5.9	7.4	9.0	10.6	12.5	14.3	16.0

^a Totals may not add to 100.0 due to rounding.

Medium risk borrowers have a much higher chance of exiting the lender within the next 10-year period (Tables 96-98). Generally 30 to 40 percent of these borrowers paid off their loan, moved to another lender or exited farming, sometimes with a lender write-off.

**Table 96. Transition Through Time
for Borrowers Starting as Small, Medium Risk Farmers**

Size and Risk	Year										
	Start	1	2	3	4	5	6	7	8	9	10
	----- Percent of Borrowers ^a -----										
Small, low	0.0	1.0	1.8	2.4	2.9	3.3	3.4	3.6	3.6	3.7	3.6
Small, medium	100.0	83.0	69.4	58.3	49.0	41.4	35.0	29.6	25.5	22.2	19.3
Small, high	0.0	0.4	0.5	0.1	0.3	0.3	0.3	0.2	0.2	0.2	0.2
Mid, low	0.0	0.3	1.3	2.4	3.4	4.5	5.7	6.4	7.4	7.7	8.1
Mid, medium	0.0	9.7	15.7	19.0	21.0	21.5	21.3	20.9	19.4	17.8	16.5
Mid, high	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Large, low	0.0	0.0	0.1	0.3	0.7	1.2	1.6	2.1	2.6	3.3	4.0
Large, medium	0.0	0.2	0.9	2.1	3.3	4.7	5.9	6.9	8.1	9.1	9.9
Large, high	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.1	0.1	0.0	0.1
Exit	0.0	5.4	10.5	15.3	19.4	23.1	26.8	30.2	33.1	35.9	38.4

^a Totals may not add to 100.0 due to rounding.

A number of these borrowers expanded loan volume. This could be caused by poor cash flows or result from the farmer borrowing more money to expand the business in an effort to make it more profitable. Some were successful, since 12 percent of borrowers moved from medium risk to low risk with either a mid-sized or large loan volume. The majority of those who expanded their loan volume (26 percent), however, remained at the medium level of risk.

Data presented earlier in this publication showed that mid-sized borrowers had lower write-offs than either larger or smaller businesses. The longer run simulations are consistent with those findings. Mid-size medium risk borrowers had lower exit percentages than either smaller or larger borrowers, 30 percent compared to 38-40 percent (Tables 96-98). Further, a higher proportion of medium risk mid-sized borrowers moved to low risk situations. Twenty-six percent moved from medium risk to low risk, compared to 12 percent for small borrowers and 4 percent for large borrowers. Still, the largest proportion, 44 percent, remained at the medium level of risk.

**Table 97. Transition Through Time
for Borrowers Starting as Mid Sized, Medium Risk Farmers**

Size and Risk	Year										
	Start	1	2	3	4	5	6	7	8	9	10
	----- Percent of Borrowers ^a -----										
Small, low	0.0	0.0	0.3	0.9	1.5	2.3	2.8	3.3	3.7	4.0	4.1
Small, medium	0.0	3.8	6.1	7.3	8.2	8.3	8.2	7.6	7.2	7.0	6.5
Small, high	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.1
Mid, low	0.0	6.6	10.7	12.9	13.7	13.8	13.6	13.3	12.5	12.1	11.5
Mid, medium	100.0	78.7	62.6	50.4	40.7	33.6	28.2	24.1	20.6	17.5	15.4
Mid, high	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0
Large, low	0.0	0.6	1.6	2.7	4.3	5.6	6.9	7.9	8.8	9.4	10.0
Large, medium	0.0	7.2	12.3	16.3	18.9	20.6	21.4	21.9	22.3	22.5	22.2
Large, high	0.0	0.0	0.1	0.0	0.1	0.3	0.3	0.4	0.3	0.3	0.3
Exit	0.0	3.2	6.4	9.4	12.5	15.5	18.6	21.5	24.5	27.2	29.9

^a Totals may not add to 100.0 due to rounding.

Large medium risk borrowers tended to either stay as large medium risk borrowers or exit the lender (Table 98). Only about 13 percent ended up in other size or risk categories. Only modest numbers paid down their loans enough to move to smaller size situations, or improved their financial situation sufficiently to move into a lower risk class.

**Table 98. Transition Through Time
for Borrowers Starting as Large, Medium Risk Farmers**

Size and Risk	Year										
	Start	1	2	3	4	5	6	7	8	9	10
	----- Percent of Borrowers ^a -----										
Small, low	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.2	0.2	0.3	0.4
Small, medium	0.0	0.0	0.1	0.3	0.4	0.5	0.7	0.8	0.9	1.0	1.1
Small, high	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mid, low	0.0	0.0	0.2	0.4	0.8	1.0	1.3	1.5	1.8	1.9	2.0
Mid, medium	0.0	2.4	4.1	5.3	6.1	6.8	7.0	7.1	7.2	7.5	7.0
Mid, high	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Large, low	0.0	0.0	0.1	0.2	0.2	0.4	0.6	0.8	0.9	1.2	1.4
Large, medium	100.0	92.2	85.2	79.0	73.3	68.0	63.2	58.8	54.7	50.8	47.6
Large, high	0.0	0.8	1.1	0.5	0.9	1.0	1.0	0.9	0.9	0.8	0.8
Exit	0.0	4.6	9.3	14.4	18.3	22.2	26.2	30.0	33.4	36.6	39.7

^a Totals may not add to 100.0 due to rounding.

A slightly different perspective on the movement of borrowers through time is obtained by looking at the amount of time an average borrower spends in each stratum (Table 99). Low and medium risk borrowers tend to spend the highest proportion of their time in the strata in which they started. Movement out of any strata appears to, on average, take considerable time. This is particularly true for large borrowers. Since their size category is open ended, they can experience considerable change in the size of their business and their lending relationship without moving from their original strata. Small and mid-size borrowers tend to increase their borrowing while remaining in the original risk class.

Table 99. Percent of Time Spent in Each Strata Based on Beginning Strata

Strata, Size and Risk	Beginning Size and Risk Strata								
	1	2	3	4	5	6	7	8	9
	----- Percent of Time ^a -----								
1. Small, low	47.2	2.9	5.3	11.7	2.3	1.2	0.6	0.1	0.0
2. Small, medium	2.1	43.3	0.9	1.0	7.0	0.2	0.1	0.6	0.0
3. Small, high	0.2	0.3	4.5	0.0	0.0	0.6	0.0	0.0	0.0
4. Mid, low	20.5	4.7	1.9	42.1	12.1	4.9	4.2	1.1	0.3
5. Mid, medium	1.9	18.3	0.4	3.7	37.2	1.2	0.7	6.0	0.1
6. Mid, high	0.0	0.0	0.2	0.1	0.0	5.3	0.0	0.0	0.0
7. Large, low	7.7	1.6	0.6	25.5	5.8	2.2	75.0	0.6	6.8
8. Large, medium	1.1	5.1	0.1	4.0	18.6	0.6	10.7	67.3	0.8
9. Large, high	0.0	0.0	0.0	0.1	0.2	0.0	0.3	0.9	8.2
10. Exit	19.3	23.8	86.0	11.8	16.9	83.7	8.4	23.5	83.8

^a Totals may not add to 100.0 due to rounding.

High-risk borrowers tend to exit the lender quite soon, and thus, do not spend much time in any strata. In spite of that, however, they often do move through other strata on their way out of the lender's portfolio.

Resulting Portfolio Composition

As borrowers move through time they alter the composition of the lender's portfolio. An important component of portfolio composition is, of course, the number and character of new borrowers. New borrowers are important for expanding portfolio size and replacing borrowers who pay off their loans or move to another lender.

Without new borrowers, the character of the portfolio is determined by the changes occurring to the borrowers' businesses. Business expansion by existing borrowers increases loan volume while loan amortization and exit of borrowers reduces loan volume. The differential exit rates for borrowers of various sizes imply that changes in borrower numbers will differ from changes in loan volume.

Over time the number of small borrowers declines steadily. Many small borrowers either expand to a larger size or exit the lender (Table 100). The combined effect of these changes results in the small borrowers becoming a very small portion of the lender portfolio (Table 101).

Table 100. Portfolio Composition with No New Borrowers

Size and Risk	Year										
	0	1	2	3	4	5	6	7	8	9	10
	----- Percent of Borrowers ^a -----										
Small, low	54.2	47.1	41.3	36.4	32.0	28.4	25.2	22.4	20.3	18.6	16.8
Small, medium	6.9	6.4	5.9	5.6	5.2	4.8	4.5	4.1	3.8	3.5	3.4
Small, high	1.4	0.6	0.3	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Mid, low	24.1	25.3	25.5	25.1	24.6	23.7	22.6	21.6	20.1	18.7	17.6
Mid, medium	4.5	4.8	5.0	5.1	5.1	5.1	5.2	5.1	5.1	4.9	4.6
Mid, high	0.4	0.2	0.1	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.0
Large, low	6.8	8.8	10.7	12.6	14.3	15.9	17.3	18.3	19.4	20.2	20.7
Large, medium	1.5	1.9	2.5	3.0	3.6	4.2	4.7	5.2	5.9	6.5	7.0
Large, high	0.1	0.1	0.1	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.2
Exit		4.7	8.5	12.0	14.9	17.7	20.4	23.0	25.2	27.4	29.5

^a Totals may not add to 100.0 due to rounding.

Table 101. Portfolio Composition with No New Borrowers

Size and Risk	Year										
	0	1	2	3	4	5	6	7	8	9	10
	----- Percent of Dollars ^a -----										
Small, low	15.6	12.1	9.5	7.7	6.2	5.2	4.3	3.7	3.2	2.8	2.5
Small, medium	2.1	1.8	1.5	1.3	1.1	0.9	0.8	0.7	0.6	0.6	0.5
Small, high	0.4	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mid, low	27.9	25.9	23.6	21.2	19.2	17.2	15.6	14.4	12.7	11.4	10.6
Mid, medium	5.9	5.6	5.3	5.0	4.6	4.2	4.1	3.9	3.6	3.4	3.2
Mid, high	0.5	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Large, low	36.6	41.9	46.0	49.3	51.7	53.8	55.4	56.2	57.0	57.4	57.5
Large, medium	10.1	12.0	13.6	15.3	17.0	18.3	19.3	20.7	22.4	23.9	25.1
Large, high	0.8	0.4	0.3	0.1	0.2	0.3	0.3	0.4	0.3	0.4	0.5

^a Totals may not add to 100.0 due to rounding.

The proportion of mid-sized borrowers remained relatively constant during the ten-year period. Some small farms increased their loan volumes to become mid-sized. Some mid-sized borrowers expanded to become large borrowers and some exited.

Large borrowers have a lower exit rate than the other categories and small and mid-sized farms often expand to the large category. This results in large farms becoming an increasingly greater proportion of the borrowers in the portfolio.

Interestingly, the increase in numbers of larger farms more than offsets the decline in loan volume resulting from fewer small farms. This change expands the portfolio loan volume so that the mid-sized relationships, although relatively constant in number of borrowers, represents a declining share of total portfolio loan volume.

Although nearly 30 percent of the borrowers leave their lender in the ten-year period, the increased number of large relationships results in an increase in the size of the portfolio, even with no new borrowers (Table 102). In fact a portfolio with no new borrowers, but with normal increases in the size of existing relationships, results in nearly a doubling of portfolio size in a ten-year period.

**Table 102. Percent of Original Portfolio Remaining
Assuming No New Borrowers Were Added**

Year	Percent of Original Portfolio
01	113
02	125
03	137
04	148
05	159
06	167
07	174
08	183
09	189
10	193

Long-Run Profitability

The long-run profitability of borrowers in various size/risk strata showed similar relationships to that found using single year data (Table 103). Larger borrowers were more profitable. Medium risk borrowers continued to be more profitable than low risk borrowers even when the probability of the relationship moving into the high-risk category and incurring write-offs is incorporated.

Large high-risk borrowers have the highest probability of resulting in a write-off and the average loss with such borrowers is considerable. Although larger loans are very profitable, and even medium risk large loans are profitable, the frequency and magnitude of possible write-offs means that each lender must monitor these situations to be sure that they do not end up with a greater than proportionate share of large loans that become high-risk loans.

Table 103. Customer Lifetime Values (CLV)^a by Loan Volume and Risk

Customer Segment	Mean CLV^a	Standard Deviation	% Less than Zero
1 Small, low risk	\$21,020	\$27,870	01
2 Small, medium risk	23,238	34,086	01
3 Small, high risk	811	13,277	41
4 Mid-size, low risk	51,756	47,278	01
5 Mid-size, medium risk	57,120	62,071	01
6 Mid-size, high risk	7,426	24,244	24
7 Large, low risk	122,257	60,645	01
8 Large, medium risk	136,947	107,104	02
9 Large, high risk	-105,977	186,721	67

^a Present value of 10 year stream of profitability discounted by the average cost of funds.

As indicated above, the retention rates for high-risk borrowers were estimates based on less information than the other data in the transitions matrix. To test the sensitivity of the results to those estimates, the high-risk exit rates were varied by five percentage points and the simulations re-run. The results were not significantly different from that reported for the estimated values.

Summary

The profitability of agricultural loan relationships was studied using individual relationship data from six lenders with strong agricultural lending reputations. Data were collected for a random sample of borrowers stratified by size and level of risk. Size categories were (1) under \$100,000, (2) \$100,000 to \$400,000 and (3) over \$400,000 and were based on the total balance on all outstanding loans and line of credit commitments. Risk categories were (1) low, (2) medium and (3) high. To obtain an adequate sample for each size/risk category, sampling rates varied widely depending on the number of borrowers in each category. The final sample included 1,001 borrowers from a seven state region.

Data were collected from three sources. Data on all loans and services used for one full year for each relationship were obtained from the lenders' electronic and paper loan files. The loan officer for each relationship completed a questionnaire recording the time spent on the relationship and selected characteristics of the relationship. Each lender provided data on cost of funds, net income from non-loan services and personnel wage rates.

The net interest margin charged on low risk small loans was 120 basis points above that charged on similar risk large loans. The rate premium charged for medium risk loans over low risk was much higher for small loans (90 basis points) than for large loans (30 basis points).

Personnel costs were calculated from time and distance estimates made by the loan officer and cost per hour or mile provided by the lender. Personnel costs included all personnel that could be directly attributed to an individual relationship. The average relationship required 10.8 hours per year, which equated to 31.1 basis points cost per dollar of loan.

Loan fee income, excluding all pass through charges, averaged \$189 per relationship or 15 basis points per dollar of loan. Fees charged increased with relationship size, but were quite similar per dollar of loan over all size categories. The highest level of fees was charged on new relationships where fees averaged 101 basis points cost per dollar of loan.

Loan write-offs averaged \$166 per relationship and 13 basis points per dollar of loan. Mid-sized loans consistently had lower write-off costs than either small or large loans. This appears to result from lenders' ability and willingness to carefully evaluate

these loans and the readiness of the Farm Service Agency to take over these types of relationships.

The overall profitability of each relationship to the lender was calculated as the annual return to general overhead, fixed costs and profit. All costs that could be attributed directly to an individual relationship were included in the calculations. In general, income included net interest income, loan fees, loan servicing fees, interest assistance and net income from non-loan services. Costs included personnel costs for loan officers, credit analysts, accounting, loan officer supervisor and credit committee, as well as write-off costs. The average relationship earned \$3,092, which amounted to 243 basis points per dollar of loan.

Considerable economies of size in lending were evident from the data. Although these lenders spend considerably less time per relationship on small relationships (6.1 hours) than large relationship (15.6 hours), the average cost per dollar of loan was considerably higher for small loans (53 basis points) than large loans (16 basis points). However, the 120 basis point higher interest rates charged on small loans made them more profitable per dollar of loan than large loans.

Large relationships had a much higher profitability per relationship (\$15,844) compared to small relationships (\$1,143). It is clear, however, that small loans are profitable. In net, it appears that a lender with limited funds should focus on small loans because they give the highest return per dollar of loan, but lenders with limited staff should focus on large loans because they are more efficient to serve. Lenders without either limitation will achieve the highest profitability by serving all sizes.

High-risk loans require considerably more personnel costs per dollar of loan (83 basis points) than low risk loans (30 basis points). On average, lenders were receiving 110 basis point higher interest rates in an attempt to cover these higher costs and expected loan write-offs. Medium risk relationships were actually slightly more profitable than low risk relationships because of the higher rates received, and because in the year the data were collected the lenders experienced no write-offs on these borrowers. Further, based on servicing costs it appears that large medium risk borrowers receive about the same treatment from their loan officer as large low risk borrowers: both apparently get a complete detailed analysis and considerable attention. However, high-risk loans were quite unprofitable with an average write-off of \$5,216.

The predominant farm type in the study area was dairy, followed in order of importance by annual crops, other animals (beef, sheep, swine and poultry), permanent plantings and the green industry (nursery, greenhouse, sod). Differences in costs or profitability between farm types were modest. The green industry had slightly higher personnel costs, likely because the majority of the loan volume was represented by annual loans that must be re-written each year and the importance of rapidly changing inventory as collateral. The dairy industry was modestly (12 to 35 basis points) more profitable than other farm types, due at least in part to its predominance in the region studied.

The business stages of relationships were categorized as beginning farmers, growth, major growth, stable, transferring, not in business, or declining. Beginning farms made up only 5 percent of the relationships and 2 percent of loan volume. Nearly half of the relationships were stable. Businesses in either of the growth stages had the highest loan volumes and the highest profitability per relationship. However, these businesses were charged the lowest interest rates, possibly because (1) lenders were willing to give up part of the potential profit to get the loan, (2) lenders provided lower rates in the “heat of the battle” to get loans, or (3) the lending efficiencies in personnel costs etc. are being passed through to the borrower. This process resulted in major growth farms having the lowest profitability per dollar of loan.

Beginning farmers had much higher personnel costs (by 50 basis points) and had the lowest loan balances of all the business stages. This made these farms the least profitable per relationship. However, they were also charged higher interest rates so that they were among the highest in profitability per dollar of loan.

The personal stage of the primary operator of these businesses was categorized as single, married without children, married with young children, married with college-age children, silver years and retirement. Loan volume and personnel costs tended to follow a life-cycle pattern with personnel costs peaking for those with college age children and loan volume peaking for those in their silver years. Silver years farmers had the lowest personnel costs per dollar of loan due to high loan volume and a greater tendency to have stable businesses with longer relationships with the lender. Profitability followed the life cycle pattern with a gradual increase to a peak income for silver years borrowers and a decline for those in retirement. There was little relationship between personal stage and profitability per dollar of loan.

Analysis of these businesses based on the age of the youngest operator also showed a life-cycle relationship. Loan volume and relationship profitability peaked at 40-49 years. Personnel costs per dollar of loan declined with advancing age and bottomed out at 50-59 years. There was little relationship between operator age and profitability per dollar of loan.

Loan volume tends to increase with the lengthening of customer relationships up to 9-12 years, after which pay down of loan volume occurs. Interest rates tend to decline slightly as loan volume increases up to 9-12 year relationships. However, beyond that point, rates rise much more rapidly than the decline in loan volume would imply. Lenders are able to maintain higher rates to long-term relationships than other factors would justify.

The efficiencies of longer-term relationships appear to be small. Personnel costs per dollar of loan decline modestly as relationships lengthen up to 13-16 years. Costs for 13-16 year relationships are only 13 basis points lower than less than five-year relationships. Total relationship personnel costs continue to decline for longer

relationships, but loan volume declines even more rapidly, resulting in higher cost per dollar of loan.

Profitability per relationship trends upward with relationship length but peaks at 13-16 years even though loan volume peaks at 9-12 years. The later peak is achieved as increasing interest rates and declining personnel costs offset the effect of declining loan volume. Profitability per dollar of loan trends with interest rates with highest profit for the relationships longer than 12 years.

When each loan is counted as a separate service, the number of services provided is strongly related to profitability per relationship. This follows logically because loan volume is highly correlated with number of loans and higher loan volume relationships are more profitable.

When only non-loan services are considered, loan volume increases with the number of non-loan services. Interest rates tend to decline with more services, either due to the increased loan volume, or because the added services increase efficiency or reduce risk. Personnel costs per dollar of loan are one-third lower for those with the most non-loan services. However, that only amounts to seven to ten basis points per dollar of loan. The number of non-loan services is related to the length of customer relationships. Increasing the number of services from zero to 3 or more, nearly doubles longevity, from 7.6 to 13.6 years. The combined impact of these effects is that profitability per relationship increases strongly with number of number of non-loan services. On a dollar of loan basis, profitability peaks at two services.

In the two years prior to becoming a borrower, most new relationships had been visited by the loan officer at least once, and about half had been phoned. Average loan officer and vehicle costs in the two prior years for loans of less than \$100,000 were about \$100 per new relationship.

The long-term profitability (customer lifetime value) of borrowers was estimated by simulating the movement of borrowers through business stages for a ten-year period. Data on retention rates, duration in a stage and movement between stages were used to develop conditional transition matrices that indicated the probability of moving to each stage given the number of years the borrower had been in the current stage. Profitability was based on the distribution of incomes earned by the farms within each stage for the borrower sample. The program @RISK was used to simulate borrowers through 10,000 replications.

As was the case with the annual analysis, in the longer-run analysis the most profitable business stages were growth and major growth. Farms that start in the profitable stages are sure to go through these stages, which contributes to long run profitability.

Although beginning farmers had low profitability in the short run analysis, they were quite profitable in the long run. These farms have a quite high probability of going

through the profitable growth stages within a few years of starting farming. This makes them nearly as profitable over a ten-year period as stable borrowers. In the long run, beginning farmers are good business for the lender.

Customer lifetime values were also estimated based on the borrower's size and risk strata. Four years of historical data on risk rating and business size were used to develop a transitions matrix indicating the probability that a business of given size and risk level will change size or risk level. Income levels were taken from the distribution of incomes observed in the borrower sample by size and risk.

Over a 10-year period, a portfolio with no new loans might expect the number of small relationships to decline from 63 percent of the portfolio to about 20 percent. Loan volume for these farms drops from 18 percent of the portfolio to 3 percent. About 30 percent of the original relationships left the lender because they exited farming, paid off their loans, or moved to another lender. During that same 10-year period, the proportion of the borrowers with large balances increased from eight percent to 28 percent. Because the size of these borrowers is so large, their increased loan volume more than offsets the disappearance of small borrowers and the total portfolio size expands.

The long run profitability of borrowers in various size and risk strata showed similar relationships to that found using single year data. Larger borrowers were more profitable. Medium risk borrowers continued to be more profitable than low risk borrowers even when the probability of the loan moving into the high-risk category and incurring write-offs is incorporated.

Large high-risk borrowers have the highest probability of resulting in a write-off and the average loss with such borrowers is large. Although larger loans are very profitable, and even medium risk large loans are profitable, the frequency and magnitude of possible write-offs means that each lender must monitor these situations to be sure that they do not end up with a greater than proportionate share of large loans that become high-risk loans.

Conclusions and Implications

This study examined the costs and returns of agricultural lending at the borrower level. The analysis revealed several important results. These results should be of assistance to lenders as they develop profitable agricultural portfolios and may help the industry understand how agricultural lending may evolve.

One of the most important findings of the study was that all sizes of agricultural loan relationships can be profitable. Both large and small loan relationships make substantial contributions to lender overhead and profit.

The presence of substantial economies of size indicates that on a per unit basis, the cost of extending credit falls considerably as loan volume increases. This contributes

to high profit potential for large loans and implies that in the competitive agricultural lending market large borrowers will generally receive favorable rates.

Economies of size also mean that, other things equal, the rates on smaller loans will likely be higher. In fact our study found that the higher rates on small loans more than off-set higher servicing costs. Both of these findings represent areas of opportunity for lenders.

First, they should consider the approach used to underwrite and monitor the credit risk associated with smaller loans as opposed to the approach used on larger loans. Our results suggest that lenders spend less time on small loans, but that in relation to loan volume, the time requirements are still quite high. Perhaps additional use of rapid underwriting and less customer contact would allow the lender to be more profitable and offer better rates to smaller borrowers.

With respect to larger loans, the margin available to absorb losses is quite thin. The analysis indicates that losses on large loan can be substantial and can quickly erase the benefits of increased economies of size. Lenders must carefully and constantly examine the underwriting standards and approaches used to grant increasingly large loans.

In short, the differences between profitable lending on large loan relationships and small loan relationships are substantial. Lenders must consider whether a one size fits all approach to granting credit best serves their interests. Our results suggest that applying the same approach could be costly.

The study provided some information about the risk premium that lenders attach to medium risk as opposed to low risk loans. This risk premium must be large enough to compensate for increased monitoring and servicing costs as well as increased chances of default. While our study carefully estimated the increased servicing costs, the amount of data on loan losses was small. It would appear that the risk premium is sufficient to compensate for increased losses, but additional work is needed to better understand the true economic costs associated with loan losses. Likewise, it would be useful to understand the factors that increase the likelihood of losses and what can be done to reduce the magnitude of losses once they begin to occur.

The study indicates that some of the characteristics of customers contained in a lender's portfolio influence profitability. While some farm types such as dairy are modestly more profitable, the difference in profitability between farm types is small and is likely more a function of price cycles and weather variability than basic differences resulting from different types of agriculture. The modestly higher profitability of dairy loans may result from the predominance of dairy in the region studied.

The farmer's business stage was among the most important determinants of profitability. Those farms that are more likely to enter growth stages are more profitable. Successfully targeting these types of farms can lead to higher profit levels for lenders.

Beginning farmers had higher personnel costs per dollar of loan and low loan volumes, leading to low profitability during those beginning years. However, in the longer run these borrowers have a high tendency to go through growth stages that result in ten-year profitability levels similar to that of stable borrowers. Making loans to beginning farmers is not only a social benefit to the community, but also makes good business sense.

Borrower loan volume tends to follow a life-cycle pattern with increases in volume to 40-49 years of age, or those entering their silver years personal stage, and then declining. Profitability per relationship follows loan volume. However, there appear to be no real efficiencies per dollar of loan for different ages or personal stages.

Non-loan services *per se* add modestly to lender profitability. In addition, three or more non-loan services also result in a very small (7-10) basis point reduction in personal costs. Non-loan services are related to strong differences in profitability per relationship, but much of this difference is due to the high correlation between number of services and loan volume. The major benefit of non-loan services is likely that they lead to longer-term relationships.

Longer-term relationships benefit from a modest decline in personnel costs (approximately 13 basis points). However, the larger benefit is that lenders appear to be able to charge higher rates to longer-term relationships. Farm managers in longer-term relationships appear to be less interest rate sensitive than others.

Mid-sized loan relationships tend to consistently have lower loan losses than either small or large relationships. Lenders need to assess whether this finding implies a degree of under lending to this group of farmers.

Appendix A

Data Questionnaires

File data form – completed by research associate from loan files

Loan officer questionnaire – completed by the loan officer handling the account

Institution level data questionnaire – completed by a lender representative, usually the head of the agricultural lending department or senior management.

17. Current Loan Information

Loans and Owned Leases Outstanding During the Last 12 Months

12-month period _____ to _____

	1	2	3	4	5
Loan or Lease Type (L, LP, C, S, M)					
Original Term (Years)					
Original Loan Amount (\$) (if not line of credit)					
Credit Line (\$) (maximum \$ if reborrowable.)					
Fixed or Variable Interest Rate (F/V)					
If Fixed, Cost of Funds (%)					
Remaining Years					
Current Interest Rate (%) as of: _____					
Average Daily (or Monthly) Balance (\$)					
Interest Earned Last 12 Months (\$)					
Fees Paid Last 12 Months (\$):					
Origination					
Appraisal					
Construction loan fee					
Credit check					
Other: _____					
Other: _____					
Amount of Guarantee (%)					
Guarantee Portion Sold? (Y/N)					
If Sold, Servicing Fee (%)					
Secondary Market Eligibility (Y/N)					
Sold (Y/N)					
Servicing Fee Retained (%)					
Fees Paid by Institution: Specify: _____					
Special Servicing Category					
Amount Written Off:					
Last 12 Months					
Prior 12 Months					
Amount Currently Delinquent					
Times Over 30 Days Delinquent Last 12 Months					

17. Current Loan Information, CONTINUED
Loans and Owned Leases Outstanding During the Last 12 Months

12-month period _____ to _____

	6	7	8	9	10
Loan or Lease Type (L, LP, C, S, M)					
Original Term (Years)					
Original Loan Amount (\$) (if not line of credit)					
Credit Line (\$) (maximum \$ if reborrowable.)					
Fixed or Variable Interest Rate (F/V)					
If Fixed, Cost of Funds (%)					
Remaining Years					
Current Interest Rate (%) as of: _____					
Average Daily (or Monthly) Balance (\$)					
Interest Earned Last 12 Months (\$)					
Fees Paid Last 12 Months (\$):					
Origination					
Appraisal					
Construction loan fee					
Credit check					
Other: _____					
Other: _____					
Amount of Guarantee (%)					
Guarantee Portion Sold? (Y/N)					
If Sold, Servicing Fee (%)					
Secondary Market Eligibility (Y/N)					
Sold (Y/N)					
Servicing Fee Retained (%)					
Fees Paid by Institution: Specify: _____					
Special Servicing Category					
Amount Written Off:					
Last 12 Months					
Prior 12 Months					
Amount Currently Delinquent					
Times Over 30 Days Delinquent Last 12 Months					

18. Other Services Used By Customer:

Fees (\$)
(last 12 months):

- a.) Tax Preparation _____ \$ _____
- b.) Record Keeping _____ \$ _____
- c.) Appraisal _____ \$ _____
- d.) Consulting _____ \$ _____
- e.) Trust Services _____ \$ _____
- f.) Insurance Services _____ \$ _____
- g.) Brokerage Services _____ \$ _____
- h.) OTHER: _____ \$ _____
- i.) OTHER: _____ \$ _____
- j) Leases Paid on a Fee Basis (Total All Leases) \$ _____

	Lease Amount	Payment Amount	Term of Lease			Buyout %
			Original	Remaining	M/Y	
Lease 1						
Lease 2						
Lease 3						
Lease 4						

BANKS ONLY:

19. Deposit Accounts (average last 12 months):

Account Type	Average Balance (\$)	Interest Paid (\$)
Checking Account		
Savings Account		
CDs		
Other (specify): _____		

**CUSTOMER PROFITABILITY STUDY
LOAN OFFICER QUESTIONNAIRE**

Time Spent with Customer in Last 12 Months:

20. Loan Officer Time (Hours): _____
21. Loan Officer Car Use:
 Visits: _____
 Average total distance (to and return): _____ miles
22. Credit Analysts Time (Hours): _____
23. Accounting Time Cost (Hours): _____
24. Loan Officer's Supervisors' Time (Hours): _____
25. Number of Times Borrower's Loans Went to Credit Committee
 in Last 12 Months: _____

Circle the loans listed on Question 17 that were involved in credit committee evaluations.

All loans	loan 1	loan 2	loan 3	loan 4	loan 5
	loan 6	loan 7	loan 8	loan 9	loan 10

26. Attorney Fees for Normal Credit Functions: \$ _____
 (not passed through to farmer in last 12 months)

IF A NEW LOAN ACCOUNT

Loan Officer Contact in Two Years Prior to this 12 Month Period:

27. Number of Visits: _____
28. Time Spent Per Visit (Hours): _____
29. Miles Per Visit: _____
30. Phone Contact (Hours): _____

IF A LOSS LOAN ACCOUNT

- | | Last 12 months | Prior 12 months |
|------------------------------|-----------------------|------------------------|
| 31. Attorney Costs (\$): | _____ | _____ |
| 32. Court Fees (\$): | _____ | _____ |
| 33. Other Direct Costs (\$): | _____ | _____ |

FUTURE LOAN VOLUME

34. The Current Loan Volume of this Customer is: \$ _____ (from Question 16)
 The Loan Volume of this Customer in 5 Years (from the most recent 12 month period) is
 Estimated to Be: \$ _____

35. Stage of Growth of Business:

	<u>Current</u>	<u>Previous</u>
Beginning Farmer	_____	_____
Expansion Stage	_____	_____
Major Growth Now	_____	_____
Stable	_____	_____
Transferring	_____	_____
Declining	_____	_____
Not in Business	_____	_____
Years in Current Stage:	_____	

36. Personal Stages of Life:	Primary Operator		Second Operator	
	<i>Current Stage</i>	<i>Prior Stage</i>	<i>Current Stage</i>	<i>Prior Stage</i>
1. Single				
2. Married without Children				
3. Young Children				
4. College-Age Children				
Children Attending College? (Y/N)		X		X
5. "Silver Years"				
6. Retirement				
Years in this Stage		X		X
Divorce: Current/Recent (Y/N)				
In Past History (Y/N)				

36. Personal Stages of Life, CONTINUED:	Third Operator		Fourth Operator	
	<i>Current Stage</i>	<i>Prior Stage</i>	<i>Current Stage</i>	<i>Prior Stage</i>
1. Single				
2. Married without Children				
3. Young Children				
4. College-Age Children				
Children Attending College? (Y/N)		X		X
5. "Silver Years"				
6. Retirement				
Years in this Stage		X		X
Divorce: Current/Recent (Y/N)				
In Past History (Y/N)				

37. Did any of the loans for this relationship have interest assistance or subsidy during the last year? Enter percent interest assistance or subsidy rate where appropriate:

Loan from Q 17.	NYS Linked Deposit	Farm Service Agency	Other:define _____
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			

Institution Level Data Questionnaire

1. Costs of various services and funds. The numbers in parentheses are examples of the type of data that should be supplied for each question. These are examples only and are not estimates of the values for any lender. Some items are not applicable for some lenders. The table on the next page can be used to provide this information

- A. Tax preparation service costs per \$1 of fees (.80)
- B. Record keeping service costs per \$1 of fees (.90)
- C. Appraisal service costs per \$1 of fees (.85)
- D. Consulting service costs per \$1 of fees (.95)
- E. Trust Services cost per \$1 of fees (.70)
- F. Insurance service cost per \$1 of fees (.60)
- G. Brokerage service cost per \$1 of fees (.75)
- H. Other (1) service costs per \$1 or fees (.55)
 - a. Be sure to list the specific service for which the cost is provided
- I. Other (2) service costs per \$1 of fees (.50)
 - a. Be sure to list the specific service for which the cost is provided
- J. Lease costs per \$1 of lease fees (.10) for fee based leases
- K. Average non-interest cost of checking account balances per \$1 of balances (.01)
Average interest cost of checking account balances per \$1 of balances (.005)
- L. Average non-interest cost of savings account balances per \$1 of balances (.015)
Average interest cost of savings account balances per \$1 of balances (.018)
- M. Average non-interest cost CD balances per \$1 of balances (.017)
Average interest cost of CD balances per \$1 of balances (.02)
- N. Average non-interest cost of other account balances per \$1 of balances (.018)
Average interest cost of other account balances per \$1 of balances (.021)
- O. Cost per mile for car use (\$0.25)
 - a. This would be the average fleet cost per mile including depreciation
 - b. If all else fails, we could use the IRS allowance of 31.5 cents (or whatever it is now).
- P. Cost per hour of loan officer time (\$30)
- Q. Cost per hour of credit analyst time (\$25)
 - a. This would include the total costs including fringes of loan analysts per hour that can be assigned to accounts.
- R. Cost per hour for accounting time (\$20)
- S. Cost per hour of officer's supervisor's time (\$40)
 - a. This would be the total cost including benefits for direct supervisors of loan officers per borrower in the branch or office.
- T. Credit committee cost per loan (number of loan officers on credit committee (8) multiplied by the time per loan in review and meeting (1/2 hour) multiplied by the cost per hour for credit committee (\$75)) (\$300)
- U. Average cost of funds for variable rate loans. This is the cost of non-equity funds used in lending. It includes cost of borrowed funds, interest paid and costs of obtaining funds for deposit accounts.
- V. Percent of loans funded with equity capital.
- W. Estimated opportunity cost of equity capital. This is the rate of return expected to be earned by equity capital – what is expected, not what is desired!

Costs of Services and Funds	
Service cost per \$ of fees:	
A. Tax preparation	
B. Record keeping	
C. Appraisal	
D. Consulting	
E. Trust services	
F. Insurance	
G. Brokerage	
H. Other 1(list)_____	
I. Other 2 (list)_____	
J. Lease cost per \$ fee (fee leases)	
Cost per \$ of account balance:	
K. Checking accounts: Non-interest cost	
Interest cost	
L. Savings accounts: Non-interest cost	
Interest cost	
M. CD's: Non-interest cost	
Interest cost	
N. Other accounts: Non-interest cost	
Interest cost	
O. Cost per mile for car use	
Cost per hour:	
P. Loan officer	
Q. Credit analyst	
R. Accounting	
S. Supervisor	
T. Credit committee	
U. Cost of funds used for variable rate loans (average for the time period for which data were collected (i.e. November 1, 2000 through October 31,2001)	
January 20____	
February 20 ____	
March 20____	
April 20 ____	
May 20____	
June 20 ____	
July 20 ____	
August 20____	
September 20 ____	
October 20____	
November 20____	
December 20 ____	
V. Percent of loans funded with equity capital	
W. Opportunity cost of equity capital	

2. Data on the retention rate of different borrower groups.
 - a. This could be obtained by:
 1. Determining the exit rate by taking data from a “loans paid off file,” determining how many are in each size/risk group and dividing by the total number of loans in that group. The exit rate is then subtracted from 1.0 to get the retention rate.
OR
 2. Taking the list of borrowers (for the branch) as of 1996 and counting those in each group who left during the intervening five-year period. The number who have left divided by the total number in each size/risk category is then subtracted from one to get the retention rate.
OR
 3. Counting the number of people (proportion) in each group who left in the last year (and subtract from 1.0). If the number leaving varies from year to year or is very low, this approach could give unreliable data. Possibly, the same process could be repeated for the past two years if that would provide reliable data.

Retention Rate^a

Total Outstanding Relationship Balances			
Risk	Small <\$100k	Medium \$100k-\$400k	Large >\$400k
Low risk			
Medium risk			
Loss and non-accrual			

^a Percent of borrowers who continue to borrow from this institution (do not cut off their relationship with this institution). Those leaving would include those who have paid off their loans through normal amortization and those who borrow from another institution and pay out all of your loans.

Approximate retention rate by stage. Based on your analysis of the data above, please indicate the approximate retention rate for each of the business stages below. We realize this will be an approximation. Your best estimate will improve our analysis considerably.

<u>Business Stage</u>	<u>Retention Rate</u>
Beginning Farmer	_____
Expansion Stage	_____
Major Growth Now	_____
Stable	_____
Transferring	_____
Declining	_____

3. Sampling rates (This can be calculated from the number of borrowers in each strata from which the sample was drawn and the number of observations on which we have data, so only the number of borrowers).

Table 3. Number of borrowers in each strata from which sample was drawn

Risk	Total Outstanding Relationship Balances			
	New	Small <\$100k	Medium \$100k-\$400k	Large >\$400k
Low risk				
Medium risk				
Loss and non-accrual	XXXX			

Appendix B

Transition Matrices for Customer Lifetime Value Simulations

Matrices for borrowers who have been in a stage one and two years are Tables 80 and 81 of the text.

Totals in all tables below may not add to 100.0 due to rounding.

**Table B-1. Distribution of Borrowers in Next Year
After Being in Current Stage for Three Years**

Moving from (Current Stage)	Moving to (Next Year Stage)							
	Begin- ning	Growth	Major Growth	Stable	Trans- ferring	Declining	Not in Business	Not a Customer
	----- Percent of Borrowers -----							
Beginning	7.60	13.00	0.87	73.29	0.00	0.15	0.09	5.00
Growth	0.00	56.94	1.11	36.64	0.29	1.04	0.19	3.80
Major growth	0.00	6.44	72.78	12.60	6.48	0.63	0.28	0.80
Stable	0.00	4.83	0.71	81.64	2.53	5.79	0.70	3.80
Transferring	0.00	1.59	0.00	14.72	51.60	26.50	0.00	5.60
Declining	0.00	0.00	0.00	4.16	0.32	61.57	19.85	14.10
Not in business	0.00	0.00	0.00	0.00	0.00	0.00	50.00	50.00

**Table B-2. Distribution of Borrowers in Next Year
After Being in Current Stage for Four Years**

Moving from (Current Stage)	Moving to (Next Year Stage)							
	Begin- ning	Growth	Major Growth	Stable	Trans- ferring	Declining	Not in Business	Not a Customer
	----- Percent of Borrowers -----							
Beginning	47.50	7.06	0.48	39.83	0.00	0.08	0.05	5.00
Growth	0.00	59.59	1.03	34.16	0.27	0.97	0.18	3.80
Major growth	0.00	11.10	53.62	21.73	11.17	1.08	0.49	0.80
Stable	0.00	2.67	0.39	88.16	1.39	3.20	0.39	3.80
Transferring	0.00	2.10	0.00	19.43	37.89	34.99	0.00	5.60
Declining	0.00	0.00	0.00	2.95	0.23	68.67	14.05	14.10
Not in business	0.00	0.00	0.00	0.00	0.00	0.00	50.00	50.00

**Table B-3. Distribution of Borrowers in Next Year
After Being in Current Stage for Five Years**

Moving from (Current Stage)	Moving to (Next Year Stage)							
	Begin- ning	Growth	Major Growth	Stable	Trans- ferring	Declining	Not in Business	Not a Customer
	----- Percent of Borrowers -----							
Beginning	0.00	14.13	0.95	79.67	0.00	0.16	0.10	5.00
Growth	0.00	64.64	0.89	29.44	0.23	0.84	0.15	3.80
Major growth	0.00	20.55	14.86	40.21	20.67	2.00	0.90	0.80
Stable	0.00	13.84	2.04	54.48	7.24	16.58	2.01	3.80
Transferring	0.00	2.54	0.00	23.57	25.85	42.44	0.00	5.60
Declining	0.00	0.00	0.00	8.28	0.63	37.46	39.52	14.10
Not in business	0.00	0.00	0.00	0.00	0.00	0.00	50.00	50.00

**Table B-4. Distribution of Borrowers in Next Year
After Being in Current Stage for Six Years**

Moving from (Current Stage)	Moving to (Next Year Stage)							
	Begin- ning	Growth	Major Growth	Stable	Trans- ferring	Declining	Not in Business	Not a Customer
	----- Percent of Borrowers -----							
Beginning	0.00	14.13	0.95	79.67	0.00	0.16	0.10	5.00
Growth	0.00	83.26	0.36	12.07	0.10	0.34	0.06	3.80
Major growth	0.00	0.00	99.20	0.00	0.00	0.00	0.00	0.80
Stable	0.00	1.10	0.16	92.89	0.57	1.31	0.16	3.80
Transferring	0.00	0.00	0.00	0.00	94.40	0.00	0.00	5.60
Declining	0.00	0.00	0.00	2.20	0.17	73.05	10.48	14.10
Not in business	0.00	0.00	0.00	0.00	0.00	0.00	50.00	50.00

**Table B-5. Distribution of Borrowers in Next Year
After Being in Current Stage for Seven Years**

Moving from (Current Stage)	Moving to (Next Year Stage)							
	Begin- ning	Growth	Major Growth	Stable	Trans- ferring	Declining	Not in Business	Not a Customer
	----- Percent of Borrowers -----							
Beginning	0.00	14.13	0.95	79.67	0.00	0.16	0.10	5.00
Growth	0.00	90.30	0.17	5.51	0.04	0.16	0.03	3.80
Major growth	0.00	24.17	0.00	47.30	24.31	2.35	1.06	0.80
Stable	0.00	1.52	0.23	91.60	0.80	1.83	0.22	3.80
Transferring	0.00	0.41	0.00	3.84	83.22	6.92	0.00	5.60
Declining	0.00	0.00	0.00	0.16	0.01	84.97	0.76	14.10
Not in business	0.00	0.00	0.00	0.00	0.00	0.00	50.00	50.00

**Table B-6. Distribution of Borrowers in Next Year
After Being in Current Stage for Eight Years**

Moving from (Current Stage)	Moving to (Next Year Stage)							
	Begin- ning	Growth	Major Growth	Stable	Trans- ferring	Declining	Not in Business	Not a Customer
	----- Percent of Borrowers -----							
Beginning	0.00	14.13	0.95	79.67	0.00	0.16	0.10	5.00
Growth	0.00	78.81	0.49	16.23	0.13	0.46	0.09	3.80
Major growth	0.00	24.17	0.00	47.30	24.31	2.35	1.06	0.80
Stable	0.00	0.83	0.12	93.71	0.43	0.99	0.12	3.80
Transferring	0.00	1.23	0.00	11.42	61.19	20.56	0.00	5.60
Declining	0.00	0.00	0.00	2.45	0.19	71.57	11.69	14.10
Not in business	0.00	0.00	0.00	0.00	0.00	0.00	50.00	50.00

**Table B-7. Distribution of Borrowers in Next Year
After Being in Current Stage for Nine Years**

Moving from (Current Stage)	Moving to (Next Year Stage)							
	Begin- ning	Growth	Major Growth	Stable	Trans- ferring	Declining	Not in Business	Not a Customer
	----- Percent of Borrowers -----							
Beginning	0.00	14.13	0.95	79.67	0.00	0.16	0.10	5.00
Growth	0.00	96.20	0.00	0.00	0.00	0.00	0.00	3.80
Major growth	0.00	24.17	0.00	47.30	24.31	2.35	1.06	0.80
Stable	0.00	0.36	0.05	95.10	0.19	0.44	0.05	3.80
Transferring	0.00	2.50	0.00	23.15	27.05	41.69	0.00	5.60
Declining	0.00	0.00	0.00	0.00	0.00	85.90	0.00	14.10
Not in business	0.00	0.00	0.00	0.00	0.00	0.00	50.00	50.00

**Table B-8. Distribution of Borrowers in Next Year
After Being in Current Stage for Ten Years**

Moving from (Current Stage)	Moving to (Next Year Stage)							
	Begin- ning	Growth	Major Growth	Stable	Trans- ferring	Declining	Not in Business	Not a Customer
	----- Percent of Borrowers -----							
Beginning	0.00	14.13	0.95	79.67	0.00	0.16	0.10	5.00
Growth	0.00	35.93	1.70	56.24	0.45	1.60	0.30	3.80
Major growth	0.00	24.17	0.00	47.30	24.31	2.35	1.06	0.80
Stable	0.00	17.34	2.56	43.93	9.07	20.78	2.52	3.80
Transferring	0.00	3.50	0.00	32.45	0.00	58.44	0.00	5.60
Declining	0.00	0.00	0.00	13.23	1.01	8.55	63.11	14.10
Not in business	0.00	0.00	0.00	0.00	0.00	0.00	50.00	50.00

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