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**Influence of Agricultural Lending Policies
on Commercial Bank Loan Volume**

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Abstract

The effect of agricultural loan policies on changes in the loan volume of commercial banks for the 1986-88 period is estimated using OLS regression. Terms of credit, borrower analysis criteria and marketing policies explain a significant portion of loan volume changes.

Influence of Agricultural Lending Policies on Commercial Bank Loan Volume
Eddy LaDue and John Thurgood¹

Lending policies are generally established by credit institutions to assist in the development of a sound loan portfolio and improve communications with regulators (Bruton and Kinzer). Research on lending policies of agricultural creditors has generally focused on the quality of the agricultural portfolio. A number of studies have investigated various credit evaluation and loan monitoring procedures (Johnson and Hagan, Dunn and Frey, Weed and Hardy, Lufburrow, et al., Vandever, et al., Miller and LaDue, Sherman and Schrader and Pederson). However, the effect of these procedures and the other characteristics of lending policy on changes in the size of the loan portfolio have been given little consideration. Clearly there is a trade-off between portfolio quality and size. Further, other bank policies may have planned or inadvertent effects on loan volume.

The objective of this study is to investigate the extent to which the policies selected actually do affect loan volume. A model, which expresses changes in loan volume as a function of various policy variables, is developed and estimated using data on New York commercial banks for the 1986-88 period. In the discussion that follows we present (1) a description of the data sources and basic relationships observed, (2) a review of the model and variables used, (3) the results obtained, and (4) some implications and conclusions.

The Data

The data on agricultural loan policies were obtained using a mail survey of New York commercial banks (Thurgood). Banks surveyed were those with over \$1 million of agricultural loans outstanding on December 31, 1987, according to the Report of Condition and Income for Commercial Banks and Selected Other Financial Institutions (Call Reports) published by the Board of Governors of the Federal System. Forty of the 41 institutions meeting this criteria responded to the survey. Questionnaires were sent to the senior agricultural loan officer or senior loan officer responsible for agricultural loans where such identity was known. In the absence of this information, the survey was sent to the chief executive officer who was asked to forward the survey to the appropriate individuals. Thirty-seven banks provided usable questionnaires. Respondents providing the unusable questionnaires indicated that they did not have agricultural loans or had so few that they had no policies for agricultural loans. Two banks within the same holding company transferred loans from one to the other during 1988 as part of a territorial realignment process. Since these loans could not be accurately separated, the two banks were combined for the analysis.

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Survey respondents provided data about the specific characteristics of their agricultural loan policies for each year of the 1986-88 period. In general, agricultural policy at individual banks changed very little during the three years (reference to be supplied).

The surveyed banks had average December 31, 1988 assets of \$1.4 billion (median \$166 million). However, 17 percent of the banks had assets of under \$50 million and the assets of only 22 percent exceeded \$1 billion (Table 1). The agricultural loan portfolios averaged \$11 million with 39 percent of the banks having under \$2 million and 14 percent having over \$20 million. Forty-three percent of the banks had separate agricultural loan departments. Sixty-two percent of the banks had written agricultural loan policies. Respondents at banks without written policies were asked to refer to the set of bank policies that are applied to agricultural loans.

Table 1. Characteristics of Surveyed Banks
New York, 1988

Characteristics	Percent of Banks
<i>Total Assets (Million Dollars):</i>	
Under 50	17
50 - 99	17
100 - 199	19
200 - 299	11
300 - 999	14
1,000 and over	22
<i>Agricultural Loans (Million Dollars):</i>	
Under 2	39
2 - 9	17
10 - 14	22
15 - 19	8
20 and over	14
Agricultural Loan Department	43
Written Agricultural Lending Policy	62
	<u>Number</u>
Agricultural Lending Staff (average full time equivalent)	1.5
Agricultural Loans per Loan Officer (million dollars)	7.1

Data on agricultural loan volumes of individual banks were taken from the December 31 Report of Condition and Income for Commercial Banks and Selected Other Financial Institutions published by the Board of Governors of the Federal Reserve System. Year end values were used for 1986, 1987 and 1988. In cases where mergers had taken place during the period, merged banks were combined for the entire three years.

Gross Relationships

The gross relationships between lending policy variables and loan volume, as exhibited by tabular analysis, are generally consistent with economic expectations. Lower interest rate spreads, longer amortization periods and higher loan-to-value maximums resulted in larger increases in loan volumes over the 1986-88 period (Table 2). The use of differential interest rates apparently allowed lenders to tailor loan terms to the level of credit risk of individual borrowers, resulting in larger increases in portfolio size.

Individual loan evaluation criteria were less consistent in their relationship to loan volume (Table 3). Minimum cash flow coverage ratio (cash available for debt payments) was strongly related to volume in the expected manner. However, by itself, low equity requirements appeared to decrease loan volume rather than increase it.

All marketing policies were strongly related to loan volume changes (Table 4). Positive marketing activities resulted in increases in loan volume while banks not participating in such activities experienced reductions in their agricultural loan portfolios.

The Model

The model of change in loan volume was specified as;

$$L = b_0 + R b_1 X_1 + n \quad (1)$$

Where: L - Growth rate of agricultural loan volume over the 1986-88 period (percent change from 12/31/85 to 12/31/88).

b_1 - Parameters
 X_1 - Lending policy variables
 n - Disturbance term

A cross-sectional analysis was employed. The endogenous variable was defined as the rate of growth in agricultural loan volume during the 1986-88 period. This was calculated as the difference between the December 31, 1985, and December 31, 1988, agricultural loan volume, as reported on the Call Reports, divided by the 1985 value. The rate of growth, rather than absolute change in loan volume, was used to allow for the considerable difference in bank size and market area of the various banks. Rate of growth is also superior to the change in the ratio of agricultural loans to total loans due to the large absolute size of some banks relative to the size of agriculture in the market area and the lack of data on nonagricultural loan policies.

Three characteristics of loan policy are expected to influence agricultural loan volume: (1) terms of credit, (2) borrower creditworthiness analysis procedures, and (3) marketing. Terms of credit determine the cost of borrowing by the farmer. They include interest rates, amortization periods and collateral requirements. More stringent policies, and rates above those charged by other lenders, impose a cost on the borrower that can be avoided by borrowing elsewhere.

Table 2. Changes in Loan Volume Associated with
Alternate Terms of Credit
New York Banks, 1988

Term of Credit	Median Change in Loan Volume (%)
Interest Rate Spread over Prime (basis points):	
<i>Real Estate Loans:</i>	
0 - 150	19.4
over 150	1.9
<i>Machinery Loans:</i>	
0 - 200	16.6
over 200	-3.5
Maximum Amortization Period (years):	
<i>Real Estate Loans:</i>	
0 - 15	1.0
over 15	13.8
<i>Machinery Loans:</i>	
0 - 5	.2
over 5	3.2
Maximum Loan to Value of Security (percent):	
<i>Real Estate Loans:</i>	
75 and over	7.6
under 75	1.9
<i>Machinery Loans:</i>	
75 and over	15.0
under 75	1.9
<i>Livestock Loans:</i>	
70 and over	14.8
under 70	-8.9
Different Rates Used:	
<i>Real Estate Loans:</i>	
Yes	9.2
No	0.2
<i>Machinery Loan:</i>	
Yes	20.5
No	-10.5

Terms of credit are represented in the model by the weighted average interest rate spread for real estate and machinery, equipment and livestock (MEL) loans, measured in basis points. The rate spread is the difference

between the rate charged and the national prime rate. These data were obtained by the survey. The weights were based on the loan volumes for farm real estate loans and loans to finance agricultural production as reported by the December 31st Call Reports for each year. The weight for real estate rates was the percentage of total agricultural loan volume that was real estate loans. The weight for MEL rates was the percentage of total agricultural loan volume that represented loans to finance agricultural production. Since higher interest rates are expected to encourage farmers to borrow elsewhere, a negative relationship between rate spread and loan volume change is expected.

Table 3. Changes in Loan Volume Associated with Alternate Loan Evaluation Criteria New York Banks, 1986-88

Loan Evaluation Criteria	Median Change in Loan Volume (%)
<i>Minimum Percent Equity:</i>	
over 30 percent	13.7
30 percent or less	10.2
<i>Minimum Cash Flow Coverage Ratio:</i>	
over 1.0	-8.9
1.0 or less	10.5

Loan analysis procedures determine which farmers qualify for loans. These procedures include the type of analysis to be conducted, the factors or ratios that are considered important and the critical values of those factors or ratios that determine whether a loan is acceptable.

For this analysis, an index of borrower analysis procedures was constructed from one measure of repayment ability (the cash flow coverage ratio) and one measure of solvency (percent equity). Numerous researchers have found measures of repayment ability to be statistically significant indicators of the creditworthiness of borrowers (Johnson and Hagan, Dunn and Frey, Weed and Hardy, Lufburrow, Barry and Dixon, Mortensen, Watt and Leistriz, and Miller and LaDue). The same researchers (except Miller and LaDue) found measures of solvency to be important.

Each surveyed bank indicated the minimum cash flow coverage ratio and percent equity that was required for a loan to be acceptable. Each of these values was standardized by dividing by their respective means (cash flow coverage ratio: 36.65 and percent equity: 1.21) before averaging.

Survey respondents ranked eight commonly used financial ratios (1 = most important, 8 = least important). The cash flow coverage ratio and percent equity received the highest rankings with average rankings of 1.3 and 2.6, respectively (reference to be supplied). Clearly the cash flow

ratio is more important than percent equity. To reflect this relative importance, they were given respective weightings of 70 percent and 30 percent. Because more conservative lending policies are expected to lead to a higher proportion of loans being rejected, a negative relationship between this index and loan volume is expected. A single index is constructed, rather than using the ratios independently, because it is the combined effect of various ratios that determine loan acceptability.

Table 4. Changes in Loan Volume Associated with Alternate Marketing Policies New York Banks, 1986-88

Marketing Policy	Median Change in Loan Volume (%)
<i>Used Print Media Advertising:</i>	
Yes	16.2
No	-8.9
<i>Had Farm Loan Department:</i>	
Yes	12.0
No	-10.5
<i>Promotional Visits to Existing Borrowers:</i>	
Yes	29.0
No	0.0
<i>Cold Calls:</i>	
Yes	19.5
No	-10.5
<i>Attend Farm Meetings:</i>	
Yes	10.2
No	-10.5
<i>Sponsor Farm Meetings:</i>	
Yes	17.6
No	-6.5
<i>Reduce Rates to Potential Borrowers:</i>	
Yes	4.6
No	1.0

The marketing of agricultural loans is expected to have a positive influence on agricultural loan volume because it increases the number of loan applications received by the banks and tends to foster good-will with existing borrowers, encouraging them to continue their relationship with the bank. Marketing activities of three types were considered:

(1) advertising, (2) promotional activities, and (3) special agricultural lending expertise. An index combining these three types of activities was developed by assigning each a possible total of 10 points and adding their scores.

Advertising was measured by whether the bank used the print media to advertise the agricultural loan program at least once per year. If so, the bank was awarded 10 points. If not, it received zero.

Five components were counted as promotional activities: (1) visiting existing borrowers to encourage them to borrow, (2) making cold calls on potential borrowers, (3) offering reduced rates to potential borrowers, (4) having loan officers attend farm meetings, and (5) sponsoring farm meetings. A bank was awarded two points for each of these activities that were part of bank policy.

The existence of special expertise in agriculture was inferred by the presence of an agricultural loan department. A high proportion of banks with agricultural departments had at least one loan officer who spent full time on agricultural loans. None of the banks without such a department had a person who spent full time on agriculture. Thus, a much higher degree of specialization was allowed in banks with an agricultural department. Ten points was awarded to banks with a department and zero to all others.

It is assumed that the demand for credit experienced by the various banks is similar. All are subject to the same state laws. All Farm Credit Associations are in the same Farm Credit District and at the time of the study the districts had considerable control over Association policies. The primary agricultural commodity is dairy throughout, representing about two-thirds of agricultural production. Secondary agricultural commodities may be fruit, vegetables or cash crops depending on the area of the state in which the bank operates.

The Results

The model was estimated using ordinary least squares. Descriptive statistics for model variables are presented in Table 5. The estimated model possessed an adjusted R^2 of 48.7 and the overall model was significant at the .01 level as indicated by the F statistic (Table 6). Given the small sample size and the cross-sectional nature of the data, the R^2 is acceptable. Plotting each explanatory variable versus the standardized residuals indicated no evidence of heteroscedasticity in the analysis.

All of the variables carried the expected sign. The t-ratios for credit terms (interest rate) and marketing were 2.37 and 2.55 respectively, indicating a high level of significance. The borrower analysis variable had a relatively low t-ratio of 0.74 but was retained in the model because it is believed to be a relevant explanatory variable and its exclusion would cause specification error.

Table 5. Descriptive Statistics of Model Variables
New York Banks, 1986-88

Statistic	(L) % Change in Loan Volume	(X ₁) Interest Rate Index ^a	(X ₂) Borrower Analysis Index	(X ₃) Marketing Index
Mean	7.40	180	.97	13
Stand. Deviation	38.14	46	.22	10
Minimum	-54.81	100	.74	0
Maximum	95.70	319	1.65	30

^a Measured in basis points.

The robustness of the model was tested by observing the changes in coefficients and t-ratios when the model was moderately perturbed by successively removing one explanatory variable and estimating the model with only two predictors. None of the signs associated with the explanatory variables changed throughout this process. The interest rate variable was fairly robust in that coefficient and t values changed little as other variables were removed. The borrower creditworthiness analysis index and marketing indices were stable when the interest rate index was removed from the model. However, these indices were not stable when either variable was removed from the model. For example, the t-ratio of the borrower analysis index is 1.30 in the absence of the marketing index. This might be explained by the small number of observations. The possible existence of multicollinearity seems unlikely to be an important problem since the correlation coefficient between these variables is -0.29.

Adjusting the weights associated with the borrower creditworthiness analysis index changed the coefficient and t-ratio associated with the borrower analysis variable only moderately. Assigning a weight of 80 and 20 percent to the cash-flow-coverage ratio and percent equity respectively, resulted in a slightly enhanced t-ratio of 0.78 and increased the adjusted R² for the model to 48.9 percent. Weighting the cash-flow-coverage ratio 60 percent and percent equity at 40 percent resulted in a decreased t-ratio of 0.70 and a lower adjusted R² of 48.4 percent. Solvency was retained in the model to avoid possible specification error even though it modestly reduced the model's statistical performance. The literature cited previously suggests that it is a relevant variable.

Reducing the relative weights of the advertising and agricultural loan department variables in the marketing index decreases the statistical attributes of the model. Decreasing the points associated with the advertising component of the marketing index to five decreases the t-ratio to 2.35 and the adjusted R² of the model to 45.9 percent. Reducing the points associated with the agricultural loan department component of the

index to five, reduced the t-ratio associated with the marketing index to 2.45 and the adjusted R^2 of the model to 47.3 percent.

Table 6. The Influence of Lending Policy on Changes in Agricultural Loan Volume New York Banks, 1986-88

Model Characteristic	Model Value
Intercept	58.45 ^a (1.44) ^b
Interest Rate Index	-0.2821 ^a (2.37) ^b
Borrower Analysis Index	-21.49 ^a (0.74) ^b
Marketing Index	1.613 ^a (2.55) ^b
Degrees of Freedom	
Regression	3
Error	13
Total	16
Adjusted R^2 (percent)	48.7
Standard Error of Regression	23.97
F-Statistic	6.06
Critical F-Statistic, Alpha - .01	5.74

^a Estimated Coefficient.

^b t-Ratio.

Reducing the weight assigned to the promotional component of the index modestly improved model performance. For example, reducing the number of points awarded for promotional activities to a total of five resulted in a t-ratio of 2.69 and an adjusted R^2 for the model of 50.6 percent. Promotional activities were retained in the model even though they moderately reduced the statistical attributes of the model because these activities are believed to be important to the generation of loan requests and the creation of goodwill.

Loan volume elasticities, calculated at the means of the independent variables (Table 7), indicate that each of these variables has an important effect on changes in loan volume. Elasticities were -6.5 for interest rate spread, -2.7 for borrower analysis and 2.7 for marketing. Given the significance of the variables and the magnitude of the elasticities, it is clear that interest rate and marketing are important determinants of changes in loan volume at commercial banks.

Table 7. Estimated Loan Volume Elasticities

Variable	Percent Growth in Loan Volume with 1 percent Change in Variable ^a	
	Absolute Change	Percent Change
Interest Rate Spread	-.51	-6.5
Borrower Analysis Index	-.21	-2.7
Marketing Index	.21	2.7

^a Evaluated at the mean of the independent variables.

Given the character of the independent variables and that the elasticities represent percentage changes in the percent change, loan volume changes with typical policy changes were calculated (Table 8). A 25 basis point spread in interest rates increased loan value 7.1 percent. A five point change in the marketing index increased loan volume by 8.1 percent. When compared to the average actual change of 7.4 percent by all banks for the period studied, these clearly represent significant changes in loan volume.

Table 8. Effect of Typical Policy Changes

Policy	Change	Value in Loan Volume (%)
Interest Rate Spread (basis points)	25	7.1
Borrower Analysis Index	.1	2.1
Marketing Index	5	8.1

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Conclusions and Implications

An econometric model of changes in the agricultural loan volume of commercial banks indicates that interest rate spread, borrower analysis criteria and marketing policies explain a significant portion of loan volume changes over the 1986-88 period. The average interest rate spread and an index of marketing policies were statistically significant and had loan volume elasticities of -6.5 and 2.7, respectively. Clearly, banks do influence the size of their agricultural loan portfolios through the loan policies they select.

The model estimated for this analysis used aggregate measures of basic policy variables. This approach successfully identified the basic influences on loan volume of policies that are within the lenders control. The basic model design appears to be appropriate. However, with a larger sample size, disaggregation of some of these variables might require less subjectivity in variable weighting and allow more specific policy recommendations for lenders. The analysis and results provide an initial base quantification of the effect of policy on loan volume. Additional studies in different geographical areas and under a more favorable economic climate for agricultural lending would contribute to a broader understanding of the relationships involved.

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