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**The Effect of Commercial Bank Agricultural Loan Policies on Loan Volume**

**Eddy LaDue and John Thurgood**

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**The Effect of Commercial Bank  
Agricultural Loan Policies on Loan Volume**

**Eddy LaDue and John Thurgood\***

Most lenders develop agricultural loan policies to influence the magnitude and quality of their agricultural loan portfolio. Other objectives, such as improving the consistency between loan officers and enhancing communication within the bank, are important, but primarily because they influence these two basic factors.

The objective of this study is to investigate the extent to which the policies selected actually do effect loan volume. A simple 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, (2) a review of the model and variables used, (3) the results obtained, and (4) brief 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 their 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 agriculture. Two banks within the same holding company transferred loans during 1988 that could not be accurately separated. These two banks were combined for the analysis.

Survey respondents provided data for each year of the 1986-88 period. In general, agricultural policy changed very little during the three years.

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.

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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.

### The Model

The model of change in loan volume was specified as;

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

Where: L - Percentage change in agricultural loan volume over the 1986-88 period (12/31/85 - 12/31/88).

$b_1$  - Parameters

$X_1$  - Lending policy variable

n - Disturbance term

Table 1. Characteristics of Surveyed Banks, 1988

Characteristics	Percent of Banks
Total Assets (Million Dollars):	
Under 50	17
50 - 99	17
100 - 199	19
200 - 299	11
300 - 999	14
1,000 and over	22
Agricultural Loans (Million Dollars):	
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 (Full Time Equivalent)	1.5
Agricultural Loans per Loan Officer (million dollars)	7.1

The endogenous variable was defined as the percent change 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 percentage change, rather than absolute change, was used to allow for the considerable difference in bank size and market area of the various banks.

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.

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 that was 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.

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 Leistritz, 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 (Thurgood and LaDue). 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.

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 faced by the various banks is similar. All are subject to the same state laws. All Farm Credit Associations are in the same 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 techniques on Minitab Inc software. Descriptive statistics for model variables are presented in Table 2. 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 3). Given the small sample size and the cross-sectional nature of the data, the  $R^2$  is reasonable. Plotting each explanatory variable versus the standardized residuals indicated no evidence of heteroscedasticity in the analysis.

All of the variables carried the appropriate 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 2. Descriptive Statistics of Model Variables  
New York Banks, 1986-88**

Statistic	(L) % Change in Loan Volume	(X <sub>1</sub> ) Interest Rate Index <sup>a</sup>	(X <sub>2</sub> ) Borrower Analysis Index	(X <sub>3</sub> ) Marketing Index
Mean	7.40	180	.97	13
Upper Quartile	28.29	200	1.07	22
Median	1.03	183	.91	14
Lower Quartile	-18.25	150	.80	2
St. Deviation	38.14	46	.22	10
Min	-54.81	100	.74	0
Max	95.70	319	1.65	30

<sup>a</sup> 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.

Table 3. The Influence of Lending Policy on Changes in Agricultural  
Loan Volume - New York Banks, 1986-88

Model Characteristic	Model Value
Intercept	58.45 <sup>a</sup> (40.62) <sup>b</sup> (1.44) <sup>c</sup>
Interest Rate Index	-0.2821 <sup>a</sup> (0.1193) <sup>b</sup> (2.37) <sup>c</sup>
Borrower Analysis Index	-21.49 <sup>a</sup> (29.02) <sup>b</sup> (0.74) <sup>c</sup>
Marketing Index	1.613 <sup>a</sup> (0.6325) <sup>b</sup> (2.55) <sup>c</sup>
Degrees of Freedom	
Regression	3
Error	13
Total	16
Adjusted R <sup>2</sup> (percent)	48.7
Standard Error of Regression	23.97
F-Statistic	6.06
Critical F-Statistic, Alpha - .01	5.74

<sup>a</sup> Estimated Coefficient.

<sup>b</sup> Standard Error.

<sup>c</sup> t-Ratio.

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 R<sup>2</sup> 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 R<sup>2</sup> 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 R<sup>2</sup> 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.

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 4), 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 4. Estimated Loan Volume Elasticities

Variable	Loan Volume Change with 1% Change in Variable <sup>a</sup>	
	Absolute Change	Percent Change
Interest Rate Spread	-.51	-6.5
Borrower Analysis Index	-.21	-2.7
Marketing Index	.21	2.7

<sup>a</sup> 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 5). 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 5. Effect of Typical Policy Changes

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

## Conclusions

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.

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