THE DETERMINATION OF FARM SERVICE AGENCY LOAN SIZE: THE GEORGIA CASE

by

RODNEY LAMONT BROOKS

(Under the Direction of JAMES E. EPPERSON)

ABSTRACT

The Farm Service Agency (FSA) administers two types of loan programs – Direct and Guaranteed – which cater to borrowers in different financial situations. These programs are considered to be temporary and last resorts for distressed farmers. This study sought to validate the contention that the FSA operates as a "lender of last resort" for farm borrowers considered highly risky by other lenders and that the FSA performs its role without discriminating against socially disadvantaged applicants. The loan portfolio data are for Georgia for the period 1999 to 2002. The hypothesized model contains the common components of previous credit scoring models plus binary variables to capture differences in regional lending practices and identified probable indicators of discriminatory lending practices. According to the findings of this study, the FSA seems to be living up to its primary role as the lender of last resort for farmers who have experienced hardships. The FSA seemingly does not scrutinize the financial backgrounds of borrowers as one would expect from commercial lenders. Thus, the financial background of a borrower appears not to have a significant effect on the size of loans granted by the FSA. This is apparent for both FSA loan types – Direct and Guaranteed.

INDEX WORDS: loan programs, credit scoring models, financial background

THE DETERMINATION OF FARM SERVICE AGENCY LOAN SIZE: THE GEORGIA CASE

by

RODNEY LAMONT BROOKS

B. S., Fort Valley State University, 2001

A Thesis Submitted to the Graduate Faculty of The University of Georgia in Partial Fulfillment of the Requirements for the Degree

MASTER OF SCIENCE

ATHENS, GEORGIA

2003

THE DETERMINATION OF FARM SERVICE AGENCY LOAN SIZE: THE GEORGIA CASE

by

RODNEY LAMONT BROOKS

Major Professor: James E. Epperson

Committee: Cesar Escalante
Forrest Stegelin

Electronic Version Approved:

Maureen Grasso
Dean of the Graduate School
The University of Georgia
December 2003

DEDICATION

To my mother, Phyllis Lambert Butts, who is no longer with us in the flesh. It was she who instilled in me the value of a good education and putting God first. And, to my grandmother Ruth Lambert who continued to guide me after the passing of my mother.

ACKNOWLEDGEMENTS

First and foremost, I would like to thank God for giving me the ability to be able to pursue this degree and the motivation to successfully reach this milestone. Through Christ all things are possible.

To my wife, Shala and my children, Druscilla and Rodney, Jr., for providing me the inspiration to complete my studies, I am extremely grateful. Without their encouragement I could not have made it.

To my major professor Dr. James Epperson, thanks are due for guidance and patience during the critical stages of my journey at UGA. To the rest of my advisory committee, Drs. Cesar Escalante and Forrest Stegelin, thanks are expressed for imparting valuable insight and suggestions that improved my thesis. A special thanks is due Dr. Mack Nelson for introducing me to the discipline of Agricultural Economics. And to Drs. Nathaniel Brown, Jr. and Melvin Walker I am grateful for assisting Dr. Nelson in laying the foundation during my undergraduate study in AgEcon at Fort Valley State University. To the faculty and staff of the Agricultural Economics Dept. at UGA I am indebted for being kind and helpful and making my stay at UGA very fulfilling. Also, a special thanks goes out to David Laster, Farm Loan Program Chief at FSA, for providing me with the data used in this study.

To my family, most notably my aunts, uncles and cousins, your support of me in all my endeavors throughout the past few years has meant a great deal.

To my brother and sister, Torrey and Ebonee, I hope that I have been the big brother that you deserve. Take the positive things that I have done, build on them, and learn from my mistakes.

To the members of the Shumate Street Church of Christ in Quitman, GA, you have been my spiritual family throughout the course of my life. Your prayers and encouragement have truly helped me along the way.

Also, I would like to thank various friends, associates, and teachers who encouraged me throughout my upbringing. Encouraging words go a long way in helping to shape a person's life.

Lastly, I would like to thank my fellow graduate students at UGA who helped to keep me going.

To the coworkers that I have been fortunate enough to work with in Brooks Co. and Athens at the State Office, I wish to thank you for treating me more like an adoptive son than just another employee. I am grateful that you welcomed me as a part of your team. Also for coworkers in Athens, I sincerely thank you for being my home away from home.

TABLE OF CONTENTS

LIST OF TABLES

Page

LIST OF FIGURES

Page

CHAPTER 1

INTRODUCTION

The number of large farms (operations that generate more than $250,000 in gross revenue) is growing at steady rate, while the number of smaller farms is decreasing at an alarming rate. Large farms account for a greater amount of farm commodity production than smaller farms. According to the Census of Agriculture, large farms totaled 11.5% of all farms in Georgia while controlling more than 84% of the market value of agricultural products sold (USDA, NASS). Over the years, modern agricultural production has become more specialized and capital intensive even though most farm commodity price levels have trended flat (Koenig and Doye). The increasing consolidation of farm businesses, thus, redefines the capital and operating requirements of farms which translates into modifications for financing requirements of farm borrowers.

The four major suppliers of agricultural credit are commercial banks; the Farm Credit System (FCS); the U. S. Department of Agriculture (USDA), Farm Service Agency (FSA); and life insurance companies. As of December 31, 2002, commercial banks held the largest market share of agricultural indebtedness at 39.4%. While FSA held the smallest percentage of the market at 3.5% (Stam et al.), it is the primary source of credit for farmers who could not receive credit otherwise. Specifically, FSA has programs targeted to beginning and socially disadvantaged farmers. These two groups usually have little or no credit history, a poor credit history, or insufficient collateral for conventional agricultural lenders as indicated above (USDA, ERS, *Agricultural Outlook, FSA Credit Programs Target Minority Farmers*).

Background and Mission

Federal involvement in farm credit originated in 1916 when President Woodrow Wilson signed the Federal Farm Loan Act designed to provide legitimate credit sources to U.S. farmers at low interest rates (USDA, FmHA). Today, one avenue the federal government uses to provide credit to farmers is through the FSA. Programs of the agency date back to 1935 when the Resettlement Administration was created to oversee the supervised loan program.

The Resettlement Administration focused on helping poor people on poor land. The supervised loan program was its most popular source of aid. Loans under this program were short-term operating loans targeted to a farm and home management plan devised by the county, farm and home supervisors in collaboration with the family seeking aid. Such aid provided the opportunity for poor families to reestablish themselves and become independent (USDA, FmHA).

In 1937 the successor to the Resettlement Administration, the Farm Security Administration, was established. It handled farm credit programs until 1947 when it was restructured and renamed the Farmer's Home Administration (FmHA). Supervised farm ownership and farm operating loan programs were the primary operations of the agency (USDA, FmHA). Over the years the program evolved and Direct and Guaranteed loan programs were created. These programs have been aimed at helping farmers who could not attain needed credit from private lenders at competitive rates and terms. FmHA later expanded to include emergency loans under the Direct program to farmers who suffered losses due to disaster (USDA, FmHA).

The FmHA experienced tremendous growth in lending programs after 1970. This growth was met with accusations of excessive lending and unauthorized use of loan funds by some borrowers (Barry). It appeared that the agency had strayed from its role as a lender of last resort.

Because of the broad scope of programs, the FmHA was restructured in 1993 resulting in the farm credit programs being transferred to the newly created FSA. The FmHA moved from an agency primarily focused on providing credit to needy farmers to one providing loans for rural development (Herr). FmHA non-farm lending included loans for rural housing, community facilities, water, waste disposal, and business loans (Herr). Specific criteria for the acceptance of borrowers, borrower graduation to commercial lending, and possible termination have become more clear due to restructuring and narrowing the scope of the agency (Barry). The two major farm loan programs, Direct and Guaranteed, of the FSA are summarized in Table 1.1. Given that FSA serves as a temporary source of credit for farm businesses, a target of the agency is to take Direct borrowers, those who pose the highest risk, and graduate them to the Guaranteed program. Once this has been achieved, FSA intends for the borrower to successfully satisfy the provisions of the Guaranteed loan program and seek credit from conventional agricultural lenders (USDA, FmHA).

Under the FmHA, there were no guidelines on the length of assistance provided to farmers in the loan program (Drabenstott). Unlike the FmHA, FSA emphasizes temporary assistance. FSA does not intend to compete with commercial lenders, but acts as a lender of last resort to borrowers who have the potential to be successful with the aim of graduating borrowers to commercial lenders. Potential borrowers must meet eligibility requirements as shown in Table 1.2.

Problem Statement

Even with established guidelines, the final decision to grant or deny a loan can be somewhat subjective (Miller and LaDue). The loan officer often uses heuristics, "rules of thumb" or principles acquired through experience, to aid in evaluating the potential borrower's

Table 1.1. **Summary of Farm Loan Programs, USDA, Farm Service Agency**

Program	**Maximum Loan Amount**	**Rates and Terms**	**Use of Proceeds**
Direct Farm Ownership (FO)	$200,000	• Up to 40 years • Rates based on Agency borrowing costs • Temporary limited resource interest rates are available for those unable to repay at regular rates	Purchase land; Construct buildings or other improvements; Soil and water conservation
Beginning Farmer Down Payment Farm Ownership	Lesser of 40% of purchase price or appraised value	• Term: 15 years • Interest rate: 4%	Purchase farm or ranch
Direct Operating (OL)	$200,000	• From 1 to 7 years • Rates based on Agency borrowing cost • Temporary limited resource interest rates are available for those unable to repay at regular rates	Purchase livestock, poultry, equipment, feed, seed, farm chemicals, and supplies; Soil and water conservation; Refinancing indebtedness with certain limitations
Direct Emergency	100% actual physical losses or $500,000 maximum program indebtedness	• From 1 to 7 years for non-real estate purposes • Up to 40 years for physical losses on real estate • Interest rate of 3.75%	Restore or replace essential property; Pay all or part of production costs associated with the disaster year; Pay essential family living expenses; Reorganize the farming operation; Refinancing indebtedness with certain limitations

Table 1.1. **Continued**

Guaranteed Operating	$762,000 (Amount adjusted annually for inflation)	• From 1 to 7 years • Rates not to exceed those lenders charge average farm customers • Interest rate reduction of 4% available for those unable to repay at regular rates (with certain limitations)	Same as Direct Operating except loan may be used to refinance debts
Guaranteed Farm Ownership	$762,000 (Amount adjusted annually for inflation	• Up to 40 years • Rates not to exceed those lenders charge average farm customers	Same as Direct Farm Ownership except loan may be used to refinance debts

Source: USDA, FSA, *Loan Information*.

Table 1.2. **Eligibility Requirements for FSA Borrowers**

To Qualify for a Farm Ownership (FO) Loan, an applicant must:
• Have operated a farm for at least 3 years (this requirement applies only to Direct FO Loans)
• Be a citizen of the United States (or legal resident alien) which includes Puerto Rico, the U.S. Virgin Islands, Guam, American Samoa, and certain Pacific Trust Territories
• Have the legal capacity to incur obligations of the loan
• Be unable to obtain sufficient credit elsewhere at reasonable rates and terms to finance loan needs
• Be the owner and operator of the family farm after the loan is closed; and
• Not be delinquent on any Federal debt

The eligibility requirements of Operating Loans (OL's) are the same as those for FO Loans except:
• Applicants do not need to have 3 years of farm operating experience to qualify; and
• Applicants do not have to be the owner of the farm. However, the applicant must operate the farm to qualify for an OL loan

To qualify for an Emergency Loan (EM), the eligibility requirements are the same as for OL's, in addition:
• Applicants must also have operated in a designated/declared disaster county and suffered qualifying losses

Source: USDA, FSA, *Producer's Guide to FSA Loan Programs*.

application (Gustafson, Beyer, and Saxowsky). Experience varies among loan officers throughout each lending agency. This may suggest inconsistency among loan officers in properly evaluating a borrower's application. "In general, credit evaluations have mostly occurred through the personal observations and subjective judgments of loan officers," according to Lufburrow, Barry, and Dixon.

The issue of a loan officer's attitude toward risk of default is also important. The risk attitude may be responsible for undue influence on the loan officer's ability to evaluate the variables used in the loan decision (Stover, Teas, and Gardener). Failure to be objective with regards to risk may result in an improper decision to grant or deny the loan.

The USDA has encountered accusations of inequities in the administration of loan programs. For years, Black farmers throughout the country felt that their credit needs were being ineffectually served by the FmHA (USDA, ERS, *Agricultural Income and Finance Situation and Outlook*). The alleged unfairness by FmHA prompted Black farmers across the country to file a class-action discrimination suit entitled "Pigford v. Glickman," against FSA in 1997. In response, the Secretary of Agriculture formed the Civil Rights Action Team (CRAT) to investigate the claims. CRAT concluded that discrimination, often extreme, had taken place during the years 1981 to 1996, and CRAT made 92 recommendations to end such practices. These recommendations cover far-reaching areas for change which included holding USDA managers accountable for ensuring the civil rights of all employees and customers, making USDA programs accessible to all customers, creating a
diverse workforce and improving the organizational structure of civil rights. The USDA settled the lawsuit on January 5, 1999 by means of a Consent Decree which provided for compensation to Black farmers who could prove discrimination during the aforementioned years.

In an effort to eliminate discrimination, the FSA targets farmers who are considered socially disadvantaged (SDA). A SDA individual is defined as one who may have been subject to discrimination because of his/her identity as a member of a group without regard to individual qualities (P. L. 100-233). SDA groups include women, African Americans, American Indians, Alaskan Natives, Hispanics, Asians, and Pacific Islanders. Annually, funds are allocated for use by SDA applicants based on the proportion of SDA farmers or residents in a county or state (USDA, ERS, *Agricultural Oulook, FSA Credit Programs Target Minority Farmers*). The goals of this program include: targeting Direct and Guaranteed loan assistance to SDA farmers, discovering and removing barriers that prevent full participation of SDA applicants in FSA farm loan programs, and providing information and assistance to SDA applicants so that they may develop sound farm management practices, analyze problems, and plan the best use of available farm resources (USDA, FSA, *Producer's Guide to FSA Loan Programs*).

Objectives

This study seeks to validate the contention that the FSA operates as a "lender of last resort" for farm borrowers considered highly risky by other lenders and that the FSA performs its role without discriminating against any particular group of borrowers. This study examines the relationship between several variables used in the conventional loan decision-making process and the size/amount of the loan in order to deduce the nature of loan evaluation procedures employed by FSA loan officers. The incidence of borrower discrimination is also investigated through the inclusion of certain demographical/structural variables which bear on the investigation.

Procedure

The data are analyzed to determine which variables may be relevant to this study. The analytical procedure starts with the identification of all possible financial measures that are consistent with the usual credit scoring variables reported in previous empirical studies. Moreover, demographic/structural variables are defined to represent different classes of borrowers to shed light on the "discriminatory lending" issue.

In the absence of other indicators of credit rationing, this study uses the amount of loan granted as the dependent variable. Model estimation involves Ordinary Least Squares (OLS) to investigate the relationship between loan amount and the financial and demographic/structural variables.

A review of the relevant literature is conducted followed by a description of the data in Chapter 2. Based on the objectives of the study and previous works, the econometric model is specified also in Chapter 2. Chapter 3 is devoted to empirical results. The study culminates with a summary and conclusions in Chapter 4.

CHAPTER 2

LITERATURE REVIEW AND MODEL

Literature Review

Several studies have been conducted involving different variables used in analyzing loans. Foundational works are summarized here as they relate to the present study.

Miller and LaDue, in a study of credit assessment models, examined financial ratios of farm size, liquidity, solvency, profitability, capital efficiency, and operating efficiency as explanatory variables. Using logistic regression techniques, they concluded that borrower quality could be indicated by liquidity, profitability, and operating efficiency.

Using the four most common approaches for modeling credit risk, i.e., linear programming, discriminant analysis, and logistic/probit regression, Turvey also used measures of liquidity, profitability, and efficiency as well as leverage in order to obtain estimates for an alternative credit scoring model for Canada's Farm Credit Corporation. Turvey's conclusion paralleled that of Miller and LaDue. While liquidity and leverage were found to have the greatest impact on determining default risk associated with borrowers, profitability and efficiency were also found to be positive indicators.

Generally, loans are secured by assets (collateral) owned by the borrower. Verifying collateral values can be a time-consuming task. For different reasons, farmers and lenders often use market value of assets whereas accountants generally use book value (Crane). Gustafson, Beyer, and Saxowsky suggested that lenders who extend credit on the basis of collateral coverage must ensure that accurate inventories of current, chattel, and real estate assets exist and are correctly valued. This is based on the understanding that collateral is liquidated only to recover outstanding principal and accrued interest if the loan cannot be repaid (Miller and

LaDue). Since collateral is an indicator of borrower quality (Miller and LaDue), generally more collateral relative to loan amount is often required for higher risk loans (Lufburrow, Barry, and Dixon). This argument has relevance to the loan portfolio being administered by the FSA. The FSA portfolio consists primarily of farm borrowers with high credit risk profiles – generally those that can not obtain credit elsewhere. In the study conducted by Gustafson, Beyer, and Saxowsky eight of 10 lenders based the maximum amount of credit they would grant on a fixed percentage, between 50% and 80%, of the appraised collateral value used to secure the loan. All 10 lenders said solvency was a very important variable used in credit evaluation.

According to Gallagher, leverage should be expected to play an inverse role in the success of a loan. He further stated that lenders within the Farm Credit System consider leverage to be a gauge for the riskiness of a loan. Interest rates are lowered for borrowers with lower debt-to-asset (solvency) ratios. The amount of the loan is invariably affected by the interest rate.

Specific variable measures have been identified by the Farm Financial Standards Task Force (FFSTF) with the intentions of standardizing financial reporting and analysis of agriculture on a national level (Splett et al.). Varying structural characteristics of farm operations such as size, tenure, and farm-business type involve financial ratios that vary considerably among unique farming situations. Nonfinancial measures such as farm type and region were found to be important in credit scoring models by Turvey and Brown.

Kohl also emphasized the idea of developing different versions of the credit scoring model to cater to different classes of farm borrowers. For instance, he constructed a credit scoring model that specifically applies only to large farm borrowers and considers such financial measures as repayment ability, liquidity, collateral, solvency, profitability, and financial efficiency (Kohl). On the other hand, the credit scores for smaller agricultural loans are

calculated based merely on measures of repayment ability, previous track record, leverage, and collateral. He classified these measures according to levels of risk: low, moderate, and high (Table 2.1).

The credit scoring models developed by Splett et al. mirror Kohl's approach. After conferring with midwestern agricultural lenders, they constructed two versions of a credit scoring model using statistical approaches. Their credit-scoring model for term-loan applications includes financial measures that are vital to the assessment of credit risk on a long-term basis. Another version for operating-loan applications emphasizes more short-term measures of financial performance.

Data

Loan portfolio data were obtained from the Georgia office of the USDA, FSA. The Georgia data set includes 191 observations. Of these observations 94 are for Guaranteed loans while the other 97 are for Direct loans for the period 1999 to 2002. These loans were randomly selected by the FSA for verification that governmental procedures used in making loans were followed. Information extracted from the loan portfolios include borrower declarations from income statements, balance sheets, off-farm income, and expense statements, as well as declarations as to ethnic background and gender. Portfolio information taken by loan officers was verified through tax returns, lien searches, and credit checks.

The data came from eight FSA loan districts. For purposes of this study, contiguous loan districts were combined based on climate and commonality of agricultural enterprises. Loan regions were formed as follows, Figure 2.1 (USDA, FSA, *Georgia State and County Directory*). Districts 2 and 5 were combined to form the CENTRAL region. Districts 3 and 4 were combined to form the EAST region. Districts 7 and 8 were combined to form the SOUTH

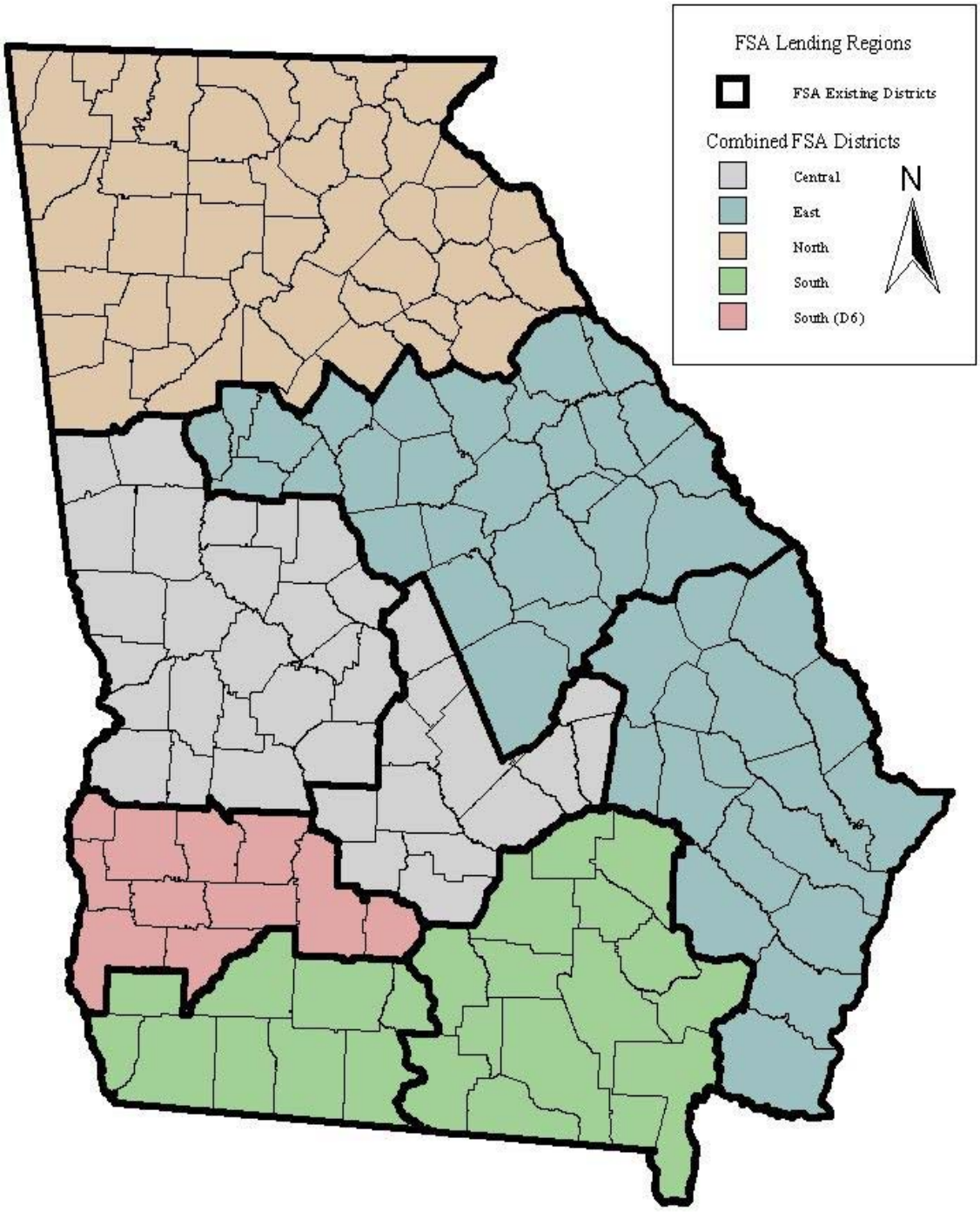
Table 2.1. **Risk Classification**

Risk Level	**Repayment Ability (Debt Payment/ Income Ratio)**	**Collateral (Coverage Ratio)[a]**	**Leverage (Debt/Asset Ratio)**
Low	<25%	>2.00	<50%
Moderate	25%-50%	----	50%-75%
High	>50%	Close to 1.00	>75%

Source: Kohl.

[a] This ratio compares the value of pledged collateral to the amount of the loan.

Figure 2.1. FSA Lending Regions



region, while District 1 was retained as the NORTH region. One strategic exception was made. FSA loan district 6, though located in south Georgia, was set apart from the SOUTH region and designated SOUTH (D6) because of substantial differences. SOUTH (D6) had a relatively high number of nonwhite borrowers – 25% relative to 6% for the SOUTH region. Loan size on average was much higher in SOUTH (D6) – about 64% higher than for the SOUTH region. Further, gross farm income was almost 35% higher in SOUTH (D6) than in SOUTH on average.

Model Development

Lufburrow, Barry, and Dixon used data from Production Credit Association (PCA) offices in different regions of Illinois in their credit scoring model. Liquidity, leverage, profitability, collateral, repayment capacity, repayment history, and percentage of farm acreage owned were used in their estimation to properly classify loans. Loans were classified into three groups: Class I, Prime (lowest risk); Class II, Base (intermediate risk); and Class III, Premium (highest risk). The critical factors for the loan risk classification model were found to be liquidity, leverage, collateral, repayment ability, and repayment history. Further research in the same vein was suggested for different farm situations and types of lenders.

In a study by Gustafson, Beyer, and Saxowsky nonfarm income was found to be an important determinant in farm loan evaluation. Of 10 lenders in the study, six used income tax returns to verify declarations of nonfarm income while the other four did not.

Out of 287 FFSTF measures researched, only 16 were found useful in a study by Splett et al. The 16 measures involved liquidity, solvency, profitability, repayment capacity, and financial efficiency. The study was composed of two models, one for term loans and the other for operating loans. The financial measures were weighted in each model. Solvency and repayment capacity were the major contributors to the credit score in the term model. Repayment capacity

stood out above the other measures in the operating loan model. The financial efficiency measure was found to have no bearing in the operating loan model.

Gallagher conducted a study that examined the success and failure of agribusiness loans. He summarized financial ratios used in seven noted failure-predictive models. The summary included measures for liquidity, profitability, leverage, solvency, activity, and coverage (fixed payment obligations). As a measure of liquidity, the current ratio was used in three of the seven models. As a measure for profitability, ROE was used in one of the seven models. One measure for leverage, the debt-to-asset ratio (total debts divided by total assets), was used in three of the seven models. This ratio is also widely used as a measure of solvency (Crane). As Gallagher expected, the ratio values for successful loans were stronger than those of the failed loans.

Based on the works of Gallagher; Miller and LaDue; Splett, et al.; Lufburrow, Barry, and Dixon; and Turvey and Brown the hypothesized model for this study contains the common components of previous credit scoring models (i.e., measures for liquidity, solvency, profitability, loan repayment, and financial/operating efficiency) plus binary variables to capture differences in regional lending practices and identified probable indicators of discriminatory lending practices. The hypothesized model is formulated as

(1) LSIZE = f(CURR, SOLV, OPR, NONFI, ROE, MARGIN, SOUTH, SOUTH(D6), EAST, CENTRAL, FM, NW, SZ, and DRT),

where LSIZE is the amount of the FSA loan issued to the borrower; CURR is a liquidity measure calculated as current assets divided by current liabilities; SOLV is a measure of solvency – total farm liabilities divided by total farm assets; OPR represents a measure of operating/financial efficiency and is calculated as annual operating expenses divided by gross

farm income; NONFI is the amount of nonfarm income reported by the borrower; return on equity (ROE), a profitability measure, is net farm income divided by equity in the farm business; MARGIN is an absolute measure of repayment capacity and is defined as the balance (cash available to make all debt payments for the year) available minus the total annual debt payments (including all farm and personal debt); SOUTH denotes loans originating in the southern region of the state; SOUTH (D6) indicates loans originating in the region of south Georgia with a relatively large number of nonwhite borrowers; EAST denotes loans originating in the eastern region of the state; CENTRAL indicates loans originating in the central region of the state; FM represents female borrowers; NW denotes nonwhite borrowers; SZ indicates the designation of a small farm based on gross farm income; and DRT denotes Direct loans as opposed to Guaranteed loans. Descriptions and simple statistics of the variables are provided in Table 2.2.

Hypothesized Relationships

Previous literature has not been found that examines loan size and financial measures. As previously shown, the literature is replete with analyses of the success/failure of an agribusiness loan and financial measures. Generally, in order to generate more revenue one needs more capital to finance the operation. As a result, loan size should be associated with the success of the operation as reflected in the financial variables. It is possible that smaller loans may reflect smaller capital needs; but in the main, producers are expected to be motivated to pursue revenue growth. Additionally, risk adverse lenders are expected to pay attention to financial variables, preferring to incur losses, if necessary, on smaller loans rather than larger loans.

CURR measures the liquidity of a borrower. Liquidity is considered to positively affect the size of agribusiness loans (Gallagher). The availability of more liquid assets vis-à-vis

Table 2.2. **Description of the Variables in the Hypothesized Model**

Variable	Description	Min. Value	Max. Value	Mean	Std. Dev.
LSIZE	Loan amount in dollars	8,700	752,000	170,989	164,267
CURR	Current ratio (current assets/current liabilities)	0.017	159.000	2.840	13.840
SOLV	Solvency (total farm liabilities/total farm assets)	0.040	3.360	0.780	0.450
OPR	Operating efficiency (annual operating expenses/gross farm revenue)	0.025	4.750	0.800	0.410
ROE	Return on equity (net farm income/equity in farming operation)	-35.240	17.140	0.050	3.880
NONFI	Nonfarm income in dollars	0	184,211	17,182	23,492
MARGIN	Cash available for annual debt payments minus total annual debt payments including repayment of FSA loan	1	862,449	50,266	110,913
SOUTH (D6)	FSA loan district 6	0	1	0.08	0.28
EAST	FSA loan districts 3 and 4	0	1	0.26	0.44
SOUTH	FSA loan districts 7 and 8	0	1	0.26	0.44
CENTRAL	FSA loan districts 2 and 5	0	1	0.21	0.41
FM	Female borrowers = 1, male borrowers = 0	0	1	0.05	0.22
NW	Nonwhite borrowers = 1, otherwise 0	0	1	0.10	0.31
SZ	Small farm (gross farm income under $250,000) = 1, otherwise 0	0	1	0.54	0.50
DRT	Direct loan = 1, Guaranteed loan = 0	0	1	0.51	0.50

immediately maturing loan obligations could be indicative of more prudent cashflow management practices by the farm and, thus, would enhance the credit risk rating of the borrower.

SOLV, debt-to-asset ratio, could possibly have a dual effect, either positive or negative, on the amount of the loan but it mostly depends on external economic conditions (Barry et al.). Lower debt/asset ratios indicate a reduced loan risk as loans could be more easily repaid, while allowing more room for further leveraging given the lower utilization of farm credit reserves (or borrowing capacity). On the other hand, high debt-to-asset ratios could translate into greater financial stress for the farm given the larger cash outlays required for debt servicing. Owing to the difficult economic situation for farms during the study period, it is anticipated that solvency will be carefully considered in determining loan amount (USDA, ERS, *Agricultural Income and Finance Situation and Outlook*). Thus, SOLV is expected to be negatively related to LSIZE.

Operating or financial efficiency, OPR, can be reflective of managerial ability, which plays a major role in the success of a farming operation (Gallagher). Since this study uses the operating expense ratio as a proxy for financial efficiency, lower values of this ratio are more favorable and thus enhance the credit rating of the farm borrower. In this regard, lower values of OPR should be associated with larger loan amount – a negative relationship.

The availability of nonfarm sources of income, NONFI, generated by farmers could also be an additional factor that would help facilitate the process of receiving a loan. McKeely noted that several Black farmers were under the impression that employment other than farming was needed to secure a loan with FSA. Race aside, the effect of NONFI may be a wash. Though nonfarm income can lower the risk of making the loan, low or nonexistent nonfarm income is

partial evidence that the loan is actually needed. Thus, the coefficient sign for NONFI is indeterminate.

ROE is a common measure for how efficiently a business uses equity to generate income – a profitability indicator similar to return on assets. Turvey found that higher returns on farm assets were associated with the likelihood of loan success. Thus, ROE should have a positive effect on loan size in this study.

The MARGIN variable, an absolute measure of loan repayment capacity, demonstrates the ability of a borrower to generate adequate net cash flows in excess of the usual operating, capital and debt servicing requirements. It is therefore expected to be positively related to the dependent variable.

There were no sign expectations for the coefficients of the regional binary variables. The predominant agricultural interests of the NORTH region, which is in the intercept, are poultry and livestock. Georgia leads the nation in poultry production. According to the 1997 Census of Agriculture, eight of the top 100 poultry-producing counties in the United States are in the NORTH region of Georgia. Livestock enterprises are common to the EAST region which also includes concentrations of dairy units. Cotton is prevalent in the CENTRAL region while peanuts and tobacco are also important in the regions designated as SOUTH and SOUTH (D6) (USDA, NASS).

Additional binary variables were included to capture structural/demographic characteristics that may be the bases of discriminatory lending practices. There were no sign expectations for the coefficients for FM (females) and NW (nonwhite). SZ was expected to be negatively related to LSIZE as smaller farms were expected to require smaller loans. Farm size was determined according to annual gross revenue. Operations generating less than $250,000

annually are considered small farms, while operations generating $250,000 and above are considered large farms (USDA, ERS, *Farm Structure Characteristics*). The sign for the DRT (Direct loan) coefficient was also expected to be negative because of FSA policy, Table 1.1. The loan-size limits are lower for the Direct loan program (DRT) versus the Guaranteed loan program.

In addition to making and servicing accounts under the Direct Loans Program, FSA officials provide borrowers with supervision and credit counseling. Guaranteed loans are made by commercial agricultural lenders and secured up to 95% of loss by FSA. The maximum amount of a Direct loan is $500,000, while the limit on Guaranteed loans is $762,000.

CHAPTER 3

ECONOMETRIC ANALYSIS

Hypothesized Model Results

The results of estimation of the hypothesized model are summarized in Table 3.1. The functional form of the model is semilog where the dependent variable is in natural logarithmic form. The functional form is based on goodness of fit.

The explanatory power of the model with an R^2 of 0.47 is substantial given that estimation involves a mix of cross sectional and time series data. The F-value, another measure of the explanatory power of the model, is 11.02 which is significant well beyond the 0.01 level.

To test for mulicollinearity, variance inflation factors (VIF) were obtained for each independent variable in the model. All values were less than 10 suggesting no multicollinearity.

Multicollinearity is present when two or more independent variables are approximately linearly related in the data set. When the regression coefficients of the explanatory variables are indeterminate and their standard errors are infinite, the presence of multicollinearity is perfect. On the other hand, multicollinearity is less than perfect when the regression coefficients are determinate but large standard errors are formed. Given this definition, under the veil of multicollinearity the regression coefficients can not be estimated with vast exactness or correctness.

The VIF measures the strength of the relationship between each explanatory variable and all other explanatory variables in the regression model. Any individual VIF larger than 10 indicates that multicollinearity may have an unfavorable affect on the least squares estimates of the regression model (Gujarati, p. 362).

Table 3.1. **Estimated Coefficients for Hypothesized Model**

Variable	**Coefficient**	**Standard Error**	**T-Value**
Intercept	12.4139***	0.2444	50.80
CURR	0.0074*	0.0043	1.71
SOLV	0.2085	0.1335	1.56
OPR	0.1804	0.1424	1.27
NONFI	-2.11e-06	2.56e-06	-0.82
ROE	0.0176	0.0149	1.18
MARGIN	5.84e-07	5.56e-07	1.05
SOUTH(D6)	-0.0497	0.2615	-0.19
EAST	-0.5057***	0.1896	-2.67
SOUTH	-0.4597**	0.1840	-2.50
CENTRAL	-0.3428*	0.1877	-1.83
FM	0.6761**	0.3206	2.11
NW	-0.3773	0.2324	-1.62
SZ	-0.6349***	0.1334	-4.76
DRT	-0.9232***	0.1292	-7.14
N = 191			
R^2 = 0.47			
F-Value = 11.02			
DF = 14			

Note: ***,**, * denote significance at the 0.01, 0.05, and 0.10 levels, respectively.

The Breusch-Pagan-Godfrey (BPG) test for heteroskedasticity was conducted using fitted values for the natural log of the dependent variable, LSIZE. Results did not indicate the presence of heteroskedasticity in the model. If the assumption for the OLS estimator that the disturbances have uniform variance is violated, the model is deemed heteroskedastic (Kennedy, p.43). The OLS estimator still has unbiased and consistent parameter estimates in the presence of heteroskedasticity though the OLS estimator is no longer efficient (no longer has minimum variance). The BPG test statistic is

(2) $$\chi^2_{BPG} = (SSR^*/2) / (SSE/n)^2,$$

where SSR* is the regression sum of squares of the regression of e^2 on X and SSE is the error sum of squares of the regression of y on X, and e represents the residuals. When n is sufficiently large and variance (σ^2) is constant, χ^2_{BPG} is distributed as a chi-square distribution with one degree of freedom. Large values of χ^2_{BPG} lead to the conclusion that σ^2 is not constant (Gujarati pp. 411-412).

Autocorrelation brings into question the independence of the errors in the model over time. A serial pattern in the error terms causes a distortion in model estimation (Gujarati pp. 442-445). Since the observations in this study are not taken from a panel dataset where a particular borrower is present in all of the annual observations, a test for autocorrelation is not relevant.

Of six financial variables deemed important based on credit scoring models previously cited, only one had a coefficient significantly different from zero. The coefficient for the current ratio (CURR) was significant at the 0.10 level. The positive coefficient for CURR was as expected.

Financial variables with coefficients that were not significant include solvency (SOLV), operating efficiency (OPR), nonfarm income (NONFI), return on equity (ROE), and annual cash balance over debt payments (MARGIN). Apparently, strict adherence to financial ratios in determining loan amounts is not of paramount importance to the FSA. The FSA has a reputation for being the lender of last resort. The evidence suggests that this may indeed be the case.

The regional variables did not reveal any unusual patterns in spatial differences in loan amounts. As expected, the loan amounts were significantly lower in the EAST, SOUTH, and CENTRAL regions, ranging from about $71,450 to almost $98,000 under the average loan amount in the NORTH region, the region captured in the intercept of the model. The loan amounts for the SOUTH (D6) region were not significantly different from those in the NORTH region.

The four remaining explanatory variables are demographic or structural in nature. The female (FM) and nonwhite (NW) variables were included as checks for nondiscrimination compliance. The farm size (SZ) and type of loan-program (DRT) variables were included to allow loan size to vary by farm size and loan-program type.

For nondiscrimination compliance the coefficients for FM and NW should not be significantly different from zero. Indeed, the coefficient for the nonwhite variable was not significant. However, the coefficient for the female variable was significant and surprisingly positive indicating higher loans for females by almost $238,000 on average. This could reflect overzealous targeting of women as part of the FSA program to target socially disadvantaged applicants (SDA). Closer scrutiny of the data revealed that female loan recipients were presumably operating with their spouses and had better credit scores. Further, there were only

10 female loan recipients in the data set. Thus, the data are inconclusive regarding the treatment of women.

As expected the coefficients for SZ and DRT were negative and significant. Loans for smaller farms (SZ) averaged almost $116,000 less than those for larger farms. Direct loans (DRT) averaged $148,402 less than those for Guaranteed loans.

Such significant differences in loan size may indicate structural differences in the loan-size model with respect to farm size (SZ) and loan type (DRT). As indicated by Splett et al., certain structural characteristics of farm enterprises likely influence credit scores.

Testing for Structural Differences

The Chow test can be used to test for structural change in the loan-size model with respect to farm size (SZ) and loan program (DRT). The Chow test is an application of an F ratio and the basis for its use is produced from the residual sums of squares formed from the regressions described below. The explanation and notation follows closely that of Greene, pp. 211-214.

The relationship between loan size (y) and the independent variables (X) may be different for small farmers versus large farmers and for the Direct loan program versus the Guaranteed loan program. For example, one can test the hypothesis of structural difference between the Direct and Guaranteed loan program as follows. Denote the data from the Direct program in y and X as y_1 and X_1. An unrestricted regression which allows the coefficients to differ from one another in the two programs is

(3) $$[y_1] = [X_1\ 0][B_1] + [e_1]$$

$$[y_2] = [0\ X_2][B_2] + [e_2].$$

Denoting the data matrices as y and X, the unrestricted least squares estimator is

(4) $$b= (X'X)^{-1}X'y$$

$$= [X'_1X_1\ 0]^{-1}[X'_1y_1] = [b_1]$$

$$[0\ \ X'_2X_2]^{-1}[X'_2y_2] = [b_2],$$

which is least squares applied to the two equations separately. Therefore, the total sum of squared residuals from this regression will be the sum of the two residual sums of squares from the two separate regressions,

$$e'e = e'_1e_1 + e'_2e_2.$$

The restricted coefficient vector can be obtained in two ways. Formally, the restriction $\boldsymbol{B_1} = \boldsymbol{B_2}$ is $R\boldsymbol{B} = q$, where R= [I:-I] and q = 0. The general result given earlier can be applied directly. An easier way to proceed is to build the restriction directly into the model. If the two coefficient vectors are the same, the initial matrices can be written

(5) $$[y_1] = [X_1]\ B + [e_1]$$

$$[y_2] = [X_2]\ B + [e_2],$$

and the restricted estimator can be obtained simply by stacking the data and estimating a single regression.

The Chow test is defined as

(6) $$[SSE_T - (SSE_1 + SSE_2)/ K] / [(SSE_1 + SSE_2)/ (N_1 + N_2 – 2K)],$$

where SSE_T is the sum of squared residuals (errors) for the pooled (restricted) model encompassing observations for both Direct and Guaranteed loans, $SSE_1$is the sum of squared residuals for the Direct loan model, SSE_2 is the sum of squared residuals for the Guaranteed loan model, $N_1$is the number of observations in the Direct loan model, N_2 is the number of observations in the Guaranteed loan model, and K is the number of parameters (including the intercept).

Results from the Chow test indicated that the loan-size model was structurally different with respect to loan program – Direct versus Guaranteed. The $F_{(14, 163)}$ ratio from the Chow test of 7.09 exceeded the critical value of 2.20 at the 0.01 level of significance (Table 3.2).

The loan-size model was also found to be structurally different for small versus large farms. The $F_{(14, 163)}$ ratio from the Chow test of 3.27 eclipsed the critical value of 2.20 at the 0.01 level of significance (Table 3.3).

Direct Versus Guaranteed Lending Models

The Direct lending model had an F-value of 3.62 and was significant at the 0.01 level with an R^2 of 0.36 while the Guaranteed lending model had an F-value of 4.16 and was also significant at the 0.01 level with an R^2 of 0.40. The diagnostic tests, covered earlier, were conducted to detect multicollinearity and heteroskedasticity and none in either case was found.

The estimated coefficients for the two unrestricted loan-size models – Direct loan and Guaranteed loan – are provided in Table 3.2 for purposes of comparison. As can be seen, none of the financial variables had any bearing on loan size in the unrestricted models at the 0.10 level of significance. These results are generally in agreement with that for the original collective model (equation 1), further indication that traditional financial ratios are not of controlling importance to the FSA regardless of loan program.

The impacts of regional variables are quite different in the unrestricted models – Direct loan versus Guaranteed loan programs. The significant coefficients and direction of relationships for the regional variables in the Guaranteed loan model follow the same pattern as was found in the originally hypothesized model (equation 1). However, the regional impacts on

Table 3.2. **Chow Test Results and Estimated Coefficients for the Direct and Guaranteed Loan Models**

Variable	Pooled Model	Direct Model	Guaranteed Model
Intercept	12.1245 (44.42)***	11.3130 (34.42)***	12.8297 (33.01)***
CURR	0.0111 (2.27)**	-0.0256 (-0.92)	0.0068 (1.62)
SOLV	0.0417 (0.28)	0.0540 (0.35)	0.2794 (1.12)
OPR	0.1867 (1.16)	0.0065 (0.03)	0.2442 (1.43)
NONFI	4.77e-07 (0.17)	1.05e-06 (0.23)	-1.73e-06 (-0.60)
ROE	0.0104 (0.62)	0.0041 (0.23)	0.0002 (0.01)
MARGIN	1.58e-06 (2.59)***	7.33e-06 (1.54)	2.55e-07 (0.49)
SOUTH(D6)	-0.0618 (-0.21)	0.6561 (1.75)*	-0.7047 (-1.89)*
EAST	-0.6508 (-3.05)***	-0.1162 (-0.48)	-0.9034 (-3.05)***
SOUTH	-0.4655 (-2.23)**	0.2074 (0.83)	-1.0047 (-3.78)***
CENTRAL	-0.2896 (-1.36)	0.6749 (2.50)**	-1.1052 (-4.13)***
FM	0.8805 (2.43)**	-0.5942 (1.20)	0.6979 (1.75*
NW	-0.5641 (-2.16)**	-0.8066 (-2.71)***	-0.0087 (-0.02)
SZ	-0.8591 (-5.85) **	-0.8311 (-4.27)***	-0.7566 (-3.74)***
	$R^2 = 0.31$ F-Value = 6.19 DF = 13	$R^2 = 0.36$ F-Value = 3.62 DF = 13	$R^2 = 0.40$ F-Value = 4.16 DF = 13
SSE = Sum of squared residuals (errors)	139.1206	46.7167	39.7585
N = Number of observations	191	97	94
K = Parameters including intercept	14	14	14
$F_{(14,163,0.01)} = 2.20$ $F_{CHOW\ TEST} = 7.09$			

Note: T-values are in parenthesis and ***, **, * denote significance at the 0.01, 0.05, and 0.10, respectively.

Table 3.3. **Chow Test Results and Estimated Coefficients for the Small and Large Farm Models**

Variable	Pooled Model	Small Farm Model	Large Farm Model
Intercept	12.0560 (48.94)***	11.7507 (37.26)***	12.6533 (22.71)***
CURR	0.0048 (1.06)	0.0077 (1.60)	-0.0434 (-1.42)
SOLV	0.1988 (1.41)	0.2561 (1.51)	-0.3213 (-1.32)
OPR	0.1388 (0.92)	0.2487 (1.55)	-0.6735 (-1.02)
NONFI	-3.16e-06 (-1.34)	1.20e-06 (0.24)	-4.18e-06 (-1.48)
ROE	0.0221 (1.40)	0.0032 (0.16)	0.0224 (0.99)
MARGIN	1.05e-06 (1.81)*	2.85e-07 (0.16)	5.99e-07 (1.16)
SOUTH(D6)	0.2535 (0.94)	-0.0832 (-0.16)	0.7969 (2.30)**
EAST	-0.2355 (-1.23)	-0.9916 (-3.28)***	0.4944 (1.72)*
SOUTH	-0.3003 (-1.57)	-0.4992 (-1.91)*	0.3558 (1.18)
CENTRAL	-0.2829 (-1.43)	-0.3133 (-1.24)	0.3207 (0.90)
FM	0.8029 (2.37)**	0.5308 (1.03)	0.9119 (2.45)**
NW	-0.5661 (-2.33)**	-0.3383 (-0.95)	-0.4704 (-1.31)
DRT	-1.0679 (-8.02)***	-0.9868 (-4.71)***	-0.6405 (-3.57)***
	$R^2 = 0.40$ F-Value = 9.02 DF = 13	$R^2 = 0.45$ F-Value = 5.57 DF = 13	$R^2 = 0.43$ F-Value = 4.16 DF = 13
SSE = Sum of squared residuals (errors)	121.7294	66.0684	28.9780
N = Number of observations	191	104	87
K = Parameters including intercept	14	14	14
$F_{(14,163,0.01)} = 2.20$ $F_{CHOW\ TEST} = 3.27$			

Note: T-values are in parenthesis and ***, **, * denote significance levels of 0.01, 0.05, and 0.10, respectively.

loan size for Direct loans were found to be quite different. Coefficients for the SOUTH (D6) and CENTRAL regions were significant and positive. Direct-loan amounts in these two regions, respectively, exceeded that in the NORTH region on average by $75,926 and $78,928. Deeper examination of the Direct loan program in these two regions revealed several clients new to farming with limited credit histories and several clients who had suffered major financial setbacks due to weather anomalies.

Of the demographic/structural variables, two impacted loan size differently in the Direct versus Guaranteed loan models. The farm size variable (SZ) impacted in a similar fashion across the board for both models – smaller loans for smaller farms. Gender (FM) and race (NW) were two variables that impacted differently in the two unrestricted models – Direct versus Guaranteed.

The coefficient for the female variable (FM) was not significant in the Direct loan model but was significant in the Guaranteed loan model with higher loans for females of $376,699 on average. The apparent female preference found in the originally hypothesized model (equation 1), thus, has been isolated to the Guaranteed loan program. The same caution applies as before: loans were to wives of husband and wife operations where the credit score of the wife was better and there were only 10 female observations in the data set.

The coefficient for the nonwhite (NW) variable was significant in the Direct loan model but not the Guaranteed loan model. The originally hypothesized model (equation 1) also did not reveal apparent noncompliance with SDA targeting. The significance of the coefficient for the nonwhite variable with loans on average lower for nonwhites by just over $45,000 in the Direct loan program is indeed surprising in that all Direct loans are handled solely by FSA loan officers.

However, a deeper probe of the Direct loan data shows that the smaller average loan size for nonwhites was associated with smaller average farm size. Average net worth for nonwhites was $31,337 versus $80,346 for whites. Gross farm income was $159,000 versus 240,035 and operating expenses were $115,927 versus $190,493. Moreover, of 97 Direct-loan observations, only 13 were nonwhite.

In an effort to shed light on the reason for the structural differences between the Direct versus Guaranteed loan-size models, variables helpful in characterizing loan groups were assembled in Table 3.4. In addition to financial variables from the explanatory model (equation 1), other variables that help to characterize businesses were also included.

An inspection of mean and t-values in Table 3.4 shows very different clientele for Direct versus Guaranteed FSA loans. The difference in these two clientele groups is largely based on scale of operation. Assets, liabilities, income, and operating expenses were all much larger for the Guaranteed-loan clientele than for the Direct-loan clientele. Cash available for annual debt payments (MARGIN) was also much higher for the Guaranteed-loan clientele. Even the solvency ratio (SOLV) was significantly better at the 0.05 level for the Guaranteed loan group. A visual comparison of mean values for significant variables can be seen in Figure 3.1.

Small Versus Large Farm Models

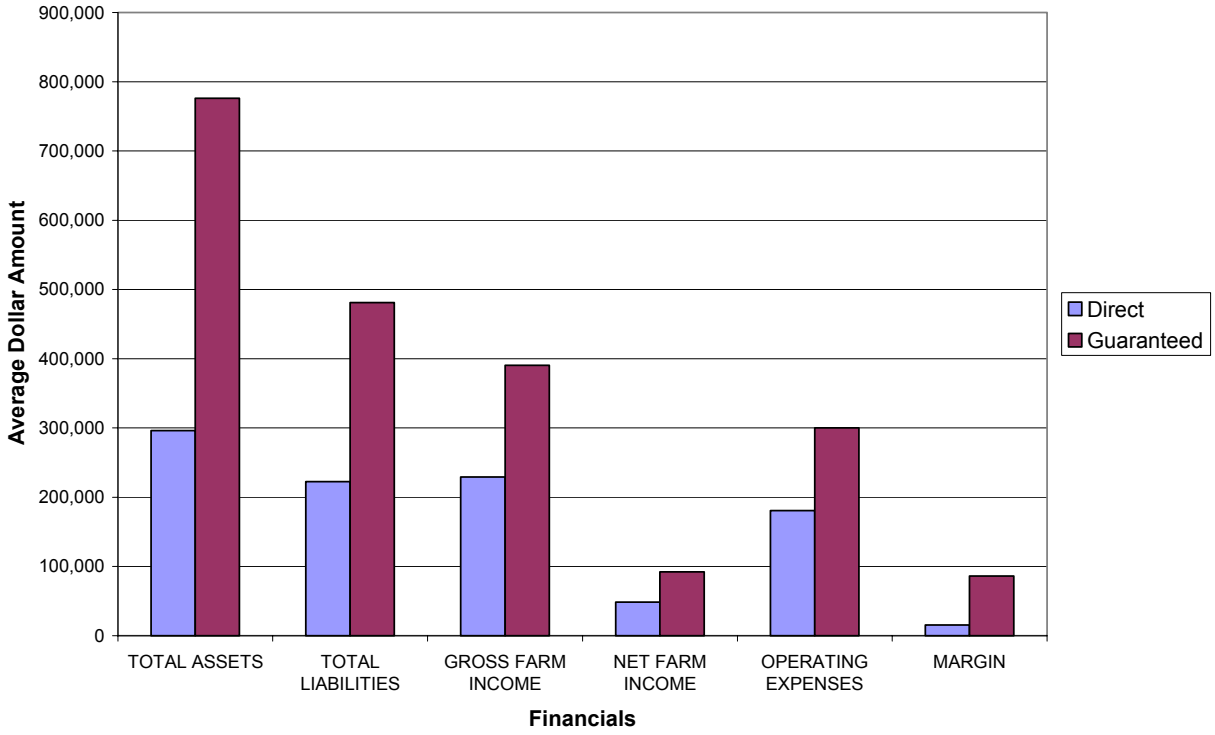
The small farm model with an R^2 of almost 0.45 had an F-value of 5.57 which is significant well beyond the 0.01 level, Table 3.3. The large farm model with an R^2 of almost 0.43 had an F-value of 4.16 which is also significant well beyond the 0.01 level. Diagnostic tests were conducted to detect multicollinearity and heteroskedasticity and none in either case was found.

Table 3.4. **Direct Versus Guaranteed Loan Clientele Characteristics**

Variable	T-Value	Direct Loan Averages	Guaranteed Loan Averages
TOTAL ASSETS($)	5.07**	296,339	776,243
TOTAL LIABILITIES ($)	4.72**	222,561	480,980
GROSS FARM INCOME ($)	4.11**	229,175	390,454
NET FARM INCOME ($)	4.31**	48,644	92,062
OPERATING EXPENSES ($)	3.70**	180,499	300,163
MARGIN ($)	4.55**	15,589	86,050
CURR	1.60	1.2476	4.4922
SOLV	2.17**	0.7286	0.6171
OPR	0.83	0.8246	0.7756
ROE	0.34	0.1433	-0.0447

** denotes significance at the 0.05 level.

Figure 3.1. Comparison of the Direct and Guaranteed Loan Pools



The estimated coefficients for the two unrestricted loan-size models – small and large farms – are provided in Table 3.3 for purposes of comparison. As shown, none of the financial variables were linked to loan size in the unrestricted models at the 0.10 level of significance. These results are generally in agreement with those for all previous models – the originally hypothesized model (equation 1) and the two unrestricted loan-program models, Direct and Guaranteed. This is further evidence that traditionally important financial ratios are not instrumental in determining FSA loan amounts.

The effects of regional variables were dissimilar between the small and large-farm models. Coefficients for the EAST and SOUTH regions were negative and significant at the 0.10 level or higher for the small-farm model while coefficients for the SOUTH (D6) and EAST regions were positive and significant at the 0.10 level or higher for the large-farm model. Loan size tended to be lower in the EAST and SOUTH regions relative to the NORTH region by $79,786 and $49,844, respectively, for the small-farm model. For the large-farm model, loan size tended to be higher in the SOUTH (D6) and EAST regions relative to the NORTH region by $381,143 and $200,009, respectively.

Based on Table 3.4, borrowers in the Direct-loan group tended to have smaller farms than borrowers in the Guaranteed-loan group. However, no common pattern was found by region for the Direct versus small models and the Guaranteed versus large models, Tables 3.2 and 3.3.

Of the demographic/structural variables only the loan-program (DRT) coefficient was significant in both the small and large-farm models. In both cases the DRT coefficient was significant at the 0.01 level. Direct loans tended to be lower than Guaranteed loans in the small and large-farm models by $79,559 and $147,928, respectively, the same pattern found in the original model (equation 1).

The nonwhite (NW) coefficient was not significant in either unrestricted model – small versus large – which is consistent with that found in the original model (equation 1). The apparent nonwhite bias then was limited to the Direct loan model. However, within the Direct-loan borrower group, nonwhite farmers had smaller operations on average as previously shown.

The gender (FM) coefficient was significant in the large-farm model as it was in the Guaranteed loan model and the original model (equation 1). The FM coefficient in the large-farm model was significant at the 0.05 level. Loans in the large-farm model tended to be higher for females by $465,744. It seems that the apparent gender bias was limited to Guaranteed loans for larger farming operations. Again, the previously indicated mitigating factors regarding gender bias apply here as well.

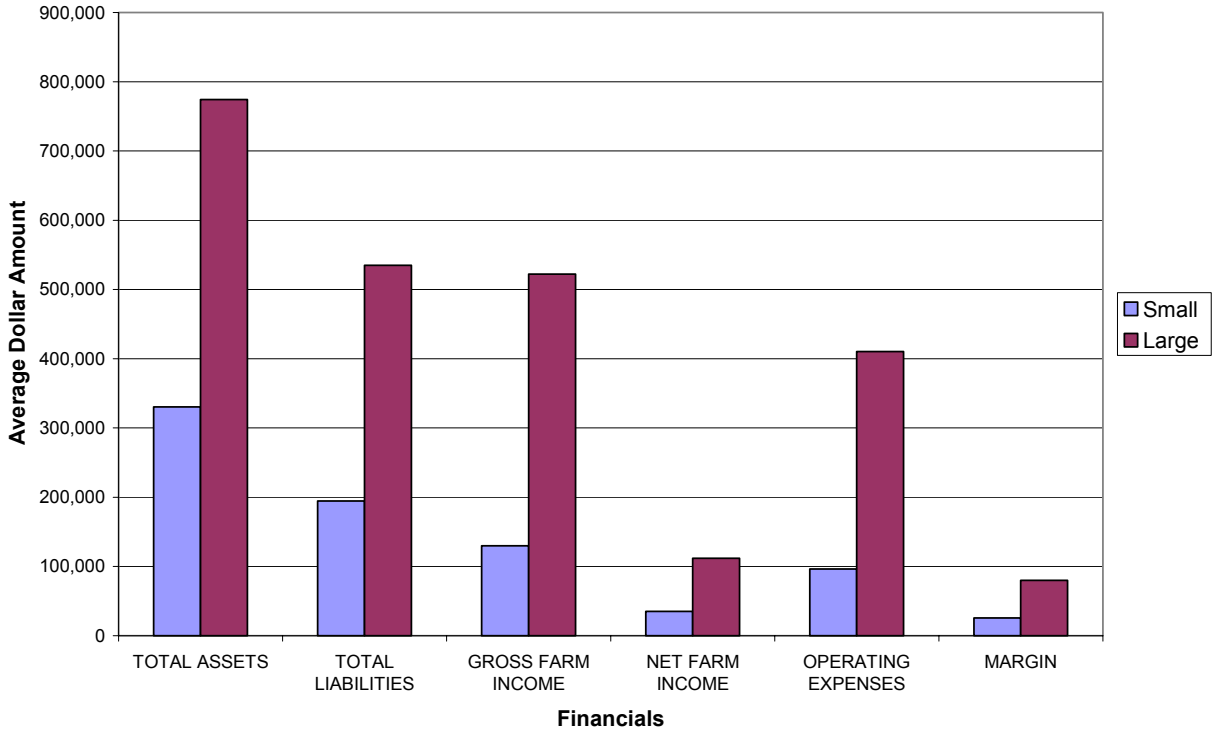
An inspection of mean values and t-tests in Table 3.5 shows very different clientele with respect to small versus large farms. The differences in these two clientele groups closely mirror those of the Direct-loan program versus the Guaranteed-loan program – differences primarily based on scale of operation. A visual comparison of mean values for significant variables for small versus large farms can be seen in Figure 3.2.

Table 3.5. **Small Versus Large Farm Clientele Characteristics**

Variable	T-Value	Small Farm Averages	Large Farm Averages
TOTAL ASSETS($)	4.62**	330,456	774,073
TOTAL LIABILLITIES ($)	6.12**	194,727	535,046
GROSS FARM INCOME ($)	12.38**	129,772	522,256
NET FARM INCOME ($)	8.02**	35,073	111,780
OPERATING EXPENSES ($)	11.91**	96,272	410,476
MARGIN ($)	3.23**	25,620	79,729
CURR	1.57	4.1590	1.2729
SOLV	1.20	0.8111	0.7362
OPR	0.69	0.8175	0.7801
ROE	0.86	-0.1644	0.3080

** denotes significance at the 0.05 level.

Figure 3.2 Comparison of Small and Large Farm Loan Pools



CHAPTER 4

SUMMARY AND CONCLUSIONS

Summary

Dating back to 1916, the federal government has extended an opportunity to provide credit to U.S. farmers at reasonable terms. Over the years, several different agencies have attempted to help farmers. Today, the Farm Service Agency (FSA) of the USDA is the primary government agency that grants credit to farmers who cannot receive credit from conventional lenders.

The FSA administers two types of loan programs – Direct and Guaranteed – which cater to borrowers in different financial situations. These programs are considered to be temporary and a last resort for distressed farmers. The objective is to provide assistance to farmers in the Direct-loan program giving them an opportunity to improve their financial positions so as to be able to advance to the Guaranteed-loan program that is serviced by conventional lenders but secured by the FSA. Upon repayment of the Guaranteed loan, the borrower is expected to be in position to secure conventional loans without governmental assistance.

This study sought to validate the contention that the FSA operates as a "lender of last resort" for farm borrowers considered highly risky by other lenders and that the FSA performs its role without discriminating against socially disadvantaged applicants (SDAs). The relationship between several variables used in the conventional loan decision-making process and the size of the loan was studied in order to deduce the nature of loan evaluation procedures employed by FSA loan officers. The incidence of borrower discrimination was also investigated through certain demographical/structural variables included in the analysis.

Loan portfolio data for the period 1999 to 2002 were obtained from the Georgia FSA office. Information extracted from the loan portfolios included borrower declarations from income statements, balance sheets, off-farm income, and expense statements, as well as declarations as to ethnic background and gender. The data came from eight FSA loan districts. Contiguous loan districts were combined based on climate and commonality of agricultural enterprises.

The hypothesized model for this study contains the common components of previous credit scoring models (i.e., measures for liquidity, solvency, profitability, loan repayment, and financial/operating efficiency) plus binary variables to capture differences in regional lending practices and identified probable indicators of discriminatory lending practices.

Of six financial variables deemed important based on credit scoring models from the literature, only one had a significant coefficient – the current ratio which was positive as expected. Apparently, strict adherence to financial ratios in determining loan amounts is not of paramount importance to the FSA. The evidence supports the FSA reputation as the lender of last resort.

The regional variables did not reveal any unusual patterns in spatial differences in loan amounts. Nonwhite discrimination was not found in the hypothesized model. However, the coefficient for the female variable was significant and surprisingly positive indicating substantially higher loans for females. This could reflect overzealous targeting of women as part of the FSA program for inclusion of SDAs. Closer scrutiny of the data revealed that female loan recipients were presumably operating with spouses and had better credit scores. Further, there were only 10 female loan recipients in the data set. Thus, the data are inconclusive regarding the treatment of women.

As expected, small-farm applicants, gross farm income under $250,000, and FSA Direct loan applicants received significantly smaller loans than large-farm applicants and FSA Guaranteed loan applicants, respectively. In fact, Chow tests showed significant structural differences in the loan-size model with respect to farm size and FSA loan type – Direct versus Guaranteed.

None of the financial variables were found to have any bearing on the loan-size models for Direct versus Guaranteed-loan clientele groups. These results are in general agreement with that for the original hypothesized model, further indication that traditional financial ratios are not of controlling importance to the FSA regardless of loan program.

The female variable was found to be important for Guaranteed loans but not Direct loans. Thus, the apparent female preference found in the originally hypothesized model was isolated to the Guaranteed loan program.

Contrary to the originally hypothesized model, the nonwhite variable was found to be important for Direct loans. Loans to nonwhites were significantly lower on average. This finding was indeed surprising in that all Direct loans are handled solely by FSA loan officers. However, a deeper probe of the Direct-loan data showed that the smaller average loan size for nonwhites was associated with smaller average farm size. Moreover, of 97 Direct-loan observations, only 13 were nonwhite.

The analysis showed very different clientele for Direct versus Guaranteed FSA loans. The difference was primarily attributed to scale of operation.

The loan-size models for small versus large farming operations again showed that none of the financial variables were linked to loan size – further evidence that traditionally important financial ratios are not instrumental in determining FSA loan amounts.

As expected, Direct loans were found to be significantly smaller than Guaranteed loans regardless of farm size. Loans were found to be significantly higher for female applicants in the large-farm clientele group. Thus, the apparent gender bias was further limited to Guaranteed loans for larger farming operations.

Conclusions

According to the findings of this study, the FSA seems to be living up to its primary role as the lender of last resort for farmers who have experienced hardships. The FSA seemingly does not scrutinize the financial backgrounds of borrowers as one would expect from commercial lenders. Thus, the financial background of a borrower appears not to have a significant effect on the size of loans granted by the FSA. This is apparent for both FSA loan types – Direct and Guaranteed.

A major thrust of the FSA involves graduating borrowers from the Direct-loan program to the Guaranteed-loan program. The FSA may to be successful in this task as suggested by the financial ratios of the borrowers in the Guaranteed versus Direct programs. With improved financial positions, borrowers should be able to transition to commercial lenders without the need for FSA help.

Other differences in the two lending programs involve loan size by region. The NORTH region typically involved large loans due to the large number of capital-intensive poultry enterprises. But for the Direct-loan program, loans appeared to be significantly higher in the SOUTH (D6) and CENTRAL regions. Causes for this occurrence were an unusual number of beginning farmers and several clients who had suffered major financial setbacks due to weather anomalies.

Again, based on the results, it can be logically concluded that smaller operations require smaller amounts of capital and larger operations require larger amounts of capital to operate. However, in reality, the situation may not be so straightforward given the time period, 1999-2002, covered in the analysis. During this period the farm sector experienced severe adverse economic conditions. It was not a time for firm expansion but rather a time of preservation for small and large operations alike.

Interestingly, size of operation was found to be linked to the type of loan program. Smaller farmers tended to be in the Direct loan program. This reflects the purpose of the FSA, the lender of last resort, providing direct help to those who need it most. Operations that manage to grow are transitioned to the Guaranteed program and hopefully subsequently to commercial lenders without FSA assistance.

Unfortunately, the issue of race was a factor in the analysis. Nonwhites received significantly smaller loans in the Direct-loan program. This result may perhaps be attributed to the fact that nonwhites on average had smaller operations than whites and thus required smaller loans. Further, there were only 13 nonwhite observations in the data. As such, the analysis does not show a pattern of discrimination nor is it ruled out. Given the subjectivity involved in the loan-granting process, isolated instances of discrimination may occur. McKelly states that most federal programs become operational at the county level as do discriminatory practices. The decision to grant or deny a loan, which occurs at the county level, opens the door for bias. Loan officers tend to be familiar with potential borrowers as they usually live in the same general area. For whatever reason, loan officers may make decisions based on personal feeling notwithstanding the procedures that FSA has in place for proper screening.

Also, the fact that the USDA has acknowledged that discrimination has occurred in the past challenges the ability of nonwhites to trust the FSA. The inability to trust loan officers may prompt nonwhite borrowers to request smaller loans than would otherwise be the case in hopes that the amount seems insignificant to the loan officer thereby improving the odds of loan approval.

Females, also considered SDAs by the FSA, surprisingly received significantly higher loans in one category – large farms in the Guaranteed-loan program. Reportedly, such operations involved husband and wife teams largely in the NORTH region involving capital intensive poultry enterprises. Apparently, the female member of such teams had the better credit score. A conclusion that the FSA was over targeting females as SDAs cannot be drawn given the circumstances. Moreover, there were only 10 female observations in the data.

Overall, the FSA appears to be carrying out its mission. Some of the operations serviced by the FSA are in poor financial condition but apparently have a reasonable chance of succeeding. Borrowers are not subjected to a litmus test where financial ratios must exceed certain thresholds. As long as the operation displays sufficient cash flow and repayment ability, the FSA seems inclined to service the loan.

There are several limitations to this study. The data were limited to the state of Georgia which has distinct demographic attributes. Thus, the conclusions from this study cannot be deemed relevant for the remainder of the United States. Data were not available on potential borrowers who were denied loans. Without this information, it cannot be said with certainty whether the FSA uses the financial background of borrowers on the same scale as commercial lenders. There was no information available on the amount of the loan requested. The amount of the loan requested would allow one to determine whether the accusations made by some

nonwhite farmers that they receive less funds than requested is unfounded or not. The data did not include specific farm enterprises to which the loans may have been attached. Such data would have been useful in assessing differences among regions and the financing needed to start up and/or continue specific enterprises. Also, subjective, nonquantifiable information such as integrity, managerial ability, and spending habits of the borrowers were not obtained and therefore not used in the study. According to Luffburrow, Barry, and Dixon such factors strongly influence credit evaluation. Other information such as age, education, and credit score of the borrower was not available but could have proved useful.

REFERENCES

Barry, P.J. "Needed Changes in the Farmers Home Administration Lending Programs." *American Journal of Agricultural Economics* 67(1985):341-344.

Barry, P.J., P.N. Ellinger, J.A. Hopkin, and C.B. Baker. *Financial Management in Agriculture*, 6th ed. New York, NY: Prentice Hall, 1999.

Cook, R.D., and S. Weisberg. "Diagnostics for Heteroskedasticity in Regression." *Biometrika* 70 (1983):1-10.

Crane, L.M. "Measuring Financial Performance: A Critical Key to Managing Risk." Department of Agricultural Economics, Michigan State University, East Lansing, MI. Website www.aec.msu.edu/agecon/blackj/Measuring%20Financial%20Performance3.rtf accessed 25 June 2003.

Drabenstott, M. "Capital for Agriculture and Rural America: Redefining the Federal Role" *Economic Review*. Kansas City, MO: Federal Reserve Bank of Kansas City, Third Quarter 1995.

Gallagher, R.L. "Distinguishing Characteristics of Unsuccessful versus Successful Agribusiness Loans." *Agricultural Finance Review* 61(2001):19-35.

Greene, W.H. *Econometric Analysis*, 2nd ed. New York, NY: Macmillan Publishing Company, 1993.

Gujarati, D.N. *Basic Econometrics, 4th ed*. New York, NY: McGraw-Hill, 2003.

Gustafson, C.R., R.J. Beyer, and D.M. Saxowsky. "Credit Evaluation: Investigating the Decision Processes of Agricultural Loan Officers." *Agricultural Finance Review* 51(1991):55-63.

Herr, W.M. "Are Farmers Home Administration's Farm Loan Programs

Redundant." *Agricultural Finance Review* 54(1994):1-14.

Kennedy, P. *A Guide to Econometrics*, 4 ed. Cambridge, MA: MIT Press, 1998.

Kohl, D.M. "Credit and Marketing Evaluation." 20th Annual Southeastern Agricultural Lenders School. Clemson University, Clemson, SC. April 28-May 2, 2003.

Koenig, S., and D. Doye. "Agricultural Credit Policy" Farm Foundation, Oak Brook, IL. Website www.farmfoundation.org/2002FB/8-3.pdf, accessed 25 June 2003.

Lufburrow, J., P.J. Barry, and B.L. Dixon. "Credit Scoring for Farm Loan Pricing." *Agricultural Finance Review* 44(1984):8-14.

McKeely, B.A. "Why Can't Jacob Read? Why Can't Black Farmer's Farm?" Ph.D. Dissertation, University of Georgia, 2003.

Miller, L.H., and E.L. LaDue. "Credit Assessment Models for Farm Borrowers: A Logit Analysis." *Agricultural Finance Review* 49(1989):22-36.

Splett, N.S., P.J. Barry, B.L. Dixon, and P.N. Ellinger. "A Joint Experience and Statistical Approach to Credit Scoring." *Agricultural* Finance *Review* 54(1994):

Stam, J., D. Milkove, S. Koenig, J. Ryan, T. Covey, R. Hoppe, and P. Sundell. *Agricultural Income and Finance Annual Lender Issue*. Electronic Outlook Report AIS-80. USDA, Economic Research Service (ERS), March 2003.

Stover, R.D., R.K. Teas, and R.J. Gardner. "Agricultural Lending Decision: A Multiattribute Analysis." *American Journal of Agricultural Economics* 67(1985):513-520.

Turvey, C.G. "Credit Scoring for Agricultural Loans: A Review with Applications." *Agricultural Finance Review* 51(1991):43-54.

Turvey, C.G., and R. Brown. "Credit Scoring for a Federal Lending Institution: The Case of Canada's Farm Credit Corporation." *Agricultural Finance Review* 50(1990):47-57.

USDA, Economic Research Service (ERS). *Agricultural Income and Finance Situation and Outlook.* Website www.ers.usda.gov/Briefing/FarmIncome, accessed 2 September 2003.

USDA, Economic Research Service (ERS). *Farm Structure Characteristics.* Website www.ers.usda.gov/Briefing/FarmStructure, accessed 25 July 2003.

USDA, Economic Research Service (ERS). *Agricultural Outlook, FSA Credit Programs Target Minority Farmers*. Washington, DC: U. S. Government Printing Office, November 1999.

USDA, Farmers Home Administration (FmHA). *A Brief History of the Farmers Home Administration*. Washington, DC: U. S. Government Printing Office, February 1988.

USDA, Farm Service Agency (FSA). *Georgia State and County Directory*. Athens, GA, March 2003.

USDA, Farm Service Agency (FSA). *Loan Information*. MP-23. Washington, DC: U. S. Government Printing Office, 2001.

USDA, Farm Service Agency (FSA). *Producer's Guide to FSA Loan Programs*. Washington, DC: U. S. Government Printing Office, 2000.

USDA, National Agricultural Statistics Service (NASS). *1997 Census Of Agriculture*. Washington, DC: U. S. Government Printing Office, 1999.

APPENDIX

Description of the Variables in the Direct-Lending Model

Variable	Description	Min. Value	Max. Value	Mean	Std. Dev.
LSIZE	Loan amount in dollars	8,700	344,540	83,794	59,404
CURR	Current ratio (current assets/current liabilities)	0.017	26.06	1.25	2.95
SOLV	Solvency (total farm liabilities/ total farm assets)	0.12	3.36	0.86	0.54
OPR	Operating efficiency (annual operating expenses/by gross farm revenue)	0.44	4.10	0.82	0.36
ROE	Return on equity (net farm income/ equity in farming operation)	-35.24	17.14	0.14	4.55
NONFI	Non farm income in dollars	0	68,233	14,398	17,979
MARGIN	Cash available for annual debt payments minus total annual debt payments including repayment of FSA loan	1	131,734	15,589	18,868
SOUTH (D6)	FSA loan district 6	0	1	0.08	0.28
EAST	FSA loan districts 3 and 4	0	1	0.30	0.46
SOUTH	FSA loan districts 7 and 8	0	1	0.25	0.43
CENTRAL	FSA loan districts 2 and 5	0	1	0.20	0.40
FM	Female borrowers = 1, male borrowers = 0	0	1	0.04	0.20
NW	Non-white borrowers = 1, otherwise 0	0	1	0.13	0.34
SZ	Small farm (gross farm income under $250,000) = 1, otherwise 0	0	1	0.67	0.47

Description of the Variables in the Guaranteed-Lending Model

Variable	Description	Min. Value	Max. Value	Mean	Std. Dev.
LSIZE	Loan amount in dollars	22,250	752,000	260,967	188,075
CURR	Current ratio (current assets/current liabilities)	0.02	159.0	4.49	19.4
SOLV	Solvency (total farm liabilities/ total farm assets)	0.04	1.94	0.68	0.32
OPR	Operating efficiency (annual operating expenses/by gross farm revenue)	0.03	4.74	0.78	0.45
ROE	Return on equity (net farm income/ equity in farming operation)	-25.45	3.81	-0.04	3.07
NONFI	Non farm income in dollars	0	184,211	20,054	27,883
MARGIN	Cash available for annual debt payments minus total annual debt payments including repayment of FSA loan	115	862,449	86,050	149,051
SOUTH (D6)	FSA loan district 6	0	1	0.08	0.28
EAST	FSA loan districts 3 and 4	0	1	0.21	0.41
SOUTH	FSA loan districts 7 and 8	0	1	0.28	0.45
CENTRAL	FSA loan districts 2 and 5	0	1	0.23	0.43
FM	Female borrowers = 1, male borrowers = 0	0	1	0.06	0.25
NW	Non-white borrowers = 1, otherwise 0	0	1	0.07	0.26
SZ	Small farm (gross farm income under $250,000) = 1, otherwise 0	0	1	0.41	0.50

Description of the Variables in the Small Farm Model

Variable	Description	Min. Value	Max. Value	Mean	Std. Dev.
LSIZE	Loan amount in dollars	8,700	752,000	129,228	154,353
CURR	Current ratio (current assets/current liabilities)	0.02	159.0	4.16	18.56
SOLV	Solvency (total farm liabilities/ total farm assets)	0.04	3.36	0.81	0.54
OPR	Operating efficiency (annual operating expenses/by gross farm revenue)	0.03	4.75	0.82	0.54
ROE	Return on equity (net farm income/ equity in farming operation)	-35.24	17.14	-0.16	4.34
NONFI	Non farm income in dollars	0	87,336	20,437	19,958
MARGIN	Cash available for annual debt payments minus total annual debt payments including repayment of FSA loan	1	383,673	25,620	54,978
SOUTH (D6)	FSA loan district 6	0	1	0.05	0.21
EAST	FSA loan districts 3 and 4	0	1	0.17	0.38
SOUTH	FSA loan districts 7 and 8	0	1	0.24	0.43
CENTRAL	FSA loan districts 2 and 5	0	1	0.27	0.45
FM	Female borrowers = 1, male borrowers = 0	0	1	0.06	0.23
NW	Non-white borrowers = 1, otherwise 0	0	1	0.14	0.35
DRT	Direct loan = 1, Guaranteed loan = 0	0	1	0.63	0.49

Description of the Variables in the Large Farm Model

Variable	Description	Min. Value	Max. Value	Mean	Std. Dev.
LSIZE	Loan amount in dollars	18,000	700,000	220,910	162,637
CURR	Current ratio (current assets/current liabilities)	0.02	19.77	1.27	2.42
SOLV	Solvency (total farm liabilities/ total farm assets)	0.15	1.75	0.74	0.31
OPR	Operating efficiency (annual operating expenses/by gross farm revenue)	0.41	1.03	0.78	0.12
ROE	Return on equity (net farm income/ equity in farming operation)	-25.45	9.05	0.31	3.25
NONFI	Non farm income in dollars	0	184,211	13,291	26,722
MARGIN	Cash available for annual debt payments minus total annual debt payments including repayment of FSA loan	115	862,449	79,729	148,139
SOUTH (POULTRY)	FSA loan district 6	0	1	0.13	0.33
EAST	FSA loan districts 3 and 4	0	1	0.35	0.48
SOUTH	FSA loan districts 7 and 8	0	1	0.29	0.46
CENTRAL	FSA loan districts 2 and 5	0	1	0.15	0.36
FM	Female borrowers = 1, male borrowers = 0	0	1	0.05	0.21
NW	Non-white borrowers = 1, otherwise 0	0	1	0.06	0.23
DRT	Direct loan = 1, Guaranteed loan = 0	0	1	0.37	0.49

Complete Results from Hypothesized Model

Source	SS	DF	MS	
Model	94.5517035	14	6.75369311	Number of obs = 191
Residual	107.851292	176	.612791433	F(14, 176) = 11.02
Total	202.402996	190	1.06527893	Prob > F = 0.0000
				R-squared = 0.4671
				Adj R-squared = 0.4248
				Root MSE = .78281

Variable	Coef.	Std. Error	P>|t|	T	[95% C. I.]	
D6	-.0496977	.2615359	0.850	-0.19	-.5658477	.4664523
CENTRAL	-.3427891	.1877359	0.070	-1.83	-.7132923	.0277141
SOUTH	-.4597432	.1839544	0.013	-2.50	-.8227834	-.0967029
EAST	-.5056684	.1895797	0.008	-2.67	-.8798105	-.1315263
FM	.6761117	.3205935	0.036	2.11	.0434094	1.308814
NW	-.3773473	.2324262	0.106	-1.62	-.8360483	.0813537
DRT	-.9232353	.1292437	0.000	-7.14	-1.178302	-.6681685
SZ	-.6348814	.1334088	0.000	-4.76	-.8981682	-.3715946
NONFI	-2.11e-06	2.56e-06	0.411	-0.82	-7.16e-06	2.94e-06
MARGIN	5.84e-07	5.56e-07	0.295	1.05	-5.13e-07	1.68e-06
OPR	.1804205	.1423581	0.207	1.27	-.1005281	.461369
SOLV	.2085105	.1334702	0.120	1.56	-.0548975	.4719184
CURR	.0074252	.0043353	0.089	1.71	-.0011306	.015981
ROE	.0176297	.0149165	0.239	1.18	-.0118086	.047068
Intercept	12.4139	.2443897	0.000	50.8	11.93159	12.89621

Cook-Weisberg test for heteroskedasticity using fitted values
Ho: Constant variance; Chi2(1) = 2.82 Prob > Chi2 = 0.0933

Variable	VIF	1/VIF
EAST	2.14	0.468035
SOUTH	2.04	0.490610
CENTRAL	1.85	0.539978
D6	1.64	0.611119
FM	1.59	0.629156
NW	1.58	0.633505
SZ	1.38	0.726816
DRT	1.30	0.768472
MARGIN	1.18	0.849081
NONFI	1.12	0.891369
SOLV	1.12	0.893615
CURR	1.12	0.896443
OPR	1.04	0.962876
ROE	1.04	0.963073
MEAN VIF	1.44	

Complete Results from Pooled Model for Direct vs. Guaranteed Loan Comparison

Source	SS	DF	MS	
Model	63.2823475	13	4.86787289	Number of obs = 191
Residual	139.120648	177	.785992363	F(14, 176) = 6.19
Total	202.402996	190	1.06527893	Prob > F = 0.0000
				R-squared = 0.3127
				Adj R-squared = 0.2622
				Root MSE = .88656

Variable	Coef.	Std. Error	P>|t|	T	[95% C. I.]	
D6	-.0617684	.2961932	0.835	-0.21	-.6462929	.5227561
CENTRAL	-.2896411	.212451	0.175	-1.36	-.7089041	.1296218
SOUTH	-.4655236	.2083333	0.027	-2.23	-.8766605	-.0543868
EAST	-.6508153	.2134695	0.003	-3.05	-1.072088	-.2295424
FM	.8805234	.3616351	0.016	2.43	.166852	1.594195
NW	-.5641383	.2615603	0.032	-2.16	-1.080316	-.0479602
SZ	-.8590755	.14685	0.000	-5.85	-1.148878	-.5692733
NONFI	4.77e-07	2.87e-06	0.868	0.17	-5.19e-06	6.14e-06
MARGIN	1.58e-06	6.09e-07	0.010	2.59	3.76e-07	2.78e-06
OPR	.1867227	.1612229	0.248	1.16	-.1314437	.5048891
SOLV	.0416754	.1488278	0.780	0.28	-.2520299	.3353808
CURR	.0110863	.0048754	0.024	2.27	.0014648	.0207077
ROE	.0103958	.0168546	0.538	0.62	-.022866	.0436576
Intercept	12.12445	.2729499	0.000	44.4	11.5858	12.66311

Cook-Weisberg test for heteroskedasticity using fitted values
Ho: Constant variance; Chi2(1) = 0.40 Prob > Chi2 = 0.5246

Variable	VIF	1/VIF
EAST	2.11	0.473474
SOUTH	2.04	0.490620
CENTRAL	1.85	0.540828
D6	1.64	0.611144
FM	1.58	0.634208
NW	1.56	0.641626
SZ	1.30	0.769398
MARGIN	1.10	0.905928
CURR	1.10	0.909149
NONFI	1.10	0.909541
SOLV	1.08	0.921841
OPR	1.04	0.962913
ROE	1.03	0.967532
MEAN VIF	1.43	

Complete Results from Pooled Model for Small vs. Large Farm Comparison

Source	**SS**	**DF**	**MS**	Number of obs = 191
Model	80.6736357	13	6.20566428	F(14, 176) = 9.02
Residual	121.72936	177	.687736498	Prob > F = 0.0000
Total	202.402996	190	1.06527893	R-squared = 0.3986
				Adj R-squared = 0.3544
				Root MSE = .8293

Variable	**Coef.**	**Std. Error**	**P>|t|**	**T**	**[95% C. I.]**	
D6	.2534905	.2687215	0.347	0.94	-.2768198	.7838008
CENTRAL	-.2829092	.1984378	0.156	-1.43	-.6745176	.1086992
SOUTH	-.3002954	.1916191	0.119	-1.57	-.6784476	.0778568
EAST	-.2355073	.1916223	0.221	-1.23	-.6136657	.1426511
FM	.8029205	.3384574	0.019	2.37	.1349892	1.470852
NW	-.5661392	.2426161	0.021	-2.33	-1.044932	-.0873467
DRT	-1.06793	.1330763	0.000	-8.02	-1.330551	-.8053101
NONFI	-3.61e-06	2.69e-06	0.181	-1.34	-8.92e-06	1.70e-06
MARGIN	1.05e-06	5.80e-07	0.072	1.81	-9.51e-08	2.19e-06
OPR	.1387926	.1505273	0.358	0.92	-.1582666	.4358519
SOLV	.1987503	.1413799	0.162	1.41	-.0802568	.4777575
CURR	.0048493	.0045568	0.289	1.06	-.0041433	.013842
ROE	.0221288	.0157706	0.162	1.40	-.0089939	.0532515
Intercept	12.05599	.2463387	0.000	48.9	11.56985	12.54212

Cook-Weisberg test for heteroskedasticity using fitted values
Ho: Constant variance; Chi2(1) = 2.28 Prob > Chi2 = 0.1308

Variable	**VIF**	**1/VIF**
SOUTH	1.97	0.507444
EAST	1.95	0.514137
CENTRAL	1.84	0.542415
FM	1.58	0.633532
D6	1.54	0.649670
NW	1.53	0.652514
DRT	1.23	0.813494
MARGIN	1.14	0.876168
SOLV	1.12	0.893826
NONFI	1.10	0.905153
CURR	1.10	0.910638
OPR	1.03	0.966526
ROE	1.03	0.966957
MEAN VIF	1.40	

Complete Results from Direct Loan Model

Source	SS	DF	MS	
Model	26.4736447	13	2.03643421	Number of obs = 97
Residual	46.7166841	83	.562851616	F(14, 176) = 3.62
Total	73.1903289	96	.762399259	Prob > F = 0.0002
				R-squared = 0.3617
				Adj R-squared = 0.2617
				Root MSE = .75023

Variable	Coef.	Std. Error	P>|t|	T	[95% C. I.]	
D6	.6561053	.3749478	0.084	1.75	-.0896508	1.401861
CENTRAL	.674949	.2702847	0.014	2.50	.1373636	1.212534
SOUTH	.2074253	.2504552	0.410	0.83	-.29072	.7055707
EAST	-.1162313	.2414077	0.631	-.048	-.5963815	.3639189
FM	.594164	.4948048	0.233	1.20	-.3899829	1.578311
NW	-.8066214	.2976065	0.008	-2.71	-1.398549	-.2146942
NONFI	1.05e-06	4.59e-06	0.819	0.23	-8.08e-06	.0000102
MARGIN	7.33e-06	4.76e-06	0.128	1.54	-2.15e-06	.0000168
OPR	.0064631	.2207947	0.977	0.03	-.4326887	.4456149
SOLV	.0540462	.1563006	0.730	0.35	-.2568295	.3649219
CURR	-.025583	.0277902	0.360	-0.92	-.0808566	.0296907
ROE	.004092	.0179002	0.820	0.23	-.0315108	.0396949
SZ	-.8310887	.1944404	0.000	-4.27	-1.217823	-.4443544
Intercept	11.31302	.3287032	0.000	34.4	10.65924	11.9668

Cook-Weisberg test for heteroskedasticity using fitted values
Ho: Constant variance; Chi2(1) = 2.37 Prob > Chi2 = 0.1235

Variable	VIF	1/VIF
EAST	2.10	0.475069
SOUTH	2.01	0.496788
CENTRAL	1.98	0.504283
D6	1.83	0.545436
NW	1.77	0.564493
FM	1.67	0.599453
SZ	1.44	0.694271
MARGIN	1.38	0.725763
SOLV	1.20	0.830916
NONFI	1.16	0.860577
CURR	1.14	0.873398
ROE	1.13	0.885606
OPR	1.09	0.919188
MEAN VIF	1.53	

Complete Results from Guaranteed Loan Model

Source	SS	DF	MS	
Model	26.8606812	13	2.06620625	Number of obs = 94
Residual	39.7585057	80	.496981321	F(14, 176) = 4.16
Total	66.6191869	93	.716335343	Prob > F = 0.0000
				R-squared = 0.4032
				Adj R-squared = 0.3062
				Root MSE = .70497

Variable	Coef.	Std. Error	P>|t|	T	[95% C. I.]	
D6	-.7047284	.3719769	0.062	-1.89	-1.444986	.0355292
CENTRAL	-1.105206	.2678143	0.000	-4.13	-1.638173	-.5722383
SOUTH	-1.004669	.2657926	0.000	-3.78	-1.533613	-.475725
EAST	-.9034042	.2961935	0.003	-3.05	-1.492848	-.3139603
FM	.6979245	.3993367	0.084	1.75	-.0967807	1.49263
NW	-.0086765	.3711245	0.981	-0.02	-.7472378	.7298848
NONFI	-1.73e-06	2.86e-06	0.547	-0.60	-7.41e-06	3.96e-06
MARGIN	2.55e-07	5.16e-07	0.623	0.49	-7.72e-07	1.28e-06
OPR	.2441799	.170564	0.156	1.43	-.0952532	.5836131
SOLV	.2793808	.2492324	0.266	1.12	-.2166075	.7753691
CURR	.0067533	.0041684	0.109	1.62	-.0015421	.0150487
ROE	.0001909	.0252814	0.994	0.01	-.0501208	.0505025
SZ	-.7565602	.2022131	0.000	-3.74	-1.158977	-.3541434
Intercept	12.82967	.3886071	0.000	33.0	12.05632	13.60303

Cook-Weisberg test for heteroskedasticity using fitted values
Ho: Constant variance; Chi2(1) = 1.67 Prob > Chi2 = 0.1967

Variable	VIF	1/VIF
EAST	2.78	0.359795
SOUTH	2.67	0.374024
CENTRAL	2.43	0.411193
D6	2.04	0.490736
SZ	1.88	0.532626
FM	1.80	0.554825
NW	1.80	0.556944
CURR	1.22	0.816403
NONFI	1.19	0.841587
SOLV	1.17	0.856655
ROE	1.12	0.889180
MARGIN	1.11	0.903316
OPR	1.10	0.912142
MEAN VIF	1.72	

Complete Results from Large Farm Model

Source	SS	DF	MS	
Model	21.4897085	13	1.6530545	Number of obs = 87
Residual	28.9780062	73	.396958989	F(14, 176) = 4.16
Total	50.4677147	86	.586833892	Prob > F = 0.0000
				R-squared = 0.4258
				Adj R-squared = 0.3236
				Root MSE = .63005

Variable	Coef.	Std. Error	P>|t|	T	[95% C. I.]	
D6	.796864	.3462783	0.024	2.30	.1067324	1.486996
CENTRAL	.3207245	.3551018	0.369	0.90	-.3869924	1.028441
SOUTH	.3557947	.3018514	0.242	1.18	-.2457944	.9573837
EAST	.4943659	.2868051	0.089	1.72	-.0772357	1.065968
FM	.9119035	.3719229	0.017	2.45	.1706621	1.653145
NW	-.4703841	.3592634	0.195	-1.31	-1.186395	.2456269
NONFI	-4.18e-06	2.83e-06	0.144	-1.48	-9.83e-06	1.46e-06
MARGIN	5.99e-07	5.17e-07	0.250	1.16	-4.31e-07	1.63e-06
OPR	-.673525	.6608365	0.311	-1.02	-1.99057	.6435203
SOLV	-.3212792	.2443077	0.193	-1.32	-.8081838	.1656254
CURR	-.0433673	.0305358	0.160	-1.42	-.1042252	.0174905
ROE	.0223963	.0226265	0.326	0.99	-.0226983	.067491
DRT	-.6404567	.1793082	0.001	-3.57	-.9978175	-.2830959
Intercept	12.65325	.5570621	0.000	22.7	11.54303	13.76347

Cook-Weisberg test for heteroskedasticity using fitted values
Ho: Constant variance; Chi2(1) = 0.07 Prob > Chi2 = 0.7959

Variable	VIF	1/VIF
EAST	4.13	0.241847
SOUTH	4.09	0.244538
CENTRAL	3.51	0.284698
D6	2.90	0.344515
DRT	1.64	0.610312
NW	1.53	0.652612
FM	1.33	0.752005
OPR	1.27	0.784569
MARGIN	1.27	0.787064
SOLV	1.25	0.797880
NONFI	1.24	0.806300
CURR	1.18	0.845491
ROE	1.17	0.853251
MEAN VIF	2.04	

Complete Results from Small Farm Model

Source	SS	DF	MS	
Model	53.1364218	13	4.08741706	Number of obs = 104
Residual	66.0684278	90	.734093642	F(14, 176) = 5.57
Total	119.204885	103	1.15732864	Prob > F = 0.0000
				R-squared = 0.4458
				Adj R-squared = 0.3657
				Root MSE = .85679

Variable	Coef.	Std. Error	P>|t|	T	[95% C. I.]	
D6	-.0831506	.5264965	0.875	-0.16	-1.129128	.9628266
CENTRAL	-.3133437	.2527033	0.218	-1.24	-.815383	.1886955
SOUTH	-.4991728	.2612214	0.059	-1.91	-1.018135	.0197892
EAST	-.9916168	.3022868	0.001	-3.28	-1.592162	-.3910714
FM	.5308103	.5141388	0.305	1.03	-.4906161	1.552237
NW	-.3382954	.3554959	0.344	-0.95	-1.04455	.3679593
NONFI	1.20e-06	5.04e-06	0.813	0.24	-8.81e-06	.0000112
MARGIN	2.85e-07	1.80e-06	0.875	0.16	-3.30e-06	3.87e-06
OPR	.2487402	.1606443	0.125	1.55	-.0704077	.5678882
SOLV	.2560959	.1695905	0.135	1.51	-.0808252	.593017
CURR	.0077472	.0048466	0.113	1.60	-.0018814	.0173757
ROE	.003168	.020306	0.876	0.16	-.0371735	.0435095
DRT	-.9868086	.2094904	0.000	-4.71	-1.402998	-.5706194
Intercept	11.75069	.3153315	0.000	37.3	11.12423	12.37715

Cook-Weisberg test for heteroskedasticity using fitted values
Ho: Constant variance; Chi2(1) = 0.08 Prob > Chi2 = 0.7792

Variable	VIF	1/VIF
NW	2.21	0.452516
FM	2.04	0.491187
EAST	1.85	0.539729
D6	1.80	0.556402
CENTRAL	1.78	0.561812
SOUTH	1.77	0.566500
DRT	1.46	0.686244
NONFI	1.42	0.704758
MARGIN	1.38	0.724195
SOLV	1.17	0.853871
CURR	1.14	0.881019
ROE	1.09	0.917518
OPR	1.06	0.942584
MEAN VIF	1.55	