Credit Risk Assessment and Racial Minority Lending at the Farm Service Agency

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The nature of credit risk assessment and basis of loan approval decisions of the Farm Service Agency are analyzed in the aftermath of the black farmers' 1997 class action suit against the U.S. Department of Agriculture. This study did not uncover convincing evidence of racial discrimination against nonwhite borrowers under a binomial logistic framework based on the probability of a loan application's approval. Moreover, the collective use of more stringent and objective credit-scoring measures usually employed by commercial lenders is less evident in the Farm Service Agency's evaluation of loan applications.

Key Words: binomial logistic regression, credit risk, credit-scoring model, direct lending, Farm Service Agency, guaranteed lending, racial bias

JEL Classifications: G20, G21, G28, Q10, Q14

The primary avenue the federal government uses to provide credit to farmers is through the Farm Service Agency (FSA), an agency of the U.S. Department of Agriculture (USDA). FSA provides direct and guaranteed loans as temporary sources of agricultural credit. The mission of the agency is to fill the gaps in the commercial credit market in which creditworthy farmers, especially high-risk borrowers,

are unable to obtain credit. FSA is mandated to provide these borrowers with direct loans and eventually help borrowers graduate to commercial sector credit sources. Guaranteed credit is regarded as an intermediate step from direct loans to commercial credit in case graduation from the direct lending program to commercial credit cannot be completed, although some borrowers can immediately begin with guaranteed loans, bypassing the direct-loan stage.

Such government credit programs are guided by the government's mission to assist underserved sectors of the farm economy experiencing difficulty in gaining access to borrowed funds through commercial lending channels. FSA's clients are usually either younger farmers with inadequate financial resources or established farmers whose businesses have been affected by significant economic downturns or disasters. However, to

qualify for FSA assistance, these borrowers must pass the "credit-elsewhere test," which requires proof of previous denials of loan requests by commercial lenders. Through this requirement, the FSA has been regarded as the farmers' "lender of last resort" (Chite; Hanson, Delavan, and Power).

The nature of assistance offered through FSA lending programs is different than that of other government subsidy programs. FSA loans do not belong to the category of government income transfer payments that typically characterize benefits from most government farm programs.[1] Hence, the FSA implements guidelines for the assessment of credit risk or repayment potential of prospective participants for FSA lending programs. These lending programs also depend on periodic funding allocations determined by legislation.

The issue of credit risk assessment is complicated by accusations of inequities in the administration of USDA loan programs. For years, African-American farmers throughout the country felt that their credit needs were being ineffectually served by the Farmer's Home Administration, FSA's predecessor (Koenig and Dodson). The alleged unfairness by this administration prompted black farmers across the country to file several class-action discrimination suits against the FSA, one of which is known as "Pigford v. Glickman," filed in 1997 (BlackState.com; Bennett; Mittall and Powell). Earlier, after conferring with black farmers in listening sessions around the country, the Secretary of Agriculture formed the Civil Rights Action Team (CRAT) to investigate the claims. The team concluded that discrimination, often extreme, had taken place during the years 1981 to 1996, and CRAT made 92 recommendations to end such practices.[2] These recommendations covered far-

reaching areas for change, including holding USDA managers accountable for ensuring the civil rights of all employees and customers, making USDA programs accessible to all customers, and creating a diverse workforce. The USDA settled the lawsuit on January 5, 1999, by means of a consent decree that provided for compensation to black farmers who could prove discrimination during those 16 years (Bennett; Mittall and Powell).

This study addresses two major issues in connection with FSA's role as "lender of last resort." First, it determines the relative importance within the FSA lending framework of financial measures usually included in commercial lenders' credit risk assessment models. Second, it assesses whether there is persuasive evidence of racial discrimination in FSA lending operations during the aftermath of the class action suits in the 1990s. An empirical framework is developed using actual FSA loan application data during the period 1999 to 2002 to analyze relationships between variables conventionally used by regular, commercial lenders in the loan decision-making process and decisions made by FSA on loan applications. The model also includes demographic variables to determine if discriminatory lending practices were still evident during the sample period that coincides with the class action settlement and program rectification phase. The following sections discuss this study's theoretical and empirical frameworks and present the econometric results and implications.

Theoretical Foundation

Increased lending competition, improved borrower information and the lenders' growing concern about loan quality have led to the development of more formal and comprehensive methods of loan evaluation now being used by banks and other farm lenders (Ellinger, Splett

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[1] According to the Report on Federal Aid to States by the U.S. Census Bureau, in 2002 the government released a total of $21.5 billion in grants and other payments to the Department of Agriculture, of which $3.034 billion was disbursed to the FSA.

[2] The full text of the report could no longer be retrieved from the following link in the USDA website: (http://www.usda.gov/news/civil/cr_index.htm). A list

of the CRAT recommendations, however, can be found in a report prepared by the USDA's Civil Rights Implementation Team that outlined the status of the implementation of each recommendation as of September 1997. This report can be accessed through the link http://permanent.access.gpo.gov/lps15852/critprog.pdf.

and Barry). Although lenders in general do not utilize a uniform credit assessment model, the basic framework underlying their differentiated models normally involves the assignment of a credit score to each borrower that is determined as the weighted sum of borrower/ business performance measures. The determinants of the credit score and corresponding weights, however, vary among lenders.

Conventional Credit Risk Assessment

Miller and LaDue, in a study of credit assessment models, examined financial ratios of liquidity, solvency, profitability, capital efficiency, and operating efficiency as explanatory variables. Using logistic regression techniques, they concluded that liquidity, profitability, and operating efficiency determined borrower quality. These results were validated in another study conducted by Turvey for Canada's Farm Credit Corporation. Turvey's results indicated that liquidity and leverage were strong determinants of default risk, in addition to profitability and efficiency.

Gallagher emphasized the inverse relationship between leverage and agribusiness loan success, thus recommending that leverage be considered an important gauge of credit risk. His results also indicated that reduced interest rates were offered to borrowers with lower debt-to-asset ratios and that the amount of the loan was invariably affected by the interest rate.

Certain lenders develop more than one version of credit-scoring models to apply to categories of borrowing clients. Modified financial benchmarks and criteria are used depending on the structural characteristics of farm operations, such as size, tenure, and farm business type. Turvey and Brown, for instance, verified that farm type and location could be important considerations in credit-scoring models. Kohl emphasized the idea of developing different versions of the credit-scoring model to cater to different farm business sizes. His proposed credit-scoring model for large farm borrowers considered such financial measures as repayment ability, liquidity, collateral, solvency, profitability, and fi-

nancial efficiency, whereas smaller farm businesses are evaluated merely on the basis of repayment ability, previous track record, leverage, and collateral coverage. Splett et al. developed two versions of a credit-scoring model from a statistical analysis of inputs from a farm lender workshop held in the early 1990s. Their proposed credit-scoring models considered different sets of financial variables and weights to apply separately to term loan and to operating credit applications.

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 application (Gustafson, Beyer, and Saxowsky). The use of subjective judgment in credit evaluation can result in inconsistent credit decisions among loan officers with varied levels and types of experience. Moreover, a loan officer's attitude toward risk of default could also exert undue influence on his/her ability to evaluate the variables used in the loan decision (Stover, Teas, and Gardener). Failure to be objective with regard to risk may result in a suboptimal decision to grant or deny the loan.

The Unconventional FSA Lending Framework

The lending guidelines of the FSA loan programs clearly state that compliance with some specific eligibility requirements, even in the case of socially disadvantaged (SDA) borrowers, is not sufficient to guarantee loan approval (USDA FSA, 2003). The loan applicants also need to prove creditworthiness in order to obtain approval of loan requests, although the FSA's screening guidelines appear to be more considerate of "special borrower circumstances" that normally would not be considered under commercial lenders' stricter credit-risk assessment frameworks.

The FSA has modified its definition of "creditworthiness" through the years. The Department of Agriculture Reorganization Act of 1994 repealed the statutory provisions in which creditworthiness was determined from

the loan applicant's "(1) character, industry, and ability to carry out the proposed operation; and (2) honesty in endeavoring to carry out obligations associated with the loan" (USDA FSA, 1995, p.1; also in USDA FSA, May 1997, September 1997).

Subsequent agency circular notices introduced the following modifications in the assessment of creditworthiness by the agency's lending officers:

a) Determination of realistic repayment plans based on prudent lending principles and current and historical information available (USDA FSA, September 1997, 1998).
b) Nonpayment of debts or delinquent payments due to circumstances within an applicant's control as an indication of unacceptable credit history (USDA FSA, 1995, May 1997, September 1997).
c) Falsification of information, intentional omission of important loan information, and evidence of lack of reasonable effort to comply with conditions and terms of a proposed loan as grounds for loan denial (USDA FSA, 1995, September 1997, 1999, 2000, 2001).

Thus far, these guidelines resemble the principles of credit risk that define a typical commercial lender's credit risk evaluation system. Two additional FSA lending provisions, however, elucidate the departure points between the federal and commercial credit risk assessment models. These provisions provide for special considerations in defining "historical credit delinquency" or "unacceptable credit history" for borrowers who:

a) Have been unable to pay previous loans or have delinquent payments due to temporary circumstances, such as job loss, loss of benefits or other income, and increase of living expenses due to illness, injury, or death (USDA FSA, 1995, May 1997, September 1997).
b) Have no previous credit history (USDA FSA, 1995).

Generally, commercial lenders do not grant such special considerations. The lack of an acceptable historical and/or qualitative credit track record, regardless of a loan applicant's justification for deficiencies, is sufficient grounds for a commercial lender to deny the loan application.

FSA Funding Constraints

The credit-rationing paradigm ordinarily used by commercial lenders has very limited application to the FSA lending framework. Each FSA lending program has a stipulated borrowing cost that is invariably applied to all loan accounts of a given loan type, thus eliminating interest rate as a risk management and credit-rationing device. Other provisions of the loan covenant, such as loan maturity, foreclosure conditions, and prepayment/default penalties, are standard among all borrowing accounts.

Loan approvals and disbursements in each FSA lending program are restricted by finite funding allocations that are available only for a specific period (USDA FSA, May 2004). These allocations are appropriated by Congress as part of the USDA budget in each government fiscal year that runs from October 1 to September 30 of the following year. These funding appropriations are then allocated by the FSA based on perceived potential demand for FSA loans in each state. In the event that a certain loan program in a given state starts to run low on allocated funding, the FSA can resort to the National Headquarters pooled funds, which are unused allocations to the state offices that can be either redistributed among all states or disbursed on a loan-by-loan basis to states that make requests. Congress can also pass a supplemental appropriations bill to make more funds available. Otherwise, approved loan applications in any given year must wait to be funded during the subsequent fiscal year when new appropriations become available.

Class Action Suits

The equitable implementation of FSA's lending programs, however, has been challenged in the last decade. In 1995, Hispanic farmers

filed a lawsuit known as "Williams versus Glickman," accusing the USDA of racial discrimination in the implementation of its programs. The lawsuit, however, was considered not worthy of class action status and was quickly dismissed by a judicial court (Bennett).

In 1996 a group of black farmers marched to the White House gates to lodge the same protest. This mass action succeeded in eliciting national media coverage and subsequently the USDA's attention (Mittall and Powell). Secretary Glickman formed the CRAT to investigate the allegations. He also conducted listening sessions among black farmers around the country (Bennett).

The Pigford versus Glickman case, which became known as the "black farmers' class action suit," was formally filed in 1997. Hundreds of black farmers appeared to testify before the Black Congressional Caucus in April 1997 (BlackState.com; Mittall and Powell). Their testimonies uncovered various forms of discriminatory lending practices. Aside from the higher probability of denial of loan applications vis-à-vis the rejection rate for the white borrowers' applications, they cited the longer processing times of black borrowers' loan applications, which usually took about 222 days versus 84 days (Mittall and Powell). Moreover, highly conservative yield calculation methods were allegedly used in the evaluation of black farmer loan applications that resulted in understated projected crop yields and eventual loan rejection (Mittall and Powell). Those fortunate enough to have loan applications approved complained about the significant disparity between the loan amount requested and approved (Bennett; Mittall and Powell).

In January 1999, the USDA and the black farmers' lawyers reached an out-of-court settlement. A 5-year consent decree between African-American farmers and the USDA, which began in 1999, was established to provide a framework for the settlement of eligible (upheld) claims (Bennett; Mittall and Powell).

Empirical Design

An analytical framework is developed to determine the significance, within the FSA lending framework, of financial measures that are usually included in traditional credit risk assessment models adopted by commercial lending institutions. Further, the empirical analysis considers the borrowers' structural/demographic attributes (e.g., farm size, race, gender) to determine the relative strengths of objective credit risk assessment criteria among separate models for certain social classes of FSA borrowers. Subsets of direct and guaranteed loan observations are analyzed separately to discern whether distinct differences in credit risk assessment that determine loan approval decisions exist between direct loans (evaluated by FSA loan officers) and guaranteed loans (screened by regular, commercial lenders).

The racial discrimination issue is addressed in this model through the inclusion of a racial class indicator variable in the whole sample model. Two additional models are estimated using subsets of observations sorted by racial classifications as a means of searching for inconsistencies in the application of credit risk assessment criteria.

FSA Borrower Data

The borrower data used in this study were obtained from the Georgia FSA State office. Table 1 presents a breakdown of the sample into programs and racial classes as well as sample proportions to total number of FSA loan applications and loan approval rates. The dataset consists of 348 loan applications filed with the agency from 1999 to 2002. Of these loan observations, 222 are for the direct lending program and 126 are for guaranteed loans. The majority of the loan applicants were white farmers, composing 85.34% (297 observations) of the total number of loan applications. This dataset has a loan approval rate of 54.89% (191 out of 348 loan applications).

The approved loan observations used in this study represent 7.14% of the 2,676 loan applications approved by the FSA from 1999 to 2002. Some 157 denied loan applications in the sample consist of applications with complete, usable records kept by the eight FSA district offices in the state. The rest of the de-

Table 1. FSA Loan Data Sampling and Approval Rate, 1999 to 2002

Categories	Sample Size (No. of Borrowers)		Proportion to Total FSA Loans (Percent)		Proportion of Approved to Total Loan Applications, Study's Sample (Percent)
	Approvals	Rejections	Approvals*	Rejections**	
All loans	191	157	7.14	47.58	54.89
Direct loans	97	125	5.88	43.86	43.69
Guaranteed Loans	94	32	9.15	71.11	74.60
White Borrowers	171	126	7.52	53.85	57.58
Nonwhite Borrowers	20	31	4.98	32.29	39.22

* The sample of 191 approved loan observations was randomly selected by the FSA fron 2,676 loan approvals made by the Georgia FSA lending offices during the sample period.

** These proportions were calculated based only on 330 loan applications that were rejected by the Georgia FSA lending offices from 1999 to 2002 that had submitted documents for loan processing. Other applications that were allegedly quickly rejected based on eligibility considerations did not have any loan records on file and, hence, could not be accounted for.

nied loan applications have either very minimal information (and were thus unusable and discarded for this study's purposes) or no record of applications on file. Allegedly, there were applicants who were immediately detected as ineligible to borrow under any of the FSA lending programs and, hence, did not warrant further collection of additional information for loan processing and credit risk assessment. Thus, 47.58% of the recorded, denied loan applications are included in the sample used for logit model estimation.[3]

Separate sampling techniques were used in compiling the dataset. The Georgia FSA State office selected the approved loan observations using simple random sampling procedures, and all usable loan observations from FSA's database of rejected loan applications were used in this study.

Information extracted from the loan portfolios include borrower declarations from income statements and balance sheets, in addition to information of the ethnic background and gender of the primary borrowers. Portfolio data were verified by FSA loan officers through tax returns, lien searches, and credit checks.

Econometric Framework

A binomial logistic framework is used to determine important linkages between the FSA's decision on each loan application and the applicants' financial and demographic attributes. The estimating equation is defined as:

$$(1) \quad P(Y = 1) = \frac{1}{1 + \exp^{-(a + B'x)}}$$

where Y is the event of interest that takes on a value of 1 if the FSA loan application is approved and 0 if disapproved; P is the probability of event occurrence, i.e., $P(Y = 1)$; and a, B, and x correspond to the intercept, the slope coefficients, and the explanatory variables, respectively, which are the right-hand side components of the estimating equation (Greene). Five models are estimated in this study, that is, the entire farm borrower dataset and four subsets of data categorized according to the type of FSA credit exposure (direct versus guaranteed lending) and the racial class of

[3] The Georgia FSA State Office has compiled a total of 330 records of rejected loan applications with some documents on file, from which the 157 rejected loan observations used in this study were obtained. The actual number of rejected loans, however, is believed to be much larger than 330. Loan rejection could have occurred even before borrowers would have submitted documents to support loan applications. These decisions, probably based primarily on basic program eligibility considerations, could have been made by loan officers after a quick phone call or a short interview with the prospective borrowers.

the farmer applicants (white versus nonwhite farmers).[4]

The explanatory variables include proxy financial measures representing the recurring components of credit-scoring models from the literature (Miller and LaDue; Turvey; Splett, et al.; Kohl). These variables are:

i)   Debt-asset ratio representing solvency conditions.
ii) Return on assets as a measure of profitability.
iii) Net farm income ratio, calculated as the ratio of net farm income to gross revenues, as a measure of financial efficiency.
iv) Ratio of current assets to current liabilities (current ratio) to capture liquidity position.
v)   Asset turnover ratio, calculated as the ratio of gross farm revenues to total farm assets, to account for asset productivity.
vi) Capital debt repayment margin ratio (repayment margin ratio), calculated as the ratio of the level of net cash margin to the amount of debt-servicing requirements, as a measure of repayment capacity.

The regressors also include the following indicator variables created to discern whether the loan approval process is significantly influenced by demographic factors:

i)   Size, which takes on a value of 1 for small farms with gross revenues below $250,000, and 0 otherwise.
ii) Nonwhite, with a value of 1 for nonwhite borrowers and 0 otherwise, to capture racial impact.
iii) Female, with a value of 1 for a female primary borrower and 0 otherwise, to discern gender impact.
iv) Direct loans, which takes on a value of 1 for loans accommodated under the direct lending programs and 0 otherwise.

Additional dummy variables were also included in the model to account for differences in certain farming areas in the state. The observations in this analysis were obtained from eight FSA loan districts. For purposes of this study, some contiguous loan districts were combined based on climate and homogeneity of farm production profiles of certain regions. Hence, Districts 2 and 5 were combined to form the Central Region, Districts 3 and 4 became the East Region, Districts 7 and 8 became the South Region, and District 1 remained the North Region. One strategic exception was made. District 6, although located in South Georgia, was set apart from the South Region and designated South (D6). Loan size on average was much higher in South (D6), about 64% higher than for the South region. Further, gross farm income was 35% higher in South (D6) than in South on average. In this analysis, the excluded category among the regional dummy variables is the North Region.

Descriptive Analysis

Table 2 presents the mean values of selected financial measures for the entire dataset and for three categories of farmer applicants based on loan approval status, lending program considered, and racial group. *T* statistics were calculated to determine significant differences between pairs of mean values obtained for each borrower category. The results indicate that approved loan applicants have significantly larger gross farm revenues and net farm incomes than do the rejected applicants. This group also outperformed the rejected applicants in all financial performance measures considered in the analysis, except for solvency.

As indicated in Table 2, mean assets, net worth, gross revenue, and net farm income are higher for guaranteed farm loans.[5] Moreover,

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[4] Separate analyses of borrowers belonging to gender classes could not be made given the small number of female borrowers (25) in the sample. Diagnostic tests indicate that all models are free of heteroscedasticity and multicollinearity.

[5] Guaranteed loan programs usually have much higher caps on loan amounts than do direct lending programs. Currently, FSA can provide guaranteed loans up to $813,000, whereas direct loans are limited to $200,000, except for emergency loans (USDA FSA, 2004).

Table 2. Mean Values and Standard Deviations (in Parentheses) of Selected Financial Measures, 1999–2002

Financial Variables ($)	Entire Sample	Application Status		Race		Lending Program	
		Rejected	Approved	White	Nonwhite	Guaranteed	Direct
Total assets ($)	497,833	455,630	532,522	545,891[a]	217,963[a]	795,385[a]	330,654[a]
	(637,675)	(570,226)	(687,737)	(674,370)	(190,073)	(789,488)	(456,490)
Total net worth ($)	159,480	131,132	182,781	175,380[a]	66,885[a]	289,446[a]	85,715[a]
	(379,713)	(24,121)	(437,134)	(405,426)	(131,549)	(521,938)	(239,179)
Gross farm income ($)	278,665	242,311[c]	308,548[c]	303,285[a]	135,290[a]	376,113[a]	223,357[a]
	(321,126)	(361,994)	(280,629)	(336,165)	(148,652)	(323,725)	(306,844)
Net farm income ($)	58,067	43,535[b]	70,013[b]	63,922[a]	23,969[a]	87,176[a]	41,546[a]
	(99,359)	(123,252)	(72,382)	(104,437)	(50,538)	(92,849)	(99,335)
Return on assets (%)	20.12	14.61[c]	24.64[c]	20.09	20.28	19.35	20.55
	(45.41)	(58.19)	(30.65)	(43.15)	(57.33)	(19.43)	(54.98)
Net farm income ratio	0.1852	0.1106[a]	0.2465[a]	0.1986[c]	0.1069[c]	0.2960[a]	0.1223[a]
	(0.3966)	(0.2779)	(0.4641)	(0.4080)	(0.3136)	(0.4883)	(0.3180)
Asset turnover	1.6686	2.0682[c]	1.3402[c]	1.4914	2.7008	0.8348[a]	2.1419[a]
	(3.8364)	(5.3306)	(1.8190)	(3.0361)	(6.8045)	(0.9246)	(4.6909)
Repayment ratio	1.1876	0.8416[a]	1.4721[a]	1.2131	1.0392	1.5502[a]	0.9818[a]
	(0.9585)	(0.5694)	(1.1096)	(0.9530)	(0.9861)	(1.3686)	(0.5154)
Current ratio	1.8071	0.5451[b]	2.8444[b]	2.0401[b]	0.4498[b]	3.6563[c]	0.7575[c]
	(10.3284)	(1.1031)	(13.8358)	(11.1596)	(0.9373)	(16.8195)	(2.1052)
Debt-asset ratio	0.9153	1.0834	0.7770	0.9342	0.8048	0.6889[b]	1.0437[b]
	(2.0793)	(3.0526)	(0.4501)	(2.2335)	(0.6769)	(0.2968)	(2.5871)
No. of observations	348	157	191	297	51	126	222

[a,b,c] Indicate significant differences of pairs of means at the 99%, 95%, and 90% confidence levels, repectively.

most financial ratios associated with guaranteed loan borrowers are more favorable than those of farmers who received direct loans from the agency. This is a logical result given that guaranteed borrowers have been previously screened and evaluated by commercial lenders before being referred for the FSA guarantee.

The patterns for the gross financial measures obtained for white and nonwhite borrowers mirror the direct versus guaranteed loan comparisons. White farmer applicants had significantly larger asset, net worth, gross farm revenue, and net farm income positions than did nonwhite counterparts. However, the results for the financial ratios indicate only significant differences in net farm income and current ratios, where white applicants had more favorable financial efficiency and liquidity positions than did nonwhite applicants. In these categories, the average net farm income and current ratios obtained for nonwhite borrowers (0.1069 and 0.4498, respectively) are even lower than those calculated for the rejected loan applicants (0.1106 and 0.5451, respectively).

Moreover, the results across all data groups indicate that FSA loan programs usually attract highly leveraged borrowers with mean debt-to-asset ratios ranging from 0.6889 to 1.0834, or an overall mean solvency measure of 0.9153. Even approved loan applications had an average debt-to-asset ratio of 0.7770. Notably, the difference between the overall current ratio of 1.8071 and the norm of 2.0 (Berry; Edwards) is not statistically significant. The same result is obtained for the approved FSA loan applications' mean current ratio of 2.84.

Econometric Analysis

The binomial logistic regression results obtained for the five regression models are summarized in Table 3, which provides coefficient estimates and levels of significance in addition to the overall explanatory power and predictive ability of the models. Because logit coefficient estimates can only be interpreted relative to the "log odds ratio" and do not

provide a direct measure of the rate of change in values of the dependent variable with changes in the independent variable, the marginal effect of each regressor was derived as:

$$(2) \quad \frac{\partial P(Y = 1)}{\partial x} = \Lambda(B'x)[1 - \Lambda(B'x)]B,$$

where B is the logit coefficient vector and Λ is the logistic cumulative distribution function (Greene). The marginal effect provides more intuitive information on the effect of each unit change in the value of the variable on the magnitude of change in the probability of approval of the FSA loan application. However, because the units of the independent variables affect the magnitude of the marginal effect coefficients, elasticities (derived as $d[\ln P(Y = 1)]/d[\ln x]$ to measure percent changes in the probability of loan approval for each percent change in an explanatory variable [x]) are also calculated to allow comparisons of coefficient results among the variables. The marginal effects and elasticities of the significant regressors (continuous variables), which were both calculated at the means of the independent variables, are presented in Table 4.

The general logit model correctly classified 80.75% of the observations in this study. Of the 191 loan approvals, the model correctly predicted approval for 163 for a rate of 85.34%. This figure is much larger than the observed approval rate of 54.89% (Table 1). Loan rejections had a correct prediction rate of 75.16%.

The results for the all loan applications model (column 1 in Table 4) indicate that only two credit-scoring–related variables, repayment margin ratio and current ratio, have significant influences on the dependent variable. The elasticity estimate reported in Table 4 indicates that a 1.0% change in the repayment margin ratio increases the probability of loan approval by 0.77%. This variable produces a more elastic impact on the probability of loan approval than does the current ratio variable, which has an elasticity estimate of 0.14%. The marginal effect estimates for these two variables confirm these findings.

The results for the indicator variables in

Table 3. Logistic Regression Results, Georgia FSA Loan Application Dataset, 1999–2002

Variables	All Loan Applications	By Lending Program Type		By Race	
		Direct Loans	Guaranteed Loans	Nonwhite	White
Coefficient Estimates and Standard Errors (in Parentheses)					
Intercept	0.09098*	−0.06972*	−3.86463*	4.38333*	−0.66464*
	(0.91077)	(1.05640)	(2.53532)	(6.06235)	(1.05897)
A. Credit scoring–related variables					
Return on assets	0.33120	0.11668	8.11984[b]	−2.02186	0.43024
	(0.39572)	(0.43242)	(4.03519)	(2.58791)	(0.42947)
Asset turnover ratio	−0.01973	−0.01956	−0.07688	−0.04082	0.33523
	(0.04703)	(0.05059)	(0.74933)	(0.20002)	(0.06725)
Repayment margin ratio	2.01017[a]	1.31392[b]	4.81976[a]	4.35022	2.28585[a]
	(0.49600)	(0.54737)	(1.46769)	(3.05442)	(0.61011)
Current ratio	0.23620[c]	0.63857[a]	0.06147	4.50217[c]	0.14316
	(0.12399)	(0.21940)	(0.12580)	(2.54082)	(0.11792)
Debt-asset ratio	−0.08657	−0.04413	0.35352	0.96075	−0.10890
	(0.08232)	(0.09340)	(1.40961)	(0.95041)	(0.09658)
Net farm income ratio	−0.40990	−0.04132	−0.72501	−2.72423	−0.32142
	(0.41210)	(0.60747)	(0.54287)	(2.69256)	(0.43203)
B. Demographic/structural and FSA regional indicator variables					
Size	−0.49649	0.13672	−1.51137[b]	−3.84050[c]	−0.38562
	(0.31216)	(0.40169)	(0.72755)	(2.18276)	(0.32888)
Female	−1.53455[b]	−2.36566[a]	2.96119	−3.02631	−3.24064[a]
	(0.66741)	(0.82700)	(6.62547)	(4.00207)	(1.08335)
Nonwhite	−0.40474	−0.39390	0.34299		
	(0.44429)	(0.48276)	(1.36400)		
Direct loans	−0.59475[c]			−2.38135	−0.58160[c]
	(0.32992)			(1.99998)	(0.35978)
East region	−1.81491[a]	−2.01456[b]	−2.32846[c]	−6.67925	−1.46112[b]
	(0.69344)	(0.87681)	(1.42303)	(4.71378)	(0.74582)
South region	−1.59557[b]	−1.97012[b]	−2.11498	−7.41106	−0.96469
	(0.70856)	(0.88636)	(1.44156)	(5.13611)	(0.75385)
Central region	−3.04803[a]	−3.80515[a]	−2.86578[b]	−7.26777[c]	−2.66670[a]
	(0.69071)	(0.88872)	(1.36523)	(4.47077)	(0.72820)
South-D6 region**	−0.33014	−0.98911			−0.45421
	(1.03300)	(1.16837)			(1.08595)
Log likelihood	−158.70768	−103.47890	−36.26986	−10.69891	−134.09321
LR chi-square	161.69[a]	97.26[a]	65.39[a]	38.89[a]	136.70[a]
Pseudo R²	0.3375	0.3197	0.4741	0.6450	0.3376
Number of observations	348	222	118	47	297
Correct predictions (%)	80.75	78.83	88.98	91.49	81.48

[a,b,c] Denote significance at the 99%, 95%, and 90% confidence levels, respectively.

* All intercepts have been adjusted to account for nonproportionate sampling of accepted and rejected loan application data (Maddala). The original logit intercepts have been increased by $(\log p_1 - \log p_2)$, where p_1 and p_2 correspond to the proportion values reported in Table 1 for the sample of accepted and rejected loan applications, respectively.

** This dummy variable was dropped from the estimating equation for nonwhite and guaranteed loan applicants because d6 = 0 predicts success perfectly.

Table 4. Marginal Effects and Elasticities of Significant Credit-Scoring Variables

Variables	All Loan Applications	By Lending Program Type		By Race	
		Direct Loans	Guaranteed Loans	Nonwhite	White
A. Marginal effects					
Return on assets			0.23360		
Repayment margin ratio	0.43776	0.32295	0.13866		0.48134
Current ratio	0.05144	0.15695		1.07809	
B. Elasticities					
Return on assets			0.04270		
Repayment margin ratio	0.76510	0.72872	0.15384		0.83588
Current ratio	0.13679	0.27324		1.26941	

Table 3 indicate that the loan applications from male applicants and those filed under the guaranteed lending program were more likely to be approved. Moreover, farmer applicants from the North Region were more likely to have loan applications approved than were those from the East, South, and Central Regions in the state. This could be attributed to the stronger financial position of poultry producers in the North Region compared with peanut, cotton, and grain producers in the other areas (Boatright and Bachtel).

There are two compelling trends in this set of estimates: the insignificance of the racial minority indicator variable (nonwhite) and the general lack of explanatory power of several credit-scoring–related variables in relation to the probability of loan approval. These findings indicate that there is no statistically significant evidence of racial discrimination in the approval decisions made by FSA loan officers on loan applications considered in this analysis.

Although the coefficient on gender is statistically significant, we are reluctant to emphasize the significance of this result. The number of female borrowers in the sample is small (25) compared with the number of nonwhites (51). There is also the problem regarding the uncertain number of rejected applications and the way in which those data were collected. At this point, we find the significance of the gender coefficient suggestive and encourage additional research.

The insignificance of most financial measures seems to indicate that FSA loan clientele is dominated by high-risk borrowers who would not have passed the usual credit risk assessment standards of commercial lenders. These commercial lenders generally impose more stringent standards that require applicants to meet certain thresholds for most, if not all, of the financial performance categories considered in this study. Comparable logit models used in previous credit risk assessment that analyzed borrower data from commercial lenders produced much more robust results. In these studies, there were usually more than two significant credit-scoring–related variables representing most of the major financial performance categories (solvency, liquidity, profitability, repayment, and efficiency) that made up commercial lender credit risk assessment models. For instance, the three loan default/classification studies in Gallagher's compilation of bankruptcy and loan default studies reported five to seven significant financial measures of liquidity, profitability, and leverage. Miller and LaDue determined the significance of liquidity, profitability, and efficiency measures, and Turvey's study produced significant results for efficiency measures as well.

Direct Versus Guaranteed Loan Applicants

One aspect of the analysis is designed to determine if there are adjustments in credit risk assessment methods between the two FSA lending programs. The results in Table 3 show that each of the direct and guaranteed loan

models had two significant credit-scoring–related variables. The results for the direct loan model mirror those obtained for the general model. The repayment margin and current ratios coefficients were significantly positively signed, with the repayment variable exerting more significant influence on the dependent variable (marginal effect of 0.33 and elasticity of 0.73 in Table 4) than the current ratio (marginal effect of 0.16 and elasticity of 0.27 in Table 4). The repayment variable coefficient is also significant in the guaranteed loan model and has a larger elasticity (0.15) than that for return on assets (0.04), the other regressor with a significant coefficient in the model.

Other results in Table 3 indicate that larger farms are more likely to have guaranteed loan applications approved, and male borrowers are more likely to have direct loan applications approved. The results for the regional indicator variables in both models are similar to those obtained in the general model, except that the coefficient for the South Region variable is insignificant in the guaranteed loan model. Again, the same patterns are observed in this portion of the analysis: lack of significance for the coefficients of the racial minority indicator variable and most of the credit-scoring–related variables.

Nonwhite Versus White Loan Applicants

The rationale for this portion of the analysis is to determine whether different sets of credit risk assessment criteria are used for the two racial classes of loan applicants. A Wald test of the equality of the coefficient vectors for the white and nonwhite logit models was performed to address this issue. The results indicate rejection of the null hypothesis of coefficient homogeneity, which suggests that modified criteria might have been used by the FSA in evaluation of applications from white and nonwhite farmers. Table 3 shows that each of the two racial class models produced only one significant financial variable coefficient. The current ratio was an important indicator of loan approval probability for nonwhite borrowers, while the coefficient for repayment capacity of white borrowers was significant in

the other model. These are consistent with the descriptive information in Table 2, in which significant differences are shown to exist between the average financial performance profiles of white and nonwhite borrowers. Nonwhite borrowers as a group have weaker financial conditions relative to white borrowers in terms of liquidity and other financial performance categories. The average current ratio of nonwhite borrowers (0.4498) is not only lower than that of white borrowers (2.0401) but is even lower than the mean value of 0.5451 calculated for the rejected loans (Table 1).[6] Thus, at a minimum, this financial measure would seem pivotal in evaluating applications.

Repayment capacity has been consistently established as an important indicator of loan approval in the general and two-program logit models. Thus, its significance in the white borrower logit model is not an exception. In the nonwhite borrower logit model, the coefficient for repayment capacity might be considered marginally significant (85% confidence level). Current ratio, the more dominant financial variable in the nonwhite model, is marginally significant (80% confidence level) in the white logit model.

For the most part, nonwhite farmers with larger operations and white male operators were more likely to have loan applications approved. White farmer applicants under the guaranteed lending program also were more likely to experience loan approval. North Region applicants had a greater chance of successfully obtaining an FSA loan compared with nonwhite farmers in the Central Region and white farmers in the East and Central Regions.

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[6] Among the other financial ratios, mean net farm income ratio for nonwhite (0.1069) loan applicants is less than the mean ratios calculated for white (0.1986) and rejected (0.1106) loan applicants. The difference between the mean ratios for nonwhite and white borrowers, however, is not significant at the 95% confidence level. On the other hand, the difference between the mean current ratios for these two racial classes is significant at that confidence level.

Summary and Conclusions

This study provides important clarification of the nature of credit risk assessment methods employed by FSA lending officers in making loan approval decisions. Although FSA operating guidelines exist for the evaluation of basic "creditworthiness" that more or less resemble the commercial lenders' risk rating systems, certain exemptions are allowed for special reasonable circumstances (which are normally sufficient grounds for loan denials by commercial lenders) that undermine a farmer's chances of obtaining farm loans from commercial lenders. The results of this analysis indicate that the collective use of more stringent and objective credit scoring measures on FSA loan approval decisions is less evident compared with results of similar credit risk assessment studies based on commercial lending data. One possible explanation for this is that most FSA borrowers probably have been able to justify certain weaknesses in their historical financial performance using the exemption provisions allowed by the FSA for determining credit delinquency. Unfortunately, this cannot be verified in this study given our lack of access to this type of information.

This analysis did not uncover convincing evidence of racial discrimination against nonwhite borrowers in loan approval decisions made by FSA lending officers in Georgia during the period 1999 to 2002. The weaker financial conditions of nonwhite farmer applicants in this study expectedly led to a much lower loan approval rate of 39.22% compared with a rate of 57.58% for white farmers (Table 1). Notably, the racial indicator variable was consistently insignificant in the general and the two program models. Repayment capacity and liquidity, the only two significant financial indicators of loan approval probability for all applicants in the dataset, were the two most important financial regressors in both the white and nonwhite borrower models. Liquidity considerations, however, were more emphasized in the evaluation of applications from nonwhite farmers, whereas the liquidity coefficient was marginally significant in the white logit model. The reverse is true for the repayment capacity coefficient, which was highly significant in the white borrower model but marginally significant for nonwhite borrowers.

Caution must be observed in interpreting the results of this study for several reasons. First, this study is limited in coverage to FSA borrowers in Georgia who have distinct demographic attributes relative to those in the rest of the country. Second, the actual size of total rejected loan applications is unknown and therefore understated given the absence of records on quick loan denials that were not entered into the FSA loan application database. Thus, our results are conditional on the assumption that the sample of rejected loan applications used in this study is representative of all denied borrowers. Finally, the empirical framework of the study allows us to verify the incidence of racial bias in loan approval decisions only. Discriminatory lending practices, however, could take many other forms, as alleged in testimonies of black farmers in the Pigford v. Glickman class action suit (BlackState.com). These unfair lending practices allegedly include, among others, significant disparity in loan amounts approved and applied for, abnormally lengthy loan processing periods, and biased assessment of values of collateral properties. Because of our lack of access to information on these aspects of the loan application process, we could only make a qualified conclusion based solely on loan approval decisions, instead of a comprehensive statement on the general state of racial minority lending at the FSA.

The discrimination issue could have been pursued further in this study with the investigation of gender bias, especially given the statistical significance of the gender indicator variable in three of the five logit models. However, the number of female borrowers in the dataset is not sufficient to enable reliable conclusions comparable to those of racial minority lending practices. Nonetheless, this research provides a starting point for a more systematic verification of FSA lending practices as data become available.

Overall, the FSA appears to be filling the gaps in the commercial credit market by providing financial assistance to farmers, espe-

cially high-risk borrowers, who cannot obtain credit elsewhere. FSA loan applicants are not subjected to a stringent litmus test similar to the methods employed by commercial lenders, where a larger set of financial metrics must exceed certain thresholds. Our results suggest that as long as the operator displays sufficient cash flow and repayment ability, the FSA appears inclined to approve the loan application.

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