Models of FSA Guaranteed Loan Use Volume and Loss Claims Among Arkansas Commercial Banks

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ARKANSAS AGRICULTURAL EXPERIMENT STATION
Division of Agriculture University of Arkansas
November 1999 Research Bulletin 962

Cover design and technical editing by Karen Eskew

Arkansas Agricultural Experiment Station, University of Arkansas Division of Agriculture, Fayetteville. Milo J. Shult, Vice President for Agriculture and Director; Charles J. Scifres, Associate Vice President for Agriculture. 1M 11/99 PM65.The Arkansas Agricultural Experiment Station follows a nondiscriminatory policy in programs and employment.

ISSN:0097-3491 CODEN:AKABA7

MODELS OF FSA GUARANTEED LOAN USE VOLUME AND LOSS CLAIMS AMONG ARKANSAS COMMERCIAL BANKS

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SUMMARY

The Farm Service Agency (FSA) guaranteed loan programs are an important source of credit to production agriculture. The two major guaranteed loan programs are the operating loan (OL) program and the farm ownership (FO) loan program. Guaranteed loans insure payment to the lender of up to 95% of the losses in the event of borrower default. FSA has historically been involved in lending to farm operators via direct loans, but emphasis has changed over the last two decades to making guaranteed loans the primary source of FSA associated lending to production agriculture. This study seeks to determine what characteristics of banks and the lending environment from 1990-1995 motivated Arkansas banks to use guaranteed loans and how the level of participation is related to such factors. In addition, factors are identified that indicate the likelihood of banks paying loss claims. Regression methods are used to identify these factors and the data base uses observations on individual Arkansas commercial banks for up to six years.

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ACKNOWLEDGMENTS

The help and assistance of David Neff in many phases of this study, particularly data compilation, are gratefully acknowledged.

We would like to thank Diana Danforth, head of the computer programmers in the Department of Agricultural Economics and Agribusiness, for her assistance.

We would like to thank Gary Groce and the Farm Service Agency for providing the data that made this possible. Gary Groce also provided considerable background knowledge that was enormously valuable. Steve Ford of FSA in Washington, DC, also was most helpful in providing data for the study and his assistance is much appreciated. However, neither is responsible for any errors. We also appreciate the assistance of Latisha Fultz in reading the manuscript. An anonymous reviewer also contributed many useful suggestions which we appreciate with the standard caveat.

Partial support for this research was provided by USDA-CSREES Agreement No. 95-34275-1319 and the Center for Farm and Rural Business Finance.

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INTRODUCTION

Commercial banks, the Farm Credit System (FCS), the Farm Service Agency (FSA)[1] and life insurance companies are the major institutional providers of credit to production agriculture. Commercial banks, referred to simply as banks hereafter, are a major participant with 41% of the farm debt market (USDA/ERS, 1999) among the four major types of financial institutions providing credit to agriculture and are the focus of this study. Many rural banks specialize in agricultural lending, and they usually dominate the rural deposit and loan demand base for their area. A bank is typically classified as an "agricultural bank" when its percentage of agricultural loans to total loans is greater than 17% (Ahrendsen et al., 1994). Other institutions such as savings and loans, FCS, merchants, dealers, and life insurance companies also provide credit to agricultural markets.

The agricultural lending environment has changed over time. Following the financial crisis of the 1980s, financial intermediaries became cautious about lending to agriculture and revised their loan portfolios to match this new attitude (Boehlje and Pederson, 1988). In Arkansas during the same period, from 1987 through 1992, a declining base of farmers (Bureau of the Census), caused the competition for the agricultural loan market to increase among banks and other lenders to agriculture.

Also in the 1980s, the federal government implemented policy changes that restricted the flow of funds to the FSA (USDA, form 389-175). FSA provides credit to farmers who cannot obtain credit from private lenders at reasonable terms and rates of interest and monitors the progress of the borrower-lender relationship. Historically, FSA was very active in directly lending funds to financially-strapped farmers. Beginning in the mid-1980s, however, FSA policy gradually switched to emphasizing the loan guarantee portion of its portfolio in order to aid farmers as before but with less direct funds and other resources from the FSA. An FSA loan guarantee insures the lending institution for up to 95% of the current principal of a defaulted loan.

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[1] FSA is the agency formed from the consolidation of The Farmers Home Administration (FmHA) and the Agricultural Stabilization and Conservation Service. For clarity, this agency is referred to as FSA throughout the remainder of the study even when referring to the FmHA in pre-consolidation years.

Loan guarantees went from 35.9% of total FSA obligations in fiscal 1986 to a high of 77.5% of total FSA obligations in 1995 and then to 66% in 1998 (USDA/ERS, 1999). In terms of total dollars obligated, fiscal 1986 had $2.808 billion in direct loans and $1.569 billion in guaranteed loans. In contrast, fiscal 1998 had $745 million in direct obligations $1.435 billion in guarantees (USDA/ERS, 1999). The loan guarantee program makes it easier for private financial institutions to lend to marginal borrowers. In this way, borrowers can obtain credit through private lenders at market interest rate levels. The loan guarantee program allows the bank to keep the loan in its portfolio since the same loan without the guarantee may be deemed as being too risky.

The FSA's increased emphasis on loan guarantees has probably encouraged banks to lend to the agricultural sector. Where previously a bank would not lend to a farmer if the farmer did not meet the bank's criteria specified in its loan policy, a bank could now lend because the loan is backed by the federal government. However, it remains an empirical question - and the subject of this study - as to what factors motivate a given bank to use or not use the guaranteed loan program.

The use of the guaranteed loan program allows banks (and other lenders such as the FCS) to access these higher risk markets consisting of beginning farmers who have no credit history, borrowers who have a poor credit history, and borrowers who do not have a large enough collateral base to support the credit requested. This allows banks to make loans to a large variety of borrowers. Commercial banks can increase their loan portfolio size with the same loanable funds base due to the different regulations imposed on guaranteed loans because only the unguaranteed portion of a loan counts against a bank's legal lending limit. For example, guaranteed loans have a higher maximum loan-to-collateral ratio than non-guaranteed loans.

Study Objectives

This study seeks to identify characteristics of banks and/or economic forces that influence commercial banks' level of FSA loan guarantee programs within Arkansas. Factors influencing the volume of loan guarantees over time and their impact are identified. This study also identifies factors affecting the volume of loss claims on FSA guaranteed operating loans by commercial banks who have used FSA loan guarantees. Factors such as geographic location of bank, loan-to-asset ratio, bank's percentage of loans in agriculture, affiliation with a bank holding company, factors associated with the loan performance of the bank (e.g., agricultural loan losses to total agricultural loans), and size of bank are among those variables hypothesized to be important. This study estimates how these factors influence a bank's decision to use loan guarantees and how they affect a bank's volume of FSA loss claims.

The 1996 Federal Agriculture Improvement and Reform Act (FAIR) has placed added emphasis on the FSA loan guarantee program. With the reduction and elimination of target prices, loan guarantees remain one of the last government policy tools to directly aid farmers. Currently, little is known about which factors motivate a bank to use the FSA loan guarantee program. If more knowledge can be gained about these factors, it should be possible to improve program effectiveness. Such knowledge is

also useful in indicating how the volume of guarantees will change as economic conditions change, e.g., a downturn in the overall agricultural economy.

The analysis in this study provides lending institutions, depository and non-depository alike, with information assisting them in marketing decisions, forecasting loan demand, and analyzing for expansion and growth opportunities into new or existing locations. The implications of the model are also useful to farm operators to help them understand the factors affecting general FSA loan availability and identify those banks most likely to use FSA loan guarantees.

Overview of Study

Within the Arkansas farm debt market, FSA increased the dollar volume of guaranteed loans obligated throughout most of the 1980s before declining slightly in the early 1990s.[2] Beginning in 1985, FSA increased the emphasis and usage of the loan guarantee program, which accounted for most of the increase in loan guarantee volume during the mid-1980s. As displayed in Table 1, there was very little guaranteed loan activity in the early 1980s. In 1985, a distinct policy change at FSA emphasized guaranteed loans. FSA total guaranteed loan volume reached a peak in 1991 of $54 million followed by another low point in 1993 of $34 million and turned up again through 1996 to $75 million. In 1988, FSA guaranteed 435 loan originations, an increase of 12% over the previous year's number of originations and an increase of 167% over originations in 1986. After 1988, the number of FSA guaranteed loan originations generally declined through 1993. In 1993, FSA guaranteed 221 loans, a decrease of 34% from the previous year's originations and a decrease of 49% from the 1988 peak. Originations increased from 1994 through 1996, with 456 originations in 1996, an increase of 106% over 1993 in which there were 221 originations.

Two categories of loans are analyzed in this study, operating loans (OL) and farm ownership (FO) loans. Operating loans are generally for a year but may be longer while the FO loans are long-term. As displayed in Fig. 1, which graphs the guaranteed loan originations in Table 1, OL guaranteed obligations increased through 1988, and stabilized through 1991 before falling off in 1992 and 1993. Then the trend reversed with increases in 1994, 1995, and 1996. In 1997, there were decreases in both numbers of loans and dollar volume followed by a 10% dollar volume increase from 1997 to 1998. Farm ownership guaranteed obligation dollar volume increased steadily throughout 1981 to 1991, where they obtained a high, followed by a decline in the following two years and then increased steadily after 1993 to an all-time high in 1997 but then dropping 28% from 1997 to 1998.

Crop reporting districts[3] (CRD) 3 and 6 experienced the highest commercial bank OL guarantee activity in both number of obligations and dollar volume for 1990-1995 as indicated in Table 2.[4] These two CRDs accounted for 72% of total numbers of

[2] The dollar volume data for FSA obligations are for fiscal years ending September 30, not calendar years.

[3] A map showing the counties in each crop reporting district is given in Appendix A.

[4] The data in Tables 1 and 2, when appropriately summed for the years 1990-1995, should give identical results. They do not agree and this is due to the fact that they are taken from different FSA data bases that have not been reconciled.

obligations and 80% of total volume of FSA OL guarantees over the six years 1990-1995. In addition, these two CRDs plus CRD 9 had the highest average OL guarantee size. CRD 6 accounted for 46% of all FSA OL loan guarantees over the six years and 26% of the farm ownership dollar volume. CRDs 2, 3, and 8 had the highest average dollar volume across the state for FSA farm ownership loan guarantees.

It should be pointed out that FSA guaranteed loans are not a major proportion of total agricultural credit in Arkansas. Most agricultural borrowers are sufficiently credit worthy so guarantees are unnecessary, since guaranteed loans cost 1% of the amount obligated and are avoided when possible. To put this in better perspective, in 1995 Arkansas had slightly more than $3.6 billion in total farm debt (U.S. Department of Commerce), but only about $52 million worth of loans (Table 1) were obligated via OL and FO guaranteed obligations of total debt.

THE FSA GUARANTEED LOAN PROGRAM

The FSA lending program began in 1935 and the administering agency has had many names including the Resettlement Administration in 1935, the Farm Security Administration in 1937, and the Farmers Home Administration (FmHA) in 1946. Its original function was to make loans and grants to depression-stricken families and help them regain self-sufficiency in making a living on family farms. Legislation was passed merging the farm programs section of the FmHA with the Agricultural Stabilization and Conservation Service and Federal Crop Insurance Corporation to form FSA effective 1 October 1995. The former farm program section of FmHA was then changed to the Agricultural Credit Department of FSA.

Until the early 1970s, FSA provided credit to farmers directly through government funded (direct) loans. The Rural Development Act of 1972 authorized FSA to guarantee loans made by commercial lenders. In guaranteeing farm loans, FSA agrees to reimburse the private lender for up to 95% of lost principal if the borrower defaults (USDA/ERS, 1996).[5]

In 1984, FSA began emphasizing guaranteed farm loans to help keep lending in the private sector, reduce budget outlays, and provide better service from a deteriorating direct loan program (USDA/FmHA, 1989). The Food Security Act of 1985 and subsequent legislation has further supported the FSA shift to guaranteed farm lending by allocating more of FSA's appropriations to the guaranteed loan program.

The borrowers' financial condition criteria for a guaranteed loan are normally slightly stronger than FSA's direct loan program eligibility criteria, which stipulate that borrowers must not be able to obtain private financing at reasonable rates and terms. Lenders may sell the guaranteed portion of loans, in whole or in part, to secondary market investors.

There are three primary guaranteed farm loan programs:

[5] Prior to 1996, the maximum guarantee was 90% (USDA/FmHA Lender Manual, 1993). The 90% limit continues to be in effect for many guaranteed loans.

1. Farm operating (OL) loans enable family farmers to obtain short-and intermediate-term financing. Two types of OL guarantees are available depending on the intended use of funds. These include the loan note guarantee (term loan) and the contract of guarantee (line of credit). Loan note guarantees cover loans needed to 1) purchase items such as equipment, livestock, and poultry; 2) pay annual operating and/or family living expenses; 3) refinance debts; and 4) pay other creditors. Line of credit guarantees allow borrowers to obtain loan funds, as needed, up to a predetermined amount for annual operating purposes.
2. Farm ownership (FO) loans enable farmers who lack other credit sources to improve, refinance, or buy farm real estate. FO loan guarantees are loan note guarantees (term loans).
3. Soil and water (SW) loans are used to encourage and facilitate the improvement, protection, and proper use of farmland and water resources. Soil and water loans are loan note guarantees (term loans). SW loans have been a very minor part of the loan guarantee activities in Arkansas compared with OL and FO loans.

To obtain an FSA OL, FO, or SW loan guarantee, a private lending institution must certify that it will not provide credit to or continue lending to a borrower without a loan guarantee. Additionally, the lender must provide information showing that the borrower has income and security to ensure repayment of the loan or line of credit. The interest rate on a guaranteed loan is negotiated between the lender and borrower. The interest rate may be a fixed or variable rate agreed upon by the borrower and the lender. The lender may not charge a rate that exceeds the rate the lender charges its average customers.

The lending limit and maximum principal indebtedness for guaranteed OL loans is $400,000 and $300,000 for guaranteed FO loans, so a farmer could have a total guaranteed loan indebtedness of $700,000. Additionally, when a borrower has or will have FSA direct loans and guaranteed loans of the same type, the combined principal indebtedness cannot exceed the guaranteed limits for either of the two types of loans.[6]

In general, FSA requires that an eligible local lending institution act as the lender who retains servicing responsibilities for any guaranteed loan. An eligible lender is defined as "...any lending institution regulated by, and in good standing with, a state or federal government body" (USDA/FmHA, Lender Manual, p. 2-2, 1993). As such, federal or state chartered banks, Farm Credit Banks, Agricultural Credit Banks, Agricultural Credit Associations, Federal Land Credit Associations, Production Credit Associations, Banks for Cooperatives, savings and loan associations, building and loan associations, mortgage companies that are a part of a bank holding company, and credit

[6] The Omnibus Consolidated and Emergency Supplemental Appropriations Act of 1998 raised the maximum borrower indebtedness for guaranteed FO and OL loan programs to $700,000. The combined maximum total indebtedness in both programs is still $700,000. The maximum indebtedness will be indexed beginning in 2000 (USDA/ERS, 1999).

unions that are subject to credit examination and supervision by either a state or federal agency would all qualify.

In addition to the eligible lender criterion above, FSA established the Approved Lender Program (ALP) in 1984 to streamline the application process for making guaranteed loans. The objectives of the ALP program are to minimize time required for loan approval, eliminate forms, and permit maximum use of forms normally used by the lender, thereby reducing the workload responsibilities of the lender and FSA. Lenders who meet the required criteria may be granted ALP status for a two-year period, at which time they may reapply with the FSA state director (USDA/FmHA Agency Handbook, 1993).

The Agriculture Act of 1992 allowed FSA to establish the Certified Lender Program (CLP). The CLP was developed to take the place of the ALP program, but the ALP has not been eliminated. The purpose of the CLP is to minimize the time required for certified lenders to obtain responses for guaranteed loan approval, permit maximum use of forms normally used by the lender, and permit lenders to certify compliance rather than providing verifications.

The eligibility requirements for becoming a CLP lender are more stringent than an ALP lender. The CLP lenders are high volume lenders with a higher degree of experience in guaranteed lending. Also, CLP lenders must have an acceptable guaranteed loan loss rate in the past and must have serviced FSA guaranteed loans in the past. Lenders with a proven record to process and service FSA guaranteed loans are given greater flexibility. In February 1999, a Preferred Lender Program was approved with minor differences from the CLP program (USDA/ERS, 1999).

METHODOLOGY

Types of Regression Models Estimated

This study attempts to explain the variation in volume of loan guarantees and loss claims over time and among banks across Arkansas. Loan guarantee volume is a function of both the supply and demand for loans. A bank's availability of funds and its attitude towards allocating those funds among possible investments provides a supply of loanable funds. A need for additional sources of capital other than leasing or using equity for operating creates farmer demand for credit. Thus, the models specified have both demand and supply variables to explain variation in FSA guaranteed loan volume. Such models are reduced form models with loan volume activity as a function of both supply and demand shifters as independent variables. Loss claims are a function of bank characteristics, loan exposure, and the general farm economy.

In the model for explaining variation in the usage of loan guarantees and loss claims, six equations are hypothesized. This six-equation model is composed of three "double hurdle" submodels. The first submodel portrays the decision and activity level of OL loans made, the second submodel explains the decision and activity level of FO loans made, and the third submodel represents the level of loss claims for OL loans.[7]

[7] As explained later in the data section, there were relatively few FO loss claims so the decision was made not to estimate a loss claims model for FO loans.

Each submodel contains a "selection" equation and "regression" equation. In the selection equation, the dependent variable is binary. In the case of the guaranteed loan submodels, the binary variables indicate whether or not the bank made any guaranteed loans in a given fiscal year. These models are estimated as probit equations. In the regression equations of the guaranteed loan submodels, the levels of loans obligated are regressed on appropriate independent variables. In the loss claims submodel, whether or not the bank has any loss claims in a given fiscal year is determined by the selection equation.[8] This is a binary variable indicating whether or not the bank has incurred any FSA loss claims on OL guaranteed loans in a given fiscal year. In the regression equation the level of OL loss-claims for a given year is modeled as a function of appropriate independent variables in the regression equation.

Each of the two equation submodels is potentially characterized by incidental truncation. That is, the level of FSA loans made (or losses claimed) is only observed if a decision is made by a bank to enter the FSA loan market. If the error term of the regression equation is correlated with the error term of the selection equation, incidental truncation occurs (Greene, 1990) and estimation of the regression equation by least squares yields inconsistent estimators. Essentially the estimators used for the selection and regression equation are those described in Greene (1995) with an appropriate modification for heteroscedasticity as discussed later.

Variables Hypothesized to Affect FSA Loan Volume

In this section, the theorized relationships of independent variables to the dependent variables are given. All the variables used in the study are defined in Table 3. Their construction is discussed in McCollum (1996). The dependent variables for the OL submodel are OBL and OLOBL. The variable OBL equals one if the bank made one or more OL loans in a year and OLOBL is the dollar loan volume made that year. The dependent variables for the FO submodel are OBF and FOOBL and are defined analogously to OBL and OLOBL, except for FO loans.

In a study of banker use of guaranteed loans by Keonig and Sullivan (1991), it was found that among rural banks, those with a higher rate of returns on assets (ROA) were more likely to have participated in the guaranteed loan program. This may occur because such banks find guaranteed loans enhance overall returns. A higher ROA could also be a result of the bank selling the guaranteed portions of the loan into a secondary market. This would leverage the bank's investment for a higher ROA. Thus we hypothesize that use of guaranteed loans is more likely by firms with higher ROA since the program helps reduce loan risk.

The lender's propensity to invest available funds in loans, as opposed to other investments, is measured by the loan-to-asset ratio (LAR) of a bank. An aggressive loan policy increases LAR while simultaneously expanding the bank's exposure to

[8] The probit model for loss claims only uses observations from banks with some outstanding FSA guaranteed loans. If a bank has no FSA guaranteed loans, it cannot make any loss claims, so the bank is not appropriate for inclusion in the probit sample.

loan losses. It is hypothesized that LAR is positively related to the bank's usage of FSA guaranteed loans.

An important variable in predicting variation in banks' market share of agricultural loans in a study of Arkansas by Ahrendsen et al. (1994) is whether the bank is in a county in a metropolitan statistical area (MSA) as defined by the U.S. Office of Management and Budget. Eleven of the 75 counties in Arkansas are in MSAs. The variable MSA is a binary variable taking on the value of one if a bank is located in an MSA county and zero otherwise. The ratio of farming population to the non-farming population is usually higher in rural counties. Also, the ratio of farm income to non-farm income is usually higher. Both of these factors imply that the demand for agricultural loans is likely to be lower in urban areas than in rural areas. Therefore, MSA is hypothesized to have a negative relationship with the number and volume of FSA guaranteed obligations.

A bank's competitive position vis-à-vis other banks in a given market determines how actively a bank seeks out borrowers, and how aggressive a bank's lending activities must be in order to increase loan volume for a given demand. The level of competition is reflected by the variable market share (MS), which is calculated as the proportion of total bank deposits held by a bank in its county or MSA if the county is in an MSA. A bank usually confines its activities to a 25- to 30-mile radius of its office, so that it experiences its greatest competition from banks in close proximity (Rose, 1993). If a bank has a high MS, it may also have a high share of the loans so it is not as aggressive in making loans. Therefore, MS is expected to be negatively related to a bank's number and volume of FSA guaranteed loans originated.

The Herfindahl-Herschmann Index (HHI) is used as a means of measuring competition in a market. The HHI measures deposit concentration of the banks in a market. HHI increases as deposit concentration in a market increases. HHI is hypothesized to be negatively related to a bank's volume of FSA guaranteed loans because the loans allow banks in competitive markets (low HHI) to increase their loan portfolios.[9]

The ratio of outstanding agricultural loans to total loans (AGTL) reflects a bank's attitude towards lending to the agricultural sector and the conditions of the local economy. As the ratio of agricultural loans to the total loan base of a bank increases, the attractiveness to that bank to use FSA loan guarantees is hypothesized to increase. Such banks obtain a comparative advantage over other more commercially-oriented banks because the agricultural bank is probably more knowledgeable and experienced in agricultural lending. These banks may also want to use loan guarantees to decrease risk from loss of loan diversification. Also, as noted by LaDue and Hanson (1996), a low AGTL probably implies a diverse local economy with banks less likely to lend to agriculture.

Banks experiencing losses on a particular investment-type larger than compared with the rest of its asset portfolio would likely evaluate the wisdom of continuing to

[9] Note a distinction between HHI and MS. The variable HHI is the same for all banks within the same bank area (county or MSA) but MS varies by bank.

allocate funds to that investment and seek ways to decrease the losses. RISK is the ratio of total net agricultural loan losses to total outstanding agricultural loans divided by the ratio of total net loan losses to total outstanding loans for a bank. The variable RISK can also be viewed as a proxy for borrower credit worthiness, an important lending consideration as noted by Miller and LaDue (1989); and Ellinger et al. (1992). The relationship of RISK to the volume of FSA guaranteed loans is ambiguous. If higher levels of risk cause curtailment of guaranteed loans, the sign is negative. However, if rising RISK encourages more use, the sign is positive.

A bank affiliation with a multi-bank holding company (MBHC) implies the bank has direct access to a correspondent bank(s). Such banks can diversify the risk of a given loan. MBHC = 1 implies a bank is a member of a multi-bank holding company. The access to correspondents argument implies an inverse relationship to the volume of FSA guaranteed loans. Alternatively, a MBHC may have an economies of size advantage to give its banks specialized processing of guaranteed loans, so MBHC would be positively related to FSA guaranteed loan use. Thus, it is not possible to sign the direction of the relationship of MBHC to FSA guaranteed loan a priori.

Total bank assets (ASSET) are a measure of bank size. It is uncertain how this variable influences guaranteed loan volume. Ellinger et al. (1990) observed that as a bank's size increases, there is an economies of size advantage over smaller banks in using various marketing techniques. This indicates a positive relationship between ASSET and use of FSA loan guarantees. Alternatively, as a bank's assets increase, the bank's dependency on the marginal or substandard borrowers as customers for the bank may decrease. Consequently, this would cause ASSET to have a negative relationship with FSA volume of guaranteed obligations.

Due to the financial hardships of the 1980s, many banks' loan policies became more conservative such as stricter collateral requirements on secured loans (Ellinger et al., 1992). CVFARMV is the coefficient of variation of the value of farm land and buildings in the county where a bank is located based on the four previous years. CVFARMV is hypothesized to be positively related to FSA guaranteed obligation volume, since greater collateral variability could make loan guarantees more desirable.

The proportionate change in farm income from one year to the next by county (ΔFMINC) was found by Ahrendsen et al. (1994) to be positively related to bank market share of agricultural loans. Increased farm income can result in the demand for agricultural loans to increase since farmers are better able to qualify for higher loan amounts and may wish to expand current farm operations, creating a need for financing. Alternatively, increased income also permits self-financing, so ΔFMINC has no a priori sign expectation. In addition, larger farm income variability increases the risk associated with lending to the agricultural sector. Therefore, CVFMINC, the coefficient of variation over the previous four years in net farm income per county, is expected to be positively related to volume of FSA guaranteed obligations.

The ratio of revenues from the sales of field crops to total agricultural revenues by county is denoted as FCREV. It is uncertain how FCREV is related to the volume of FSA guaranteed loans. It is included to reflect the differences in loan demand by differ-

ent types of agriculture in the state. Roughly, the eastern part of Arkansas is a crop based agriculture and the western part is more reliant on animal agriculture.

An approved (ALP) or certified (CLP) lender program designation by FSA means that the bank has met certain requirements stipulated by FSA. The bank must have qualified personnel, an acceptable loss rate and/or have originated at least a minimum amount of guaranteed loans. By being an ALP or CLP, the bank incurs lower transaction costs in making guaranteed loans. Banks with ALP and CLP designations may be more inclined to use FSA loan guarantees in order to retain their ALP or CLP status. Borrowers may also associate the ALP and CLP designation with a lender more likely to use FSA loan guarantees. The binary variable PREF (preferred lender) has a value of one if the bank has an ALP or CLP designation and zero otherwise. The coefficient is expected to be positive.

As the interest rate charged on loans increases, it is more difficult for a borrower to qualify for credit given his existing payment capacity. Increased loan payments lead to financial failure as noted by Shephard and Collins (1982). To offset this risk, the lender could obtain a guarantee on the loan to lower asset risk. Therefore, INT, the real interest rate which is computed as the discount rate plus 475 basis points[10] less the inflation rate, is expected to be positively related to the volume of FSA guaranteed loans.[11]

Factors Hypothesized to Affect Level of Loss Claims

Because few banks experienced loss claims, particularly for FO loans as discussed shortly, observations on loss claims are only for OL loans. Thus, a bank is designated as having a loss in a year (LS = 1) if it has one or more loss claims due to OL loans in that year. LOSS is the sum of loss claims due to OL loan defaults paid to a bank in a given fiscal year. The variables LS and LOSS are the dependent variables in the two-equation loss claims submodel.

The volume of FSA guaranteed OL loans held by a bank, FSAGOL, is hypothesized to be positively related to volume of FSA loss claims experienced by a bank, i.e. a measure of its exposure to losses. The actual volume of current, outstanding guaranteed OL loans of a bank in a given year could not be obtained due to FSA record keeping procedures. For this study, FSAGOL is computed as a moving, weighted average of volume of guaranteed OL obligations originated over the previous two years. A review of that data available at the end of fiscal 1995 indicated that guaranteed OL loans were paid back within a year or two of closing so that FSAGOL is computed as 90% of the prior years OL obligation and 20% of OL obligations lagged two years to reflect this repayment pattern.

The level of guaranteed loss claims that a bank experiences likely increases with the bank's portfolio concentration in agricultural loans due to the likely aggressiveness of the bank seeking agricultural loans. Therefore, AGTL is hypothesized to be posi-

[10] One basis point is one one-hundredth of 1%.

[11] The Arkansas usury law stipulates the interest rate on loans can be no more than the federal discount rate plus 500 basis points. It is assumed the effective loan rate is near the usury ceiling, see Dixon et al., 1993.

tively related to the incidence and volume of FSA loss claims. However, FSAGOL may capture the level of exposure effect so that AGTL represents the expertise effect and has a negative sign.

The ratio of outstanding loans to total assets (LAR) is hypothesized to be positively related to the incidence and volume of FSA loss claims because of the overall level of risk implied by a high LAR. Banks with lower MS or HHI indices may seek out marginal borrowers. Therefore, HHI and MS are expected to be negatively related to the volume of FSA loss claims.

Variations in farm land values and farm income are measures of the level of risk associated with agriculture. DeVuyst et al. (1995) hypothesized that land price volatility is an important explanatory variable for indicating the volume of loan losses. Therefore, CVFARMV and CVFMINC are both hypothesized to be positively related to the number and volume of FSA loss claims. Conversely, as farm income increases, the repayment capacity of the borrower increases. Therefore, ΔFMINC is hypothesized to be negatively related to a bank's number and volume of FSA loss claims. It is not clear how the variation in types of farm enterprises within a county should affect loss claims so it is not possible to sign FCREV.

A bank making risky agricultural loans will experience more loss claims. Therefore, RISK is hypothesized to be positively related to the volume of FSA loss claims.

An approved or certified lender designation by FSA means the bank must have an acceptable loan loss rate on FSA guaranteed loans. Such banks have an incentive to screen applicants closely. Thus, being a preferred lender (PREF), is hypothesized to be negatively related to loss claim numbers and volume.

Losses experienced on loans may also be related to the age of those loans. As loans mature the borrower likely has more to lose by a default. Therefore, AGEOL, the weighted average age of the volume of outstanding FSA guaranteed loans of a bank, would be negatively related to volume of FSA loss claims. It could also be argued that borrowers with older loans could not graduate to regular, non-guaranteed loans so that AGEOL should be positively signed. We suspect this effect is minor but will let the data determine the sign. The variable AGEOL is a weighted average age of guaranteed loans one or two years old weighted by the estimated volume of outstanding obligations for the particular year using the same estimates of outstanding OL volume as for FSAGOL.

As the interest charged against borrowed money increases, the loan payment also increases. This directly affects the cash flow of the borrower in paying off the loan and meeting other expenses. Shepherd and Collins (1982) hypothesized in their study that interest rates are positively related to the volume of loan losses experienced by a bank. Therefore, INT is expected to be positively related to the volume of FSA loss claims a bank experiences.

Losses experienced by a bank in previous years may be a good proxy for a bank's future losses. A bank experiencing heavy loan losses may have a loan policy that carries over into future years. Therefore, the sum of the previous five years of guaranteed OL loss claims (OLLAG), is expected to be positively related to the volume of FSA loss claims.

Variable Construction and Data Sources

Variables are observed annually. All variables but MS and HHI are for the entire year. MS and HHI are calculated based on June levels of deposits each year. The remaining variables except for CVFARMV, CVFMINC, ΔFMINC, and FCREV are computed using fiscal year observations since FSA obligation allotments are on a fiscal year basis. Since CVFARMV, CVFMINC, ΔFMINC, FCREV are observed over calendar years, they are all lagged one year in the models. RISK is lagged one year to allow adjustment time for changing risk conditions.Variables other than MS and HHI are either sums for the fiscal year such as loan volume or averages of quarterly data such as asset levels.

The data used in this study were obtained from several sources: the FSA State office in Little Rock, Arkansas in cooperation with the federal FSA office in Washington, DC; Federal Deposit Insurance Corporation (FDIC) quarterly call reports of income and condition, and summary of deposits; U.S. Department of Commerce, Bureau of Economic Analysis (BEA); and the Bureau of the Census. Specific details are given in McCollum (1996).

The sample data are a time-series of cross sections. The time period begins in fiscal 1990 and ends in fiscal 1995. All financial variables used in estimating the regression models are deflated by the calendar year CPI-U (1982 to 1984 = 100, Council of Economic Advisers) to give all financial figures in real terms. The sample for estimating the OL and FO submodels (OL and FO obligations) consists of 1423 observations over the six years. For the loss claims submodel, 490 observations, those with FSAGOL > 0, are used since a bank cannot make a loss claim if it holds no guaranteed loans.

Estimation Procedures

There are a large number of hypothesized independent variables in each of the three submodels. As the econometric literature suggests, there are a large number of ways that can be used in determining the exact list of variables to be included in a given model. One approach is to estimate the models as initially specified and present the results. This is the method that would be most appropriate for estimating a model where there is a precise experimental design. Such an approach has the advantage of eliminating pre-test bias. However, such an approach results in lower statistical efficiency because many coefficients whose true values are zero are left unrestricted. That is, irrelevant independent variables remain in the regression model.

To capture the statistical efficiency from eliminating irrelevant regressors from the model, the following approach was adopted. The models were initially estimated with all hypothesized independent variables included as regressors. After estimation of these models, any explanatory variables in the probit and regression equations that had calculated absolute values of z[12] less than one were removed from the regression models

[12] This is the ratio of the estimated coefficient to its estimated asymptotic standard error. It is the large sample equivalent of the "t" ratio in the classical linear regression model.

and the modified models were re-estimated. The criterion of dropping a variable if its z value is less than one in absolute value comes from the rule for model specification by maximizing adjusted R^2. The application of this rule to the probit models has not been established in the statistical literature as a specification device but is assumed here to be a good compromise between deleting all variables not significant at the .05 or .01 level, or including all regressors regardless of significance.

Heteroscedasticity in the probit equations can result in inconsistent estimates. Heteroscedasticity in a probit model means that the variance of the random error term cannot be normalized to a value of one. This assumption is of fundamental importance in estimating probit models. Unfortunately, there is not a broad set of tests in the literature for the existence of heteroscedasticity in probit models. As Greene (1990) discusses, the detection of heteroscedasticity in the probit model may indicate an omitted variable. Because of this potential, ASSET is left in the two loan volume probit equations, and FSAGOL is left in the loss claim probit equation (regardless of the value of their associated z's), to guard against a possible misspecification. Our subjective evaluation is that ASSET (or FSAGOL in the loss claims model) is the most likely source of heteroscedasticity in the probit models since the dependent variables of the probit models could be viewed as functions of loan volumes.

Because the data set is panel in nature, the error terms of the regression equation in the double hurdle model are possibly heteroscedastic as well as in the probit equation. In fact, even if the regression equation without the inclusion of the inverse Mills ratio (IMR) is homoscedastic[13], inclusion of the IMR induces heteroscedasticity (Greene, 1990). Because of this, the covariance matrices of the regression equations' parameters were estimated using White's heteroscedasticity consistent covariance matrix. Thus, the estimation procedure is to estimate the selection equation by probit and use the parameters of the estimated probit equation to estimate the IMR. Then, the IMR is included as a regressor in the regression equation and the regression coefficients are estimated by OLS and their standard errors are computed using White's heteroscedastic consistent covariance matrix. It is assumed that the resulting z values of the individual parameter estimates have an asymptotic, standard normal distribution.

DESCRIPTIVE STATISTICS AND ESTIMATED MODELS

Table 4 presents the number of banks that originated FSA guaranteed OL loans in a given year across Arkansas from fiscal years, 1985 through 1995. Guaranteed loan usage did not begin to increase noticeably until 1987 when 77 banks made originations for OL loans. The numbers have been declining since that time with a slight peak in 1991 with 70 banks, or 28% of the total number of banks, originating guaranteed OL loans and decreasing from that number in the early 1990s. The same is also true for the

[13] The inverse Mills ratio is a crucial regressor in incidental truncation models as discussed in Greene (1990). Informally, it accounts for the fact that the dependent variable in the regression model of an incidentally truncated model is observed only for part of the sample used to estimate the probit model, not its whole sample.

FCS. FCS peaked in 1988 with 11 FCS branches originating OL guarantees and has been decreasing or nearly flat every year since then.[14]

The number of FO guaranteed loan originating banks rose dramatically in 1987, but did not peak until 1991 with 35 banks, or 14% of the total number of Arkansas banks as shown in Table 5. These numbers have also been decreasing or relatively flat from 1987 to 1995. The number of FCS branches making FO loans more closely mirrors the number of OL guarantees made by FCS branches than do bank originations of FO and OL loans mirror one another. FCS peaked in 1989 with eight branches originating FO guaranteed loans and they have been decreasing or nearly flat every year since then through 1995.

Table 6 presents the number of Arkansas banks experiencing loss claims by year from 1984 to 1995. OL loss claims experienced a surge in 1988 with 11 banks reporting claims, and again in 1993 with 26 banks experiencing loss claims. Banks with FO loan loss claims have been relatively few with a 1993 peak of five banks experiencing loss claims. Figure 2 presents the volume of FSA loss claims paid out to financial institutions by year by loan type for fiscal years 1989-1998.[15] Loss claims increased markedly in 1992 and 1993 and then decreased before rising again slightly in 1997.

General Relationships Among Participating and Non-Participating Banks

Table 7 gives a brief summarization of similarities and differences between banks that made no FSA OL or FO loans in the sample years 1990 to 1995 and those that did.[16] It is interesting that fewer than half the banks in the state that could have made a guaranteed loan used that option in the six-year period. Like Koenig and Sullivan (1991), higher levels of assets, AGTL, and MBHC are associated with participating banks, although the differences between participating and non-participating banks for MBHC and ASSETS are not large. Banks in counties with more of their agricultural revenues from field crops are more likely to participate. Loan-to-asset ratios and ROA do not vary substantively between participants and non-participants.

Estimated OL and FO Obligation Submodels

Initially, the two obligation submodels hypothesized had 15 variables plus the IMR ratio in the regression equations.[17] Note that inclusion of the same variables in both the selection and regression models suggests the possibility of estimating the model as a Tobit specification. The fact that different variables are significant in a given pair of selection and regression equations rejects this approach. In the first round estimation

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[14] Farm Credit Service data are observed at the branch level.

[15] Only the latest 10 years of these data were requested. They were provided by Steve Ford of FSA. These figures do not include payments such as Chapter 12 or voluntary lender write-downs which are generally a small part of loss claims payments.

[16] These banks exclude those banks in the state for which sufficient data could not be obtained to be included in the sample for estimating the regression models.

[17] The results for the OL and FO obligation submodels are slightly different than those in Dixon et al., 1997 due to revised computations of CVFARMV, ΔFMINC, CVFMINC and FCREV.

that included all variables, the OL probit model had four variables with z's less than one in absolute value and the OL regression equation had seven such variables.[18] In the FO submodel six variables were removed from the probit equation in the first round estimation and eleven of the independent variables had z's less than one in absolute value in the FO regression equation.[19]

After eliminating the low significance variables, the final models were estimated. Table 8 displays the elasticities of statistically significant (α=.05) continuous variables and statistically significant coefficients of binary variables as well as descriptive statistics of the models' fit. The estimated models for the four equations in the obligation submodels fit reasonably well. The probit models' (OBL and OBF) classification powers are not highly impressive even though over 83% of the observations are classified correctly. That is, of the sample observations, the two probit models classify at least 83% of the observations into their observed category correctly. This high rate is obtained because most banks did not use loan guarantees in a given year. Thus, by predicting no loan would be made for all observations, the probit models could achieve a high rate of accuracy. Both of the final OL and FO probit models had eight variables significant at the .05 level.

The two regression equations explaining volume (OLOBL and FOOBL) vary considerably in terms of R^2. The OL volume equation has an R^2 of 0.256, which is somewhat low for primarily cross-sectional data, but the FO volume equation has an R^2 of 0.384, respectable for cross-sectional data. In the OL volume equation (OLOBL) model there are five variables significant at the .05 level and four significant variables in the FO volume (FOOBL) model.

To facilitate the discussion of the impacts of the statistically significant continuous independent variables, their elasticities are presented in the top of Table 8. Using elasticities removes problems engendered by the differing units of the independent variables. The estimated coefficients for the binary variables that are significant at the .05 level are presented in the lower part of Table 8.[20] Elasticities have no empirical meaning for binary variables so their estimated coefficients are presented. In the probit models, the binary variable coefficient estimates are the number of standard deviations the mean of the probit function increases when the binary goes from 0 to 1. A negative coefficient would indicate a decrease in the mean of the probit function and thus a decrease in the probability of the bank making a guaranteed loan. The binary coefficient estimates can be compared with each other. In the probit models, those estimates larger in absolute value have more impact on the probability of using loan guarantees than those variables with smaller coefficients in absolute value.

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[18] In the OL probit model the four excluded variables were ΔFMINC, CVFARMV, ROA, and MSA. In the OL volume regression model the eliminated variables were RISK, HHI, ΔFMINC, MS, ROA, PREF, and the IMR.

[19] In the FO probit model the six excluded variables were RISK, HHI, ΔFMINC, CVFARMV, ROA, and MSA. In the FO volume regression model the variables ASSET, LAR, AGTL, MS, FCREV, ΔFMINC, CVFARMV, CVFMINC, ROA, PREF, and IMR were excluded.

[20] These are direct elasticities. Total regression equation elasticities of variables that appear in both selection and regression equations in a given submodel include the effect of changes in the IMR (see Greene, 1990). However, the IMR was eliminated in the first round of the estimation of all three of the submodels.

Both probit models (OBL and OBF) have more significant variables than their counterpart volume equations (OLOBL and FOOBL). The variables LAR, AGTL, HHI and PREF, and CVFMINC in the OBL probit model have coefficients with expected signs. The signs of LAR, AGTL, HHI, and CVFMINC indicate loan guarantees are viewed as risk reducing activities. The positive PREF coefficient means preferred banks are more likely to use the loan programs. This is not surprising and the fact that the PREF coefficient (1.08) exceeds one implies a large effect. The positive sign on the MS coefficient is counter-intuitive. It suggests that as competitiveness of loan markets declines (MS increases), banks are more inclined to use guarantees, perhaps because of pursuing marginal borrowers. But this is offset by HHI having a negative elasticity which means loan guarantees increase in less concentrated deposit markets. The positive sign on FCREV reflects that counties whose primary agriculture is crops have by far the largest share of OL guarantees both in numbers and dollar volume. Relative riskiness of agricultural loans to loans in general is estimated to be negatively related to making guaranteed operating loans. This suggests that added risk in the agricultural sector does not lead to using more loan guarantees. Compared with the other variables, the elasticity of RISK is small.

In the OLOBL volume equation in Table 8, percentage changes in AGTL, FCREV, and CVFMINC are at least three times as important as the impact of ASSET, the only other significant independent variable. Thus, banks emphasizing agricultural loans and located in rural field crop counties with relatively variable farm income are likely to make the largest level of obligations given that they make guaranteed operating loans. This does not imply that each obligation to a given borrower is larger, just that the bank makes a larger volume of obligations. ASSET is significant but very inelastic, indicative that larger banks are inclined to have a larger volume given they make guaranteed loans. However, the changes in obligation volume are small for proportionate changes in ASSET.

In the FO probit model (OBF) in Table 8 there are seven significant continuous variables and three of them have elasticities in excess of one in absolute value. These are LAR, FCREV, and INT. Recall that FO guarantees are not concentrated in the eastern portions of the state as are OL loans. Thus it is not surprising to see the negative sign on FCREV, indicating some concentration of FO guaranteed loans in counties with lower intensity in field crops. LAR, CVFMINC, and INT have the anticipated (positive) signs indicating risk reduction by the banks. This is similarly reflected by the significance and positive sign on AGTL indicating the desire by banks to offset lack of diversification. The positive sign on MS, contrary to hypothesis, is surprising but can be justified for the same reasons as for its positive sign in the OL probit model, that is, these banks may be pursuing marginal borrowers. Being a preferred lender (PREF = 1) increases use as would be expected.

In the FO volume equation (FOOBL) only three continuous variables are significant. The variables INT and HHI certainly have the largest elasticities (-1.44 and -0.789, respectively) among these three variables. The negative sign on INT is surprising, particularly given the positive sign on INT in the FO probit equation. What the

negative sign may reflect is that as real interest rates rise, farm operators are inclined to borrow less. The significance of HHI indicates that as market competitiveness decreases, banks have less need to seek guarantees. Contrary to the sign of RISK in the OL probit model, greater riskiness of agricultural loans to other loans in the FO volume equation leads to increased volume of guarantees. Such behavior is probably to be expected since FO loans are potentially for longer periods than OL loans.

Only one binary variable, MSA, is significant in the FO volume equation. As we would expect, location of a bank in urban areas is likely to lead the bank to have a lower guaranteed loan volume. This is also the case with the OL loans.

Estimated OL Loss Claims Model

In the loss claims submodel the first round of estimation resulted in only six of the initial 14 regressors in the probit model having z statistics equal to or greater than one in absolute value[21]. Similarly, there are six independent variables in the loss claims regression model with z statistics equal to or greater than one in absolute value.

In the second round estimation, only variables with z statistics greater than or equal to one in absolute value were included in the models. In the probit model (LS) the four variables FCREV, lagged interest rates, FSAGOL, and OLLAG are statistically significant at the .05 level (Table 8). The estimated model predicts 86% of the observations correctly and the regression model has relatively good explanatory power with a coefficient of determination equal to 0.276. Interestingly, none of the binary variables in either model are statistically significant.

The probit model has three variables with the expected signs. As we would expect, FSAGOL, the estimated volume of outstanding obligations is positive as well as the past volume of agricultural loan losses, OLLAG. The significance of this latter variable is surprising because it suggests that some banks are consistently making loans that are subsequently defaulted. We cannot state that these banks make more bad loans on average than other banks because, in terms of profitability, we would expect that banks are going to have some loans defaulted. Moreover, it may be a positive indication because these banks insure more loans that are likely to go bad and, therefore, the bank's use of loan guarantees is justified and a profitable move. Finally, the positive sign on FCREV simply indicates that the more row crop oriented a county is, the more likely it is to have loss claims. This is to be expected since our previous results show that banks in counties with higher FCREV are more likely to make OL loans. The variable FSAGOL also picks up this effect.

The negative sign on lagged interest rates is surprising. Our prior reasoning argued that increasing interest rates should lead to more defaults. The opposite result might reflect a rise in interest rates causing banks to be more selective in lending, even with loan guarantees. Recall that the loss claims model is only for operating loans and inter-

[21] In the probit model the eight excluded variables are AGTL, HHI, MS, CVFARMV, CVFMINC, ΔFMINC, RISK, and PREF. In the regression model the eight excluded variables are HHI, MS, CVFARMV, CVFMINC, FCREV, RISK, lagged INT, and OLLAG.

est rates do not lead to more banks using loan guarantees for OL loans (OBL equation).[22] Even with the explanation of greater selectivity of borrowers, the negative sign deserves further investigation, perhaps with a longer time series.

In the volume of loss claims paid regression (LOSS), the signs of the elasticities are as anticipated for ΔFMINC and FSAGOL. As farm income increases, we would expect loss claims to go down and the negative sign on ΔFMINC reflects this. The positive sign on FSAGOL simply reflects that banks with larger exposures are going to make a greater volume of loss claims.

The sign on AGEOL is surprisingly positive. This most likely reflects that most loans were intended to be paid back within a year and were delayed as the borrower tried to find a means of paying back the loan. This may also represent banks willingness to work with a stressed borrower for a year before foreclosing on a loan. It could also imply stronger borrowers pay loans off sooner. Moreover, the result may mean that for OL loans with terms exceeding one year, it takes time for those loans to go bad.

CONCLUSIONS

Since 1985, the FSA guaranteed loan program has increased in importance and has become the main vehicle for FSA to finance production agriculture. The goal of the guaranteed loan program is to motivate private sector lenders to become more active in lending to marginal agricultural borrowers. The limits on the loans, $400,000 for operating loans and $300,000 for farm ownerships loans, imply these loans are not targeted at large farm operations.

Because the motivation for the program is to get the government out of lending for budgetary reasons and to get the private sector more involved, this study sought to find out what factors motivated commercial banks in Arkansas to use loan guarantees. The data show that over the six fiscal years from 1990 to 1995, fewer than half the banks in Arkansas made use of even one loan guarantee. Thus, it is important to know what factors are motivating use of FSA guaranteed loans, particularly since the structure of commercial banking is changing rapidly.

The data reveal that guarantees of operating loans are more frequent than farm ownership loans in Arkansas although this may be because of lower farm ownership obligation volumes appropriated by the federal government. Operating loans are more frequent in the Arkansas Delta which is a region dominated by field crops as opposed to the remainder of the state which has a more diverse agriculture. Given the higher number of operating loan guarantees, the dollar volume of operating loan guarantees surpasses that of farm ownership loans. However, the operating loan volume in Arkansas has remained fairly level over 1987 to 1997, except for a surge in 1996, whereas the farm ownership guaranteed volume has generally increased over time. Loss claims have had a decided cyclical behavior with a peak in fiscal years 1992 and 1993.

The statistical models indicate commercial banks use guaranteed loans with the goal of making risky loans more secure. Ceteris paribus, banks with higher agricultural loan to total loan ratios tended to use guaranteed loans more frequently. Rising interest

[22] When the model is run with current interests rates as opposed to lagged rates, a positive sign also results.

rates motivated banks to use guarantees on farm ownership loans but interest rates were not significant in the decision to make guaranteed operating loans. There are some economies of size effects associated with bank size in making guaranteed loans. As we would expect, the impact of certified or approved lender status is associated with a greater likelihood of a bank using guaranteed loans. However, having this preferred status does not lead to a bank necessarily having a greater volume of loans since the variable indicating preferred status was not significant in the volume equations for either operating or farm ownership loans. Banks in rural counties tended to make a higher volume of guaranteed obligations.

Not surprisingly, loss claims are associated with banks having larger exposures to guaranteed loans. Moreover, prior loss claims by a bank are positively associated with a bank making current loss claims. This does not indicate that a bank is consistently making bad loans, but it may suggest that the bank uses guaranteed loans very much to its benefit. Perhaps the more policy relevant aspect of loss claims is whether volumes of payments are too high and whether criteria for making loans should be strengthened to cut government losses. This is an issue deserving of further investigation.

Variables reflecting general economic conditions in the agricultural sector had some significant effects as independent variables. In particular, interest rates and the variability of farm income appeared in several estimated equations. Interest rates clearly have major impacts in making farm ownership loans. As interest rates rise, the costs of paying back are higher and the likelihood of defaulting becomes greater. Thus, as has been shown in the past, the agricultural sector is tied to what is happening in the economy at large. Moreover, if the FAIR Act leads to greater volatility of farm income, the significance of the variability of farm income will be even more important and lead to an increased demand for guaranteed loans. Farm income decreased decisively in 1998. Congress and the Administration reacted by broadening provisions for using the guaranteed loan program. Thus, with greater farm income volatility and increased accessibility to guaranteed loans, we can expect more use of guaranteed loans.

Bank mergers are occurring and are likely to continue. However, it appears that this trend will not necessarily lead to fewer guaranteed loans being made. Membership in a multi-bank holding company did not significantly affect guarantee use. Thus more merger activity will not necessarily lead to less use of guaranteed loans. Also, rural Arkansas agricultural banks find guaranteed loans attractive.

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Table 1. Arkansas FSA Guaranteed Loan Obligations Originated and Number of Originations, 1981-1998*

Year	FO ($)	FO (#)	OL ($)	OL (#)	Total ($)	Total (#)
1981	78,930	2	299,250	4	378,180	6
1982	121,500	1	586,800	6	708,300	7
1983	174,000	2	1,943,940	14	2,117,940	16
1984	251,300	3	1,681,880	13	1,933,180	16
1985	1,677,500	11	14,029,900	82	15,707,400	93
1986	5,023,380	30	15,442,830	133	20,466,210	163
1987	9,824,510	59	34,339,150	328	44,163,660	387
1988	12,760,040	76	37,562,150	359	50,322,190	435
1989	11,927,800	69	34,540,440	322	46,468,240	391
1990	15,961,300	88	31,612,490	284	47,573,790	372
1991	17,084,430	87	37,247,620	323	54,332,050	410
1992	15,224,320	89	29,338,250	245	44,562,570	334
1993	13,089,280	61	20,963,100	160	34,052,380	221
1994	17,174,050	83	28,961,120	218	46,135,170	301
1995	20,550,680	103	31,499,400	274	52,050,080	377
1996	28,239,120	132	46,920,210	324	75,159,330	456
1997	33,474,380	153	27,364,820	233	60,839,200	386
1998	24,080,170	103	30,206,730	227	54,286,900	330

Source: FSA Form 389-175.

* FO = Farm Ownership, and OL = operating loan.

Table 2. Arkansas FSA Guaranteed Loan Obligations by Crop Reporting District (CRD): 1990-1995

CRD	Operating Loan Guarantees				Farm Ownership Loan Guarantees			
	Number	Volume ($)	Average obligation ($)	Percent of Ark. OL obligations	Number	Volume ($)	Average obligation ($)	Percent of Ark. FO obligation
1	22	1,063,840	48,356	0.58	43	6,043,661	140,550	6.31
2	28	1,872,671	66,881	1.03	70	16,542,790	236,326	17.26
3	467	61,674,000	132,064	33.85	47	10,411,716	221,526	10.86
4	44	3,618,678	82,243	1.99	98	18,909,363	192,953	19.73
5	30	2,303,350	76,778	1.26	18	3,287,735	182,652	3.43
6	564	83,912,592	148,781	46.06	140	24,509,351	175,067	25.57
7	29	1,661,940	57,308	0.91	34	2,734,578	80,429	2.85
8	43	2,685,900	62,463	1.47	52	11,740,520	225,779	12.25
9	197	23,404,918	118,807	12.85	19	1,659,942	87,365	1.73

Source: Computed from FSA Arkansas State Office data.

Table 3. Definitions of All Dependent and Independent Variables [a.b]

NAME	DEFINITION
Dependent Variables	
OBL	OBL = 1 if a bank obligates one or more guaranteed operating loans in year t, 0 otherwise
OLOBL	Volume of FSA guaranteed operating loan obligations a bank originated in year t (thousands of dollars)
OBF	OBF = 1 if a bank obligates one or more guaranteed farm ownership loans in year t, 0 otherwise
FOOBL	Volume of FSA guaranteed farm ownership loan obligations a bank originated in year t (thousands of dollars)
LS	LS = 1 if a bank has an FSA loss claim in year t, 0 otherwise
LOSS	Volume of FSA guaranteed loan loss claims paid to a bank in a given year (thousands of dollars)
Independent Variables	
ROA	Ratio of return to assets
LAR	Ratio of outstanding loans to total assets per bank by year
MSA	MSA = 1 if bank is located in a metropolitan statistical area, 0 otherwise
MS	Proportion of total deposits held by a bank in its market area
AGTL	Ratio of outstanding agricultural loans to total loans per bank

continued

Table 3. Continued.

NAME	DEFINITION
RISK	Ratio of volume of agricultural loan losses to total agricultural loans divided by the ratio of total loan losses to total loans per bank
MBHC	MBHC = 1 if bank is member of a multi-bank holding company, 0 otherwise
ASSET	Size of bank in total assets (thousands of dollars)
PREF	PREF = 1 if bank is an FSA approved lender (ALP or CLP), 0 otherwise
INT	Discount rate plus 475 basis points divided by 100, less the inflation rate
FSAGOL	Estimated volume of outstanding FSA guaranteed OL loan obligations per bank[c] (thousands of dollars)
AGEOL	Estimated average age of a bank's volume of outstanding FSA or guaranteed loan obligations thousands of dollars
OLLAG	Sum of the volume of FSA guaranteed operating loan loss claims paid to a bank over the previous five years (thousands of dollars)
IMR	Inverse Mills Ratio
HHI	Concentration of deposits in bank's market area (Herfindahl–Herschmann Index)
CVFARMV	Coefficient of variation in value of farmland and buildings for the previous four years for the county in which bank is located
ΔFMINC	Proportional change in farm income from one year to the next in bank's county
CVFMINC	Coefficient of variation in net farm income for the previous four years for the county in which a bank is located
FCREV	Ratio of revenues from the sale of field crops to total agricultural revenues per county

[a] The subscripts "it" are suppressed for clarity but each variable is defined for bank i and year t except for interest rates which are lagged one year in the loss claims model.

[b] For those variables that require further transformation from the raw data set, more computational detail is provided in McCollum (1996).

[c] Because of FSA's data storage method, it was not possible to determine the actual balances for a given point in the past. The criterion for computing a bank's outstanding FSA loan guarantees was based on the empirical observation that operating loans are usually paid back within a year as discussed in a previous section.

Table 4. Arkansas Institutions Originating FSA Guaranteed Operating Loans

Year	Number of banks	Percent of banks in state	Number of FCS branches
1985	38	14%	2
1986	40	15%	3
1987	77	29%	9
1988	75	28%	11
1989	68	26%	9
1990	69	27%	6
1991	70	28%	5
1992	58	23%	6
1993	52	20%	4
1994	58	23%	4
1995	57	23%	5

Source: Computed from FSA Arkansas State Office data.

Table 5. Arkansas Institutions Originating FSA Guaranteed Farm Ownership Loans.

Year	Number of banks	Percent of banks in state	Number of FCS branches
1985	16	6%	1
1986	18	7%	2
1987	27	10%	5
1988	31	12%	7
1989	30	11%	8
1990	32	12%	5
1991	35	14%	3
1992	25	10%	3
1993	20	8%	2
1994	24	10%	4
1995	28	12%	4

Source: Computed from FSA Arkansas State Office data.

Table 6. Number of Arkansas Banks Experiencing Loss Claims

Year	Operating loan loss claims	Farm ownership loss claims
1984	2	0
1985	5	1
1986	6	0
1987	7	1
1988	11	1
1989	6	3
1990	8	0
1991	10	2
1992	20	4
1993	26	5
1994	17	4
1995	10	2

Source: Computed from FSA Arkansas State Office data.

Table 7. Comparison of characteristics between participating and non-participating banks in regression sample[a].

	Participating	Non-participating
Banks (number)	108	135
Mean bank assets (ASSETS) (thousands of dollars)	72,544	63,754
	Mean percent[b]	
Return on assets (ROA)	1.15	1.15
Agricultural loan to total loan ratio (AGTL)	23.7	11.1
Loan to asset ratio (LAR)	51.5	50.0
Member multi-bank holding co. (MBHC)	38.8	34.2
Agricultural revenues from field crops (FCREV)	52.1	30.2

[a] A participating bank is a bank that made at least one FSA guaranteed loan during 1990-1995. Otherwise a bank is designated as a non-participant.

[b] Averages are over the annual observations.

Source: Computed.

Table 8. Estimated elasticities of significant continuous variables, coefficient estimates of significant binary variables, in the three submodels, and goodness of fit statistics[a].

Submodel	OL		FO		OL loss claim	
Dependent variable[b]	OBL	OLOBL	OBF	FOOBL	LS	Loss
Independent variables[b]						
Continuous						
ASSET		0.113	0.162			
LAR	0.693		1.765			
AGTL	0.576	0.447	0.912			
RISK	-0.145			0.211		
MS	0.558		0.398			
HHI	-.645			-0.789		
FCREV	0.331	0.568	-1.149		.914	
CVFMINC	0.424	.454	0.429			
∆FMINC						-0.079
INT[c]			1.450	-1.44	-2.74	
FSAGOL					0.533	.598
OLLAG					0.137	
AGEOL						.890
Binary variables[b]						
PREF	1.08		.864			
MSA		-206		-416		
SAMPLE SIZE	1423	308	1423	138	388	69
R^2		0.256		.384		0.276
% Correct predictions[d]	83		90		86	

[a] Elasticities and binary variable estimates are reported only for those variables significant at the 0.05 level. All variables are current fiscal year except RISK, FCREV, ∆FMINC, FSAG, and OLLAG. RISK, FCREF, and ∆FMINC are all lagged one year and FSAGOL and OLLAG are distributed lags over three and five years, respectively.

[b] Variable definitions are provided in Table 3.

[c] For the LS and LOSS models the variable INT is lagged one period.

[d] Percent of observations in the sample correctly classified by the probit model.

Source: Computed.

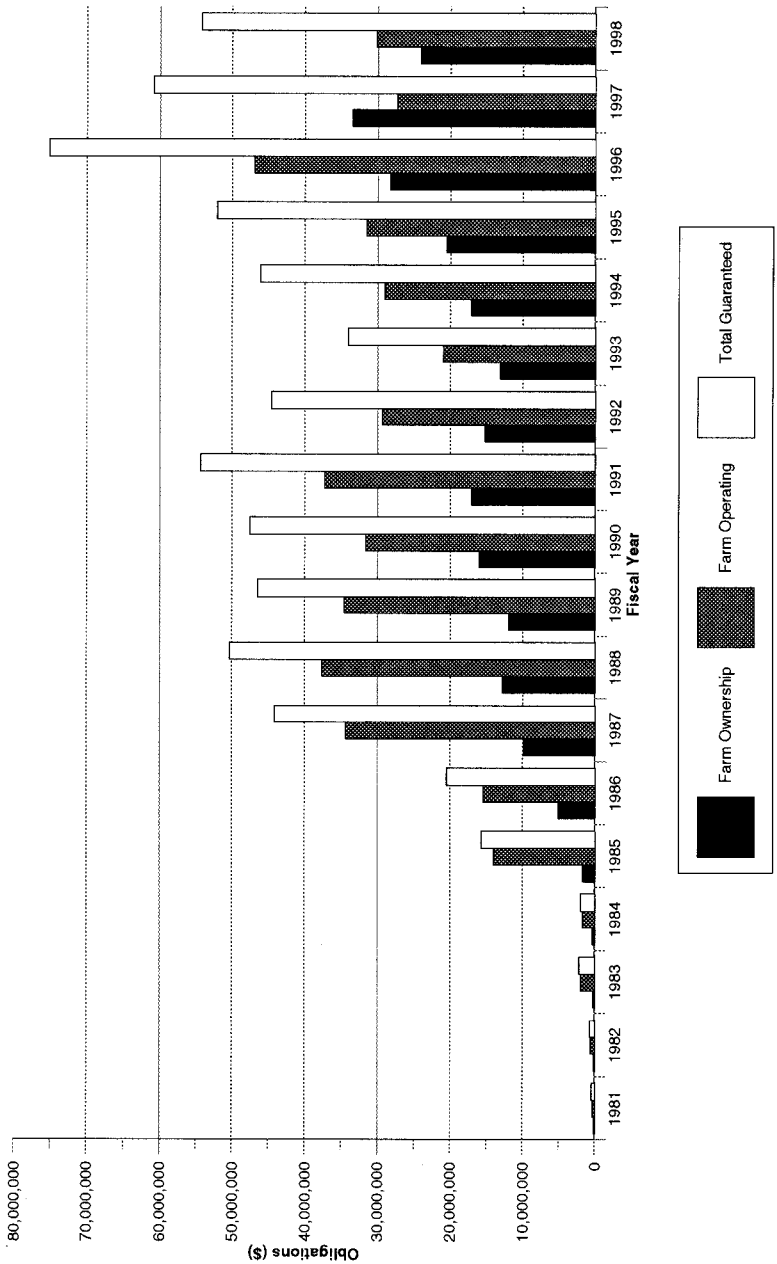


Fig. 1. Arkansas FSA guaranteed loan obligations: 1981 to 1998.

Source: FSA Form 389-175

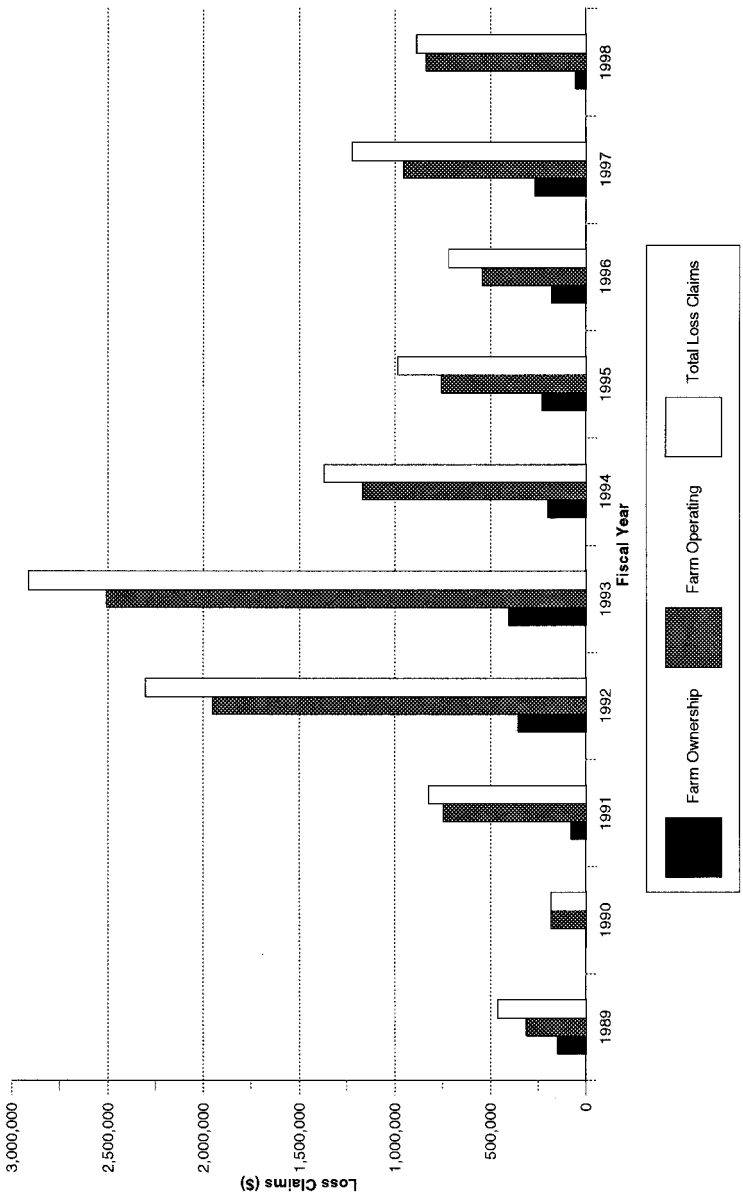
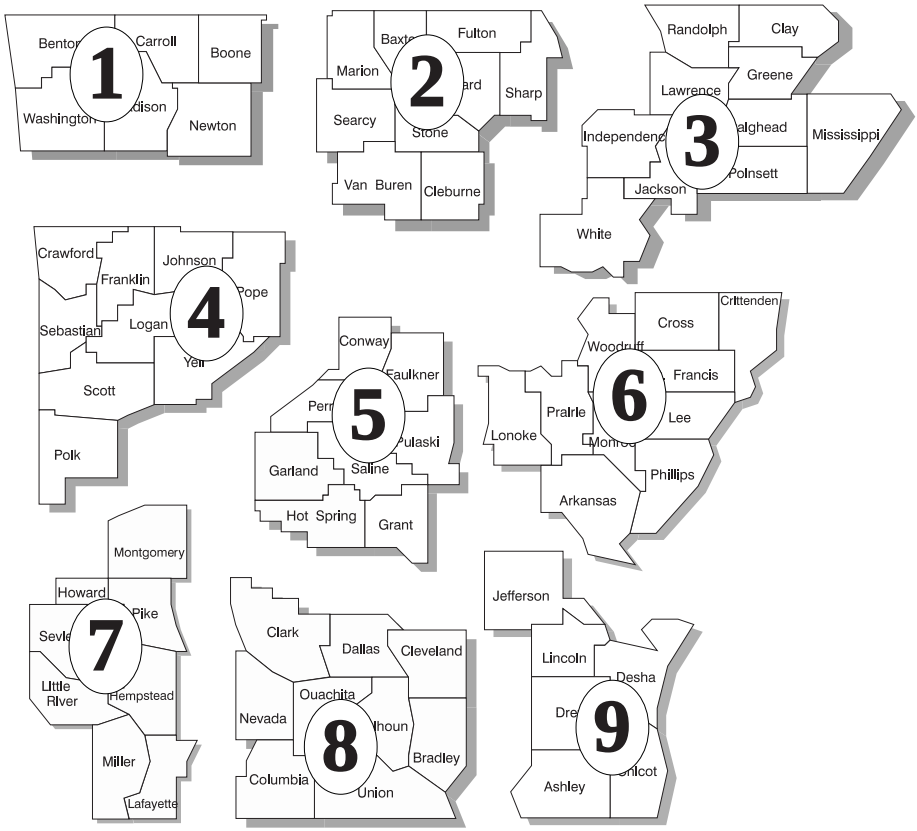


Fig. 2. Arkansas FSA loss claims on guaranteed loans: 1989 to 1998*

Source: Steve Ford, FSA, Washington D.C. office
*Totals reported are not inclusive because they do not include all loss claim payments such as payments for Chapter 12 or voluntary write-downs.

APPENDIX A: Counties and crop-reporting districts of Arkansas.

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