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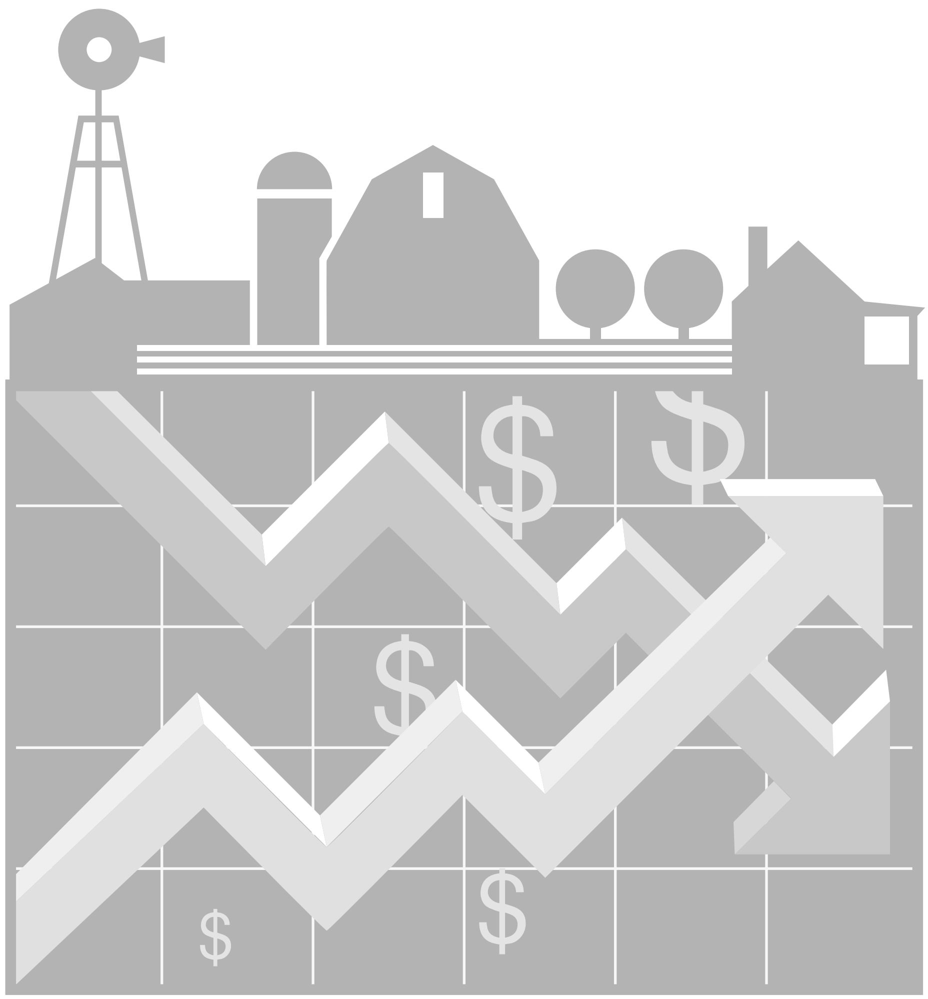

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SUMMARY

The Farm Service Agency guaranteed loan program is an important source of credit for family-sized farming operations in Arkansas and the other states of the U.S. This program provides loan guarantees to borrowers who are otherwise unable to obtain credit from traditional lenders at reasonable rates and terms. This study identifies those factors related to the program's loss claim rate performance over the years fiscal 1989 through 1998 using state-level data from forty states. For both the operating loan and farm ownership loan programs, farm operator financial variables, interest rates, and commercial bank characteristics are found to be statistically significant variables in explaining loss claim rate variation.

Key Words: Farm Service Agency, guaranteed loans, loss rates, farm loans.

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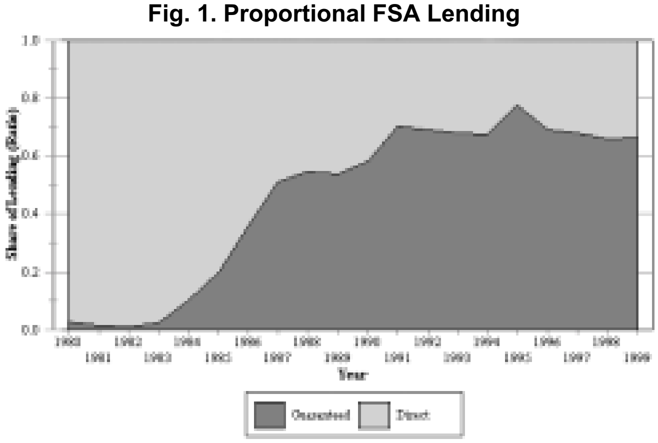
INTRODUCTION

The U.S. Department of Agriculture's Farm Service Agency (FSA) remains an important source of funds for production agriculture, accounting for about 10 percent of total U.S. farm debt through its direct and guaranteed lending programs. The agency's farm credit mission is to assist family farms unable to obtain credit from conventional sources at reasonable rates and terms, but that still possess the potential to establish financially viable family-sized farming operations. FSA credit programs are intended to serve as temporary sources of credit, so there are limits to the time and amounts an applicant can borrow from the programs. Additionally, the programs are targeted to socially disadvantaged (SDA) family farmers and beginning farmers.[1]

Until the mid-1980s, the majority of FSA farm loan assistance was provided through its direct loan programs (Figure 1). Over the last 15 years, there has been a definite policy commitment to shift much of the assistance from the public sector to the private sector through the use of loan guarantees. The guaranteed loan program enables participating lenders to originate and service loans otherwise deemed too risky. Borrowers benefit from loan guarantees because they are able to access credit at more reasonable terms and interest rates than they would otherwise be able to obtain.

Fig. 1. Proportional FSA Lending



Source: Economic Research Service, Agricultural Income and Finance, Situation and Outlook, AIS 73 (February 2000).

Under a loan guarantee, FSA covers up to 90 percent of the losses sustained if the loan defaults (95 percent for beginning farmer loans and loans refinancing certain direct FSA loans). Guaranteed loans are funded and serviced by participating lenders and made at terms set by the lender, but within the requirements of the loan guarantee programs. Rates charged on guaranteed loans must not exceed the lender's typical farm loan rate, and borrowers receiving an FSA guarantee must be able to show ability to repay the loan. A 1 percent guarantee fee is charged by FSA on the amount guaranteed.

FSA guarantees farm ownership (FO) and operating loans (OL). Loans eligible for an FO guarantee are those used to purchase farmland, construct or repair farm structures, develop farmland to promote soil and water conservation, and refinance existing indebtedness. Loans eligible for an OL guarantee are for a variety of purposes, including the purchase of livestock, machinery, annual operating expenses, and the refinancing of existing debt under certain conditions. Interest rate assistance is available on guaranteed OL loans. FSA reduces loan rates by four percentage points if the borrower is unable to repay the loan at the lender's normal farm lending rate.

Guaranteed loan program indebtedness per borrower was capped at $300,000 for the FO program and $400,000 for the OL program until the Omnibus Consolidated and Emergency Supplemental Appropriation Act of 1998 (P.L. 105-277) was passed. The legislation increased the cap to $700,000 for each program, but kept a total indebtedness cap of $700,000. The cap is now adjusted annually by "USDA's Prices Paid by Farmers Index" to reflect changes in the cost of production. Limiting borrowing is one way to ensure the programs serve family-sized farms. Additional guidelines developed by FSA require that an applicant's farming operation be comparable in size to similar operations in the area, the farm family provides a substantial share of the full-time labor, and the borrower be responsible for day-to-day decision making.

Suppliers of Guaranteed Loans

The principal users of FSA loan guarantees are commercial banks and the associations of the Farm Credit System (FCS). Commercial banks account for approximately 80 percent of the dollar volume (Koenig and Dodson). A number of factors influence a lender's decision to seek a federal loan guarantee. The primary reason lenders use loan guarantees is to cover credit risks on borrowers who fail to meet conventional credit standards. Therefore, the volume of farm loans guaranteed annually is very dependent on the financial health of farm borrowers.

Because a government guarantee reduces the amount required to capitalize a loan, commercial banks can use Federal loan guarantees to obtain greater leverage, thus increasing returns-to-equity while controlling risk. Likewise, banks facing liquidity constraints can increase their lending resources by obtaining federal loan guarantees on their farm loans. Again, less capital is required to support a guaranteed loan and the guaranteed portion can be readily sold if necessary. Small banks with limited deposit bases and growing loan demand may have the greatest incentive to seek guarantees, especially on marginal borrowers.

Very small FCS associations and banks are most likely to be concerned about lending risk associated with loans to a single

[1] An SDA farmer is one who may have been subject to racial, ethnic, or gender prejudices because of his/her identity as a member of a group without regard to his/her individual qualities. A beginning farmer is one with 10 years or less experience owning or operating a farm.

borrower, and federal guarantees allow such banks to better control that risk. Federally guaranteed loans are exempt from rules restricting the amount a bank can lend to a single borrower. FCS lenders have an incentive to use FSA guaranteed loan programs when serving FSA eligible applicants because they can make these loans at a higher loan-to-value ratio. FCS lenders can make farm real estate loans equal to 97 percent of the appraised value if the loan is guaranteed, but are limited to 85 percent of the appraised value if it is not guaranteed.

Banks and FCS lenders also have an incentive to utilize Federal guarantees to improve credit availability to under served areas and groups. Banks have incentives under the Community Reinvestment Act of 1977, and FCS associations have incentives under Section 4.19 of the Farm Credit Act of 1971, which requires the FCS to target its lending to young, beginning, and small farmers through special lending programs.

Overview of Study

This study investigates the loss claim aspect of the FSA guaranteed loan program in the U.S. The payment of a loss claim by FSA is the final step in settling a delinquent loan account with a guaranteed lender. When the borrower's financial situation no longer allows the timely payment of principal and interest on an FSA guaranteed loan, the loan becomes delinquent. Generally, some effort is made by FSA and the lender to help the borrower resume payment on the loan by restructuring the terms or conditions of the loan.

Debt restructuring can include reamortizing loan payments, reducing loan interest rates and even forgiving repayment on some debt. In situations where debt restructuring cannot remedy a borrower's ability to meet future debt obligations and continue farming operations, the lender may determine that the only alternative remaining to collect on the loan is foreclosure. The collateral is sold, and the proceeds are disbursed to the lender. If the net proceeds from the sale are not sufficient to cover the full amount of the principal due on the loan, FSA pays the lender the guaranteed percentage of the lost principal and a portion of unpaid interest. This payment is termed a loss claim. Loss claims can also be paid on debt write-downs, i.e., debt that is forgiven.

Loss claim payments to guaranteed loans for the U.S. have fluctuated since fiscal 1989. For the 1989-98 period, guaranteed loss claims for the U.S. were at their lowest in fiscal 1995 at $32.3 million and have been trending upward since (Table 1). Loss claim rates are defined as total loss claim payments as of the end of the fiscal year divided by total principal outstanding at the beginning of the year. The loss claim rates for the U.S. for both FO and OL loans are presented in Figure 2. The loss rate for FO loans shows a downward trend throughout the 1990s increasing only slightly in fiscal 1997 and 1998. The loss rate for OL loans is higher than the FO loss rate and has varied more over time. The lowest OL loss rates were observed in fiscal 1995 and 1996, while the highest rates occurred most recently in fiscal 1997 and 1998.

The financial situation of farm operators, general economic factors, and program rules have likely influenced the rate of loss claims over the past ten-year period. When farm operators experience financial stress, they may find repaying outstanding debt difficult during periods of decreased profitability. The number of defaulted loans and thus, loss claims, are likely to increase. This study explores the impact of variables such as net farm income and government payments, etc. on the variation in loss claim rates.

Although loss claim rates would be expected to rise in years

Table 1. Guaranteed Loss Claims Paid for the U.S.*, Fiscal Years 1989-1999

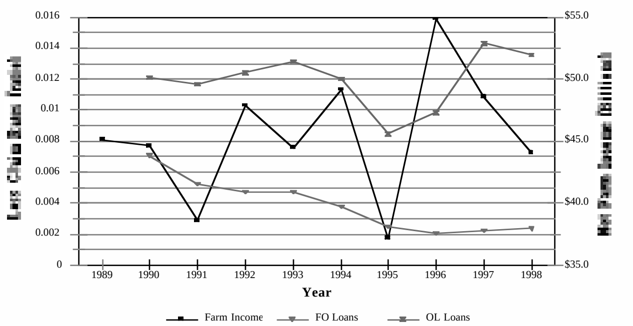
Fiscal Year	FO Loans	OL Loans	Total Guaranteed
		(Million $ - Nominal)	
1989	9.6	29.6	39.2
1990	5.7	29.9	35.6
1991	7.0	33.6	40.6
1992	7.3	37.4	44.7
1993	8.7	41.1	49.8
1994	8.1	35.7	43.8
1995	5.9	26.4	32.3
1996	5.4	33.2	38.6
1997	6.3	51.5	57.8
1998	7.0	48.0	55.0
1999	9.7	58.1	67.8
Total since Fiscal 1989	80.7	424.5	505.2

***** U.S. totals do not include loss claims paid to Alaska, Hawaii or U.S. territories.

Source: Computed from data provided by the Farm Service Agency, Washington, D.C.

after net farm income falls and vice versa, exactly the opposite appears to have happened in five of the past nine years for OL rates (Figure 2). Most dramatically, in 1996, net farm income for the U.S. reached a decade high of $54.9 billion. This is the calendar year immediately preceding fiscal 1997, a year when U.S. loss claim rates for FO and OL loans rose. In addition, it seems probable that government payments to farmers should reduce loss claim rates by subsidizing net farm income in periods of low profits. Interestingly, loss claim rates have increased since the enactment of the 1996 FAIR Act, despite record levels of direct payments to farmers. In fiscal 1998 and 1999 farmers received an estimated $35 billion in direct government payments. The present study investigates these relationships more closely.

Fig. 2. Net Farm Income and FSA Loss Claim Rates* for the U.S., 1989-1998



* Loss claim rates are computed as the sum of losses in the 48 states divided by the sum of principal for the U.S., not the mean of the 48 rates for a given year. Sources: Loss claim rates are computed from data provided by the Farm Service Agency, Washington, D.C., and net farm income figures are from the Economic Research Service web site.

Study Objectives

This study investigates the FSA guaranteed loan program over the past decade and identifies farm operator, farm economy, agricultural policy, commercial bank, and guaranteed loan program variables most important in explaining the variation in the ratio of loss claim payments to guaranteed principal outstanding. Factors such as debt-to-asset ratios, net farm income, farm size, government payments, interest rates, interest rate assistance, and loan-to-asset ratios are among those hypothesized to be important. This study estimates how these factors influence the loss claim rates for both FO and OL loans.

For the past fifteen years one key reason that guaranteed loans have been favored by policymakers relative to direct loans is the fact that they are less costly to administer and deliver. A major factor in the lower costs for guaranteed loan programs is the much lower loss rate experience on these loans relative to direct loans. Therefore, less budget authority is required to support a given amount of annual lending or obligation authority as the use of guarantees increases.

The amount of lending that a given level of budget authority will support is determined by the budget subsidy rate, or the government's cost of lending $1 under a loan program. For example, a budget authority of one dollar will support $20 of obligation authority at a 5 percent subsidy rate, but $100 of authority at a 1 percent subsidy rate. In fiscal 1999, the subsidy rate for the guaranteed FO programs was 1.56 percent while that of the direct FO program was 14.97 percent. The level of interest rate assistance provided, anticipated default costs, repayment rates, and certain transaction costs are factors that determine the subsidy rate for a given fiscal year.

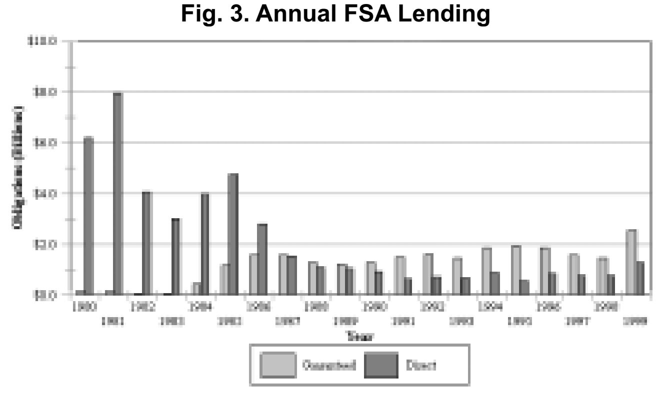
If the loan program does not provide a direct interest rate subsidy such as through the interest rate assistance program for loan guarantees, then the anticipated loss claim rate is the primary factor affecting the subsidy rate. Therefore, the amount of loss claim anticipated on loans during a fiscal year has a large effect on the program subsidy rate and hence on the amount of money Congress must appropriate to support a desired level of future lending activity.

The results of this study will aid policymakers and program administrators in forecasting or estimating loss claim rates of the guaranteed loan programs. The study also provides insight on the factors that determine annual subsidy costs for the loan guarantee programs.

FSA GUARANTEED LOAN PROGRAM ACTIVITY

Between fiscal 1983 and 1995, loan guarantees rose from 2.3 percent of total FSA annual obligations to a high of 77.5 percent of total annual obligations (USDA/ERS, 2000). This percentage has decreased somewhat since 1995 and stood at 66 percent in fiscal 1999. In terms of total dollars obligated, $1.3 billion in direct loans and $2.6 billion in guaranteed loans were obligated in fiscal 1999 (Figure 3). This was the highest level of lending during the 1990s, as Congress boosted lending authority to assist an ailing farm economy.

Fig. 3. Annual FSA Lending



Source: Farm Service Agency Report 205.

The use of loan guarantees is centered in the middle portion of the U.S. with limited use in the western and eastern parts of the country (Figure 4). For fiscal years 1989 through 1998, the Corn Belt region has the highest mean FO obligation with $83.6 million.[2] Other regions having high mean FO obliga-

2 Prior to fiscal 1999, the USDA classified the 48 contiguous states into ten regions based on homogeneity of resource base and agricultural production. These ten regions and the states that comprise each are listed in Table 5. The new regional classifications cut across state lines. However, since the data examined in the study are aggregated at the state level, only the prior regional classifications are used.

Fig. 4. Farmers with FSA Guarantees as of October 1999, by County

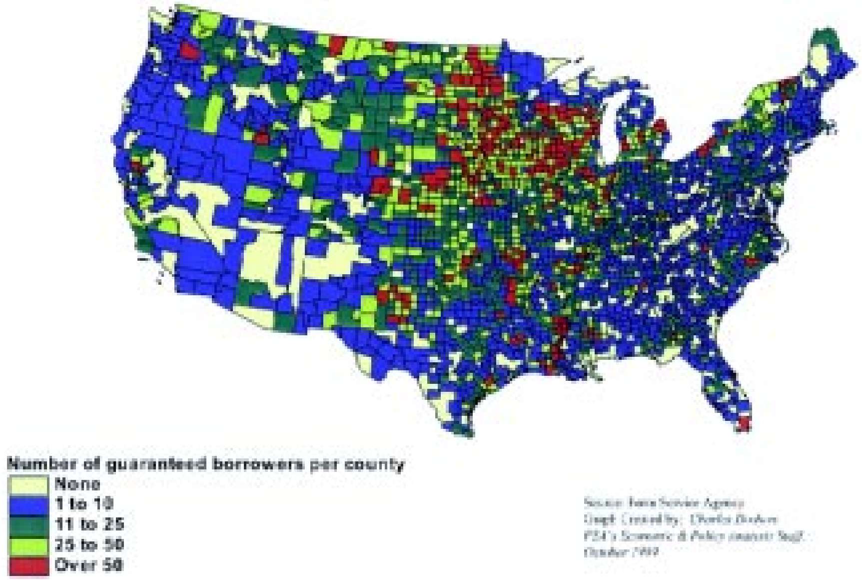
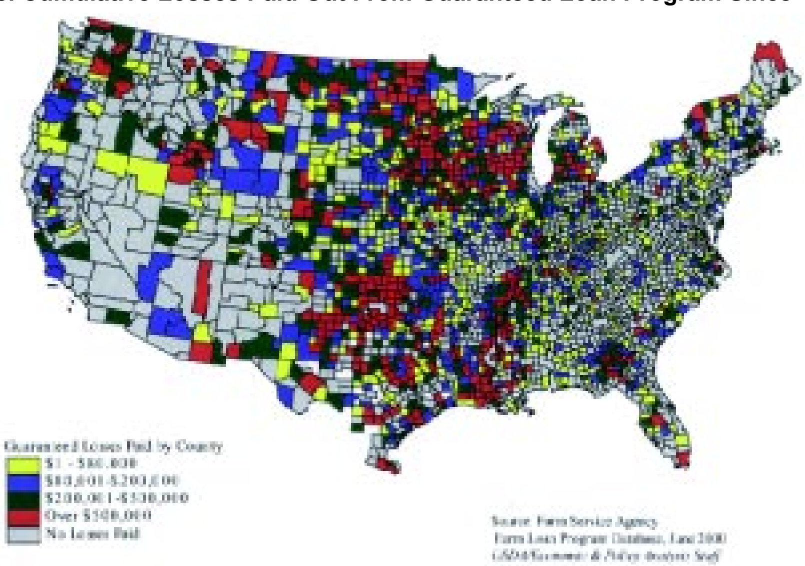


Fig. 5. Cumulative Losses Paid Out From Guaranteed Loan Program Since 1989

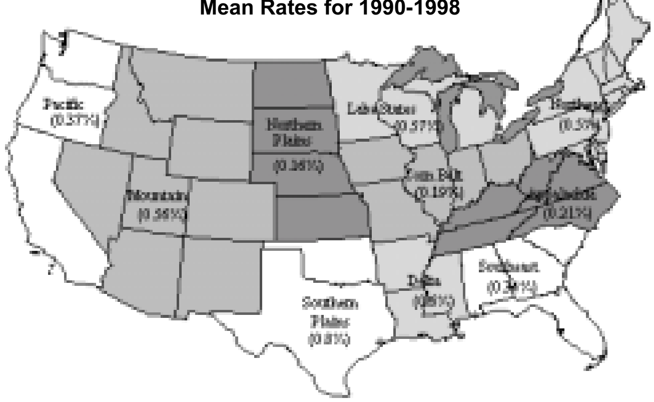


tions for the same ten-year period include the Lake States ($64.6 million), Northern Plains ($59.4 million), Appalachia ($47.4 million) and Delta ($42.2 million). The Corn Belt region also has the highest mean OL obligation with $188.8 million, followed by the Southern Plains ($154.5 million), Lake States ($144.7 million), Delta ($144.7 million), and Mountain ($78.2 million) regions.

Guaranteed loss claims in the U.S. have varied substantially over the past decade ranging from a low of $32.3 million in fiscal 1995 to a high of $67.8 million in fiscal 1999 (Table 1). In fiscal 1999, only $9.7 million (14.3 percent) of total loss claims were paid on FO loans, while $58.1 million (85.7 percent) were paid on OL loans. Like obligation levels, loss claim activity is centered in the middle portion of the U.S. (Figure 5). The Lake States region has the highest FO mean of $1.6 million for the period fiscal 1989-98, while the Southern Plains region has the highest OL mean of $9.2 million. Other regions having high FO means include the Delta ($1.2 million) and Southern Plains ($1 million) regions, while other regions having high OL means include the Delta ($8.3 million) and Lake States ($4.7 million) regions.

Since this study identifies those factors which influence the variability in guaranteed loss claim rates over time and among states, it is useful to highlight the regional and state variation in FO and OL loss claim rates over time. The mean FO loss rates for each USDA production region for fiscal years, 1990 through 1998 are shown in Figure 6. Table 2 provides the actual numerical values that correspond to the figures as well as the annual rates.

Fig. 6. Regional FO Loss Claim Rates
Mean Rates for 1990-1998

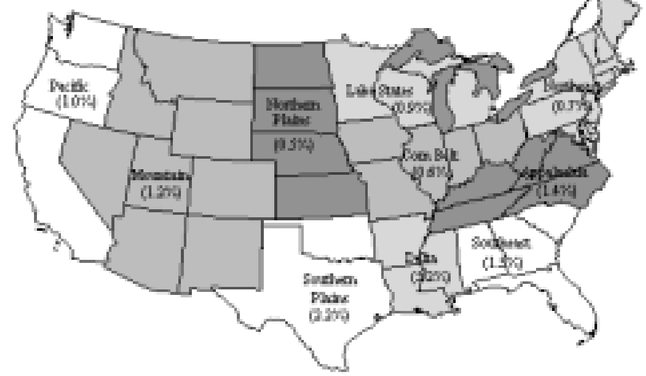


Source: Computed from data provided by the Farm Service Agency, Washington, D.C.

There is a wide disparity in the loss claim rates both between various regions and within certain regions over time. The loss claim rate for the Southern Plains region consistently ranks in the top five loss rates for all nine years. Other regions having high loss claim rates include the Lake States, Mountain, Delta and Northeast regions.

Figure 7 illustrates the mean OL loss claim rates for each production region in the U.S. over the fiscal 1990-1998 time frame. The numeric means and annual rates are found in Table 2. The OL loss claim rates are not as dispersed as the FO loss

Fig. 7. Regional OL Loss Claim Rates
Mean Rates for 1990-1998



Source: Computed from data provided by the Farm Service Agency, Washington, D.C.

claim rates. One region, the Delta, has the highest loss claim rate for all years in the period. The Southern Plains and Southeast regions also have high loss rates.

Summarizing the regional variation in loss claim rates, the Southern Plains region consistently has high rates for the sample period for both FO and OL loans. While the Northeast region shows high loss rates for FO loans, especially in recent years, its loss rate for OL loans is lower than other regions. The Delta region has the highest OL loss rates, while both the Northern Plains and Corn Belt regions have low FO and OL loss rates.

Table 3 displays the FO loss rates for each year of the study for each of the 48 contiguous states. The mean loss rates for each state over the sample period are also included. There are five states with mean FO loss claim rates for the sample period of 1 percent or greater. These are Arizona (3.3 percent), Connecticut (2.3 percent), New Hampshire (1.3 percent), Louisiana (1.2 percent) and Florida (1.0 percent). Twelve states have a mean FO loss claim rate between 0.5 and 1 percent, and the remaining 31 states have mean rates less than 0.5 percent. The states with the lowest five mean loss claim rates are Nebraska, Virginia, North Carolina, Delaware and Nevada.

The annual and mean OL loss rates for each of the 48 states for fiscal 1990 through 1998 are listed in Table 4. Twenty-four states have mean OL loss claim rates of 1 percent or greater. The ten highest rates are those of Louisiana (3.8 percent), Connecticut (3.6 percent), Mississippi (3.3 percent), Oklahoma (2.7 percent), New Mexico (2.6 percent), Oregon (2.4 percent), Tennessee (2.2 percent), Arkansas (2.1 percent), Texas (2.0 percent) and West Virginia (1.9 percent). Seventeen states have rates between 0.5 and 1 percent, while only seven states have mean rates less than 0.5 percent. The five states with the lowest OL loss claim rates include Vermont, Nebraska, Nevada, Rhode Island and Delaware.

Four states rank in the top ten highest mean loss rates for both FO and OL loans. Connecticut's high rank for both types of loans is somewhat insignificant given that it is one of the eight states making the lowest dollar volume of guaranteed obligations. If a state makes a relatively low volume of loans, a

Table 2. Loss Claim Rates by Region, Fiscal 1990-1998

	1990		1991		1992		1993	
Region	FO	OL	FO	OL	FO	OL	FO	OL
Pacific	0.002	0.008	0.023	0.007	0.000	0.008	0.001	0.014
Mountain	0.009	0.014	0.006	0.013	0.016	0.016	0.006	0.014
No. Plains	0.004	0.008	0.002	0.004	0.002	0.005	0.001	0.006
So. Plains	0.015	0.020	0.009	0.017	0.008	0.019	0.010	0.026
Lake States	0.021	0.012	0.007	0.009	0.007	0.013	0.003	0.008
Corn Belt	0.006	0.008	0.003	0.006	0.002	0.006	0.002	0.008
Delta States	0.002	0.070	0.007	0.082	0.008	0.061	0.014	0.046
Northeast	0.001	0.006	0.006	0.008	0.000	0.005	0.013	0.008
Appalachia	0.004	0.016	0.004	0.017	0.001	0.016	0.003	0.013
Southeast	0.001	0.009	0.004	0.025	0.005	0.013	0.004	0.012

	1994		1995		1996		1997	
Region	FO	OL	FO	OL	FO	OL	FO	OL
Pacific	0.000	0.005	0.002	0.013	0.002	0.009	0.002	0.007
Mountain	0.005	0.012	0.001	0.008	0.003	0.007	0.000	0.009
No. Plains	0.001	0.006	0.002	0.004	0.000	0.004	0.001	0.004
So. Plains	0.014	0.025	0.005	0.014	0.002	0.017	0.008	0.036
Lake States	0.004	0.007	0.002	0.008	0.002	0.007	0.003	0.011
Corn Belt	0.001	0.005	0.001	0.004	0.001	0.004	0.000	0.004
Delta States	0.006	0.041	0.005	0.027	0.004	0.039	0.004	0.058
Northeast	0.004	0.005	0.005	0.008	0.005	0.004	0.004	0.009
Appalachia	0.001	0.014	0.002	0.010	0.001	0.014	0.001	0.012
Southeast	0.009	0.015	0.003	0.011	0.002	0.019	0.002	0.014

	1998		Mean*	
Region	FO	OL	FO	OL
Pacific	0.001	0.015	0.004	0.010
Mountain	0.004	0.017	0.006	0.012
No. Plains	0.001	0.006	0.002	0.005
So. Plains	0.003	0.027	0.008	0.022
Lake States	0.002	0.009	0.006	0.009
Corn Belt	0.001	0.004	0.002	0.006
Delta States	0.004	0.045	0.006	0.052
Northeast	0.008	0.009	0.005	0.007
Appalachia	0.002	0.010	0.002	0.014
Southeast	0.001	0.017	0.004	0.015

* The means are calculated by summing the rates for each region over the 1990-1998 period and dividing by the number of years (9).

Table 3. FO Loss Claim Rates by States, 1990-1998

Year	Alabama	Arizona	Arkansas	California	Colorado	Connecticut
1990	0.000	0.000	0.000	0.000	0.019	0.057
1991	0.008	0.000	0.002	0.000	0.013	0.000
1992	0.000	0.190	0.006	0.000	0.032	0.000
1993	0.000	0.000	0.006	0.002	0.003	0.153
1994	0.000	0.076	0.003	0.000	0.007	0.000
1995	0.000	0.000	0.003	0.000	0.000	0.000
1996	0.000	0.000	0.002	0.004	0.000	0.000
1997	0.000	0.000	0.003	0.002	0.000	0.000
1998	0.000	0.033	0.000	0.001	0.005	0.000
Mean	0.001	0.033	0.003	0.001	0.009	0.023

Year	Delaware	Florida	Georgia	Idaho	Illinois	Indiana
1990	0.000	0.000	0.003	0.024	0.011	0.001
1991	0.000	0.015	0.000	0.016	0.003	0.007
1992	0.000	0.009	0.002	0.015	0.001	0.000
1993	0.000	0.018	0.006	0.007	0.002	0.000
1994	0.000	0.034	0.004	0.000	0.002	0.000
1995	0.000	0.009	0.002	0.004	0.004	0.001
1996	0.000	0.000	0.004	0.014	0.003	0.000
1997	0.000	0.002	0.003	0.000	0.000	0.000
1998	0.000	0.001	0.003	0.000	0.002	0.000
Mean	0.000	0.010	0.003	0.009	0.003	0.001

Year	Iowa	Kansas	Kentucky	Louisiana	Maine	Maryland
1990	0.005	0.000	0.012	0.004	0.000	0.000
1991	0.003	0.001	0.003	0.011	0.000	0.000
1992	0.001	0.000	0.002	0.012	0.000	0.000
1993	0.002	0.002	0.005	0.038	0.000	0.026
1994	0.001	0.001	0.001	0.012	0.000	0.000
1995	0.000	0.003	0.001	0.008	0.062	0.000
1996	0.001	0.001	0.000	0.004	0.000	0.000
1997	0.001	0.001	0.004	0.011	0.002	0.000
1998	0.001	0.001	0.001	0.010	0.000	0.000
Mean	0.002	0.001	0.003	0.012	0.007	0.003

Year	Massachusetts	Michigan	Minnesota	Mississippi	Missouri	Montana
1990	0.000	0.018	0.017	0.004	0.008	0.000
1991	0.000	0.004	0.006	0.009	0.002	0.000
1992	0.000	0.011	0.002	0.006	0.002	0.010
1993	0.000	0.003	0.001	0.007	0.004	0.008
1994	0.000	0.003	0.002	0.006	0.002	0.000
1995	0.015	0.002	0.002	0.004	0.000	0.000
1996	0.026	0.002	0.001	0.006	0.002	0.004
1997	0.012	0.000	0.002	0.000	0.000	0.002
1998	0.016	0.001	0.003	0.004	0.001	0.000
Mean	0.008	0.005	0.004	0.005	0.002	0.003

Table 3. FO Loss Claim Rates by States, 1990-1998 (continued)

Year	Nebraska	Nevada	New Hampshire	New Jersey	New Mexico	New York
1990	0.003	0.000	0.000	0.000	0.000	0.000
1991	0.002	0.000	0.000	0.000	0.000	0.000
1992	0.001	0.000	0.000	0.000	0.000	0.001
1993	0.000	0.000	0.000	0.000	0.016	0.022
1994	0.001	0.000	0.047	0.000	0.015	0.002
1995	0.000	0.000	0.000	0.017	0.000	0.005
1996	0.000	0.000	0.054	0.000	0.000	0.003
1997	0.001	0.000	0.020	0.000	0.000	0.005
1998	0.001	0.000	0.000	0.013	0.004	0.010
Mean	0.001	0.000	0.013	0.003	0.004	0.005

Year	North Carolina	North Dakota	Ohio	Oklahoma	Oregon	Pennsylvania
1990	0.000	0.017	0.001	0.021	0.008	0.000
1991	0.000	0.004	0.008	0.011	0.024	0.016
1992	0.000	0.007	0.012	0.006	0.000	0.000
1993	0.000	0.002	0.000	0.006	0.000	0.009
1994	0.001	0.003	0.000	0.015	0.000	0.004
1995	0.000	0.006	0.001	0.002	0.012	0.002
1996	0.000	0.001	0.000	0.002	0.000	0.000
1997	0.000	0.000	0.000	0.008	0.000	0.001
1998	0.003	0.001	0.000	0.002	0.005	0.000
Mean	0.001	0.004	0.002	0.008	0.005	0.004

Year	Rhode Island	South Carolina	South Dakota	Tennessee	Texas	Utah
1990	0.000	0.000	0.009	0.001	0.000	0.000
1991	0.000	0.000	0.000	0.023	0.005	0.000
1992	0.000	0.019	0.000	0.000	0.012	0.000
1993	0.000	0.000	0.000	0.005	0.015	0.000
1994	0.000	0.014	0.000	0.000	0.014	0.003
1995	0.000	0.002	0.001	0.008	0.009	0.005
1996	0.000	0.000	0.000	0.004	0.003	0.003
1997	0.028	0.000	0.001	0.000	0.008	0.000
1998	0.000	0.000	0.001	0.001	0.004	0.006
Mean	0.003	0.004	0.001	0.005	0.008	0.002

Year	Vermont	Virginia	Washington	West Virginia	Wisconsin	Wyoming
1990	0.000	0.000	0.000	0.000	0.026	0.000
1991	0.004	0.000	0.034	0.000	0.008	0.000
1992	0.000	0.000	0.000	0.003	0.010	0.025
1993	0.000	0.000	0.000	0.006	0.003	0.002
1994	0.006	0.003	0.001	0.000	0.005	0.002
1995	0.002	0.004	0.000	0.003	0.002	0.000
1996	0.009	0.000	0.000	0.000	0.003	0.000
1997	0.005	0.000	0.002	0.000	0.006	0.000
1998	0.021	0.000	0.000	0.003	0.002	0.007
Mean	0.005	0.001	0.004	0.002	0.007	0.004

Table 4. OL Loss Claim Rates by States, 1990-1998

Year	Alabama	Arizona	Arkansas	California	Colorado	Connecticut
1990	0.006	0.000	0.004	0.000	0.008	0.236
1991	0.016	0.000	0.015	0.004	0.032	0.000
1992	0.000	0.000	0.032	0.005	0.022	0.000
1993	0.025	0.000	0.047	0.008	0.010	0.046
1994	0.004	0.090	0.030	0.004	0.009	0.000
1995	0.000	0.000	0.018	0.005	0.015	0.039
1996	0.012	0.000	0.012	0.008	0.010	0.000
1997	0.004	0.000	0.014	0.007	0.009	0.000
1998	0.003	0.011	0.014	0.021	0.012	0.000
Mean	0.008	0.011	0.021	0.007	0.014	0.036

Year	Delaware	Florida	Georgia	Idaho	Illinois	Indiana
1990	0.000	0.013	0.012	0.016	0.010	0.006
1991	0.000	0.026	0.019	0.002	0.007	0.025
1992	0.000	0.019	0.013	0.006	0.008	0.012
1993	0.000	0.007	0.009	0.016	0.009	0.002
1994	0.000	0.019	0.011	0.004	0.002	0.009
1995	0.000	0.005	0.014	0.009	0.005	0.006
1996	0.000	0.022	0.018	0.006	0.006	0.004
1997	0.000	0.004	0.017	0.015	0.001	0.005
1998	0.000	0.023	0.018	0.032	0.004	0.001
Mean	0.000	0.015	0.015	0.012	0.006	0.008

Year	Iowa	Kansas	Kentucky	Louisiana	Maine	Maryland
1990	0.009	0.009	0.012	0.034	0.004	0.019
1991	0.005	0.005	0.015	0.057	0.000	0.005
1992	0.004	0.005	0.014	0.040	0.000	0.003
1993	0.007	0.008	0.022	0.030	0.000	0.053
1994	0.005	0.009	0.014	0.032	0.012	0.017
1995	0.003	0.006	0.016	0.020	0.000	0.007
1996	0.003	0.004	0.007	0.038	0.000	0.003
1997	0.005	0.003	0.019	0.041	0.012	0.002
1998	0.003	0.006	0.003	0.052	0.117	0.007
Mean	0.005	0.006	0.014	0.038	0.016	0.013

Year	Massachusetts	Michigan	Minnesota	Mississippi	Missouri	Montana
1990	0.000	0.020	0.012	0.017	0.005	0.013
1991	0.000	0.012	0.009	0.024	0.002	0.013
1992	0.021	0.021	0.011	0.017	0.005	0.025
1993	0.000	0.013	0.006	0.026	0.017	0.007
1994	0.000	0.004	0.010	0.047	0.009	0.011
1995	0.007	0.010	0.009	0.031	0.003	0.005
1996	0.037	0.004	0.008	0.024	0.006	0.000
1997	0.018	0.005	0.010	0.065	0.006	0.007
1998	0.000	0.005	0.007	0.050	0.013	0.015
Mean	0.009	0.011	0.009	0.033	0.007	0.011

Table 4. OL Loss Claim Rates by States, 1990-1998 (continued)

Year	Nebraska	Nevada	New Hampshire	New Jersey	New Mexico	New York
1990	0.005	0.000	0.000	0.000	0.029	0.002
1991	0.002	0.000	0.000	0.000	0.040	0.006
1992	0.002	0.000	0.000	0.000	0.042	0.004
1993	0.003	0.000	0.000	0.000	0.054	0.000
1994	0.004	0.000	0.019	0.000	0.044	0.007
1995	0.002	0.001	0.000	0.014	0.005	0.008
1996	0.003	0.000	0.020	0.022	0.003	0.001
1997	0.003	0.000	0.019	0.000	0.001	0.013
1998	0.003	0.000	0.000	0.011	0.015	0.004
Mean	0.003	0.000	0.006	0.005	0.026	0.005

Year	North Carolina	North Dakota	Ohio	Oklahoma	Oregon	Pennsylvania
1990	0.003	0.041	0.003	0.032	0.049	0.000
1991	0.017	0.008	0.007	0.022	0.018	0.034
1992	0.011	0.013	0.016	0.013	0.019	0.004
1993	0.007	0.012	0.008	0.029	0.015	0.017
1994	0.007	0.012	0.004	0.032	0.004	0.002
1995	0.002	0.006	0.002	0.020	0.053	0.010
1996	0.002	0.006	0.015	0.037	0.028	0.003
1997	0.012	0.007	0.001	0.039	0.002	0.014
1998	0.014	0.012	0.003	0.020	0.025	0.002
Mean	0.008	0.013	0.006	0.027	0.024	0.010

Year	Rhode Island	South Carolina	South Dakota	Tennessee	Texas	Utah
1990	0.000	0.003	0.004	0.041	0.009	0.008
1991	0.000	0.051	0.004	0.024	0.014	0.000
1992	0.000	0.019	0.003	0.030	0.023	0.001
1993	0.000	0.016	0.004	0.008	0.024	0.014
1994	0.000	0.027	0.004	0.025	0.022	0.012
1995	0.000	0.011	0.002	0.013	0.011	0.000
1996	0.000	0.019	0.004	0.032	0.008	0.005
1997	0.000	0.016	0.002	0.015	0.035	0.004
1998	0.000	0.009	0.007	0.012	0.030	0.003
Mean	0.000	0.019	0.004	0.022	0.020	0.005

Year	Vermont	Virginia	Washington	West Virginia	Wisconsin	Wyoming
1990	0.000	0.008	0.000	0.018	0.007	0.010
1991	0.000	0.000	0.005	0.062	0.007	0.006
1992	0.010	0.000	0.005	0.025	0.010	0.009
1993	0.002	0.001	0.019	0.023	0.007	0.011
1994	0.003	0.010	0.007	0.004	0.006	0.005
1995	0.002	0.004	0.004	0.010	0.005	0.007
1996	0.001	0.014	0.004	0.017	0.008	0.014
1997	0.001	0.000	0.010	0.000	0.015	0.018
1998	0.015	0.000	0.003	0.015	0.012	0.022
Mean	0.004	0.004	0.006	0.019	0.009	0.011

large loss in a given year can highly skew the mean rate. By looking more closely at the yearly rates for the state, it is apparent that two very high annual FO loss rates and three OL rates have spiked the mean given all of the other annual rates are zeros for the state. Louisiana, Oklahoma, and Texas rank in the top ten for both types of loans. All three states in the Delta region—Arkansas, Louisiana, and Mississippi—have three of the ten highest mean OL loss rates for the study period. The Southern Plains and Delta regions grow significant amounts of cotton and rice–two crops receiving considerable government payments.

Given the descriptive analysis of the data, it is likely that there are underlying factors that determine the variation in loss claim rates across states over time. The remainder of the study focuses on identifying what those factors are and testing their statistical significance. After the FO and OL models are developed, the out-of-sample observations of the data are used to predict the loss claim rates for fiscal 1998. These predictions are compared to the actual fiscal 1998 figures to determine the precision of the model. The study is concluded by interpreting the model results and discussing policy implications.

METHODOLOGY

Types of Regression Models Estimated

Loss claim rates are hypothesized to be a function of several variables that measure: (1) the financial well-being of farm operators; (2) the structure of the agricultural industry; (3) the overall strength of the agricultural sector and economic policies toward agriculture; (4) the agricultural lending policies of commercial banks; and (5) the level of activity in the various dimensions of the guaranteed loan program. All the variables represent underlying sources of risk either present at the time of origination or evolving from circumstances arising during the life of loans that may result in loans becoming unsuccessful.

For each of the variables included in the regression models, data are observed by state across years. Thus, the data are an annual time series of cross sections (panel) in nature. Since there are two major guaranteed loan programs with distinctly different purposes, two separate regression models are estimated. The two models do not include exactly the same variables since some variables are important in explaining FO loss claim rates but not OL loss claim rates and vice versa. Additionally, since the two types of loans are different in terms of time structure (FO loans are long-term loans and OL loans are short to medium-term loans), we expect that some of the signs on variables common to both models will differ.

Upon examination of FO and OL volumes across states, eight of the 48 states in the sample are eliminated due to low levels of guaranteed lending activity. The eight states deleted from the sample are mostly in the Northeast region and include Rhode Island, New Hampshire, Delaware, Connecticut, Nevada, New Jersey, Maine and Arizona. These eight states average less than $3 million in annual total guaranteed obligations during the 1989 through 1998 fiscal years. The state with the lowest decade average deleted from the sample was Rhode Island with an annual average of $417,589, while the state with the lowest decade obligation average included in the sample is Massachusetts at $5,402,300.

A substantial literature exists on the proper estimation of a model using panel data, and a summary may be found in Judge et al. Under very restrictive assumptions the components of the estimated coefficient vector could be estimated by ordinary least squares (OLS). Using OLS implies that the error term variance does not vary across time and cross-sectional unit and that the estimated coefficient vector is constant across time and cross-sectional unit. OLS also assumes no serial or contemporaneous correlation across time or states. These assumptions are quite restrictive.

In order to relax the assumption that the error term variance does not vary across time or cross-sectional unit, the OL loan model is specified and estimated using a time series/cross section (TSCS) model which utilizes a feasible generalized least squares estimator (FGLS). FGLS is used instead of generalized least squares because the parameter values of the error term covariance matrix are unknown. The model assumes that the error term variances do not change within a state but that the errors may vary across states. FGLS provides asymptotically efficient estimates of the coefficients and standard errors under these assumptions. The coefficient vector is assumed to be constant over time except for the intercept. State binary variables are included to allow the intercept to vary by state. This model is commonly referred to as a fixed effects model.

An alternative specification, if the coefficient vector is thought to be unequal across states, would be seemingly unrelated regression (SUR) model. However, for the particular application in this study, a SUR model is not estimated because the number of cross-sectional units (40) greatly exceeds the number of years of annual observations (eight). Thus, the empirical estimate of the error term covariance matrix would be singular.

A concern in the FO model with the particular sample is that a large proportion of the observations on the dependent variable are zeros. This violates an assumption of the OLS model. The FO regression model is estimated using a Tobit framework in order to account for the large proportion of zero observations. Fixed effects are employed in the Tobit model by using binary variables to designate production regions.[3] To accommodate variation in error variances across regions, the Harvey multiplicative model discussed in Greene (1998) is used.

Variables Hypothesized to Affect FSA Loss Claim Rates

Since there are many independent variables included in the models for this study, it is important to discuss the theorized relationships of those variables to the dependent variables. All the variables used in the study as well as the units each are measured in are defined in Table 5. Their construction is dis-

[3] Although using the state binary variables for the fixed effects in the FO model as opposed to production region binary variables would have been preferred, the statistical software used to estimate the Tobit model was unable to converge given the large number of independent variables.

Table 5. Definitions and Expected Signs of Dependent and Independent Variables*

Variable	Definition	Expected Sign
Dependent Variables:		
FONLC	Loss claims paid on FO loans divided by beginning of the year FO principal outstanding (ratio).	
OLNLC	Loss claims paid on OL loans divided by beginning of the year OL principal outstanding (ratio).	
Independent Variables:		
Group 1: Financial Variables		
DAR	Debt-to-asset ratio.	+
NFI	Net farm income divided by number of farm operations (million $).	-
ROA	Rate of return on assets from current farm income (ratio).	-
DEBTSVC	Debt servicing ratio.	+
Group 2: Structural Variables		
CREV	Proportion of State farm revenues generated by crop sales.	+
SIZE	Land in farms with annual sales greater than $10,000 divided by number of farm operations with annual sales greater than $10,000 (thousands of acres).	+/-
WORK	Proportion of farm operators in the state (with sales greater than $10,000) working more than 200 days off the farm.	+/-
Group 3: Economic Environment Variables		
LTINT	Interest rate charged by commercial banks on long-term farm real estate loans (% divided by 100).	+
STINT	Interest rate charged by commercial banks on short-term non-real estate farm loans (% divided by 100).	+
GOV	Direct government payments per farm operation (million $).	+/-
Group 4: Commercial Bank Variables		
AGTL	Ratio of agricultural loans made by commercial banks to total loans made by commercial banks.	+/-
AGBNK	Number of agricultural banks per farm operation.	+/-
LAR	Ratio of total loans made by commercial banks to total assets of commercial banks.	+

Table 5. Definitions and Expected Signs of Dependent and Independent Variables (continued)*

Variable	Definition	Expected Sign
Group 5: FSA Loan Variables		
AVGFO	FO principal outstanding divided by number of FO loans outstanding (Million $).	+
AVGOL	OL principal outstanding divided by number of OL loans outstanding (Million $).	+
OLIRA	OL interest rate assistance vouchered divided by number of OL loans outstanding ($).	+/-
FOGLTL	Guaranteed FO principal outstanding divided by total real estate debt outstanding.	+
OLGLTL	Guaranteed OL principal outstanding divided by total non-real estate debt outstanding.	+
OLBKPCT	Proportion of guaranteed OL obligations made by commercial banks.	+/-
Group 6: Regional (and State) Binary Variables		
PAC	Pacific Region–California (CA), Oregon (OR), Washington (WA).	
MTN	Mountain Region–Arizona (AZ), Colorado (CO), Idaho (ID), Montana (MT), Nevada (NV), New Mexico (NM), Utah (UT), Wyoming (WY).	
NOPL	Northern Plains Region–Kansas (KS), Nebraska (NE), North Dakota (ND), South Dakota (SD).	
SOPL	Southern Plains Region–Oklahoma (OK), Texas (TX).	
LAKE	Lake States Region–Michigan (MI), Minnesota (MN), Wisconsin (WI).	
CORN	Corn Belt Region–Illinois (IL), Indiana (IN), Iowa (IA), Missouri (MO), Ohio (OH).	
DELTA	Delta States Region–Arkansas (AR), Louisiana (LA), Mississippi (MS).	
NER	Northeast Region–Connecticut (CT), Delaware (DE), Maine (MN), Maryland (MD), Massachusetts (MA), New Hampshire (NH), New Jersey (NJ), New York (NY), Pennsylvania (PA), Rhode Island (RI), Vermont (VT).	
APP	Appalachia Region–Kentucky (KY), North Carolina (NC), Tennessee (TN), Virginia (VA), West Virginia (WV).	
SER	Southeast Region–Alabama (AL), Florida (FL), Georgia (GA), South Carolina (SC).	

* The subscripts “it” are suppressed for clarity, but each variable is defined for state i and year t.

cussed in Fultz except for the modifications noted herein. The dependent variable for the FO model is the ratio of annual loss claims paid on guaranteed FO loans to beginning of the year principal outstanding on FO loans (FONLC).[4] The dependent variable for the OL model, OLNLC, is analogous to FONLC except it is defined for OL loss claims and principal outstanding on OL loans. In both models, it is assumed that beginning year principal outstanding is known, i.e., predetermined. Thus, in interpreting variable signs, we are concerned with how those variables affect loss claim levels given the existing principal outstanding.

Farm Firm Financial Variables

Farm operator characteristics measure various aspects of the financial condition of farm borrowers such as liquidity, solvency and profitability. The hypothesis is that a strong financial position promotes timely principal and interest payments of guaranteed loans. Thus, with strong financial variables, fewer borrowers become delinquent, and loss claim ratios decrease.

A farm operation is said to be solvent if the value of the farm assets is high enough to pay all creditors if the farm's total debt obligation became due immediately. There are a variety of ways to measure solvency, such as the ratio of debt pledged against farm business assets to farm assets (DAR). In 1995, Dodson and Koenig found that borrowers with FSA guaranteed bank loans had a weighted debt-to-asset ratio of 0.29 compared with only about 15 percent for all farm borrowers. Additionally, in an early 1980s study by Turvey of Canada's Farm Credit Corporation, debt-to-asset ratios were found significant in explaining the probability of a loan being noncurrent. Since an increase in the debt-to-asset ratio would indicate a higher level of financial risk faced by farm operations, this variable is hypothesized to be directly related to loss claim rates.

A farm is profitable if the total amount of revenue generated exceeds total expenses. One measure of profitability is the average net farm income earned by farm operations in the state (NFI). In a 1910-1978 study of bankruptcy rates in the U.S., Shepard and Collins found bankruptcy rates to be significantly and inversely related to farm income. That is, as farm income increased, bankruptcy rates among farm operators decreased and vice versa. Farm businesses that are profitable generally have fewer difficulties meeting financial obligations in a timely manner. In the present study, NFI is expected to be inversely related to loss claim rates.

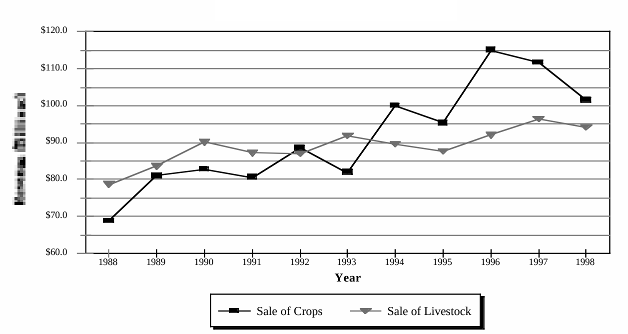
The return to farm assets within the state from current income divided by farm assets within the state (ROA) is a measure of how efficiently the farm business uses its assets to generate income. ROA does not include income realized from capital gains on assets. Thus, this ratio provides a pure measure of the profitability of farm operations in the state. In the Turvey study, higher rates of return on farm assets were found to correspond with lower probabilities of loans being noncurrent. Thus, ROA is hypothesized to be inversely related to loss claim rates as well.

Cash available to pay debt is clearly an important indicator of default likelihood. The debt servicing ratio in a state (DEBTSVC), computed as the sum of interest and principal payments divided by gross cash farm income, measures the share of gross income needed to service debt. This ratio indicates the liquidity of farm operations and the ease with which debt obligations can be met from readily available income. Miller and LaDue used a similar variable in their 1983 credit scoring models for dairy farm borrowers. In their study, lower debt payments per dollar of milk sales were found to significantly indicate higher borrower loan quality. Therefore, DEBTSVC is hypothesized to be directly related to loss claim rates.

Structural Variables

There appears to be a difference in the types of agriculture that use the two types of guaranteed loans. Koenig and Sullivan estimated that only 30 percent of those farm operators using OL loan guarantees had livestock (including dairy) as their major farm enterprise versus 54 percent using FO loans. In addition, during the time period of the study, revenues from the sale of crops varied much more dramatically than revenues from the sale of livestock as shown in Figure 8. The variable crop revenue (CREV) is defined as the proportion of gross agricultural revenue from crops in a state. A greater concentration of crop farms in a state increases the likelihood that farm income will be affected adversely by weather events. In addition, crop farms have more borrowed capital for operating expenses, and as such their credits are less secure. Therefore, as the share of crop revenue to total revenue rises, we expect loss rates for loans to increase.

Fig. 8. Agricultural Revenue for the U.S., 1988-1998



Source: Economic Research Service website.

From 1988 to 1997, the average size of farms in the U.S. with sales of more than $10,000 rose from 788 to 821 acres.[5] Shepard and Collins hypothesized that an increase in farm size places greater emphasis on machinery, irrigation equipment and

4 Since several of the independent variables considered by the study are ratios, the dependent variables, FO and OL loss claims paid, are normalized as proportions of principal outstanding. The normalizations are required because the sizes of the agricultural economies vary greatly across states. Thus, without normalization, any variables that vary as a function of the size of a state's agricultural economy would likely explain a majority of the variation in the volume of loss claims across states.

5 NASS-Farms and Land in Farms: 1988-92 <http://usda.mannlib.cornell.edu/data-sets/land/95895/sb895.txt> and 1993-97 <http://usda.mannlib.cornell.edu/usda/reports/general/sb/b9550199.txt> accessed 1/26/99.

other fixed or quasi-fixed inputs. In addition, a capital intensive operation requires annual purchases of insecticides, seeds, fertilizers, feeds or animals to complement the fixed inputs. Thus, as average farm size increases, financial risk may also increase. However, larger farms may be more efficient in all aspects of farming: production, marketing and financing. Under this hypothesis, increased farm size may result in less risk. To capture the potential effect of average farm size on loss claim rates, the total number of agricultural acres divided by number of farm operations (SIZE) is defined. Koenig and Dodson report that most guaranteed loans are made to family-sized farms and not small, "hobby" farms.[6] Therefore, SIZE is calculated as land in farms with annual sales of greater than $10,000 divided by number of farm operations with annual sales of greater than $10,000.

In order to reduce a portion of the financial risk associated with production agriculture, a substantial number of farm operators are employed off the farm. In 1994, the proportion of total income for farm operator households derived from off-farm income was 90 percent. While this figure decreases when considering farm operator households with farm sales between $50,000 and $249,000 (70 percent) and $500,000 or more (23 percent), a major portion of farm operator households receive at least some off-farm income.[7] The importance of off-farm income to farm operators within a state is measured by the proportion of farm operators in a state working more than 200 days off the farm (WORK).[8] The direction of the relationship between WORK and loss claim rates cannot be specified with complete certainty. While off-farm income provides a risk-reducing supplement to net farm income, a high proportion of farm operators spending working days off the farm may indicate an absolute need for additional income to avoid financial problems.

<u>Economic Environment Variables</u>

Characteristics of the general economic environment measure the overall condition and health of the agricultural economy. As the interest rates charged on loans increase, borrowers may find qualifying for credit given their existing repayment capacity more difficult because lenders are less willing to extend credit. Low interest rates allow farm operators to acquire credit to see them through difficult times, preventing or delaying failure (Shepard and Collins). To account for this impact, the interest rate charged by commercial banks on long-term farm real estate loans (LTINT) is included in the FO model, and the interest rate charged by commercial banks on short-term non-real estate farm loans (STINT) is included in the OL model. Positive coefficients are expected for both LTINT and STINT.[9]

The other farm environment variable is defined as the annual direct government payments paid to farm operators in the state divided by number of farms (GOV). Farm policy may affect loss claim rates by supporting and stabilizing farmer income through direct payments to farmers. However, substantial payments to farmers might also indicate financial stress (more government assistance needed to shield farmers from the full financial effects of natural disasters or unfavorable market conditions). Thus, a directional relationship between government payments and loss claim rates cannot be determined on theoretical grounds.

<u>Banking Variables</u>

The commercial bank characteristics considered in this study measure the importance of agriculture in the loan portfolio and the propensity of banks within a state to make agricultural loans. Variation in loss claim rates due to changes in lending behavior to the agricultural sector is captured by the ratio of agricultural loans-to-total loans made by commercial banks in the state (AGTL). The number of agricultural banks per farm (AGBNK) measures the availability of credit from banks making a significant volume of agricultural loans to farm operations located within the state.[10] The ratio of total loans made by commercial banks in the state to total assets of commercial banks in the state (LAR) measures lenders' propensities to invest available funds in loans as opposed to other investments.

Dixon, Ahrendsen and McCollum reported that agricultural banks are likely to make more FSA guaranteed loans than nonagricultural banks and found that increasing loan-to-asset ratios were associated with greater bank participation in the guaranteed farm loan programs. This increased use of guarantees was thought to shield lenders with aggressive lending policies from an otherwise expanded exposure to agricultural loan losses. That is, as banks seek to make more loans in a given area, the base of customers left to extend credit to are marginally less credit worthy.

Since increases in all three of these commercial bank variables–AGTL, AGBNK and LAR–are hypothesized to result in a larger number of guaranteed loans made at a greater risk level, they are thought to have positive relationships with loss claim rates in both the FO and OL models. However, agricultural lenders may be more sensitive to the potential problems that arise in production agriculture that adversely affect the financial performance of their farm borrowers. These lenders are probably more likely to make special repayment arrangements to help their farmers through difficult times. This would imply that increases in AGTL and AGBNK would decrease loss claim rates. So the sign expectations on these two variables are ambiguous.

<u>FSA Loan Variables</u>

Characteristics of the guaranteed loan program should be important determinants of loss claim rate variations. Principal

6 ERS <http://www.ers.usda.gov/whatsnew/issues/lending/chart1.htm>.

7 ERS <http://www.econ.ag.gov/briefing/fbe/hhold/hh_t0203.htm> accessed 3/16/99.

8 Only those operating farms with annual sales greater than $10,000 are used in the calculation of the WORK variable.

9 LTINT and STINT are both nominal interest rates.

10 The Board of Governors of the Federal Reserve System (FRB) classifies a bank as agricultural if its ratio of farm loans to total loans exceeds the unweighted average of the ratio at all banks on June 30 of each year (USDA/ERS, 2000). This is the definition used in this study instead of the definition in Fultz.

outstanding on guaranteed loans is a good measure of the current level of exposure FSA has to possible loss claims.[11] The dollar amount of principal outstanding on FO loans divided by the number of FO loans with outstanding principal (AVGFO) is defined to measure the average amount of FO loan principal subject to loss claim payment in a given fiscal year. The average dollar amount of OL loan principal outstanding subject to loss claim payments is measured by AVGOL. AVGOL is calculated as the dollar amount of principal outstanding on OL loans divided by the number of OL loans with outstanding principal. AVGFO is included in the FO loss claim rate model, while AVGOL is included in the OL loss claim rate model. Both variables are expected to carry positive signs.

The amount of interest rate assistance paid per guaranteed OL loan outstanding (OLIRA) measures the variation in loss claim rates due to subsidizing the interest rates on guaranteed OL loans.[12] The amount of interest rate assistance provided for guaranteed loans is thought to facilitate the payment of loan principal by lowering the total interest cost of the loan, but higher amounts of interest rate assistance may foreshadow larger loss claim ratios since loans are being made to borrowers who merit interest rate assistance. Determining the sign of OLIRA is an empirical matter, since we can theoretically justify positive or negative signs.[13]

The proportion of total agricultural debt supported by guaranteed loans or the share of FSA guaranteed loans in the agricultural credit market is another variable hypothesized to be important in determining loss claim rates. Two variables, proportion of FO guaranteed loans in the agricultural real estate debt market (FOGLTL) and proportion of OL guaranteed loans in the agricultural non-real estate debt market (OLGLTL), are defined to measure the variability in FO and OL loss claim rates due to increases in debt market share. Increases in FSA guarantee proportions likely indicate increasing numbers of financially stressed farm operators, indicating positive signs on these variables.

One final FSA program variable, the proportion of OL guaranteed obligations made by commercial banks as opposed to other eligible guaranteed lenders such as FCS, mortgage loan companies or insurance companies (OLBKPCT), is included in the OL model to measure variation in OL rates due to type of lender.[14] The sign on this variable is difficult to hypothesize a priori. If commercial banks have a lower risk tolerance and therefore use guarantees more frequently, a negative sign would be expected and vice versa if banks are more risk tolerant than other lenders.

Variable Construction and Data Sources

The units of observation in this study are states on an annual basis. The sample period used to estimate the FO model begins in fiscal year 1990 and ends in fiscal year 1997. The sample period for the OL model is from fiscal 1992 through fiscal 1997.[15] The data consist of 320 observations over the eight years in the FO model and 240 observations over the six years in the OL model. The years in this study are FSA fiscal years which end on September 30 of each year. Several of the independent variables are computed on a calendar year basis.[16] However, the dependent variables, FONLC and OLNLC, are computed on a fiscal year basis. Since the calendar year includes one quarter (the fourth) that is not included in the current fiscal year, all calendar year variables are lagged one year in order to avoid having the future explain the present.

The data used in this study were obtained from the following sources: Farm Service Agency offices in Kansas City and Washington D.C., Economic Research Service (ERS), Bureau of the Census, National Agricultural Statistics Service (NASS) and Federal Reserve Bank of Chicago's *Report of Bank Condition and Income Database*. Specific details are given in Fultz. All dollar figures used in the study were deflated using chain type price indexes for gross domestic product reported in *The Economic Report of the President* with 1992 as the base year. Although the FSA data are reported on a fiscal year basis, they are deflated using the calendar year gross domestic product deflator.

Estimation Procedures

Both the FO and OL models are first estimated with the complete set of relevant independent variables in addition to regional/state shifters. To reduce the number of independent variables in the models, all variables with a t-ratio less than one are deleted, and the models are re-estimated.[17] This procedure is used to give a more parsimonious parameterization. The parameter estimates of both the FO and OL models are presented in the next sections.

Due to the large proportion of FO observations taking on a value of zero in the sample (35 percent), Tobit models are esti-

11 Unfortunately, principal outstanding is not the contingent liability for FSA. An attempt was made to obtain such data, but the record keeping system does not record such variables on a yearly basis by state. On an annual basis for the U.S. as a whole, the contingent liability and principal outstanding are highly correlated (see Fultz).

12 In this study interest rate assistance for FO loans is ignored. While the legal authority to make such loans exists, such payments were only made for a short period and are not a part of current lending practices.

13 The data for FSA interest rate assistance are limited to fiscal years 1992 through 1998. Although interest rate assistance was available for guaranteed loans prior to fiscal 1992, observations for those years were unavailable.

14 Unfortunately, only data for this variable were available for fiscal years 1992 through 1998. Thus inclusion of these data into the models limits the sample size by two years. Preliminary estimation indicated that inclusion of these data into the OL model significantly affected results, while inclusion of a similar variable into the FO model was insignificant.

15 While considerable descriptive analysis is presented for the FSA variables for the period 1989 to 1998, the time frame of the regression models is limited to 1990 to 1997 for FO loans and 1992 to 1997 for OL loans. This is due to constraints in the availability of observations on the independent variables for certain years included in the study.

16 Independent variables reported on a calendar year basis include DAR, NFI, ROA, DEBTSVC, CREV, SIZE, WORK, GOV, AGBNK, FOGLTL and OLGLTL. Independent variables reported on a fiscal year basis include LTINT, STINT, AGTL, LAR, AVGFO, AVGOL, OLIRA and OLBKPCT.

17 The initial results of both models are found in the Appendix. None of the coefficients in the reduced model change sign from the models with all hypothesized variables.

mated. Although preliminary OLS estimation indicated that including regions as the fixed effects groups is less desirable than state fixed effects, the LIMDEP algorithm would not converge with all 40 state binary variables included. Therefore, regional fixed effects are used instead.

Unfortunately, software to estimate the presence of autocorrelation (error terms that are serially correlated) in a model most appropriately estimated by a Tobit estimator is not available. As an approximate test for the presence of autocorrelation, the full FO model is estimated as a fixed effects model by OLS including all the hypothesized regressors. The estimate of the first order correlation coefficient, assuming it is the same for each state, gave a value of 0.0196. Because this magnitude is so slight, it is assumed in further estimation of the FO model that the error terms were non-autocorrelated.[18] As discussed previously, a Harvey multiplicative Tobit model is specified to provide asymptotically efficient coefficient and standard error estimates in the FO model where the error term variances are allowed to vary by region.[19] Seven of the nine regional terms are significant at the 0.05 level for the final FO model.

For the OL loans, a time series/cross sectional (TSCS) model is specified and estimated using FGLS. A Tobit framework is not employed for the OL model because relatively few of the observations for OLNLC are zeros (5 percent). The coefficient vector is assumed to be constant over time except for the intercept. State binary variables are included to represent fixed effects. As with the FO model, a check was made for the presence of autocorrelation. The first order autocorrelation estimate from the OLS fixed effects model for OL loans including all the hypothesized regressors was -0.0739 indicating that autocorrelation is not an important factor. Thus, in the subsequent OL model, the error terms are assumed to be non-autocorrelated.[20] A likelihood ratio test for constant error term variances across states is rejected at the 0.05 level, so the subsequent OL model is estimated assuming no variation in error variances within a state but variation in error variances across states.

RESULTS AND ANALYSIS

Estimated FO Model

The estimated coefficients of the continuous independent variables in the final FO model are displayed in Table 6.[21] The variables debt servicing ratio (DEBTSVC) and proportion of real estate debt supported by FO guarantees (FOGLTL) are omitted from the model after initial estimation because their t-ratios are less than one in absolute value. Of the twelve ex-

Table 6. Tobit Coefficients for Farm Ownership Loan Model

Variable[a]	Coefficient	Standard Error	/Std Error	Elasticity[†]
DAR	0.058*	0.026	2.217	1.732
NFI	0.193*	0.083	2.324	0.792
ROA	-0.735E-03*	0.298E-03	-2.471	-0.441
CREV	0.008*	0.004	2.130	0.679
SIZE	-0.002	0.001	-1.439	-0.292
WORK	-0.025	0.015	-1.672	-1.118
LTINT	0.149*	0.043	3.429	2.761
GOV	0.272	0.238	1.141	0.218
AGTL	-0.022*	0.009	-2.455	-0.282
AGBNK	-1.293*	0.488	-2.650	-0.368
LAR	-0.035*	0.009	-3.820	-3.979
AVGFO	-0.042	0.029	-1.448	-1.192

[a] The variable names and units are defined in Table 5.

[†] The elasticities for the continuous variables retained in the FO model were computed using the coefficients adjusted for truncation in the TOBIT model (Greene, 1998), the sample means of the independent variables and the expected value of the dependent variable evaluated at the sample means of the independent variables (Thraen, Hammond and Buxton). R^2 for the OLS estimate of this model is 0.201.

* Significantly different from zero based on a two-sided test at the 0.05 level.

Source: Computed.

[18] The final models are also estimated using OLS to derive first order correlation coefficient estimates. The estimate for the FO model is 0.0191.

[19] The Harvey multiplicative heteroscedasticity model in LIMDEP (Greene, 1998) is used.

[20] As with the FO model, the final OL regression model is re-estimated using OLS to derive a final autocorrelation estimate. The estimate is -0.0677.

[21] See Appendix A for the initial FO model that includes all the hypothesized regressors. The variables DEBTSVC and FOGLTL are negligibly correlated with each other nor do they have a correlation coefficient with FONLC greater than .05 in absolute value.

planatory variables in the final FO model, seven variables—debt-to-asset ratio (DAR), rate of return on assets (ROA), net farm income (NFI), crop revenue (CREV), long-term interest rates (LTINT), commercial bank loan-to-asset ratio (LAR), and average FO principal outstanding (AVGFO)—are hypothesized to have specific signs. Of those seven variables, DAR, ROA, CREV, and LTINT have the coefficient signs expected and are significantly different from zero. The sign on NFI is unexpectedly positive and LAR is unexpectedly negative, and both are significant at the 0.05 level. Of the five variables in the FO model with no a priori signs, two commercial bank variables–agricultural loans-to-total loans ratio (AGTL) and agricultural banks per farm (AGBNK)—are significant at the 0.05 level and have negative signs. The other three variables–off-farm income (WORK), government payments (GOV) and average farm size (SIZE)–are not significant at the 0.05 level.

The positive sign on the debt-to-asset ratio (DAR) indicates that as farmers in the state have a greater amount of debt relative to assets, the ratio of FO loss claims to outstanding principal increases. This is expected because a decrease in solvency implies more financial risk. The negative sign on return on assets (ROA) indicates that as farming becomes more efficient, loss claim rates decline.

The coefficient for net farm income (NFI) is unexpectedly positive meaning that loss claim rates increase at higher levels of net farm income. Although this relationship is counter-intuitive, it does seem plausible given that the data typically show higher loss claim rates following years of higher net farm income. One possible explanation could be that farmers suffering due to low net farm income in a given year may have been able to obtain enough credit to enable them to continue their business hoping that future income increases would compensate for the bad year. Then, perhaps, the subsequent increases in net farm income were not sufficient to enable those farmers already on the brink of financial failure to service their debt. Thus, though net farm income increased, loss claim rates increased as well. Alternatively, if fewer loans are guaranteed in high net farm income years, then loss claim payments may not change enough to effect the decrease in the denominator of FONLC.

The positive and significant sign on the share of farm revenues from crops (CREV) confirms the hypothesis that an increase in revenues from crops–a riskier enterprise–leads to higher loss claim rates. The positive sign on CREV may indicate that as a state has a higher proportion of revenues coming from crops, crop farmers using FO guarantees are forced into default when crop prices are low or there is drought (assuming that most of the variability of CREV is due to diversity of enterprise and not price or output fluctuations). Since relatively few loans are defaulted in any year, a modest increase in the absolute number of crop farmers defaulting on FO loans explains the positive sign.

The negative coefficient on off-farm income (WORK) indicates that as the proportion of farm operators working off the farm more than 200 days per year increases, FO loss claim rates decrease. This might be explained by farm operators reducing financial risk by supplementing farm income with off-farm sources of income. However, the coefficient for this variable is not significantly different from zero at the 0.05 level. Not surprisingly, the interest rate charged on long-term real estate loans (LTINT) is positively signed indicating that increased costs of debt result in higher loss claim rates. Even if FO loans have a fixed interest rates (this can vary) generally rising rates stress overall farm operations.

All three commercial bank variables–agricultural loans-to-total loans ratio (AGTL), loan-to-asset ratio (LAR) and availability of agricultural banks (AGBNK)–were negatively and significantly related to FO loss claim rates. The significance of AGTL and AGBNK support the notion that agricultural lenders are more sensitive to farm economy fluctuations that may adversely affect their borrowers' financial performances. Such lenders are able to select borrowers and adjust loan terms accordingly, and perhaps, guarantee proportionately more loans. This increased sensitivity on the part of agriculturally oriented commercial banks to agricultural borrowers results in a decrease in FO loss claim rates. The significance of AGTL and AGBNK also emphasizes the role played by lenders with agricultural expertise. As more agricultural banks get merged into larger banks and lose their agricultural interest (Ahrendsen, Dixon and Lee), FO loss claim rates might increase, implying a higher cost per dollar borrowed to the FSA guaranteed loan program.

The negative sign and significance of the loan-to-asset ratio (LAR) for the banking industry are intriguing. Dixon, Ahrendsen, and McCollum found increasing loan-to-asset ratios associated with increased guarantee use. Our data show that states with higher loan-to-asset ratios tend to be states dominated by larger banks.[22] If larger banks are less aggressive agricultural lenders, they may be more likely to require an FSA guarantee even though these loans carry a modest credit risk. An FSA guarantee would enable such banks to reduce their lending risk exposure and capital needs because the guaranteed portion of the loan carries a lower risk rating (Koenig and Dodson). This is important since larger banks tend to have higher loan-to-asset ratios which means that a higher percentage of the bank's assets may be subject to more default risk. These larger banks also would be expected to require an FSA guarantee when lending to farms of modest risk because they tend to use the Small Business Administration loan guarantee programs when serving small businesses of modest risk. The results imply that such behavior by banks would reduce FO loss claim rates.

In order to compare the effects of these variables on FO loss claim rates (FONLC) without accounting for differences in units among the variables, elasticities were computed. The elasticities for all continuous variables in the FO model are listed

[22] One problem with the definition of the loan-to-asset variable is that it is calculated with data at the commercial bank level. Although commercial banks may have branches in several different states, the data for all branches are reported in the state where the bank is headquartered so that the loan-to-asset ratio is computed at the bank level. This becomes more of a problem for the later years in the sample, i.e., 1997, when there was an increase in branching by banks across state lines.

in Table 6. The elasticities of these variables computed at the sample means vary from -3.98 for loan-to-asset ratio to 2.76 for long-term interest rate. Five of the eight variables significant at the 0.05 level–return on assets, net farm income, crop revenue, agricultural loans-to-total loans ratio, and availability of agricultural banks–are in the inelastic range. However, the other three variables significant at the 0.05 level–debt-to-asset ratio, long-term interest rate, and loan-to-asset ratio–are elastic. Thus, proportionate variations in these variables have the greatest impact on the variation of the ratio of loss claims paid to outstanding principal for FO loans.[23]

The elasticity of 1.73 for debt-to-asset ratio indicates that loss claim payments are quite sensitive to farm operators' debt burdens. In the 1980s when many highly leveraged farmers experienced financial difficulties, farm loan losses soared, especially for FSA loan programs (USDA/ERS,1998). A future rise in farm debt burdens similar to the 1980s would likely stimulate higher levels of guaranteed loss claim rates.

The long-term interest rate variable is important in explaining loss claim rates as well. An increase in the cost of credit to farm operators for farm real estate could result in a surge of FO loss claim activity, especially since a large share of FO debt is priced with variable rates. The large negative elasticity for the loan-to-asset ratio suggests that aggressive lending policies of commercial banks can actually lead to decreases in loss claim rates as lenders expand their loan portfolio and seek to limit their overall risk exposure by seeking guarantees on agricultural loans that may have only modest risk.

In order to test the prediction accuracy of the FO model, the observations on the independent variables for 1998 were used to forecast the loss claim rates for fiscal 1998. These rates were then multiplied by the principal outstanding figures for fiscal 1997 (beginning fiscal 1998) to calculate the dollar amount of predicted loss claims for fiscal 1998. Summing across the 40 states in the sample, the actual volume of loss claims was \$6.9 million, while the predicted volume of loss claims is \$14.2 million. Obviously, there is quite a difference in these two figures. However, while not desirable, the differential is somewhat expected for two reasons. First, several of the states in 1998 did not have any loss claims, but given the observations of the independent variables for those states, the model still predicts a positive loss rate. Second, instead of using the more desirable state binary variables for the fixed effects in the regression models, we compensate for the estimation software's inability to converge by using regional binary variables. Given these two reasons, the predicted levels for FO loss claims are about double the actual levels.[24]

Estimated OL Model

The regression statistics for the continuous explanatory variables retained in the final operating loan model are presented in Table 7.[25] The variables debt-to-asset ratio (DAR), crop revenue (CREV), average farm size (SIZE), government payments (GOV), agricultural loans-to-total loans ratio (AGTL) and average OL principal outstanding (AVGOL) are omitted from the model due to the insignificance of their estimated coefficients. The R-squared for the final model is 0.445, reasonable for cross-sectional and time series data.

Of the ten explanatory variables in the OL model, six variables are hypothesized to have specific signs. Of those six variables, debt servicing ratio (DEBTSVC) has a positive sign on its coefficient as expected and is significantly different from zero at the 0.05 level. The short-term interest rate (STINT) coefficient is significant but unexpectedly negative, and both rate of return on assets (ROA) and net farm income (NFI) are insignificant with ROA being negative as expected and NFI being unexpectedly positive. Loan-to-asset ratio (LAR) and the ratio of guaranteed OL principal outstanding to total non-real estate debt (OLGLTL) both have unexpectedly negative signs but only OLGLTL is significant. Four variables in the OL model have no a priori expected signs. Off-farm income (WORK) and percentage of OL guarantees made by commercial banks (OLBKPCT) are statistically significant with positive and negative signs, respectively. The interest rate assistance variable (OLIRA) is insignificant, and agricultural banks per farm (AGBNK) is significant at the 0.05 level with a positive coefficient.

The positive sign on the debt servicing ratio (DEBTSVC) indicates that as the proportion of annual gross farm income needed to service debt payments increases, OL loss claim rates also increase. This is expected because liquid farm operators are able to meet principal and interest payments more easily than less liquid operations. As in the FO model where debt-to-asset ratio is significant, the level of farm debt burden is important in the OL model as measured by the debt servicing ratio.

The negative sign on short-term interest rate (STINT) is unexpected since an increase in the cost of short-term capital is hypothesized to make it more difficult for farmers to service existing debts and obtain additional temporary credit to offset cash flow difficulties. However, if an increase in the rate charged on short-term capital stifles the demand and eligibility for short-term loans of marginal borrowers, the overall quality or financial strength of borrowers in the program would rise. Additionally, the OL loan program can provide applicants with four percentage point reductions in interest rates. When interest rates

[23] Coefficients of variation were calculated for all independent variables to identify those variables that had approximately the largest percentage deviations from their sample means. In general, the coefficients of variation for the inelastic significant variables were higher than the coefficients of variation for the elastic variables. Thus, the low relative variability of the elastic variables as compared with the inelastic variables over the sample period implies that no one particular independent variable explained a substantially larger proportion of the dependent variable's variation than other significant independent variables.

[24] When a TSCS model allowing state binaries is used, the prediction is reduced to an error of about 25% indicating state heterogeneity is an important factor.

[25] See Appendix B for results of the OL model including all hypothesized regressors. All the deleted variables have no correlation coefficients greater than .5 with the other deleted variables except AGTL and GOV which have a .75 correlation coefficient. Neither of these variables has a correlation coefficient with OLNLC greater than .1 in absolute value.

Table 7. Estimated Coefficients for Operating Loan Model

Variable[a]	Coefficient	Standard Error	/Std Error	Elasticity†
NFI	0.080	0.099	0.803	0.142
ROA	-0.467E-03	0.430E-03	-1.086	-0.115
DEBTSVC	0.059*	0.025	2.355	0.734
WORK	0.309*	0.070	4.392	6.310
STINT	-0.112*	0.048	-2.338	-0.790
AGBNK	9.021*	2.105	4.286	1.100
LAR	-0.016	0.012	-1.310	-0.799
OLIRA	-2.304	1.950	-1.182	-0.047
OLGLTL	-0.079*	0.032	-2.464	-0.341
OLBKPCT	-0.022*	0.004	-5.006	-1.404

[a] Variable names and units are defined in Table 5.

† Elasticities are computed at the sample means.

* Significantly different from zero based on a two-sided test at the 0.05 level. R^2 = 0.445

Source: Computed.

rise, these subsidies might be more effective in improving cash flow and hence helping minimize defaults. Rising interest rates often prompt Congress to grant more authority for these subsidies.

The positive coefficient on WORK indicates that as the proportion of farm operators working off the farm more than 200 days per year increases, OL loss claim rates increase. This sign favors the hypothesis that financially stressed farm operators seek to supplement farm income with off-farm sources of income in order to provide sufficient cash flow. Also, as a farm operator concentrates more time on off-farm employment, the farming operation might suffer due to lack of time spent in management. Recall that the coefficient for this variable in the FO model was insignificant and negative. Thus, the effect of the variable appears more pronounced in short-term lending versus long-term lending.

The availability of agricultural banks (AGBNK) also has a sign opposite of that exhibited in the FO model. Its positive sign in the OL model indicates that as the number of commercial banks with a considerable volume of agricultural lending increases, the loss claim rates for guaranteed OL loans also increase. This is consistent with the notion that these agricultural banks might be competing more for agricultural loans and, in the process, are taking on a higher risk profile of customers through use of loan guarantees. The difference in signs between the OL and FO models might indicate agricultural banks are more knowledgeable about long-term farm viability and have a desire to insure against less predictable short-term fluctuations. Also, this result may be because non-agricultural banks are less familiar with evaluating the risks of lending to agriculture and, therefore, err on the side of caution by guaranteeing loans of moderate risk that do not result in loss claims.

The negative and highly significant coefficients on the share of total non-real estate debt supported by OL guarantees (OLGLTL) and the share of OL guarantees made by all commercial banks (OLBKPCT) are interesting. The results indicate that as FSA's overall exposure in the non-real estate debt market increases and as banks continue to make a larger percentage of OL guarantees than other lenders (FCS or others), OL loss claim rates decrease. An increasing OLGLTL implies that lenders are more likely to use loan guarantees for a given borrower risk profile than in other states. Also, the sign on OLBKPCT may indicate more risk aversion by banks or better ability to identify weak credits. Thus, in a state with a large proportion of guaranteed OL loans made by banks, loss rates are lower.

The elasticities for all continuous variables retained in the OL model are listed in Table 7. These elasticities computed at the sample means vary from -1.40 for proportion of guaranteed OL obligations made by commercial banks to 6.31 for off-farm income. Three of the six variables significant at the 0.05 level–debt servicing ratio, short-term interest rate and guaranteed operating loan principal to total non-real estate debt–are inelastic.

The remaining three significant variables–off-farm income, availability of agricultural banks, and proportion of guaranteed OL obligations made by banks–are elastic indicating OL loss rates are most sensitive to percentage changes in these variables. Thus, as the structure of the farm sector changes and the proportion of farm operators working more than 200 days off the farm per year increases, guaranteed OL loss rates increase. Additionally, as the density of agricultural banks increase, OL loss claims increase for a given principal outstanding. However, continued bank mergers in the future could lead to more agricultural banks losing their agricultural interest and thereby lower loss claim ratios. However, the impact of such mergers on principal outstanding is also important. Finally, increasing the percentage of loan guarantees made by commercial banks lowers loss claim ratios for the guaranteed OL program.

As in the guaranteed FO model, the out-of-sample observations for fiscal 1998 are used to predict loss claim rates for that year. The rates are then multiplied by the OL principal outstanding at the beginning of fiscal 1998 to calculate the forecasted levels of OL loss claims for fiscal 1998. Summing OL loss claims for the 40 states included in the sample, the actual total loss claim volume is $47.1 million, and the forecasted total loss claim volume is $45.9 million. This is exceptionally good and is a difference of only -2.6 percent. The OL model's prediction accuracy is much better than the FO model. The large difference is most likely due to the inclusion of state binary variables as opposed to regions, emphasizing the importance of state heterogeneity.

A final aspect of the OL model is the lack of commonality of significant variables between the OL and FO models. The two loan types are different in purpose and term and, as discussed earlier, are used by different types of agricultural enterprises implying that different regions of the country use the two loan types in varying proportions which could lead to different responses by lenders. The overall volume of OL loss claims is much greater than FO loss claims so substantive differences between the two models should not be surprising.

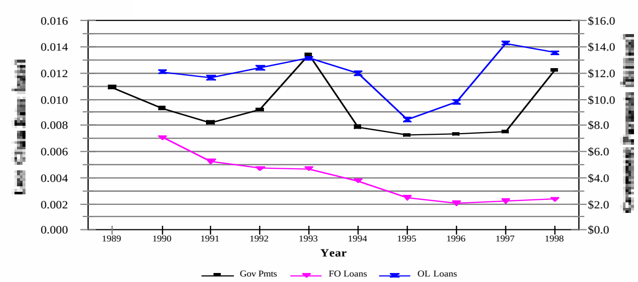
Implications of Insignificant Variables

In both the FO and OL models, the policy variable GOV is insignificant. The lack of relationship between government payments and the ratio of loss claims to outstanding principal is not too surprising. Figure 9 shows the U.S. figures for government payments and guaranteed loss rates for 1989 through 1998. As shown in this figure, it appears that the relationship between these variables is indeterminant. Depending on which years are considered, the relationship changes. For example, between 1989 and 1990, when government payments decrease, loss rates the following year also decrease, but between 1990 and 1991, when payments decrease, OL loss rates increase. Indeed, the heterogeneity in loss claim rates across states and lack of association of GOV to both FONLC and OLNLC supports the conjecture that government payments were not particularly effective in changing loss claim rates during the period of this study.

Clearly government payments are used by some farmers to service debt. However, lenders include anticipated government payments in evaluating borrower creditworthiness so that, at the margin, government payments are not a factor in loss claim rates. While government payments are not directly, statistically significant in the models, payments likely have indirect impacts. To the extent substantial changes in payments could alter a number of the variables (debt-to-asset ratio, net farm income, debt servicing ratio, and OL interest rate assistance), loss claim rates would change in accordance to the models.

There is insufficient evidence to reject the hypothesis of no relationship between interest rate assistance and loss claim rates. This does not imply that the interest rate assistance program (IRA) is failing to help farmers stay in farming. Undoubtedly some farmers receiving this additional assistance are helped. The fact that IRA is unassociated with loss claim rates might indicate that the program is accomplishing its goal of helping more marginal farmers survive. That is, with the additional assistance, such farmers fail at about the same rate as non-assisted farmers, ceteris paribus. Yet, the insignificance of OLIRA might also indicate that the levels of assistance provided are too modest to have an observable impact.

Fig. 9. Government Payments and FSA Loss Claim Rates* for the U.S., 1989-1998



* Loss claim rates are computed as the sum of losses in the 48 states divided by the sum of principal for the U.S., not the mean of the 48 rates for a given year. Sources: Loss claim rates are computed from data provided by Farm Service Agency, Washington D.C., and government payment figures are from the Economic Research Service website.

CONCLUSIONS

Annual Farm Service Agency loan guarantee obligations decreased somewhat through 1997, but rose sharply in the last two years as commodity prices collapsed and as Congress has provided greater lending authority because of the perception of increased loan risk. Principal outstanding doubled since fiscal 1989, and loss claims have been at their highest levels for the decade in recent years ($68 million in 1999). In fiscal 1997, the mean operating loan loss claim rate for the U.S. reached its highest level since fiscal 1989 at 1.4 percent, but the mean farm ownership loan loss claim rate for the U.S. has increased only slightly in past years. Although obligation levels did not increase immediately following the enactment of the FAIR Act, recent changes to the maximum loan limits for both FO and OL loans make the FSA guaranteed loan program accessible to more farmers who do not qualify for credit at reasonable rates of interest or terms.

The characteristics that influence the variation in guaranteed loss claim rates can be utilized by FSA to predict loss claim levels as a function of several variables. Financial characteristics of farm operators–including debt-to-asset ratios, rates of return on assets, net farm income, and debt servicing ratios–are important in predicting loss claim rates. Also, structural characteristics of the farm economy such as percentage of total farm revenue derived from the sale of crops and the proportion of farm operators with substantial off-farm work can be used to predict loss claims. Interest rates in the farm economy are also important in determining loss claim rates. One of the shortcomings of the study is that the sample period does not include years with a substantial downturn in the farm economy like the early 1980s when interest rates ballooned and asset values plummeted. Our results might be different in such conditions. However, guaranteed loans were not used then to any significant degree.

The highly significant relationships between the commercial bank characteristics and the loss claims to principal outstanding ratio imply factors external to agriculture impact loss claims. The banking industry has experienced a high level of mergers and acquisitions during the 1990s. As a result, banks may have become more competitive to stay in business. This study indicates aggressiveness in lending practices has positively affected FO guaranteed loss claims. This may be because commercial banks with a large proportion of their assets in loans guarantee some loans even though the loans may be of moderate risk. In the OL model, higher densities of agricultural banks appear to increase loss rates. The relationship implies that the more agricultural banks per farm there are in a state, the greater the OL loss claim rates. However, if agricultural banks lose their "agricultural" status due to mergers or loan diversification, OL loss rates may decline. Again, this result may be because nonagricultural banks are less familiar with evaluating the risks of lending to agriculture and, therefore, err on the side of caution by guaranteeing loans of moderate risk. The study finds that in states where banks make a higher proportion of guaranteed OL loans, OL loss claim rates are lower. This suggests different types of lenders may use guaranteed loans differently. That is, nonbank guaranteed lenders may evaluate credit risks differently.

The results of the study indicate that interest rate assistance does not affect the across-state variation in the ratio of OL loss claims to principal outstanding. So while interest rate assistance allows lenders to charge borrowers lower interest rates, this subsidy does not appear to alter overall state-level loss claim rates. This might indicate that the IRA program is successful in putting all borrowers with guaranteed loans on a level playing field. However, there is considerable variation in loss claim ratios across states, so reallocating interest rate assistance targeting among states might change this finding. Even though interest rate assistance showed little impact on loss claim rates in this study, it undoubtedly helps a number of farmers stay in business who would likely fail otherwise–the main purpose of the assistance program. Since long-term interest rates were found to have a significant impact on FO loss claim rates, providing interest rate assistance on FO loans may be a future policy option when large increases in long-term interest rates affect guaranteed FO borrowers.

Government farm payments are found to be insignificant in explaining the ratio of loss claims to principal outstanding during the period of the study. Because government payments tend to be counter cyclical (offsetting declines in income from crop sales) and are anticipated in advance, their direct impact on year-to-year changes in loss claim rates was minimal during the early and mid-1990s. If payments suddenly ceased or were distributed by much different criteria than in the past, both borrowers and lenders would adjust accordingly, and loss claim rates would undoubtedly reflect some of the impacts of these changes.

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Appendix A. Initial FO Model Estimation

Variable[a]	Coefficient	Standard Error	β/Std Error
DAR	0.061*	0.031	1.986
NFI	0.202*	0.085	2.389
ROA	-0.765E-03*	0.366E-03	-2.089
DEBTSVC	-0.003	0.025	-0.122
CREV	0.008	0.004	1.889
SIZE	-0.001	0.001	-1.290
WORK	-0.023	0.018	-1.280
LTINT	0.162*	0.055	2.950
GOV	0.306	0.252	1.216
AGTL	-0.024*	0.010	-2.487
AGBNK	-1.287*	0.518	-2.482
LAR	-0.035*	0.009	-3.807
AVGFO	-0.042	0.031	-1.367
FOGLTL	0.021	0.029	0.719
PAC	-0.004	0.014	-0.276
MTN	0.009	0.013	0.683
NOPL	0.008	0.013	0.599
SOPL	0.015	0.013	1.151
LAKE	0.008	0.013	0.634
CORN	0.008	0.013	0.621
DELTA	0.008	0.013	0.575
NER	0.001	0.012	0.047
APP	0.007	0.012	0.540
SER	0.007	0.013	0.584

[a] The variable names and units are defined in Table 5.

* Significantly different from zero based on a two-sided test at the 0.05 level. R^2 for the OLS estimates of this model is 0.204.

Source: Computed.

Appendix B. Initial OL Model Estimation

Variable[a]	Coefficient	Standard Error	β/Std Error
DAR	-0.034	0.056	-0.609
NFI	0.120	0.104	1.155
ROA	-0.539E-03	0.456E-03	-1.180
DEBTSVC	0.087*	0.034	2.606
CREV	-0.001	0.013	-0.109
SIZE	-0.003	0.004	-0.782
WORK	0.292*	0.072	4.066
STINT	-0.110*	0.050	-2.227
GOV	0.181	0.215	0.841
AGTL	-0.024	0.031	-0.795
AGBNK	8.431*	2.136	3.948
LAR	-0.013	0.013	-1.053
AVGOL	0.010	0.051	0.200
OLIRA	-2.686	1.983	-1.354
OLGLTL	-0.077*	0.031	-2.498
OLBKPCT	-0.021*	0.004	-4.650
AL	-0.061	0.023	-2.729
AR	-0.028	0.022	-1.266
CA	-0.047	0.021	-2.263
CO	-0.033	0.020	-1.655
FL	-0.050	0.021	-2.320
GA	-0.046	0.022	-2.041
ID	-0.019	0.020	-0.967
IL	-0.074	0.024	-3.113
IN	-0.061	0.023	-2.662
IA	-0.056	0.024	-2.338
KS	-0.065	0.025	-2.584
KY	-0.058	0.024	-2.409
LA	0.003	0.019	0.128
MD	-0.040	0.019	-2.146
MA	-0.026	0.016	-1.642
MI	-0.041	0.020	-2.062
MN	-0.045	0.021	-2.162
MS	-0.017	0.023	-0.749
MO	-0.061	0.022	-2.828
MT	-0.014	0.024	-0.570
NE	-0.054	0.025	-2.164
NM	-0.001	0.028	-0.051
NY	-0.017	0.013	-1.264
NC	-0.032	0.019	-1.719
ND	-0.023	0.023	-0.971
OH	-0.066	0.023	-2.821
OK	-0.045	0.024	-1.890
OR	-0.014	0.020	-0.704
PA	-0.023	0.014	-1.615
SC	-0.039	0.019	-2.033

Appendix B. Initial OL Model Estimation (continued)

Variable*	Coefficient	Standard Error	β/Std Error
SD	-0.027	0.020	-1.375
TN	-0.054	0.023	-2.304
TX	-0.041	0.022	-1.859
UT	-0.055	0.021	-2.616
VT	-0.003	0.014	-0.220
VA	-0.061	0.020	-3.132
WA	-0.018	0.019	-0.944
WV	-0.053	0.022	-2.448
WI	-0.023	0.017	-1.365
WY	-0.015	0.032	-0.480

[a] Variable names and units are defined in Table 5.

* Significantly different from zero based on a two-sided test at the 0.05 level.

Source: Computed.