# Analysis of Farm Service Agency Direct Loan Loss Likelihoods and Loss Rates

**Bruce L. Ahrendsen**
**Bruce L. Dixon**
**O. John Nwoha**
**Sandra J. Hamm**
**Diana Danforth**

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The authors are associate professor, professor, and program associates of agricultural economics, University of Arkansas, Division of Agriculture at Fayetteville. The comments and assistance of Ed Chavez, Daniel Settlage, Charles Dodson, and Steven Koenig are gratefully acknowledged. This research was supported by Cooperative State Research, Extension, and Education Service (CSREES) Award number 2004-39528-14476 between the Farm Service Agency and the Department of Agricultural Economics and Agribusiness at the University of Arkansas, Division of Agriculture at Fayetteville. The views expressed herein are those of the authors and do not necessarily reflect the views of the University of Arkansas or the Farm Service Agency of the U.S. Department of Agriculture.

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## Abstract

The USDA's Farm Service Agency (FSA) serves as the nation's lender of last resort by providing direct loans to farmers unable to obtain credit at reasonable rates and terms. Annual loan losses have been substantial, averaging $576 million for fiscal 1994-2004. An econometric model using survey data from a sample of FSA loans originated in fiscal 1994-1996 is estimated to identify factors associated with loan losses. The results indicate previous debt settlement experience, loan type, farm type, farm size, and farm financial characteristics are important factors. This information may be used by FSA to adjust its underwriting standards in an effort to reduce loan losses and provide additional loans to farmers given its current funding.



**Key Words:** Farm Service Agency, direct loan, loss likelihood, default cost


The USDA's Farm Service Agency (FSA) serves as the nation's lender of last resort by providing loans to family-size farmers unable to obtain credit at reasonable rates and terms despite having adequate repayment capacity and collateral. FSA serves these farmers through its direct and guaranteed farm loan programs (FLPs). The guaranteed FLP has been emphasized since 1985 and guarantees loans made by commercial creditors to farmers meeting FSA eligibility criteria. The direct FLP, which primarily consists of operating (OL) loans, real estate-secured farm ownership (FO) loans, and emergency disaster (EM) loans, is generally considered to be for less creditworthy farmers who are unable to obtain credit from commercial creditors even with a guarantee.

Despite the shift in policy from direct loans to loan guarantees, the direct FLP remains an important source of credit for many farmers and has about $7 billion in principal outstanding. Moreover, the FSA, by mandate, has increasingly targeted its direct FLP to socially disadvantaged (SDA) farmers and beginning (BF) farmers.[1] These groups of farmers have historically had difficulty obtaining credit because of prejudice and lack of experience, respectively.

Although there may be many social benefits of the direct FLP, which are difficult to quantify, the subsidy costs of this program are substantial and are more easily quantified. The four components of subsidy costs are defaults net of recoveries, interest, fees, and all other costs.[2] Of the four components, the vast majority of subsidy cost in recent years (Office of Management and Budget, 2005) is attributed to defaults net of recoveries.[3] If default costs were reduced, FSA could provide additional loans to farmers

[1] FSA defines a socially disadvantaged farmer or rancher as "one of a group whose members have been subjected to racial, ethnic, or gender prejudice because of their identity as members of the group without regard to their individual qualities. For purposes of FSA programs, socially disadvantaged (SDA) groups are women, African Americans, American Indians, Alaskan Natives, Hispanics, and Asian Americans and Pacific Islanders." (USDA/FSA, 2005a). The definition of a beginning farmer (BF) varies by loan type. For OL purposes, a BF is a farmer who meets the general eligibility criteria for an OL loan and has ten or less years of farming experience. For FO purposes, a BF is a farmer who meets the general criteria for an FO loan, has three to ten years of farming experience, and owns acreage which does not exceed 30 percent of the county average farm size, although, the acreage limit was 25 percent of the county average farm size prior to 2004 (U.S. 7 CFR 1943.4). If the applicant is an entity, all members must be related by blood or marriage, and all stockholders in a corporation must be eligible beginning farmers (USDA/FSA, 2005b).

[2] The fee component is applicable to FSA guaranteed loans since a 1 percent fee is collected. However, the fee component is not applicable to FSA direct loans since fees are not collected.

[3] Interest subsidy via the limited resource and EM interest rates is very costly when Government borrowing rates are high (Koenig and Dodson, 1998). However, regular OL and regular FO interest rates, which reflect the Government's borrowing rate, have been

given its current funding level. For this reason, this article focuses on identifying factors associated with default cost as measured by the sum of lost principal and accrued interest. By identifying factors associated with direct FLP loan losses, FSA will be able to develop a better prediction of the success or failure of a given loan. Also, FSA may be able to use this information to adjust its underwriting standards in an effort to reduce loan losses.

The following section of the article discusses FSA's direct FLP loan losses for FY 1994–2004. The subsequent section describes the collection of data for a sample of FSA direct loans originated in FY 1994-1996. Next, an econometric model to identify factors associated with loan loss occurrences and loan loss rates is presented and estimated. The results from the model are then used to investigate how changes in credit standards may result in changes to future loan losses.

**Recent Loan Loss Experience for the FSA Direct FLP**

The FSA direct FLP has persistently experienced large loan losses and loss rates. During FY1994–2004, the average annual loss of principal and interest for OL, FO, and EM loans combined was $576 million. Over the same period, the largest loss ($1,125 million) occurred in 1996 and the smallest loss ($260 million) occurred most recently in 2004 (table 1). Also, 10.7 percent was the highest loss rate for the period and happened in 1996, whereas the lowest rate of just below 3.6 percent occurred in 2001.

The amounts of direct FLP loan losses have generally trended downward over FY 1994–2004. Part of the explanation for the downward trend is that FSA was still reacting in the 1990s to the financial crisis in agriculture of the early and mid-1980s. Of the three

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near or below the limited resource rate of 5 percent and the emergency disaster rate of 3.75 percent since 2000, such that interest subsidy has been relatively minor.

loan types, EM loans consistently experienced the largest losses, except for 2004 when OL loans sustained higher losses.

It might have been expected that FO loans would have experienced the highest losses since they have the largest volume of outstanding principal in each year. However, FO loans have the lowest average annual loss ($88 million) compared with those of OL ($148 million) and EM ($341 million). It is not surprising that EM loans experienced such large losses since farmers must have experienced large losses of production (30 percent or more), and associated income losses, as the result of a natural disaster to qualify for such loans.

The beginning-of-year outstanding principal for direct FO and EM loans decreased consistently every year during the period. These decreasing balances are likely the result of decreasing obligation authority or decreasing demand in recent years relative to earlier years. A consistently declining balance has not been the case for OL loans. The beginning-of-year outstanding principal for OL loans decreased annually from $3,100 million in 1994 to $2,559 million in 1999, and oscillated the rest of the period, ending with $2,723 million in 2004.

Loan loss percentages in table 1 are computed from principal and interest losses and beginning-of-year outstanding principal balances. The loss percentages for the three direct loan types have trended downward over the period. EM loans have the highest loss percentage with an average annual percentage loss of 13.2 percent, followed by OL loans with 5.3 percent and FO loans with 2.0 percent.

The EM loss percentage was particularly high in 1996 when over one dollar of principal and interest was lost for every four dollars of beginning-of-year outstanding principal. The

unusually large losses may have been the result of drought in the southwestern United States. These losses may have also been the result of procedural changes. FSA suspended some foreclosures in March 1993 pending a review of its implementation of borrower appeal rules. The suspension was lifted in February 1994 and a taskforce was formed to collect from borrowers with delinquent, large loans. The taskforce's assignment was expanded in August 1994 to collect on delinquent loans of all sizes for the next two years (USDA/ERS, 1995). Therefore, there may have been a backlog of loans in foreclosure and greater emphasis was placed on collecting delinquent loans. Again, it is expected that EM loans have large losses since these loans are given to farmers who have experienced significant income losses because of natural disasters. Also, an EM loan if used as an annual production loan may be secured less well than a corresponding OL loan. An EM loan may only have the growing crop as security, whereas an OL loan may have other chattel property as security in addition to the growing crop, particularly if FSA also has a seven-year OL loan with the farmer that is secured by intermediate-term assets. In addition, FSA may have a lower lien position if a borrower has credit from multiple sources, thus FSA would be more likely to suffer a loss if secured assets are liquidated.

It is not surprising that FO loans had lower loss percentages than OL and EM loans. FO loans are secured with real estate while OL and EM loans may be secured with non-real estate or real estate. Real estate tends to maintain its value better than non-real estate, particularly over this period when the U.S. average farm real estate-value per acre has increased every year (USDA/NASS, 2004a). In addition, when cash flows are insufficient to service all debts, real estate-secured loans are more likely to be paid first by farmers since loss of this asset is more critical to the farm business as a going concern than a non-real estate asset. Moreover, there is

often more equity to protect in real estate assets than non-real estate assets. Also, farmers are generally more attached to their farmland than non-real estate assets, particularly if the farmland has been owned by their family for a number of years. Therefore, farmers may take greater care not to lose the family homestead, potentially holding more equity, than a tractor which is easily replaced and may have little equity. In addition, FSA can require more farming experience for farmers receiving FO loans than for farmers receiving OL loans in general.

It is expected that FSA, in its traditional role as lender of last resort, would have higher loss rates than other lenders since FSA borrowers are generally riskier than other borrowers. However, even small a decrease in loan losses could allow FSA to serve many more farmers.

**Survey Data from a Sample of FY 1994-1996 Direct FLP Loans**

To estimate the likelihood of an FSA direct FLP loan resulting in a loss and the relative size of the loss, farm loan managers (FLMs) located in FSA offices from across the United States were surveyed in 2004 to collect information on a sample of loans originated in FY 1994–1996. This time period was chosen because surveying loans originated more recently than this would likely have fewer loan losses associated with them since it may take several years for a loss to occur and to determine the loss amount. In addition, the Agricultural Credit Improvement Act of 1992 (P.L. 102-554) authorized the beginning farmer (BF) program, which continues to be targeted by FSA. Thus, a survey of loans originated before 1994 would have resulted in few loans to beginning farmers. Three years were chosen so that unique characteristics of any one year would not unduly influence the variables observed.

During the three years sampled, 34,026 OL, 3,083 FO, and 8,359 EM loans were originated. Financial information and demographic data were obtained from the Request

for Direct Loan Assistance (form FSA-410-1) and the Farm and Home Plan (form FmHA 431-2) that borrowers complete as part of the application process. Information on these forms was not readily available electronically from any centralized database and could only be obtained by survey methods requiring FLM participation.

The sampling frame of all FY 1994–1996 originations was sampled to insure representation across five loan types: (1) FO loans for non-BF borrowers, (2) FO loans for BF borrowers, (3) OL loans for non-BF borrowers, (4) OL loans for BF borrowers, and (5) EM loans. The sample was chosen to have gender, racial, geographical, and time representation as described in Nwoha et al. (2005). The predominant FSA borrower race and gender are white and males. Because white males were relatively so abundant, white males were sampled at a rate of one in eighteen, whereas all other gender and races were sampled at a rate of one in nine.[4]

There were 2,715 usable responses after cleaning the data out of a sample of 3,004 for a 90 percent response rate. There was good geographical, gender, loan type, and racial representation so that no one particular cohort of interest was under- or over-represented in the sample data. A copy of the survey instrument, a further description of the sampling procedure, and a full discussion of summary statistics of the data are included in Nwoha et al.

**Factors Associated with Loan Losses**

For the survey data, a loan loss is said to occur when the FLM indicates either the loan has experienced a debt write-down or the loan terminated due to foreclosure,

[4] Because of the different sampling rates, all the statistical analyses are done using weights for the observations. Since the two sampling rates were one in eighteen and one in nine, the respective weights were two and one.

bankruptcy, or debt write-off and there was a dollar amount recorded. Loan write-down and debt settlement (write-off) programs were established by the Agricultural Credit Act of 1987 (P.L. 100-233) to restructure delinquent loans with the objective of keeping farmers on the farm at the lowest cost to the Government. These programs are available to the borrower after servicing actions, such as reducing interest rates or rescheduling debt, have been considered when a loan becomes delinquent.

A loan write-down is a situation where the borrower continues with FSA. The loan balance may be written down to the calculated net recovery value of the collateral (market value less liquidation costs). If this servicing action fails to produce a successful debt repayment plan, the debt settlement program is considered. Debt settlements and write-offs are situations where the borrower pays off the loan at the calculated net recovery value if the borrower is able to receive funds from other sources (USDA/ERS, 1991). A debt settlement is considered final whereas a loan write-down and write-off may be subject to recapture if funds subsequently become available to the borrower. It is our understanding that recapture of loan write-downs and write-offs have been relatively infrequent. Therefore, they are considered as loan losses for this article.

There are loans that are still active and may potentially have a loss occur in the future. However, these loans are assumed to have zero loss for the analysis presented here since none had occurred prior to the survey.

***Incidental Truncation Model***

To predict the likelihood of a loan loss and the relative size of the loss, a two-equation, incidental truncation model is hypothesized as presented in Greene (2003) and applied in Dixon et al. (1997). The first equation (1) predicts the probability of a loan

experiencing a loss. The second equation (2) explains the variation in the percentage of the loan loss if a loss occurs. The forms of these equations are:

$$(1) \qquad z_i = \beta' x_i + \varepsilon_i$$

$$(2) \qquad y_i = \gamma' w_i + \eta_i$$

where $z_i$ is a binary variable indicating whether or not a loss has occurred for loan i. The variable $y_i$ is the dollar loss amount divided by the initial loan amount, in percent, for loan i when $z_i$ equals 1. The vectors $x_i$ and $w_i$ represent independent variables. Vectors $\beta$ and $\gamma$ contain parameters to be estimated. The error terms $\varepsilon_i$ and $\eta_i$ are assumed to be normally distributed with zero means and variances of one and $\sigma^2$.

The dependent variable in the second equation is only observable if a loan loss occurs. This may result in incidental truncation, which occurs if the covariance of $\varepsilon_i$ and $\eta_i$ is not zero. A two-step estimation approach is used to obtain consistent estimates of the parameters in the second equation (Greene, 2003).

The two-step approach is to estimate the selection equation as a probit model, then use the parameter estimates to estimate the inverse Mill's ratio (IMR), which accounts for any incidental truncation. The IMR is then included as a regressor in the regression equation. If the estimated IMR coefficient is statistically insignificant in the regression equation, it indicates insignificant incidental truncation and the IMR may be dropped from the regression equation. The regression equation can then be re-estimated using ordinary least squares. An estimation consideration is the presence of heteroscedasticity in the regression equation. To allow for this situation, the standard errors in the regression equation are estimated using White's heteroscedasticity-consistent estimator.

***Empirical Model Specification***

An exact description of the variables used in estimating the empirical model is given in table 2 and descriptive statistics are presented in table 3. The mean of dependent variable LOSS indicates 9 percent of the loans originated in FY 1994-1996 had a loss. For those loans with a loss, the average loss was 134 percent of the original loan amount (LOSSPCT).

The same independent variables are hypothesized for both equations of the model, since variables thought to be associated with a loan loss occurrence are also thought to be associated with the percent of loan loss. The independent variables included are grouped into four categories: (1) borrower demographics, (2) characteristics of the current loan, (3) borrower prior and current financial distress and involvement with FSA direct loans, and (4) borrower financial characteristics. Demographic variable age (AGE) averaged 41 years of age and indicates the wealth of knowledge that the borrower has accumulated, which is expected to be negatively related to loan losses.[5]

Characteristics of the current loan include whether the loan is OL, one-year OL (ONEYR), FO, limited resource (LR), BF, or SDA. These variables are binary and take on the value of 1 if the loan has the particular characteristic. It is expected that OL, ONEYR, and FO are negatively related to the incidence of a loss and the percentage of the loss relative to the effect of EM loans, which is captured by the constant term in the

[5] Other demographic variables considered are number of years of farming experience (EXP), race (RACE), and gender (FEMALE). AGE and EXP are highly correlated, so only AGE is included in the estimated model since there are more observations for this variable than EXP. Binary variables RACE and GENDER were considered during pretest estimation, however, they are related to the SDA variable, which was included in the estimation.

estimated equations. These relationships are expected because OL and FO loans have lower loss rates than EM loans, as discussed earlier. It is expected that LR is unrelated to loss occurrence and loss percentage. An LR loan initially receives a lower interest rate so it will have a similar repayment capacity as a non-LR loan that does not receive this lower interest rate. Therefore, LR and non-LR loans should have a similar chance of success if all other non-repayment capacity characteristics of the borrowers and loans are the same. However, if the borrower and farm operation associated with an LR loan actually have more limited resources than those of a non-LR loan such that the lower interest rate does not fully compensate for these limitations, a positive relationship would be expected. There are no prior expectations on the signs of the BF and SDA coefficients.

The third category of independent variables contains variables available at the time of origination about past and current involvement with direct loans and prior financial distress. Variables included in the estimation to gauge the level of involvement and how much experience the borrower has with FSA are the number of active OL loans at time of application (NUMOL) and similar measures for number of FO loans (NUMFO) and number of EM loans (NUMEM). The signs of the coefficients are unknown *a priori*. A positive relationship between the number of loans and loan losses would indicate that as FSA borrowers become more reliant on FSA loans instead of loans from conventional creditors, the weaker financial situation they are in and the more likely they are to have a loan loss. Conversely, a negative relationship would indicate more and better information between the borrower and FLM such that the borrower has performed satisfactorily on the loans and the FLM is willing to extend additional credit to the borrower.

A binary variable indicating prior financial difficulty is created from responses to the question on the loan application: Has the proposed entity had a loan debt settlement action (DEBTSETT)? The answer was yes for the recipients of 4 percent of the loans. DEBTSETT is expected to be positively related to loan losses. It suggests that if the borrower has had financial difficulty in the past, debt settlement in itself may not be enough assistance to have the borrower completely recover from the past problems. It also suggests that if the borrower has been able to settle debts when in financial difficulty in the past, the borrower may have learned from this experience and is thereby more likely to settle debts in the future.

Borrower financial variables are computed from information documented in the Farm and Home Plan and available to the FLM prior to loan closing. The total debt-to-asset ratio (DA) averaged 0.69 and measures relative solvency. DA is expected to be positively related to losses. The current ratio (CR) had an average of 2.01 and is a measure of liquidity. CR is expected to be negatively related to losses. Repayment capacity (REPAY) is the ratio of the balance available to service principal and interest payments to the total amount of principal and interest due. REPAY averaged 1.16 and is expected to be negatively related to losses.

An indicator of borrower farm type is the proportion of crop and livestock gross cash farm income from crops (CRPINPRO). Crop income is typically more variable than livestock income because weather variations have a larger impact on crop income than livestock income (Dixon et al., 2004; Settlage et al., 2001). Since crop income is riskier than livestock income, a positive relationship between the proportion of farm income from crops and loan losses is expected.

Finally, total cash farm income (TCFI) averaged $153 thousand and is a gross measure of cash farm income, which is an indicator of farm size. The *a priori* relationship between farm size and loan losses is unknown. It is commonly thought larger farms are more likely to take advantage of size economies and be more efficient. This suggests larger farms are less likely to have loan losses. However, larger farms, particularly farms with limited financial and managerial resources that are common among LR and non-LR FSA borrowers, may be difficult to manage effectively, resulting in a greater probability of a loan loss.

***Estimation Results for the Loan Loss Selection Equation***

The selection equation is estimated as a probit model and the parameter estimates are used to estimate the IMR. The IMR is included as a regressor in the regression equation and is found to be statistically insignificant. Therefore, the regression equation is re-estimated without the IMR using ordinary least squares. The results of the estimated selection and re-estimated regression equations are presented in tables 4 and 5.[6]

The test of the hypothesis that all coefficients equal zero is a test of equation validity. The $\chi^2$ statistic for the selection equation and the F statistic for the regression equation clearly reject this hypothesis for both equations. Measures of explanatory power are also considered. The selection equation predicts 92 percent of the observations correctly as having a loss or not. This percentage is no better than if all loans are predicted to not have a loss, which would also result in 92 percent of the loans being

[6] The regression results with and without the IMR were similar. The only differences were that FO was insignificant and OL was only significant at the 0.10 level in the regression equation with IMR as compared to FO and OL were significant at the 0.05 level when IMR was excluded.

predicted correctly. The regression equation has an $R^2$ of 0.197, indicating nearly 20 percent of the variation in loan loss rates is explained by the independent variables, which is respectable for cross-sectional data, but also means much of the variation is left unexplained. This is not surprising considering economic, social, and personal events that occur after loan origination are likely to have a large impact on the potential success of a loan and are not captured by the model.[7] The selection and regression equations have significant coefficient estimates, which indicate explanatory power.

The estimated selection equation has a number of variables with significant coefficients at the 0.05 level for a two-tailed test (table 4). All of these coefficients have the anticipated signs. The DEBTSETT coefficient has a positive sign that indicates a positive relationship between the borrower having a previous debt settlement experience and FSA having a loan loss occur. This indicates that these borrowers are higher risk and they may not have received enough debt relief for them to be successful with future loans.

This debt settlement result may also indicate moral hazard behavior. Moral hazard in this case is when farm borrowers may not do everything in their power to repay a loan if they think or, particularly, if they have experienced, that they will be able to settle for less than full repayment.

While there was no expected sign *a priori* for the NUMFO coefficient, the negative sign supports the notion that information about the farm business and borrower

[7] The model is incomplete because only information available at the time of loan origination is included, yet events occurring after loan closing that are likely to have a large impact on the loan are excluded. But the purpose of the article is to identify factors associated with loan losses from information that is available to FLMs at the time of loan origination so that FSA may decrease loan default costs.

is learned by the FLM because of their previous experience with the borrower. This information may be used to make a better decision, i.e., not make a bad loan. It can also be argued that borrowers with more FO loans are more dedicated to paying off loans to increase their likelihood of keeping their land and protecting equity.

Borrower financial characteristics are important in explaining the probability of a loan loss occurring. As expected, the probability of loan loss increases as the debt-to-asset ratio increases (solvency decreases). Borrowers with high debt-to-asset ratios are highly leveraged and unable to withstand financial setbacks that are more likely to lead to loan losses. The repayment ratio is also related to loan losses. As expected, borrowers with greater repayment capacity are less likely to have a loss. In addition, the current ratio is related to loan losses, although at the lower level of statistical significance of 0.10. As expected, borrowers with greater liquidity are less likely to have a loss.

The size of the farm business (TCFI) is important in explaining loan loss occurrences for this sample of FSA loans. Larger farms, as measured by the farm's planned total cash farm income, have a greater probability of having a loan loss. This supports the hypothesis that larger farm businesses require larger FSA loans, and the farmers may not have the necessary financial and managerial resources to successfully repay their loans. Also, these larger farms with larger loans may not have sufficient non-farm income to assist in paying loan payments and family living expenses.[8]

The FO coefficient in the selection equation is marginally significant at the 0.10 level implying FO loans have a lower probability of having a loss. This result is

[8] The data support the hypothesis that total cash farm income and loan size are positively related. Also, the data support the hypothesis that total cash farm income and non-farm income are negatively related.

consistent with the data presented earlier showing FO loans have lower loss rates than EM loans.

The marginal significance of the CRPINPRO coefficient indicates that the likelihood of a loan loss increases as the farm has more crop cash income relative to livestock cash income as expected. A conclusion from this result is that crop farms have a greater chance at a loan loss than livestock farms because crop income is riskier than livestock income.

***Estimation Results for the Loss Percentage Regression Equation***

All of the estimated regression equation coefficients that are significant have the anticipated signs (table 5). The negative signs on the estimated FO and OL coefficients indicate loan loss percentages are 154 and 105 percentage points less for FO and OL loans than for EM loans.[9] FO loans primarily rely on real estate to secure the loan. As was mentioned earlier, real estate values have increased steadily since 1994. Therefore, unpaid principal and interest on an FO loan are more likely to be repaid from liquidation of the real estate security compared with those on an EM loan, which may or may not be secured by real estate. Also, OL loans have lower loss rates than EM loans, as was discussed earlier.

There was not an expected sign for the BF coefficient. However, the regression results indicate BF loans have a 143 percentage-point larger loss rate than the base case captured by the constant term.[10] Perhaps FLMs are more willing to use various servicing

[9] The results from a loan loss amount regression indicate loan losses are $54,899 and $34,456 less for FO and OL loans than for EM loans.

[10] The results from a loan loss amount regression indicate loan losses are $40,880 more for BF loans than the base case captured by the constant term.

accommodations with BF loans than other loan types in an attempt to allow beginning farmers to continue farming. For example, multiple restructurings of unpaid principal and interest into ever larger loans may ultimately result in a large loan loss. However, survey data to test this hypothesis are unavailable. An alternative explanation for BF loans having larger loss percentages than non-BF loans when a loss occurs is that FSA beginning farmer loan losses occur earlier and thereby reflect larger losses since little principal has been retired relative to non-BF farmer loans. The data support the hypothesis that BF loan losses occurred sooner after loan origination than do non-BF loan losses.[11]

The repayment variable is the only borrower financial characteristic found to be significant in explaining the loan loss percentage. As the amount available for debt servicing increases relative to the amount required to service debt, the loan loss percentage decreases as expected. Although the planned repayment capacity was not sufficient to keep a loss from occurring, the loss percentage was smaller the greater the planned repayment capacity.

Perhaps the most surprising finding is the lack of significance for debt-to-asset ratio. Although the sign of the coefficient indicates loan loss percent increases as debt-to-asset ratio increases, the estimate is insignificant. Of course all the assets are not necessarily taken as collateral to securitize the FSA loan. Some assets are non-farm assets

[11] Another alternative explanation is that BF farmers rely more on FSA credit than do non-BF farmers, such that when a loan loss occurs, few other loan sources are available. Surprisingly, the FSA proportion of total liabilities is less for BF farmers than non-BF farmers, although not significantly. This in itself could contribute to the BF loans having larger losses. The non-FSA creditors for the BF farmers may have a superior lien position to FSA, such that when a loss occurs, the non-FSA creditors are more likely than FSA to be repaid from the liquidation of secured property.

and the borrowers are reluctant to offer additional collateral. A better measure would be collateral value relative to loan value, although the measure was not collected by the survey. It would be expected that loan loss percentage decreases as the collateral-to-loan value increases.

**Implications of the Loan Loss Estimations**

The results from the estimation of the selection and regression equations have implications for reducing loan losses. In simplest terms, loan loss occurrence may be reduced several ways: by rejecting applicants who have had previous debt settlement experience; by encouraging loans to borrowers who already have FO loans; by requiring loans be given to farmers with lower debt-to-asset ratios, higher current ratios, and greater repayment capacity; by making fewer loans to crop farms; and by focusing loans on smaller farms. When a loan loss occurs, the percentage of the loan loss may be reduced by making proportionately more FO and OL loans relative to EM loans, decreasing the number of BF loans, and making loans to farmers with greater repayment capacity. Loss reductions are not as simple as this.

The debt settlement result is quite interesting. The Federal Agriculture Improvement and Reform Act of 1996 (P.L. 104-127) limited the number of times FSA may provide debt forgiveness to a borrower to just one time. The legislation goes on to make borrowers receiving debt forgiveness ineligible for additional direct or guaranteed loans, with an exception of allowing OL loans for annual operating expenses in cases of certain loan write-downs (USDA/ERS, 1997). The debt settlement result from the selection equation suggests that FSA should strictly adhere to this legislation in an effort to reduce the number of loan losses. Even then, losses may occur on the annual operating

expense-type OL loans these borrowers subsequently receive. However, it would be difficult to justify disallowing these borrowers credit for annual operating expenses just after FSA has written down their debts to levels that are expected to be manageable.

The debt settlement result brings up the broader question of allowing loan write-downs, write-offs, and debt settlements in the first place without the borrower filing for liquidation bankruptcy. Although loan write-downs, write-offs, and debt settlement are limited to the net recovery value of liquidating secured property, these actions may promote unethical behavior, such that the borrower has learned from this experience and is more likely to settle debts in the future in this manner (moral hazard problem). However, debt settlement may be effective at keeping more farmers farming, although at a lower rate than farmers without debt settlement experience. Of the loans in the survey to farmers with a previous debt settlement, 63 loans did not report a loss and 36 loans did report a loss. Presumably, more farmers benefited from previous debt settlement and did not have a loss on a subsequent loan than did have a subsequent loan loss. In fact it could be argued that the prior debt settlement assistance received by the farmers with subsequent loan losses was insufficient assistance for the farmers to be successful with those loans.

Financial characteristics are important in explaining the likelihood of a loan loss. Restricting loans to farms with less than a certain debt-to-asset ratio or greater than a certain repayment capacity would likely reduce the number of loan losses. However, many FSA applicants with high debt-to-asset ratios or low repayment ratios who receive loans would instead be denied credit by FSA if debt-to-asset and repayment limits are put in place. Some of these applicants—if granted loans—would have a loan loss, although

many more would likely make a positive contribution to agriculture if they received FSA loans. The same thing could be said for restricting loans to farms with greater than a certain current ratio.

The results suggest that crop farms are more likely to have loan losses than livestock farms. Crop insurance and additional collateral beyond the crop itself are needed to decrease the chance of a loan loss.

FSA already emphasizes providing loans to small farms. The selection equation results suggest that a continuation of this policy would limit the number of loan losses.

FO loans have inherently low loss rates. Land values have increased, at least over the study period, so that the collateral value has increased as opposed to non-real estate collateral, which frequently decreases (depreciates) in value. This is particularly important because of the lengthy appeal process for FSA borrowers and the accruing of interest on delinquent loans. Also, a real estate-secured loan is more likely to be paid before a non-real estate-secured loan when cash flows are tight since the loss of real estate is often more critical to the farm business as a going concern than a non-real estate asset. This implies FSA loans need to be secured with ample collateral. Including farmland as collateral, when possible, would likely reduce loan losses.

If FO loans have inherently low loan losses, EM loans have inherently high loan losses. It should be expected that EM loans have large loan losses because the farms with these loans have experienced large production and income losses from which the operator may never recover, even with the assistance of an EM loan. Attention should be given to having insurance products ex ante substitute for EM loans in certain circumstances. Over the years, farm policy has occasionally required farmers to purchase insurance in order to

receive farm program payments and qualify for emergency assistance. Putting this policy firmly in place should guard against adverse selection, i.e., farmers who are more likely to qualify for emergency assistance are less likely to purchase insurance since they believe the government will come to their assistance if a natural disaster occurs. Although an EM loan may allow the farmer to spread the income loss over a number of years following a disaster, the farmer may really need a grant (or an insurance check) to be able to recover. In addition, it is recommended that EM loans also be secured with ample collateral.

It is difficult to provide a recommendation related to the finding that BF loans are related to greater loss rates. FSA has increased the emphasis on providing loans to beginning farmers. Beginning farmers are the most likely group of farmers to be denied credit from conventional creditors since they have little experience, no track record, and often, little equity. Many small businesses outside of agriculture ultimately fail, and it should be expected that many small farm businesses are no different. These small farm businesses are risky by nature, and it is a matter of public policy whether or not the government will continue to assume the risk associated with providing loans to them.

The results from the selection and regression equations indicate that limited resource loans are not a significant factor in explaining loan losses. This implies that the subsidized interest rate associated with limited resource loans is allowing farmers receiving LR loans to have similar success at repaying their loans as those farmers receiving non-LR loans. However, although the default subsidy appears to be similar for LR loans and non-LR loans, it comes at the cost of increased interest subsidy.

**Summary**

The major component of subsidy costs for the FSA direct FLP in recent years is loan default cost. The outstanding principal, principal and interest loan losses, and loss rates have had a downward trend over the FY1994–2004 period. The average annual loss of principal and interest for OL, FO, and EM loans combined over this period was substantial at $576 million.

The estimation results of the selection and regression equations have implications for reducing loan losses. The likelihood of a loan loss is found to be positively related to borrowers with previous debt settlement experience, higher debt-to-asset ratios, lower current ratios, less repayment capacity, crop farms, and larger farms and negatively related to borrowers already having or receiving an FO loan. When a loan loss occurs, the percentage of the loan loss is positively related to beginning farmer loans and negatively related to borrowers with FO and OL loans and greater repayment capacity. Loan losses are not found to be significantly related to limited resource or socially disadvantaged loans.

The concept of "creditworthy" is not well defined for the purposes of loan eligibility for the direct FLP. In essence, FSA's mission is to provide credit to riskier "creditworthy" borrowers. The natural consequence is that FSA loan loss rates are higher than for conventional creditors. Whether FSA borrowers are too risky, or should even riskier borrowers be included, are policy questions and are open to discussion. Should farmers with debt settlement experience be denied credit or should they have even more debt forgiven? Are grants instead of EM loans a more cost effective way to assist farmers after a disaster? Should beginning farmer loans no longer be mandated because of their

large loss rates? Would restricting loans to farms with less than a certain debt-to-asset ratio or greater than a certain repayment capacity reduce loan losses? Such attempts to cut losses systematically would imply denying credit to some current borrowers, the majority of which would repay their loans without having a loan loss.

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**Table 1. Principal and Interest Losses for FSA Direct OL, FO, and EM Loans, FY 1994–2004 (millions of dollars)**

| Fiscal Year | OL[a] | | | FO[b] | | | EM | | | TOTAL | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Outstanding principal | Losses | Percent | Outstanding principal | Losses | Percent | Outstanding principal | Losses | Percent | Outstanding principal | Losses | Percent |
| 1994 | $3,100 | $260 | 8.4% | $5,181 | $177 | 3.4% | $3,876 | $618 | 15.9% | $12,157 | $1,055 | 8.7% |
| 1995 | $2,966 | $206 | 6.9% | $4,841 | $137 | 2.8% | $3,435 | $470 | 13.7% | $11,242 | $813 | 7.2% |
| 1996 | $2,705 | $113 | 4.2% | $4,664 | $188 | 4.0% | $3,139 | $824 | 26.2% | $10,508 | $1,125 | 10.7% |
| 1997 | $2,656 | $146 | 5.5% | $4,375 | $89 | 2.0% | $2,662 | $396 | 14.9% | $9,693 | $631 | 6.5% |
| 1998 | $2,589 | $144 | 5.6% | $4,119 | $72 | 1.7% | $2,395 | $357 | 14.9% | $9,103 | $574 | 6.3% |
| 1999 | $2,559 | $147 | 5.7% | $3,857 | $64 | 1.7% | $2,104 | $229 | 10.9% | $8,520 | $440 | 5.2% |
| 2000 | $2,692 | $116 | 4.3% | $3,641 | $49 | 1.4% | $2,041 | $248 | 12.1% | $8,375 | $413 | 4.9% |
| 2001 | $2,678 | $109 | 4.1% | $3,560 | $48 | 1.3% | $1,907 | $135 | 7.1% | $8,146 | $293 | 3.6% |
| 2002 | $2,758 | $130 | 4.7% | $3,484 | $53 | 1.5% | $1,749 | $215 | 12.3% | $7,991 | $398 | 5.0% |
| 2003 | $2,715 | $128 | 4.7% | $3,273 | $47 | 1.4% | $1,523 | $161 | 10.6% | $7,512 | $336 | 4.5% |
| 2004 | $2,723 | $126 | 4.6% | $3,031 | $40 | 1.3% | $1,405 | $93 | 6.7% | $7,159 | $260 | 3.6% |
| Total | | $1,625 | 5.3% | | $964 | 2.0% | | $3,746 | 13.2% | | $6,336 | 6.0% |

Source: FSA-KCMO-FO Report Codes 616, 541 and 523. FY 1994–2000 Loss Data from General Ledger. FY 2001–2004 Loss Data from DSTH FOCUS File. Principal is beginning-of-year outstanding principal. Losses include both principal and interest. Beginning in FY 2003, losses include judgment cases.

[a] Includes youth loans.

[b] Includes Non-Farm Enterprise loans.

**Table 2. Incidental Truncation Model Variable Definitions**

| | |
|---|---|
| **Dependent variables** | |
| LOSS | Binary variable with value of 1 if loan experienced a loan write-down or debt write-off or both, 0 otherwise, |
| LOSSPCT | Amount of loan write-down or write-off divided by initial loan amount, in percent, |
| **Independent variables** | |
| AGE | Age in years of the operator at time of loan application, |
| OL | Binary variable with value of 1 if loan is OL, 0 otherwise, |
| ONEYR | Binary variable with value of 1 if loan is one-year OL loan, 0 otherwise, |
| FO | Binary variable with value of 1 if loan is FO, 0 otherwise, |
| LR | Binary variable with value of 1 if loan has a limited resource assistance code, 0 otherwise, |
| BF | Binary variable with value of 1 if loan has a beginning farmer assistance code, 0 otherwise, |
| SDA | Binary variable with value of 1 if loan has a socially disadvantaged assistance code, 0 otherwise, |
| NUMOL | Number of active OL loans at time of loan application, |
| NUMFO | Number of active FO loans at time of loan application, |
| NUMEM | Number of active EM loans at time of loan application, |
| DEBTSETT | Binary variable with value of 1 if applicant had ever been released from personal liability as part of a debt settlement action, 0 otherwise, |
| DA | Total liabilities divided by total assets, |
| CR | Total current farm assets divided by total current farm liabilities, |
| REPAY | Balance available for debt service divided by total debt service due that year, |
| CRPINPRO | Proportion of crop and livestock cash farm income from crops, |
| TCFI | Total cash farm income from crop, livestock, and other farm income in thousands of dollars. |

**Table 3. Weighted Descriptive Statistics of Variables in Incidental Truncation Model**

| Variables | Mean | Std. dev. | N |
|---|---|---|---|
| LOSS | 0.09 | 0.29 | 2,289 |
| LOSSPCT (%) | 133.56 | 196.12 | 184 |
| AGE | 41.17 | 12.83 | 2,285 |
| OL | 0.71 | 0.45 | 2,715 |
| ONEYR | 0.39 | 0.49 | 2,715 |
| FO | 0.11 | 0.32 | 2,715 |
| EM | 0.17 | 0.38 | 2,715 |
| LR | 0.28 | 0.45 | 2,715 |
| BF | 0.23 | 0.42 | 2,715 |
| SDA | 0.07 | 0.25 | 2,715 |
| NUMOL | 1.41 | 1.71 | 2,282 |
| NUMFO | 0.44 | 0.85 | 2,289 |
| NUMEM | 0.42 | 1.00 | 2,288 |
| DEBTSETT | 0.04 | 0.20 | 2,414 |
| DA | 0.69 | 0.83 | 2,279 |
| CR | 2.01 | 9.36 | 1,932 |
| REPAY | 1.16 | 1.19 | 2,290 |
| CRPINPRO | 0.61 | 0.42 | 2,278 |
| TCFI ($1000) | 153.47 | 161.46 | 2,301 |

**Table 4. Estimated Loan Loss Selection Equation by Probit Model**

| **Dependent variable is LOSS** | | | | |
|---|---|---|---|---|
| **Independent variable** | **Coefficient** | **Standard error** | **t-ratio** | **p-value** |
| CONSTANT | -1.172 | 0.364 | -3.218 | 0.001 |
| AGE | -0.007 | 0.004 | -1.639 | 0.101 |
| FO | -0.478 | 0.269 | -1.780 | 0.075 |
| OL | 0.185 | 0.150 | 1.233 | 0.217 |
| ONEYR | -0.166 | 0.113 | -1.464 | 0.143 |
| LR | 0.139 | 0.110 | 1.264 | 0.206 |
| BF | 0.125 | 0.147 | 0.852 | 0.394 |
| SDA | 0.110 | 0.193 | 0.569 | 0.570 |
| DEBTSETT | 0.848 | 0.166 | 5.109 | 0.000 |
| NUMOL | -0.004 | 0.030 | -0.118 | 0.906 |
| NUMFO | -0.132 | 0.064 | -2.062 | 0.039 |
| NUMEM | 0.007 | 0.047 | 0.153 | 0.878 |
| DA | 0.222 | 0.069 | 3.221 | 0.001 |
| CR | -0.064 | 0.035 | -1.829 | 0.067 |
| REPAY | -0.446 | 0.225 | -1.986 | 0.047 |
| CRPINPRO | 0.229 | 0.124 | 1.839 | 0.066 |
| TCFI | 0.001 | 0.000 | 3.637 | 0.000 |
| n | 1,738 | | | |
| $\chi^2$ | 98.907 | | p-value | 0.000 |
| % Correct[a] | 91.945 | | | |

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

**Table 5. Estimated Loan Loss Percentage Regression Equation**

| **Dependent variable is LOSSPCT** | | | | |
|---|---|---|---|---|
| **Independent variable** | **Coefficient** | **Standard error** | **t-ratio** | **p-value** |
| CONSTANT | 339.045 | 116.059 | 2.921 | 0.004 |
| AGE | 1.085 | 1.153 | 0.941 | 0.349 |
| FO | -154.415 | 54.816 | -2.817 | 0.006 |
| OL | -105.421 | 46.841 | -2.251 | 0.026 |
| ONEYR | -23.745 | 27.222 | -0.872 | 0.385 |
| LR | 17.793 | 35.065 | 0.507 | 0.613 |
| BF | 142.810 | 63.105 | 2.263 | 0.026 |
| SDA | 2.261 | 34.074 | 0.066 | 0.947 |
| DEBTSETT | -4.076 | 30.164 | -0.135 | 0.893 |
| DA | 23.177 | 38.354 | 0.604 | 0.547 |
| CR | 8.993 | 7.365 | 1.221 | 0.225 |
| REPAY | -222.740 | 79.762 | -2.793 | 0.006 |
| CRPINPRO | 49.905 | 32.268 | 1.547 | 0.125 |
| TCFI | -0.030 | 0.034 | -0.872 | 0.385 |
| n | 124 | | | |
| F | 2.080 | | p-value | 0.021 |
| $R^2$ | 0.197 | | | |