# ANALYSIS OF ECONOMIC EMERGENCY LOAN ALLOCATIONS AND CREDIT MARKET EXPANSION

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## Abstract

The Economic Emergency (EE) loan program, administered by the FmHA, was created by Congress in 1978. The primary purpose of the program was to provide credit to farmers who were unable to obtain credit from normal lenders due to economic stress. Over six billion dollars of EE loans were extended nationally during fiscal years 1978 through 1981. This paper examines the allocation of EE loans at the state level and the expansionary effect of the program on farm credit markets. Empirical evidence is provided that EE funds were allocated to states consistently with the general criteria cited in the development of the EE program and that the EE program expanded farm credit markets rather than displacing loans from other sources.

*Key words:* Economic Emergency loans, farm credit, Farmers Home Administration.

Arguments for emergency farm credit programs in 1985 are similar to those made prior to passage of the Emergency Agricultural Credit Adjustment Act of 1978. Farmers are in financial distress, many face bankruptcy, and "sufficient" credit from normal lenders is apparently not forthcoming. Paradoxically, the 1985 situation appears more severe than that in 1978, due to the continued deterioration of the financial status of farmers. However, the prospects for emergency aid are not good due to the large federal budget deficits and the free market orientation of the Reagan administration with respect to agricultural policy.

Approximately six billion dollars in FmHA emergency loans were extended to farmers under the EE program from 1978 to 1981. As of June 30, 1984, 46.7 percent of outstanding EE loans were delinquent, representing 21 percent of total EE funds outstanding (USDA, ERS (a)).

The focus of this research is on the allocation of EE loan funds at the state level and on the expansionary effect of the program on the farm credit market. The initial stimuli for the research were findings of the U.S. General Accounting Office that suggested that allocation of EE funds may have conflicted with the intent of the enabling legislation and that EE funds may have displaced credit that would have been forthcoming from normal sources (United States GAO (b)). Given the increased severity of the farm financial situation today and differences in the magnitude and structure of programs currently under consideration, these are not primary concerns of the 1985 emergency credit debate. Analysis of the 1978 program may, however, provide insights into the effect of that program on the current farm financial situation.

## EMERGENCY AGRICULTURAL CREDIT ADJUSTMENT ACT OF 1978

Effective August 11, 1978, the Farmers Home Administration (FmHA) was authorized to begin making loans to farmers under the provisions of Public Law 95-334, the Emergency Agricultural Credit Adjustment Act of 1978. FmHA was authorized to guarantee loans made by private lenders and to provide insured EE loans directly to farmers from revolving funds maintained by the FmHA. Justification for the EE loan program and the intent of the legislation were stated in the Federal Register of August 11, 1978:

> *The need for this new economic emergency loan program results from the*

*current acute financial condition of many farmers and ranchers who have suffered severe economic losses due to low prices and escalating production costs* (p. 35,661).

*The intended effect is to provide Insured Economic Emergency loans to farmers and ranchers who are unable to obtain credit from their normal agricultural lender(s) due to national or areawide economic stresses such as a general tightening of agricultural credit or an unfavorable relationship between production costs and prices received for agricultural commodities* (p. 35,648).

The EE loan program had an original expiration date of May 15, 1980, but it was subsequently extended until September 30, 1981. EE loan commitments nationally were .1 billion, 3.1 billion, 2.2 billion, and 1.2 billion dollars in fiscal years 1978, 1979, 1980, and 1981, respectively, and comprised approximately .6 percent, 15.4 percent, 14.1 percent, and 6.3 percent of the total change in agricultural debt in the United States in these years (Ingram).

One perspective for analysis of the 1978 program is related to the operation of the program — was it administered consistently with the intent of the legislation? Questions about the administration of the program arise from the absence of explicit allocation guidelines for the distribution of funds, and from the ambiguity of general guidelines such as making funds available under conditions of "tight" credit or in the case of unavailability of funds at "reasonable" rates from normal lenders. A General Accounting Office (GAO) investigation of a sample of individual EE loans from selected states (United States GAO (b)) found some evidence of EE loans that were extended in apparent conflict with the intent of the legislation. These included loans used to refinance recent land purchases and loans which would have apparently been available from normal lenders. The ambiguity of the loan criteria and the GAO findings raise the possibility that the EE program may have displaced loans which would have been forthcoming from normal lenders rather than expanding the credit market. A major purpose of this research is to empirically examine the allocation of EE funds and the expansionary effect of the EE program so as to test the consistency of the operation of the program with the legislative intent.

A second perspective for the analysis of the 1978 program relates to the longrun effects of the program. Given the relatively short time period since the program expiration and the existence of other factors that have impacted current financial conditions, a direct empirical test of longrun effects of the program is not feasible at the present. Results of the analysis of the operation of the 1978 program have implications for current financial conditions, however. It can be argued that greater shortrun success in administering the program, providing funds to farmers under greater stress, and expanding the credit market is associated with increased longrun prospects for future farm failures.

The major effect of an EE program is to improve the liquidity of borrowers to ensure shortrun survival of farms having difficulties meeting current financial obligations and continuing to operate. If the 1978 emergency credit program was non-expansionary, if EE funds were used to restructure existing debt or to displace new higher cost debt from normal lenders, the increased liquidity would have been obtained without reducing the solvency of EE borrowers. If the program was expansionary and total debt levels increased more than they would have in the absence of the program, debt-equity ratios and debt servicing requirements would have increased because of the program, worsening longrun survival prospects. In making the liquidity/solvency trade-off with an emergency loan program, it is naturally hoped that farm income and equity levels will increase to avoid the negative effects of the decline in solvency. Unfortunately, the 1978 EE program has been followed by declines in income and equity values in agriculture, making the decline in solvency associated with an expansionary emergency credit program relevant to farm survival today.

## CONCEPTUAL FRAMEWORK FOR ANALYSIS OF CREDIT MARKET EXPANSION

A simplified representation of the interrelationships between the demand for loans and the supply of loans from conventional sources and from the EE loan program is presented in Figure 1. In Figure 1, $N_s$ represents the supply curve for funds from normal lenders, $EE_{max}$ represents the supply of EE funds allocated to a state, and D represents the total amount of new debt demanded in a year at various interest rates. Based on the
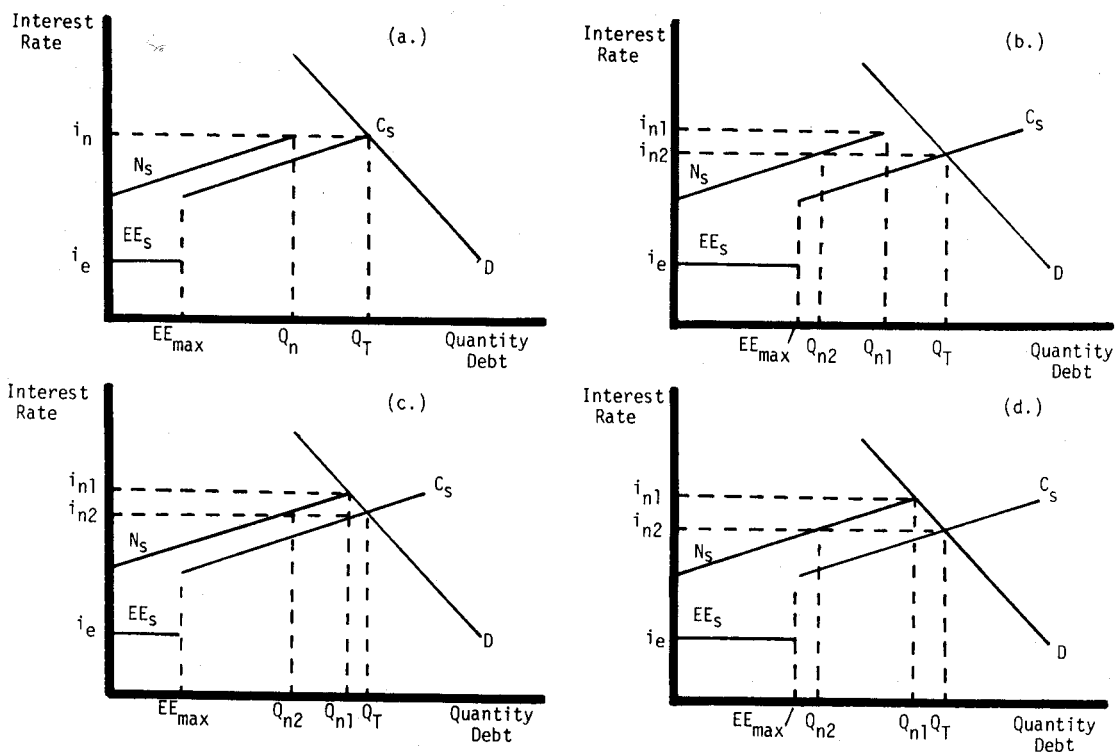
**Figure 1. Effects of Economic Emergency Loans on Farm Credit Markets.**

development of the EE loan program, the supply of EE funds, $EE_{max}$, is affected by demand for farm loans, the supply of funds from normal lenders, and on the congressional allocation of funds for the EE program. The supply of EE funds is invariant to the interest rate on EE loans, $i_e$, and the interest rate on EE loans is assumed to be less than the rate charged by normal lenders. The interest rate charged for EE loans nationally was based on the cost of government borrowing (United States GAO (a)).

Figures 1.a and 1.b represent the situation where tightness of credit exists in that normal lenders are effectively rationing credit. Credit rationing is defined here to include limits on individual loans that are extended and the denial of loans to potential borrowers with the greatest repayment risk who are "crowded out" of the market (Melichar). Excess demand exists in the market at all normal lender interest rates. Figures 1.a and 1.b differ in that the EE funds made available to the state in 1.b are approximately twice those made available in 1.a. Differences in the amount

of EE funds made available, given identical supply and demand situations otherwise, could be due either to differences in the national allocation of EE funds from year to year or to differences in the application of the general EE loan guidelines by FmHA administrators in response to the perceived supply and demand situation.

The discontinuous curves, $i_ec_s$ in Figure 1, represent the combined supply curve for new debt from conventional and EE sources. The construction of the combined supply curves assumes that all EE funds made available to a state will be used due to the lower cost of these funds and that the supply curve for funds from normal lenders remains substantially unchanged in the presence of the EE program, due to the small magnitude of EE funds relative to the total credit market.

In Figure 1.a, the combined supply curve and the demand curve for borrowed funds indicate a total quantity of new debt for the state equal to $Q_T$. The amount $EE_{max}$ is supplied from EE funds and $Q_n$ is supplied from normal lenders. In Figure 1.a, $EE_{max}$ is equal to $Q_nQ_T$. $Q_n$ would also have been supplied

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by normal lenders under the credit rationing assumption of 1.a. The EE program under this scenario can therefore be said to be completely expansionary in that the amount of funds supplied by normal lenders is the same, with or without the EE program, and each dollar of EE funds increases the total amount of new debt extended in the state by one dollar.

In Figure 1.b, the allocation of EE funds is double that in Figure 1.a and $Q_T$ is the total new debt extended. $Q_T$ in 1.b is greater than $Q_T$ in 1.a, because the marginal cost of funds at any total borrowing level is lower in the situation with the larger EE allocation. In Figure 1.b, with the EE program, $Q_{n2}$ is provided by normal lenders at an interest rate of $i_{n2}$. $Q_{n2}$ is equal to $Q_T$ minus $EE_{max}$. $Q_{n1}$ would have been provided by normal lenders in the absence of the EE program at an interest rate $i_{n1}$. The amount of EE funds in this example, $Q_{n2}Q_T$, can be partitioned into two parts. $Q_{n2}Q_{n1}$ reflects the displacement of funds by normal lenders as a result of the EE loan program. $Q_{n1}Q_T$ represents the expansion of total debt extended as a result of the EE loan program.

Figures 1.c and 1.d represent the situation where credit rationing from normal lenders is not sufficiently severe to prevent the market from clearing at the normal lender interest rate. Borrowers can obtain all of the credit demanded at interest rate $i_{n1}$. EE loans may still be extended in this case, however, consistent with the stated purposes of the program, if $i_{n1}$ is considered to be sufficiently high that it does not meet the criterion of a "reasonable" rate of interest.

Comparing 1.c to Figure 1.a shows that, with identical levels of EE funding, there is more displacement of funds in the case without effective credit rationing. There was no displacement of funds in Figure 1.a, but displacement equal to $Q_{n2}Q_{n1}$ exists in Figure 1.c.

The greatest displacement of funds from normal lenders occurs in the scenario depicted in Figure 1.d. Figure 1.d represents the case where there are relatively large amounts of EE funds, but where credit rationing from normal lenders is not effective. The displacement of funds from normal lenders in Figure 1.d is greater than that which occurs with smaller amounts of EE funding, as in Figure 1.c, and greater than that which occurs when credit rationing is in effect, as in Figure 1.b.

Figure 1 is primarily concerned with the impact of the supply of funds from normal lenders and the EE program on the total change in debt that occurs with the implementation of the EE program. The expansionary effect of EE funding is also impacted by the elasticity of demand for borrowed funds. The direct effect of EE funding is to lower the cost of borrowing. A given decrease in the cost of debt will cause a greater increase in the quantity of debt demanded when the demand for debt is more elastic and the impact of EE funding is therefore more expansionary when the demand for borrowed funds is more elastic. This can be observed in Figure 1.c by rotating the demand curve for funds around the point $i_{n1}Q_{n1}$.

## EMPIRICAL ANALYSIS OF EE LOAN ALLOCATIONS AND EXPANSIONARY EFFECTS

A simultaneous system of reduced form equations was developed to analyze the expansionary effect of emergency loans and the factors which were important in the allocation of EE funds to the states. The estimated system included an emergency loan equation and a total change in debt equation. A model of the following general form was estimated using cross-sectional data for the EE program years:

(1)  DDET = f(EE loans, S, D),

(2)  EE loans = f(Norm loans, S, D, EE national),

and

(3)  Norm loans = DDET − EE loans.

Variables are reflected as follows: DDET is the total change in agricultural debt observed in each state and EE program year, EE loans is the quantity of EE loan funds extended in each state and year, S is a vector of variables affecting the supply of loans from normal sources in each state and year, D is a vector of variables affecting the demand for agricultural loans in each state and year, "Norm loans" is the amount of loans extended by normal lenders in each state and year, and EE national is the national allocation of EE funds in each year.

Theory does not provide a unique specification or specific functional form for the system described by equations (1), (2), and (3). This is due both to governmental and non-profit lending institution involvement in

the credit market and to the lack of knowledge of the underlying utility functions of borrowers and lenders. Finance theory is helpful, however, in identifying variables that impact the supply of and demand for credit. The demand for credit is influenced by the expected risk and return from borrowing, the cost of borrowing, and internal financing capacity. The supply of agricultural credit is affected by the risk and return to lenders from agricultural loans, alternative investment opportunities for agricultural lenders, and the cost and availability of funds to lending institutions. Ideally, the analysis would use micro data from borrowers and lenders at the credit market level of aggregation. Data in this form were not available so the state level of aggregation was employed.

## SPECIFICATION OF THE CHANGE IN DEBT EQUATION

In equation (1), the change in total farm debt observed in each state and year ($DDET_{it}$) is a function of emergency loans extended to the state and supply and demand characteristics of the farm credit market in each state. Supply and demand variables are grouped into four categories for the purpose of discussion: variables related to the risk and return associated with agricultural loans, the cost of credit, internal financing capacity, and characteristics of the supply side of the farm credit market in each state. The coefficient of the emergency loan variable is of prime interest in equation (1) and the discussion of equation (1) begins with that variable.

### Economic Emergency Loan

The main focus of the change in debt equation is on the effect of economic emergency loan allocations on the total change in debt. The emergency loan variable, $EE_{it}$, is defined as the total amount of EE loans extended in state i and year t. $EE_{it}$ included both direct emergency loans from the FmHA to farmers (insured loans) and loans from other lenders that were guaranteed by FmHA under the EE loan program (guaranteed loans). Guaranteed loans represented only a minor part of the total EE program, representing approximately .3, 4, 5, and 7 percent of total EE loans nationally in 1978 through 1981, respectively (USDA, FmHA).

Statistical tests for the expansionary effect of the EE loan program on the farm credit market can be conducted for the coefficient of $EE_{it}$ in equation (1). A coefficient not significantly different from zero suggests that the main effect of the EE loan program was the displacement of funds from other lenders. A coefficient not significantly different from one suggests that the EE loan program was primarily expansionary. The point estimate of the EE loan coefficient is the estimate of the contribution of each EE loan dollar to the total change in credit observed in the state.

### Risk and Returns for Agricultural Loans

Higher levels of risk exposure in lending affect both the supply of and demand for credit. Barry et al. (1981) have noted that an important nonprice response of lenders to loan risk is the imposition of credit limits on agricultural loans. From the borrower's perspective, the possibility of credit limits with higher loan risk implies that higher loan risk is associated with smaller credit reserves. Higher loan risk is therefore associated with a decrease in the demand for credit, in order to maintain the level of credit reserves for liquidity purposes (Barry et al., 1981).

Four commonly cited statistics related to loan risk, return to borrowed funds, and credit reserves were included in the estimated change in debt model; the debt-equity ratio of farms, the ratio of net farm income to debt, the percentage change in farm sector equity, and the coefficient of variation of net farm income. The debt-equity ratio, $DE_{it}$, was the level of total farm debt divided by farmers' equity, in state i at the beginning of year t. The debt-equity ratio is a commonly used indicator of solvency (Barry et al., 1979; Brigham), and higher values of the ratio indicate greater risk and smaller credit reserves, *ceteris paribus*. A negative relationship between $DE_{it}$ and the change in debt is therefore hypothesized.

The ratio of net cash farm income in year $t-1$ to total farm debt at the beginning of year t was included in the model as $NFIDET_{it}$. Penson and Lins (p. 328) discuss the inverse of this ratio as a measure of the relative burden of debt on cash income. NFIDET in this model is an indicator of the return to borrowed funds and the ability to service debt from farm income. Higher values of NFIDET indicate less loan risk, greater credit reserves, and a larger return to borrowed

funds. A positive relationship between NFI-DET and the change in debt is hypothesized.

The percentage change in farm equity, $PCEQ_{i,t-1}$, is directly related to the amount of collateral available to secure new loans. Changes in the value of equity also reflect expectations about the returns to investments in farm land. Since higher levels of PCEQ reflect greater (lesser) relative increases (decreases) in credit reserves and better (worse) expectations about returns, a positive relationship between PCEQ and the change in debt is expected.

The coefficient of variation of net farm income, $CVINC_{it}$, was included in the equation as an additional measure of lending risk. $CVINC_{it}$ was calculated from observed net farm income in each state for years $t-1$ through $t-5$. Higher values of CVINC represent greater variability in net income and higher business risk in agriculture in a state. The hypothesized relationship between CVINC and the change in debt, *ceteris paribus,* is therefore negative.

## Costs of Credit and Returns to Agricultural Lenders

The cost of funds from normal lenders is commonly recognized to be positively related to the supply of funds and negatively associated with the demand for funds (Penson and Lins; Barry et al., 1979). Since the change in debt equation in the estimated system includes both supply and demand variables, the sign of the coefficient of the interest rate variable in the change in debt equation depends on whether the supply or demand effect is dominant. A weighted average interest rate from all normal agricultural lenders would be preferred for the model, but this was unavailable on a cross-sectional basis. The Federal Land Bank interest rate was the best available interest rate for agricultural loans. This interest rate was specified as $RATE_{it}$ in the change in debt equation.

## Internal Financing Capacity

Internal financing represents a substitute for borrowed capital and higher levels of internal financing capability, *ceteris paribus* should result in a lower cost of equity capital and a decrease in the demand for borrowed funds. To the extent that internal financing ability is considered by lenders, higher levels

of internally generated funds should also imply greater liquidity and security for potential lenders and should be positively related to the supply of loans.

Two sources of internal financing capacity were included in the change in debt model, net cash farm income and off-farm income of farm families. Net cash farm income, $NINC_{i,t-1}$, is a measure of the absolute amount of net cash farm income in the state, which sets a theoretical upper limit on the total amount of farm income available in the state for internal financing. The off-farm income variable, $OFINC_{i,t-1}$, is the total amount of off-farm income of farm families in each state. This variable represents a theoretical upper limit on the total amount of off-farm income available in a state for internal financing.

An additional variable measuring the relative importance of off-farm income in a state, $OFIAVG_{i,t-1}$, was also included in the change in debt equation. This ratio was defined as the ratio of off-farm income in a state in year t divided by a 5-year moving average of net farm income for years $t-1$ through $t-5$. This variable reflects the normal long term relationship between off-farm income and farm income, by reducing the effects of year-to-year variations in net farm income.

Based on the hypothesized positive supply response and negative demand response for higher levels of internal financing capacity, the signs of the coefficients of the internal financing variables in the change in debt equation are dependent on the dominance of the supply or demand effects.

## Credit Market Supply Characteristics

Because of the cross-sectional focus of the analysis, the size of the farm credit market at the beginning of each year, $TOTDET_{it}$, was included in the equation as a scale variable. If all other conditions were equal, the states with the largest farm credit markets would be expected to experience larger absolute changes in farm debt.

The availability of credit from normal sources is difficult to model cross-sectionally. Data on cost of funds for agricultural lending institutions, alternative investment opportunities for these institutions, and the availability of funds on a state-by-state basis were not available. Differences in the supply of agricultural credit from normal lenders in different states could theoretically result from

either: (1) differences in nonagricultural investment opportunities, available funds for loans, or the cost of funds for similar lending institutions in different states or (2) differences in the relative importance of the major lending institutions in different states. For example, the first type of difference would be related to differences in conditions faced by commercial banks in different states. The second type of difference would be related to loan supply differences between commercial banks and Farm Credit System institutions and the relative importance of the two types of lenders in the agricultural credit markets in different states.

A credit availability proxy, $CRED_{i,t-1}$, based on recent changes in regional credit availability, was included in the change in debt equation. The construction of this variable is described in the data section of this paper. A higher value of $CRED_{i,t-1}$ represents a decreasing trend in credit availability within a region and a negative relationship between CRED and the change in debt is therefore hypothesized.

Agricultural credit market share variables for commercial banks, $BSHR_{it}$, and the Farmers Home Administration, $FHSHR_{it}$, were included in the model to represent the effects of the institutional structure of the farm credit market on the change in debt. The market shares of these two institutions were chosen because their structures suggest contrasting behavior in their responses to the financial stress in the farm sector in the EE program years. Commercial banks have probably been the most flexibility of the major agricultural lenders in making portfolio adjustments away from agricultural loans during periods of increased financial stress and risk in agriculture. The FmHA, as the traditional lender of last resort, would conversely be expected to maintain or increase its loan activity during periods of increased financial stress and risk. The market share variables are specified for the beginning of each program year, and, given the hypothesized response of each type of institution during the EE program years, a negative coefficient is expected for BSHR and a positive coefficient is expected for FHSHR.

## SPECIFICATION OF THE ECONOMIC EMERGENCY LOAN EQUATION

The existence of "tightness of credit", "unavailability of funds from normal lenders at reasonable rates of interest", and "economic stress" were the most frequently cited conditions used in justification of the EE loan program. This examination of the allocation of EE funds therefore focuses on the relationship between factors related to these conditions and the amount of EE funds allocated to each state. Variables representing agricultural supply and demand conditions and the national allocation of EE funds were included in the EE loan allocation equation. The supply and demand variables included in the change in debt equation were also included in the EE allocation equation. The hypothesized effects of these variables on the EE allocation are to be discussed.

The four indicators of risk and credit capacity in the change in debt equation were: the debt-equity ratio ($DE_{it}$), the ratio of net farm income to debt ($NFIDET_{it}$), the percentage change in farmers equity ($PCEQ_{i,t-1}$), and the coefficient of variation of net farm income ($CVINC_{it}$). It was hypothesized that greater risk and smaller credit reserves would be negatively related to the change in debt and the predicted signs of the coefficients in the change in debt equation were therefore negative for DE and CVINC and positive for NFIDET and PCEQ. Since the EE loan program was developed to provide funds to farmers under financial stress and those unable to obtain credit from normal sources, the hypothesized signs of the coefficients of these four variables are opposite their expected signs in the change in debt equation.

The EE loan purpose "to provide funds when they are unavailable from normal lenders at reasonable rates" suggests a positive relationship between normal lender interest rates and emergency loans. The EE loan rate was a national rate, so it would not be expected to explain cross-sectional differences in EE allocations, but it may have explanatory power over time. $RATE_{it}$ in the emergency loan equation was defined as the land bank interest rate divided by the annual average emergency loan interest rate. High values of $RATE_{it}$ indicate that normal lender interest rates were high relative to EE rates and a positive relationship between $RATE_{it}$ and emergency loans is hypothesized.

The internal financing variables, net farm income ($NINC_{i,t-1}$), off-farm income ($OFINC_{i,t-1}$) and the ratio of off-farm income to average farm income ($OFIAVG_{i,t-1}$), were hypothesized to have a negative effect on the demand for new debt and a positive effect

on the supply of new debt from normal lenders. With respect to the emergency loan equation, higher internal financing capability should be negatively related to the allocation of EE funds. Higher internal financing capacity should increase the likelihood of funds being available either internally or from normal lenders, *ceteris paribus,* and EE funds should therefore be less necessary, given the purposes of the EE loan program.

The size of the total farm credit market in a state, $TOTDET_{it}$, should be positively related to the allocation of EE funds due to the scale effect. With all other conditions being equal, larger allocations of EE funds should be positively related to farm credit market size.

The credit availability proxy, $CRED_{it}$, is directly related to the "tightening of credit" condition specified in the EE program documentation. Since a higher value of CRED indicates a decrease in credit availability, a positive relationship between CRED and the allocation of EE funds is expected.

Given the hypothesis that commercial banks would be more restrictive than other lenders in making new loans or restructuring existing debt during the EE program years, a positive relationship between BSHR and the EE loan allocation is expected. The effect of a high FmHA market share on emergency loans is less clear. A high FmHA market share may indicate that a larger proportion of farmers in a state have experienced financial difficulties and that FHSHR would be positively related to EE loans. Conversely, if FmHA was more flexible than other lenders in restructuring existing debt, a high FmHA market share would be negatively related to EE loans.

In addition to the supply and demand variables discussed above, the amount of farm credit from normal sources, Norm loans in equations (2) and (3), should also have affected the EE fund allocation. After accounting for farm credit supply and demand determinants, states that experienced higher levels of "normal funding" would be expected to have less need for EE funding. Since Norm loans is an endogenous variable, however, and the EE allocation equation is not identified, the direct impact of Norm loans on EE funding is not measurable. The reduced form of the EE equation was used to measure the impact of the exogenous variables on the EE loan allocation.

The final explanatory variables in the emergency loan equation account for the effects of changes in the national allocation of EE funds on the individual state allocations. As explained in the data section of this paper, EE loan allocations were converted from a fiscal year to a calendar year basis for the estimation. National calendar year allocations for 1978 through 1981 were .7, 2.9, 2.0, and .9 billion dollars, respectively. Dummy variables for 1979 through 1981 (D79, D80, D81) were included in the EE loan equation and 1978 was used as the base year. Based on the pattern of national allocations; positive coefficients were expected for all dummy variables.

## DATA AND ESTIMATION

The system of equations specified for the estimation were:

(4) $EE_{it} = f(Norm\ loans_{it}, DE_{it}, NFIDET_{it}, PCEQ_{i,t-1}, CVINC_{it}, RATE_{it}, NINC_{i,t-1}, OFINC_{i,t-1}, OFIAVG_{i,t-1}, TOTDET_{it}, CRED_{i,t-1}, BSHR_{it}, FHSHR_{it}, D79, D80, D81, E1_{it})$,

(5) $DDET_{it} = f(EE_{it}, DE_{it}, NFIDET_{it}, PCEQ_{i,t-1}, CVINC_{it}, RATE_{it}, NINC_{i,t-1}, OFINC_{i,t-1}, OFIAVG_{i,t-1}, TOTDET_{it}, CRED_{i,t-1}, BSHR_{it}, FHSHR_{it}, E2_{it})$, and

(6) $Norm\ loans_{it} = DDET_{it} - EE_{it}$.

$E1_{it}$ and $E2_{it}$ are random error terms and all other variables are as previously defined.

Data for the state EE loan obligations were from FmHA "Status of Loan and Grant Obligations" (USDA, FmHA). This source reports loan obligations by state biannually during the federal fiscal year, with a 6-month subtotal as of March 31 and a fiscal year total as of September 30 for each year. Since most other variables in the model were on a calendar year basis, calendar year totals for EE loans were estimated by interpolating the data for September 30 to March 1. Half of the loan obligations in each of these periods was allocated to each of the 2 years spanned by the reporting period.

Land Bank interest rates and market share data were from the Farm Credit Administration *"Characteristics of Federal Land Bank Loans," "Nonreal Estate Farm Debt,"* and *"Real Estate Farm Debt."* Emergency loan interest rates were obtained from the Farmers Home Administration (Ischer). Farm income statistics were from the *"Economic Indicators of the Farm Sector"* (USDA, ERS (c)). The off-farm income statistic was from the Bureau of the Census *1979 Farm Finance Survey.* This figure was available only for 1979, and 1978, 1980, and 1981 values were approximated be indexing the 1979 figure

by personal income statistics for the United States over the other years.

The credit availability index was constructed from data reported in *"Farm Real Estate Market Developments"* (USDA, ERS (b)). This source provides the percentage of reporters in each of ten production regions that thought that credit availability had increased, decreased, or changed little during the previous 6 months. Percentages are provided for March and October of each year. The construction of the proxy variable was as follows: $INCR_{3t}$ and $INCR_{10t}$ represent the percentage of reporters reporting an increase in credit availability for the 6 months ending in March and October of year t. $DECR_{3t}$ and $DECR_{10t}$ represent the percentage reporting a decrease for the periods ending in March and October of year t. The variable $CRED_t$ was defined as:

$$(7) \quad CRED_t = (DECR_{10(t-1)} - INCR_{10(t-1)}) + (DECR_{3t} - INCR_{3t}).$$

This variable shows the net (decrease-increase) percentage of reporters in each region reporting a decrease or increase in the availability of credit for the two consecutive 6 month periods ending in March of each EE program year. While the proxy does not directly measure the magnitude or scope of the change in credit availability, it should be closely related to both of these measures. If the tightening of credit in a region was particularly severe or widespread throughout a region, the percentage of reporters indicating a decrease in credit availability should be large and the percentage indicating an increase should be small.

Net cash farm income was used in the NFIDET and NINC variables. Non-money income was subtracted from net farm income and depreciation and capital consumption expenses were added to the result to estimate net cash farm income.

The model described by equations (4) and (5) was estimated by pooling the cross-sectional data for the 4 years of the EE program. Equation (6) is an identity and was not estimated. The change in debt equation is unidentified by the order condition for identification (Pindyck and Rubinfield, p. 274). The reduced form of the EE loan equation was estimated by regressing emergency loans against all exogenous variables in the system. The estimated value of EE loans, EE-HAT, was used as a regressor in the change in debt equation as part of the two stage least

squares estimation procedure (Pindyck and Rubinfield, p. 227). Heteroscedasticity associated with the TOTDET variable was detected in the change in debt model using the Glejser technique (Maddala, p. 262) and the appropriate transformation was made to correct for heteroscedasticity.

## ESTIMATION RESULTS

The results from the reduced form emergency loan equation and the second stage change in debt equation are presented in Table 1. The emergency loan allocation model results indicate that three of the four variables related to loan risk and credit capacity had statistically significant effects on the allocation of EE funds. States with higher aggregate debt-to-equity ratios received more EE funds, after accounting for other effects. States with higher levels of farm income relative to debt and with greater relative in-

TABLE 1. REGRESSION RESULTS FOR EE ALLOCATION AND CHANGE IN DEBT EQUATIONS, 1978-1981

| Dependent variable | Equation | |
|---|---|---|
| | EE | DDET |
| Regressors: | | |
| Intercept | −55.26 | 82.95 |
| | (.93)[a] | (1.07) |
| EEHAT | − | .97[c] |
| | | (2.82) |
| DE | 80.70[b] | −222.90 |
| | (1.96) | (1.40) |
| NFIDET | −42.76[c] | −14.73 |
| | (2.36) | (.35) |
| PCEQ | −52.03[b] | 3.50 |
| | (1.82) | (.05) |
| CVINC | −.11 | −1.47[b] |
| | (.52) | (1.83) |
| RATE | 49.82 | −2.33 |
| | (.83) | (.30) |
| NINC | .005 | .12[c] |
| | (.77) | (3.46) |
| OFINC | .008[b] | −.058[c] |
| | (1.96) | (2.34) |
| OFIAVG | −1.78[b] | 2.13 |
| | (1.80) | (.77) |
| TOTDET | .003 | .106[c] |
| | (1.62) | (10.64) |
| CRED | .11 | −.414[c] |
| | (.96) | (2.05) |
| BSHR | 42.67[b] | 98.14 |
| | (1.69) | (1.18) |
| FHSHR | 22.80 | 163.33[b] |
| | (.76) | (1.85) |
| D79 | 45.95[c] | − |
| | (5.48) | |
| D80 | 19.26 | − |
| | (1.26) | |
| D81 | −4.96 | − |
| | (.39) | |
| F | 21.82 | 162.6 |
| R² | .65 | .93 |

[a]Student t statistics are in parentheses.
[b]Significant at .10 level. [c]Significant at .05 level.

creases in equity in the previous year received smaller EE allocations after accounting for other factors. A general statement of the impact of these three variables is that greater amounts of EE funds were provided in states where the prospects of receiving loans from normal lenders were poorer.

Two variables related to alternative financing possibilities were statistically significant in the EE allocation equation. Counter to the suggested hypothesis, the level of off-farm income of farm families in year $t-1$ was positively related to EE loan amounts in year t. The coefficient of the OFIAVG variable, however, indicates that smaller amounts of EE funds were extended in states where off-farm income was normally of greater importance relative to farm income.

The positive and significant coefficient of the commercial bank market share variable indicates that more EE funds were provided to states in which commercial banks had a larger share of the farm credit market. This supports the hypothesis that banks were more restrictive than other normal lenders during the study period and then more EE funds were consequently needed.

The only dummy variable for national loan allocations that was significant was for 1979, the year of the largest EE loan allocations. The remaining independent variables in the allocation model were insignificant at the 10 percent level.

The estimation of the change in debt equation resulted in a coefficient for the EE loan variable of .97. This coefficient is significantly different from zero at the 99 percent confidence level and is not significantly different than one at the same confidence level. The point estimate of the coefficient indicates that each dollar of EE funds resulted in an increase in the total change in debt equal to 97 cents and hence that the program was almost totally expansionary. The 99 percent confidence interval for the EE coefficient is $.09 < \beta < 1.84$ and the 90 percent confidence interval is $.41 < \beta < 1.53$. The change in debt equation was also estimated with actual values of EE loans used as a regressor rather than predicted values. The point estimate (.96) in this regression was almost identical to that reported in Table 1 and a smaller standard error of the estimate resulted in a higher t-ratio (3.26) for the coefficient.

The coefficients of variation of farm income, the level of off-farm income, and the credit availability proxy variable were all found to be statistically significant and negatively related to the change in debt. These results indicate that less new debt was extended in the presence of higher historical business risk, higher levels of off-farm income, and a recent decreasing trend in credit availability. Net farm income in the previous year, the size of the farm credit market, and the FmHA market share of agricultural debt were all found to be statistically significant and positively related to the change in debt. These results indicate that more new debt was extended in the presence of higher farm income, larger credit markets, and a greater importance of FmHA as normal lender.

## SUMMARY AND CONCLUSIONS

The stated purposes of the EE loan program were to provide credit to farmers facing economic stress, tight credit conditions, and the unavailability of funds from normal lenders at reasonable rates of interest. These justifications of the EE program suggest that the intent of the EE program was to expand the supply of credit available to farmers. The ambiguity of the EE loan criteria, lack of specific guidelines, and difficulty in enforcing the general criteria at local levels raised the possibility that EE allocations would not be consistent with congressional intent and would displace funds from normal lenders rather than expanding the credit market. A General Accounting Office examination of individual EE loans made during the early years of the EE program provided some evidence that this had occurred.

This analysis examined the allocation of emergency loans and the expansionary effect of the EE program at the state level. While this level of aggregation does not allow conclusions to be made regarding the individual loans, it does provide information on whether EE funds were made available in areas that appeared to be in the greatest need, in the context of the program, and whether the farm credit market was expanded by the program.

The empirical findings reported here provide evidence that factors indicating economic stress, tightness of credit, and the inability to obtain funds from normal sources were significant determinants of the allocation of economic emergency loans. Although variations in EE funding in different states were not completely explained and the determinants of individual loans were not di-

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rectly addressed, a general statement that EE funds were allocated in greater amounts to areas experiencing the conditions cited in support of the EE program can be made based on the empirical analysis.

The results of the estimation of the change in debt equation indicated that the EE loan program was primarily expansionary. This finding is consistent with the conclusion that more EE funds were provided in states where the restriction of credit from normal lenders was more likely.

The empirical findings regarding the expansionary and allocation characteristics of the program are positive in the sense that they indicate that the program was administered in accordance with congressional intent, but negative in that they indicate that the program may have contributed to the current financial stress faced by farmers. In the case of loans provided to farm operators who would have otherwise failed during the loan period, the failure was probably only delayed at the expense of EE loan defaults which will ultimately be borne by the taxpayers. To the extent that EE loans expanded the credit use of farm operators who could have survived the 1978-81 period without EE debt, the EE program may have contrib-

uted to their current financial stress by decreasing their solvency. Of course, neither situation would have occurred had farm income and equity increased in the post program years rather than declined.

An expansionary emergency credit program requires an improvement in financial conditions to be a long-term success. If conditions improve, some farm operators who would have failed may have been able to continue operations in the long run. If conditions deteriorate, the failure of operators is only delayed and the direct cost of the attempt is the cost of the loan defaults.

A non-expansionary credit program, used to refinance existing debt to reduce annual debt servicing requirements and to displace higher cost new credit from other lenders, improves shortrun liquidity and cash flow without decreasing solvency. Cash flow improvements from this type of program may not be sufficient to save operators in the worst financial condition. The emergency credit extended is still at risk in the face of declines in income and equity. The risk is less, however, because the program would not decrease the solvency of borrowers and credit will not have been extended to operators facing the greatest stress.

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